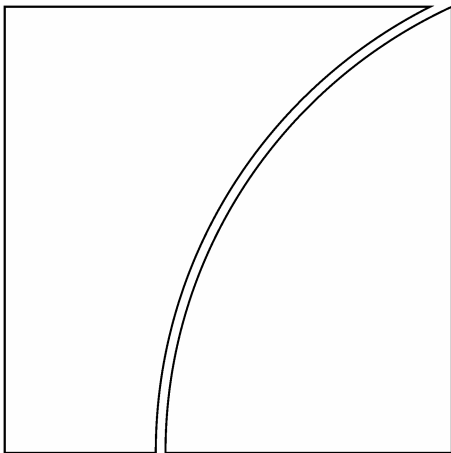




BANK FOR INTERNATIONAL SETTLEMENTS



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### Real estate indicators and financial stability

Proceedings of a joint conference organised by the BIS and the IMF in Washington DC, 27–28 October 2003

Monetary and Economic Department

April 2005



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## Foreword

The papers in this volume were presented at a joint conference on Real Estate Indicators and Financial Stability organised by the International Monetary Fund and the Bank for International Settlements in Washington, D.C., on 27-28 October 2003. The purpose of this conference was to discuss and explore the theoretical as well as the practical issues underlying the development and use of real estate indicators in assessing financial stability.

A key aspect of the current attention on financial stability is the collection of information to assess the strengths and risks of financial systems using statistical indicators collectively known as Financial Soundness Indicators (FSIs). Real estate prices are part of these indicators. However there has been less emphasis on the identification and use of appropriate statistical information relating to real estate markets. It is hoped that this volume will go some way in addressing these gaps and stimulate further discussion in this area.

The papers in the volume are grouped into broad thematic areas as they were discussed in the conference: review of the impact of real estate on monetary and financial stability, usefulness of available statistics, country experiences in the compilation of real estate price indices, methodological issues on residential and commercial real estate prices, hedonic real estate price indices, aggregation issues, valuation of real estate in special situations, and areas of future work.

The volume also contains a summary of the discussion that took place at the conference on possible future areas for work. Transcripts of the discussions during the individual sessions of the conference are available upon request.

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# Welcoming remarks

## Horst Köhler

I am pleased to welcome the distinguished experts and observers to the joint IMF/BIS Conference on Real Estate Indicators and Financial Stability.

This is the first such international conference in this area. The IMF role as an organiser reflects the fact that one of the primary areas of the IMF's mission - the safeguarding of the stability of the international financial system - must necessarily deal with the relationships between real estate activity, price cycles, and the stability of banking institutions and financial systems. The relationship between real estate market collapse and financial crisis has been demonstrated repeatedly. Examples of financial distress and crisis related to a collapse in real estate prices include cases as diverse as the U.S. savings and loan crisis in the late 1980's, the financial crises in Sweden and Japan in the early 1990's, and the widespread real estate market collapses and financial crises in Southeast Asia in 1998. The Bank for International Settlements (BIS) has long recognised these interrelationships. So, I am greatly pleased that the BIS co-sponsors this conference because their intense and continuing work in this area goes back to the real estate driven recession of the late 1980's and early 1990's.

I would like to begin by saying a few words about the evolving role of the International Monetary Fund in bolstering the vitality and stability of the international financial system. The IMF is charged with the task of supporting the operation of the international financial system. As part of its regular consultations with member countries on their economic conditions and policies, there has been increasing recognition that the achievement of many of the Fund's macroeconomic goals requires the efficient and stable operation of the financial system. Specifically, during the past two decades, financial sector crises have had recurrent, severe economic consequences that also impaired the effectiveness of macroeconomic policies.

In recognition of these needs, in 1997 the IMF and the World Bank collaborated on the creation of the Financial Sector Assessment Program (FSAP). The FSAP is a voluntary program in which countries agree to receive teams of financial sector experts drawn from the IMF, World Bank, and cooperating official institutions and standard setters who undertake a comprehensive examination of potential financial sector strengths and vulnerabilities and structural weaknesses, as well as countries' observance of key financial sector standards, codes, and good practices. Also, a specific focus of the FSAP by our sister institution, the World Bank, has been on the medium- and long-term structural development of the financial system as part of the overall economic development of the economy. The FSAP has proven to be a highly effective tool to strengthen the financial sector, as demonstrated in part by the long list of volunteers for future assessments and requests for follow-up assessments. A number of the elements of the financial sector review process are now being increasingly included in the regular Article IV surveillance process, as appropriate.

One of the aspects of the current emphasis on financial stability is the collection of statistical information needed to assess the risks and strengths of financial systems. Such information may be referred to as Financial Soundness Indicators, or FSIs, about which you will hear more later. In the IMF's research and consultations on FSIs, a recurring theme from analysts, policy officials, and practitioners was the need for information on financial sector exposures and risks related to residential and commercial real estate and construction. Numerous experts cited an apparent relationship between collapses in real estate prices and financial sector stress and crisis. Moreover, frequent mention was made about the absence of timely and reliable information, or sometimes the complete absence of any information, about the condition of the real estate market.

Our work on FSIs pointed to the need for improvement in statistics on real estate, and our Executive Directors this past June endorsed the staff's efforts to encourage the compilation and dissemination of real estate price indices for residential and commercial real estate. We are pleased that our colleagues at the BIS are our co-sponsors. This collaboration can bring great benefits by melding discussions on the links to financial stability with the technical and statistical matters that will permit national authorities, market participants, and the international community to develop timely, high-quality information on real estate activity and markets and their strengths and risks.

And this, of course, is where you come in. We have drawn together from around the world a truly expert group of researchers, central bankers, real estate professionals, standards setters, and users to

advise us on these questions. Some are sitting around the table here as presenters and discussants, but an equally illustrious group is sitting in the audience. All are invited to participate in the discussions, and we are looking forward to a lively and challenging interchange of views. It is our hope that we can make progress clarifying many of the technical issues. As well, we hope to gain a clearer understanding of what priorities should be followed, and - while fully recognising the resource issues and the complexity of the work - identifying the practical next steps that can be taken by the international community, national authorities, and the private sector.

Before turning the conference over to Mrs. Carol Carson, Director of the IMF's Statistics Department, and Mr. Paul Van den Bergh, Head of Information, Statistics, and Administration of the Bank for International Settlements, let me express my appreciation for your participation and contributions to this conference. Thank you very much.

## **Carol Carson**

I would like to add my words of welcome to that of the Managing Director to this BIS-IMF Conference on Real Estate Indicators and Financial Stability. I do so in welcoming you especially on behalf of the IMF Statistics Department.

A little bit about the history of this conference. The conference grew out of our work on the development of financial soundness indicators. As the IMF Managing Director used the term FSIs, I will go ahead and do the same. A little over a year ago, in this work on FSIs, during discussions regarding the possible role of real estate in financial stability, our colleagues at the BIS proposed a joint conference. The idea at that time was to hold a conference to explore the state of information on real estate, to assess the needs of various kinds of users of statistics on real estate, to deal to the extent that we could in a few days' conference with some of the technical issues, and then especially important, to explore the steps that might be taken by the international community to move forward in this area.

I am delighted that the BIS joined us in this first-ever conference on real estate and to deal with the issues that I just mentioned. Paul Van den Bergh and I find ourselves in a number of these collaborative ventures, and from the point of the IMF I can say they have always been very fruitful. When I look back over the last three months, we had reason to be together and work collaboratively in August, September, and now we came through finally at the end of October with this joint effort.

As the IMF Managing Director said, we look around this room and feel that we have brought together a bountiful degree of expertise - knowledgeable economists and statisticians from central banks, national statistical institutes, international organisations, academic institutions and the private sector.

The papers that have been prepared are a good leading indicator that we will have a productive, useful conference. We will have opportunities to share views, to exchange information on national practice, hopefully to identify some best practices and discuss how these best practices can be used in building real estate indicators relevant for the conduct of macroeconomic policy and the monitoring of financial stability.

The statisticians among us, of course, have long been involved in the compilation of statistics related to real estate. These statistics are used, for example, in national accounts and, as well, there have been some indices of real estate that have been used in macroeconomic policy analysis. What is different about this conference is that it takes the statisticians in a new direction to focus on the relationship between real estate indicators and the soundness of banks and the financial sector. In the process, we hope to gain insights into the new types of information that would be needed to help assess financial soundness, conduct macroeconomic policy and enrich the user community with the relevant methodological information about how the statistics are put together. In addition, we should begin outlining the steps that will carry us forward.

Briefly, I would like to foreshadow some of the questions that I believe that we will deal with in this conference. Let me start with the fact that we know that real estate prices as prices of assets may play a significant role in economic policy. They are used, for example, as information variables in making monetary policy decisions. They provide information on possible balance sheet problems that lending institutions may be facing, and hence they provide indicators of financial stability.

In that setting, we can ask, can we identify a specific set of real estate indicators useful for both macroeconomic policy and financial stability analysis, or are different types of indicators needed for these different purposes? Can leading indicators be developed that will alert emerging real estate-related problems to the banking sector and to the overall stability of the financial sector?

Moving on, a number of countries are developing and using a wide range of indicators that apply various analytical tools, concepts, and samples. Some countries are publishing relevant data in their national bulletins or on their website. However, a significant task is still ahead in terms of constructing timely, reliable, and analytically useful real estate indicators.

We know that there are inherent difficulties in real estate that make them, if not unique, certainly unusual. Among these are the fact that real estate properties are heterogeneous and they are thus non-standard assets. We also know that transactions of individual properties are infrequent. Both of these mean that putting together statistics is especially difficult.

In this respect, I would raise the following questions. Which are the techniques most widely used in compiling real estate indicators? Can we identify international best practice in the methods for constructing these indicators, or should we emphasise flexibility in adjusting the techniques to local conditions and resources? Further, which criteria should guide decisions on the type of indicators that should be disseminated to the public?

We know that the collection of information on real estate is costly and much of the available information is proprietary. We should ask which models shed light in effective sharing of information between various data providers, including both the public and the private sectors.

What steps can be taken to improve the use of the existing sources of data in compiling real estate indicators? What institutional and legal changes could facilitate the compilation of these indicators? Who are the major providers of the data and with what reliability and at what cost do they produce indicators? Of course, a question relevant to the IMF and to the BIS is what support should be provided by the international community, regional organisations, and standard-setters.

With these questions in mind, I would like to make a particular comment. I would encourage you to share your insights in this important area. We have tried to set up an environment that will encourage and facilitate a free flow of information. As the Managing Director said, all are invited to speak. There are microphones around the tables, but there will also be microphones that can be used by the audience around the edges. We have tried to set up an environment that will facilitate a free flow of information.

I stress the importance of sharing information because I do see that this conference may well have an impact in the way we go forward. The results of this conference may well affect the future priorities for work in this area, the degree of cross-country harmony that we can bring about, the types and degree of technical assistance that the international organisations might be able to offer, and the mix of public versus private that would carry us forward to the greater availability of information in this field.

I am gratified to report that the interest in this conference has been extremely high. We've been pleased that so many people were so willing to travel so far to be here for this two days of conference. And as I mentioned, the papers are, as we see it, of outstanding quality.

We know that we've made one important step in making the papers available on the website of the BIS, with their very user-friendly eBIS facility, and we look forward to putting the papers into a conference volume as well.

For all of this, then, I thank you for being here and I hope that you will find our facilities here at the IMF help us have a good conference. You will find that staff from my department are at various places around this room and outside, and I hope you will freely draw on them if you have questions or other needs. With that, I say thank you very much and again welcome.

## **Paul Van den Bergh**

Good morning, ladies and gentlemen. On behalf of the Bank for International Settlements, I would also like to welcome you to this Joint Conference on Real Estate Indicators and Financial Stability.

I'm doing this on behalf also of the colleagues that have travelled with me from Basel. Maybe we can briefly introduce them because they have done most of the work. If I just start left, Steve Arthur, Haibin Zhu, and Gert Schnabel, who is on this side of the table.

So we're very pleased to be here today and to participate in this conference. But, Carol, I'm particularly pleased at the beginning of the procedures and as a cosponsor, although I think I should reserve the final judgment until after we've finished our discussions.

First of all, I'm very pleased with the active cooperation that we've had between our two organisations and how this has led us to where we are today, with all the papers on the table and so many useful discussions to come.

I'm particularly pleased that we have been able to attract so many distinguished speakers, discussants, panellists, and session chairpersons from different parts of the world. The papers that have been produced indeed are of very good quality and there is much food for thought on the table.

I'm also pleased - and this was one of the objectives that we set out when we organised the conference - that we have been able to draw on expertise and get input from various areas - and this was a conscious decision on our part-national statistical institutes, central banks, other government agencies, academics, and commercial data compilers and vendors. And I think it's this mixture that we have, these different perspectives that we've tried to bring to this conference, that will contribute to interesting discussions, I hope.

And then finally, as you said, Carol, I'm particularly pleased already by the interest that the conference has attracted outside the group of people here today. We, at least, have had a few inquiries and a few questions before we travelled to Washington from people who said, well, we would have liked to participate. We had to limit it, but there's a clear interest from outside the group that is here today and tomorrow already.

Ladies and gentlemen, attention to property prices, real estate, at the Bank for International Settlements, as the Managing Director was saying earlier, dates back to the late '80s and early '90s, when we started to focus on the meaning of these concepts of asset price inflation and deflation and the role of asset prices in the conduct of monetary policy. And this was even before we then saw the major fluctuation in prices in asset markets in the latter part of the 1990s and during the early part of this millennium.

More recently, asset prices, including those for residential and commercial property, have started to be looked at from a financial stability perspective as well. I will not go further into details. One of my colleagues has drafted an interesting paper on this and he will present that a bit later in the conference this morning.

Now, ever since we started to pay closer attention to property prices at the BIS, we found it very difficult to collect and maintain good data on property prices. We built up a database to start monitoring developments in individual countries, and one of my colleagues will explain again a bit later this morning the difficulties that we have encountered.

Let me just very briefly state up front what these major challenges have been. First of all, surprisingly, data are simply not always available on a regular basis, at least, for many countries. That is very strange, but that is just the fact.

The representativeness of the data that we find is questionable. I mean, the data sources and the methodologies are not always very well-explained. That makes the international comparison of statistics on property prices extremely difficult, and if you then want to do a comparative economic analysis, that is not an easy task.

There are very many breaks in series, changes in the methodologies, changes in underlying sources that make it very difficult to have particular historical data. And just recently, some of my colleagues who have been doing work on predicting financial crisis have noticed that with a lack of historical data, there is just a limit now to how far back in history we can go to test some of the models that we have developed. And then last but not least, the timeliness and the frequency of the data is inappropriate.

Carol, if I were to use the IMF Data Quality Assessment Framework (DQAF) - and focus on what is in the framework - data integrity, methodological soundness, accuracy, reliability, serviceability - it's clear that almost no country would meet these various criteria for its national statistics on property prices.

Now, we were not the only ones at the BIS to be surprised by the lack of proper data in this area. In a recent survey of global property markets, The *Economist* magazine commented, and I quote, "Official

statistics officers typically collect more information about the price of shoes or cement than housing, despite its far greater importance.”

Also, in June 2003, the Governor of the Bank of Canada, David Deutsch, said in a speech to the Conference of European Statisticians, at which there were a large number of national statistical institutes present, and I quote, “Given that the investment in housing represents a big chunk of household spending, and that for most people their homes represent their most valuable asset, it is surprising that in many countries there are no comprehensive, quality-adjusted data on housing prices or rents,” end of quote.

By the way, we were both present at that conference and we took comfort from the encouragement that David Deutsch - Governor Deutsch - gave us in his speech in convening this joint conference.

We have also noticed that researchers and market participants are struggling to obtain good data, if only because we get very frequent requests at the BIS for the data that underlie the different charts, tables, and econometric results that we publish in our various publications.

In many cases, we cannot share the data because we obtained it from a commercial source, and in other cases if we are able to point people to publicly available data, we often have to explain the various limitations that exist and the weaknesses that are inherent in the available data.

So we were particularly encouraged when the IMF decided to include their property prices in their financial soundness indicators - I think we'll use the acronym FSIs, although you realise that we have an FSI in Basel that is completely different, the Financial Stability Institute. Admittedly, they will not be core indicators, but part of what is called the encouraged set of statistics. And when we had earlier discussions - and I think this dates back to about a year in this room - on the methodology for financial soundness indicators, there were clearly some open methodological questions relating to real estate. Not surprisingly, we couldn't reach agreement in this relatively new area of research.

So the conference today and tomorrow should be able to allow us to identify best practices in the development of appropriate property price statistics. And I'm sure that this can then find its way in the next version or versions of the *IMF's Compilation Guide on Financial Soundness Indicators*.

Apart from the various practical methodological issues that we will be addressing, there is one simple reason why we at the BIS felt that a conference on real estate prices might be useful. And this dates back now to the earliest work we did on property prices almost ten years ago. To quote from the seminal BIS economic paper from April 1994, and I quote, “Statistical deficiencies in this area of property prices result in part from a certain neglect bred by under estimation of the potential policy significance of the data,” end of quote.

Now, the fact that the IMF and the BIS have joined forces to call this conference is possibly the biggest contribution we could make to achieve a broader recognition that good statistics on property prices are of key importance to policymakers, to analysts, and to economic agents, and that projects to improve statistics in this area should receive high or higher priority.

Ladies and gentlemen, if I may - and I'll start on the proceedings of the conference very quickly, go not in detail through the program, but indicate that we have a very charged agenda for this conference.

We're going to start in just a minute with a review of the impact on real estate on financial and monetary stability. So we look at sort of the broad analytical and economic questions first. After that, we will hear about the usefulness of the available statistics, which will prove to be very interesting; listen to the experiences from a broad group of countries in the compilation of real estate statistics. After that, we will focus on methodological issues, specifically and separately first for residential and then for commercial real estate prices. Having done that, tomorrow we will then focus on the usefulness of particular methods, hedonic methods, in particular, for calculating real estate prices. And we will look at aggregation issues, aggregation across regions in a country, across different countries, and across different asset classes. And then toward the end, the difficulties of valuing real estate in special situations will be investigated. We will then close tomorrow afternoon with a panel discussion where we will evaluate what we have learned and try to sketch the way forward.

Ladies and gentlemen, you may agree with me that we have a challenging but very attractive program. I think all of us look forward to interesting presentations, active discussions, and good networking. And hopefully the conference will stimulate further work on methodologies and, most importantly, will convince compilers worldwide of the importance of improving property price statistics. In this way, the conference may make a modest but concrete contribution to promoting monetary and financial stability. Thank you very much.

# Real estate prices as financial soundness indicators

Robert Heath

## I. Introduction

“Real estate has been a neglected area because it has always been treated as an independent sector. Now, the real estate sector is viewed as a significant contributor to the financial position of financial institutions in terms of mortgage loans as well as asset holdings. Thus, real estate prices are critical for the financial sector and in terms of measuring the wealth of the country. This is an area where information is lacking. In our country, there is no agency that collects real estate market prices.”

This comment was received by the International Monetary Fund (IMF) in response to comments on the draft *Compilation Guide on Financial Soundness Indicators (Guide)* that was posted on the IMF's public website in March 2003. It sums up succinctly a common view of real estate prices from both the user and compiler perspectives. The data are needed but are lacking.

## II. What are financial soundness indicators?

Financial Soundness Indicators (FSIs) are indicators of the current financial health and soundness of the financial institutions in a country, and of their corporate and household counterparts. They include both aggregated individual institution data and indicators that are representative of the markets in which the financial institutions operate. FSIs are calculated and disseminated for the purpose of supporting national and international surveillance of financial systems. In short, the development of FSIs is a key tool in the IMF work to strengthen financial system stability.

This initiative was prompted by the financial market crises of the late 1990s and the growing observation of the number of banking crises that has occurred globally in the last two decades. As has been well reported in research by the IMF, BIS, and others, there are significant costs arising from these crises, both direct (such as the cost of recapitalising the deposit-takers) and indirect (such as the loss of real economic activity), and this has demonstrated a need to develop a body of statistics that could support policymakers in identifying the strengths and vulnerabilities in their financial system and in taking action to prevent the likelihood of such crises occurring.

FSIs are only one part of the IMF's work in the field of crisis prevention, and of course the IMF's work itself is part of a larger international effort, including the Bank for International Settlements and others. Notably, FSIs are an input into the IMF-World Bank Financial System Assessment Program (FSAP). This programme is designed to identify financial system strengths and vulnerabilities and to help develop appropriate policy responses. More information on FSAPs, including the countries that have participated, is available at <http://www.imf.org/external/np/fsap/fsap.asp>.

## III. Where do we stand with the FSI project?

The work began in 1999 with a conference of experts in the field of financial stability issues. That conference was similar to this one on real estate, with private and public sector experts exploring key user and compiler issues. Taking forward the outcome of that meeting, and after undertaking wide consultation, in 2001 IMF staff presented the IMF Executive Board with a list of FSIs, which it endorsed. The list (attached) is divided between core indicators and encouraged indicators in order to help prioritise future work at the national level. All the core indicators - FSIs considered to be useful in all countries and generally available - relate to deposit-takers, which are institutions that are central in all financial systems. The encouraged FSIs include real estate prices and the extent of deposit takers' exposures to residential and commercial real estate.



Subsequent to the 2001 meeting, and with Directors' endorsement, to support national compilation efforts IMF staff began preparing a draft *Guide*, collaborating with international and regional organisations, and national agencies interested in financial soundness issues. Following extensive public consultation this year, the *Guide* should be finalised in 2004. The text is available at <http://www.imf.org/external/np/sta/fsi/eng/guide/index.htm>.

#### **IV. Where do real estate prices fit into FSIs?**

From the very start of the work on FSIs at the conference for experts, it has been evident that for most economies monitoring real estate prices is important for financial stability analysis. Others will discuss this issue in more depth ahead so I will not dwell on the reasons why, but simply note that from the viewpoint of deposit-takers, and other sectors, there can be large exposures (both direct and indirect) to an asset whose price can be volatile not least because of the actions of lenders themselves. For this reason, residential and commercial real estate prices are included in the list of FSIs along with deposit-takers' lending on such real estate.

In the draft *Guide*, there is a chapter providing advice on compiling real estate prices. The chapter is modest in its ambitions. It acknowledges the relative lack of international experience in constructing real estate price indices, particularly in the official sector, and the costs involved in creating real estate price indices. Therefore, the chapter focuses on describing a range of techniques whose application can be based on local needs, conditions, and resources rather than recommending a single set of indices or compilation methods. The chapter is more focused on prerequisites than on providing detailed technical advice. We see this meeting as the beginning of a process of raising technical knowledge and capabilities in this field, and building on the start represented by the chapter in the *Guide*.

We expect that implementing the new *Guide* is likely to prove a medium-term rather than a short-term process. This is nowhere more true than in the field of real estate prices.

#### **V. Types of questions raised**

Finally, let me turn back to the author of the quote at the start of this presentation. The commentator went on to raise a number of possible technical issues that could be discussed. I leave them as examples of the types of questions that those who want to move forward with real estate prices are asking:

1. "How do we deal with the large diversity in residential and non-residential buildings?"
2. Another problem is the lack of an inventory of residential/non-residential buildings. How is this compiled?"
3. How are prices for real estate assets collected? Can unit values be used instead of actual prices? Does market price refer only to current cost of construction and land or the selling price of the real estate unit?"
4. How do we deal with conversions of agricultural land to commercial properties? Prices can increase significantly."

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**Financial soundness indicators:  
the core and encouraged sets**

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**Core set**

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Deposit-taking institutions	
<i>Capital adequacy</i>	Regulatory capital to risk-weighted assets Regulatory Tier I capital to risk-weighted assets Nonperforming loans net of provisions to capital
<i>Asset quality</i>	Nonperforming loans to total gross loans Sectoral distribution of loans to total loans
<i>Earnings and profitability</i>	Return on assets Return on equity Interest margin to gross income Noninterest expenses to gross income
<i>Liquidity</i>	Liquid assets to total assets (liquid asset ratio) Liquid assets to short-term liabilities
<i>Sensitivity to market risk</i>	Net open position in foreign exchange to capital

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**Encouraged set**

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Deposit-taking institutions	Capital to assets Large exposures to capital Geographical distribution of loans to total loans Gross asset position in financial derivatives to capital Gross liability position in financial derivatives to capital Trading income to total income Personnel expenses to noninterest expenses Spread between reference lending and deposit rates Spread between highest and lowest interbank rate Customer deposits to total (non-interbank) loans Foreign currency-denominated loans to total loans Foreign currency-denominated liabilities to total liabilities Net open position in equities to capital
Other financial corporations	Assets to total financial system assets Assets to gross domestic product (GDP)
Nonfinancial corporate sector	Total debt to equity Return on equity Earnings to interest and principal expenses Net foreign exchange exposure to equity Number of applications for protection from creditors
Households	Household debt to GDP Household debt service and principal payments to income
Market liquidity	Average bid-ask spread in the securities market <sup>1</sup> Average daily turnover ratio in the securities market <sup>1</sup>
Real estate markets	Real estate prices Residential real estate loans to total loans Commercial real estate loans to total loans

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<sup>1</sup> Or in other markets that are most relevant to bank liquidity, such as foreign exchange markets.

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# The importance of property markets for monetary policy and financial stability<sup>1</sup>

Haibin Zhu<sup>2</sup>

## 1. Introduction

The real estate sector has been a major source of strength for the global economy since the most recent economic downturn. This has been particularly true of the residential property sector: in most countries house prices have been quite strong over the past few years. Rising house prices, together with low interest rates, have boosted mortgage refinancing activities, encouraged consumer spending and supported macroeconomic performance. By contrast, real commercial property prices in most economies have remained well below their peak levels reached in the late 1980s and the early 1990s. Despite this, delinquency rates for commercial real estate loans have been much lower than their historical averages. As a result, banks' loan portfolios have remained in reasonably good shape overall and the share of non-performing loans has been relatively low (BIS (2003a)).

The strong performance of the property sector and the general resilience of financial institutions stand in sharp contrast to the experience of the early 1990s. In the previous episode, the boom and subsequent bust in the property sector, particularly on the commercial side, were a major contributor to the banking problems. Sharp downward corrections in commercial property prices caused a broad-based reduction in profitability and a widespread deterioration in asset quality in the banking industry, driving many financial institutions into distress.

Despite these obvious differences between the two episodes one decade apart, a common underlying theme is the sizeable impact of property markets on the soundness of financial institutions and on macroeconomic activity. This impact is of course not a new observation. It is generally believed that the boom-bust nature of property price fluctuations has played a role in past business cycles, fuelling the upswing and magnifying the downswing. Falling property prices tend to impose downward pressure on the banking sector, not only because of increases in bad debt expenses for real estate loans, but also because of a deterioration in the balance sheets of corporate borrowers that rely on real estate as collateral. Hence, questions about the movements of real estate prices and the extent to which they interact with the financial sector and the macroeconomy have come to the attention of monetary authorities and financial regulators.

Against this background, this paper has three major objectives. The first is to explore the determinants of real estate prices and to examine exogenous and endogenous factors that contribute to property price fluctuations. It is shown that, although property price movements share some similarities as belonging to the same class of assets, they can differ substantially across sectors and countries. The second objective is to discuss the policy implications of the real estate cycle for the conduct of monetary policy. Finally, the paper seeks to identify important channels through which bank performance would be affected by movements in property prices. The next three sections tackle these three issues sequentially.

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## 2. Real estate as a particular type of asset

The determinants of property prices are in many ways similar to those of other assets, namely the expected service stream (consumption service) or expected future cash flow (rents) and the required rate of return (the long-term interest rate plus the risk premium) as a discount factor. In the long run, property prices therefore depend on demand factors, such as national income and average discount rates, and on supply factors, such as cost of construction, land availability and the quality of the existing stock.

Nevertheless, property markets also have a number of distinctive features compared with other types of asset. The supply of property is intensively local; delivery of the new stock can take quite a long time owing to the length of the planning and construction phases; rents can be very sticky because of the use of long-term rental contracts; market prices lack transparency and most transactions occur through bilateral negotiations; the liquidity of the market is constrained because of the existence of high transaction costs; borrowers rely heavily on external finance; real estate is widely used as collateral; and short sales are usually not possible. These features cause property prices to behave differently. In particular, in the short run, property prices are more likely to deviate from their long-term fundamentals. And fluctuations in property prices can arise not only owing to cyclical movements in economic fundamentals, interest rates and the risk premium, but also as a result of the intrinsic characteristics of the property market itself.

The business cycle causes property price fluctuations for obvious reasons. Improvements in overall economic conditions tend to increase the average income of households and therefore boost the demand for new homes, putting upward pressure on house prices. Similarly, businesses see profitable opportunities and seek to expand the scale of their investments. Such an expansion implies a higher demand for office space and storage, driving up commercial property prices. In addition, the market perception of risk changes with the phases of the cycle. During a booming phase, the risk involved in a given project is considered to be lower than in a downward phase. The changing risk premiums, in combination with time-varying interest rates (decided by policymakers), determine the discount rates and by extension have a sizeable impact on real estate prices.

Property price oscillations are also driven by endogenous factors, most notably supply lags and the historical dependence of investment decisions. On the one hand, the supply response in the property market is much slower compared with that of other goods, mainly as a result of limited land supply and the length of the approval process and the construction phase. On the other hand, the flow of information in the property market is usually inefficient. Because the turnover rate of properties is usually very low, the price information is rather limited and often inaccurate. In particular, much of the information that is important to understand the dynamics of property prices is related to knowledge of local markets, which is accessible only at a substantial cost. Therefore, it is usually very difficult, if not impossible, for market participants to forecast the future movements of property prices. In practice, market forecasts either rely heavily on current property prices or are computed by extrapolating past trends. This so-called “myopic” or “rule of thumb” expectation (Hendershott (1994) and Herring and Wachter (1999)) can contribute to endogenous oscillation of property prices or deviations from their long-run equilibrium values.

For example, during a booming period real estate prices continue to rise. Based on the past trend or current prices, constructors and developers decide to start new construction. However, as new construction may take several years to be completed, the adjustment process is slow. By the time the construction is delivered, the market demand may have fallen off. As a result, vacancy rates climb. The oversupply forces rents and real estate prices to fall, sometimes even below their fundamental values.

This “overbuilding” story can occasionally result from the distortion of private incentives by inappropriate or flawed government policies on both the regulatory and legislative fronts. One notable example is related to financial liberalisation after the 1970s in a number of industrial and emerging market economies (see Borio et al (1994) and BIS (1993)). Following liberalisation and deregulation, new financial institutions emerge and compete with existing lending institutions by offering loans on cheaper terms. As competition among lenders intensifies and more resources for financing real estate projects become available, the number of potential investors in the real estate sector increases and property prices will rise above their fundamental values. The distortion effect is even stronger when there are moral hazard problems in the market related to inappropriate policies such as overly generous guarantees and inefficient regulation. Guarantees against losses create an incentive for lenders to invest in high-return, high-risk projects, resulting in excessive risk-taking and overly

exuberant property assets. This mechanism of real estate cycles has attracted a lot of attention in the past two decades. It is widely believed that financial liberalisation has contributed to a series of real estate boom and bust episodes, including the collapse of the US thrift institutions in the late 1980s and the 1997 East Asian crisis.

Beyond these common characteristics, the dynamics of property prices can vary substantially across sectors (residential vs commercial, office vs retail, etc) and across countries as a result of differences in a number of specific demand and supply factors. For example, while housing prices on average have posted robust growth since the mid-1990s, experience has differed considerably across countries. House price growth has been particularly strong in Australia, Ireland, the Netherlands, Spain and the United Kingdom, followed by the United States and some of the Nordic countries. At the other end of the spectrum are Germany, Japan and Switzerland, where prices have remained rather flat or even declined over the past decade. A second example is the usual divergence between housing markets and commercial property markets. In the most recent economic downturn, the residential sector was very strong, reflecting the substantial role of low interest rates. Conversely, the commercial property sector seemed to be more constrained by the sluggish macroeconomic environment and posted capital losses in most industrial countries. Such national and sectoral differences can be attributed to asynchronous business cycles, as well as to distinctive local factors (elasticity of supply, funding methods, subsidy/tax policies, legal framework, etc).

## **2.1 Residential property prices**

A house is a long-lived asset that delivers consumption services over many periods. In many respects it is more like a durable good than an investment asset. Given that residential property can provide accommodation to its owner, it has an intrinsic reservation value determined by the discounted value of the expected service stream. As a result, nominal housing prices are usually less likely to fall as sharply as equity prices and commercial real estate prices. Indeed, in many situations the downward pressure on the housing market is typically reflected in shrinking transaction volumes rather than in a collapse in nominal prices, as owners refrain from selling at a loss.

As noted, housing price fluctuations can be driven by macro factors and intrinsic characteristics of the housing market itself. Empirical evidence suggests that the market has its own distinct dynamics. On average, almost three fifths of the overall variation in housing prices can be explained by innovations in the housing market itself. The combined effect of other explanatory factors, such as GDP, interest rates, bank credit and equity prices, accounts for the rest (Graph 1).

However, Graph 1 also suggests that the importance of individual factors differs substantially across countries. This could be so for various reasons: the demand for houses is determined by demographic dynamics in each country; the supply of new homes can be constrained by land availability and the local land planning system; the financing cost of home purchases depends to a large extent on the housing financing system; and the liquidity of the housing market may be further constrained by the existence of transaction costs such as VAT, stamp duties and registration fees, as well as real estate taxes. All of these factors are local and specific to each market, leading to cross-country differences in housing price movements and in the relative importance of various factors.

An important factor that exhibits substantial cross-country variation is the responsiveness of supply. While house prices are determined by construction costs in the long run, the supply of new housing can only respond sluggishly to demand in the short horizon. Hence house prices may deviate from their long-term trends for a considerable period of time. The inertia of supply responsiveness depends to a large extent on local legislative and structural factors, as well as on tax and subsidy policies. The fact that new housing policy is less responsive to price movements in some countries, such as the Netherlands, the United Kingdom and some of the Nordic countries, has partially contributed to recent housing booms in these areas. Extreme cases are the Netherlands and the United Kingdom, which have witnessed actual reductions in the supply of housing during their latest round of housing booms. This pervasive development, which may be attributable to strict land development policies and caps on the supply of new housing, in turn drove housing prices even higher. By contrast, housing prices in Germany have remained flat in the past decade. Many believe that the flatness can at least be partly explained by the more flexible supply conditions in Germany relative to the other European countries.

The functioning of the housing markets also relies heavily on the housing financing system, where there is a bewildering variety of contract arrangements, policies, tax breaks and subsidies. First, the duration of the interest rate that anchors mortgage rates is different across countries. In particular,

mortgages in Australia, Canada, Finland, Ireland, Luxembourg, Norway, Portugal, Spain and the United Kingdom are mainly based on short-term interest rates, making house prices generally more responsive to short-term interest rates in these countries. By contrast, the majority of mortgage financing is tied to long-term interest rates in Belgium, Denmark, France, Germany, Italy, Japan, the Netherlands and the United States (see Borio (1995) and ECB (2003)). Second, the nature of the penalties on early repayment has a significant impact on how far households will be willing and able to refinance their mortgage debts when interest rates fall or when house prices rise. Refinancing in the United States is notably easier and cheaper than in other countries, not only because of smaller penalties but also due to innovations in mortgage securitisation introduced by Fannie Mae and Freddie Mac (see Deep and Domanski (2002)). Third, collateral valuation practices have potentially major implications for credit supply. Valuation methods that are very sensitive to market values, in combination with high loan-to-value (LTV) ratios, would generate a boom in credit supply when property prices rise and a credit crunch when prices fall (see Borio et al (2001) and G10 (2002)). Finally, lower transaction costs may stimulate turnover and enhance the responsiveness of housing markets to macroeconomic shocks. The ratios of transaction costs (including stamp duty, registration fees and real estate taxes) to house prices vary from a low level of 2% in the United Kingdom to exceptionally high levels of 20% in Belgium and 14% in France. Other things being equal, rising demand is more likely to have a larger impact on house prices in the group of countries with lower transaction costs (Graph 2).

While house prices are mainly determined by the above housing market factors, they can also be responsive to returns on other asset classes. An interesting issue that has drawn a lot of attention lately is the comovement between equity prices and housing prices. Given that equity holdings and housing are the two largest portfolio components of household wealth in developed countries, price inflation in one asset will influence the investment decisions of households; the resulting reallocation of portfolios will affect the price of the other asset. In theory, there might be two effects working in opposite directions. The substitution effect suggests that the two asset prices should move in opposite directions, as higher returns in one market will shift investment away from the other market and cause its price to decline. By contrast, the wealth effect predicts that an increase in equity (or house) prices, by increasing the value of household wealth, will allow households to expand their investment in both markets. As a result, the two asset prices will tend to move in the same direction. Depending on the relative importance of the two effects, the interaction between the two markets may be very different.

The connection between the two assets is supported by empirical evidence, which shows a clear pattern in the lead-lag relationship between equity prices and housing prices in many developed countries over the past 30 years. In particular, equity price fluctuations tend to be highly correlated with house price fluctuations six quarters later (Graph 3). Further evidence can be derived from impulse response analyses based on a VAR analysis (see Appendix). The results suggest that equity price fluctuations contribute to the variation in house prices, and the cumulative effect usually peaks after eight to 10 quarters (Graph 4). The fact that housing prices continued to rise three years after the collapse of the equity market in the most recent slowdown is mainly attributable to the current low interest rate environment, which partly offsets the downward pressure associated with falling equity prices. Overall, the substitution effect appears to have played a more important role lately as households which were disappointed with the prospects of equity market investments shifted a large proportion of savings into residential real estate.

## **2.2 Commercial property prices**

Commercial property markets have some unique characteristics, such as longer construction lags, long-term leases and volatile income streams, which cause the commercial and residential property cycles to show distinct patterns. Moreover, commercial property cycles may be asynchronous across regions and sectors. Depending on the elasticity of supply, development lags, durability of assets and funding methods, different types of commercial property may themselves have varying dynamics.

Unlike residential real estate, commercial property is more of a pure investment asset and its value is determined by the discounted value of future rents. When macroeconomic conditions weaken, shrinking business activity cuts down the demand for commercial property and results in higher vacancy rates. Rising vacancy rates and lower rental rates lead to a deterioration of real estate market fundamentals and cause prices to fall. Compared with a residential property, the reservation value for a commercial property is much lower, because its consumption value is low while its maintenance cost is very high. As a result, commercial property prices tend to be more responsive to macroeconomic

conditions, and it is common to observe a sharp decline in nominal commercial property prices during an economic downturn. As Graph 1 suggests, the dynamics of commercial property prices are somewhat less “autonomous” than those of residential sector prices, in the sense that shocks in the commercial property sector explain only 50% of the variation in property prices while the equivalent figure in the residential sector is about 60%.

Graph 1 also reveals the importance of bank credit in determining commercial property prices. This might relate to the fact that commercial property has been widely used as collateral, so that property prices are closely connected with borrowers’ financial positions. This idea has been formerly modelled in the seminal work of Bernanke et al (1994) and Kiyotaki and Moore (1997), who highlight the importance of credit market imperfections resulting from asymmetric information between borrowers and lenders. To overcome the adverse selection and moral hazard problems, banks choose to link the terms of credit to the net value of borrowers’ balance sheets. In other words, the borrowers’ borrowing capacity and cost of external finance largely depend on the value of collateral assets. This introduces a strong interaction between bank credit and the balance sheets of borrowers. Higher collateral (such as real estate) values improve the debtors’ balance sheets and allow them to finance new projects on more favourable terms. The availability of extra credit in turn pushes the asset price even higher. By contrast, falling property prices weaken the financial position of borrowers, reduce bank credit to the real estate sector and push property prices even lower. This amplification effect, which is known as the “financial accelerator”, can significantly contribute to the high volatility that has been observed in commercial property markets.

The close connection between bank lending and commercial property prices, however, may have been changed in the past decade in the wake of the emergence of new financing methods. A new trend since the early 1990s is that the commercial property sector has been less reliant on funds from traditional sources such as banks and insurance companies. As a substitute, capital market sources of financing, in both equity and debt form, have grown rapidly. This may have resulted in important changes in the dynamics of commercial real estate markets (see Zhu (2002)). On the equity side, the development of real estate investment trusts (REITs) has been particularly remarkable in Australia and the United States. In the United States, REITs have overtaken the pension funds to become the most important institutional investors in the real estate equity market. In Australia, the listed property trusts (LPTs) now control about one third of the commercial real estate assets in the country. On the debt side, securitisation of commercial mortgage-backed assets (CMBSs) has become very popular in both Europe and the United States.

The increasing importance of public real estate markets may lead to a closer integration between commercial real estate and the capital market. Some market participants have argued that this could, on balance, dampen the commercial real estate cycles. From the funding perspective, the development of new funding methods can help to even out the flow of capital into the commercial property sector. For example, in the early 1990s, when most US banks and thrifts were reluctant to extend commercial real estate loans, REIT and CMBS markets developed and successfully removed the potential risk related to financing uncertainty in the commercial property market. Moreover, the development of public markets can strengthen market discipline. Arguably, the low-leverage ownership structure of REITs makes them less likely to build aggressively for speculative future demand. Improved information disclosure and publicly observable prices reflect the changing preferences and concerns of market participants in a more timely manner, so that the market may be able to detect asset price imbalances at an early stage. If so, commercial property prices could be less prone to large swings owing to funding cycles, and their impact on bank performance will be weakened. Nevertheless, given that the integration of the commercial property sector with capital markets could introduce new sources of market volatility, the validity of such an argument remains to be tested.

### **3. Real estate prices and monetary policy transmission**

Movements in property prices could affect aggregate demand and economic activity in various ways. First, rising property prices lead to more optimistic expectations of the returns on property investment. As a result, builders start new construction and market demand in property-related sectors increases. Second, rising house prices induce households to increase private expenditure and therefore provide a big support for private consumption. Third, changes in commercial property prices may significantly

change the investment decisions of those firms that are financially constrained. Similarly, movements in house prices influence the financial behaviour of homeowners and would-be home purchasers.

The role of real estate prices in the conduct of monetary policy has attracted much attention among researchers and policymakers in recent years. There has been extensive evidence that property price movements have a large impact on private consumption and the real economy. For example, Helbling and Terrones (2003) examine the downside effect of property price movements and find that house price busts are associated with output losses twice as large as equity bubbles. In addition, Graphs 5 and 6 demonstrate the cumulative responses of real GDP to 1% shocks in house prices and commercial property prices based on a structural VAR analysis (see Appendix). The results show that increases in property prices tend to have a positive impact on real GDP in many countries. Importantly, the magnitude of this impact is different across countries and sectors. The commercial property sector seems to have a larger impact on the real economy, reflecting the fact that it is more important in affecting the investment decisions and financial conditions of corporate firms. Besides, the national difference suggests that the role of property prices in monetary policy transmission might be influenced by local factors.

### **3.1 The investment channel**

Real estate is an important investment asset in the economy. According to Tobin's  $q$  approach, the profitability of property investment depends on the ratio between property prices and property replacement cost. When property prices rise above the cost of construction, it is profitable for property developers and other non-financial firms to construct new buildings. Accordingly, the boom in the construction sector boosts employment and demand in property-related sectors. As real estate investment usually represents a significant proportion of the economy as a whole in most countries, the impact can be substantial.

The impact of property prices on construction depends on the importance of the real estate sector in the economy as a whole, the elasticity of property supply and credit conditions in the country. Owing to rigidities in supply, this impact often builds up gradually. The lagged effect can arise from constraints on the availability of land, the local land planning system or the competitive conditions in the construction sector. The lag is also affected by the ease of access to credit and the availability of new sources of funds. Particularly, a construction boom is more likely to take place in financially liberalised economies. With the entry of new financial institutions and intensified competition, property developers and builders can easily receive loans on favourable terms for new construction. Cheap loans then stimulate building activity, as exemplified in a number of countries (G10 (2002)).

In addition to the impact on the construction sector, fluctuations in property prices can have an important influence on investment decisions in other sectors via the liquidity effect or, equivalently, by changing the financial position of various economic agents. Increases in property prices improve the financial condition of property owners, enabling them to raise external funds to finance new projects. Empirical evidence suggests that the impact of financial conditions on investment decisions is greatest for financially constrained firms. Higher property prices can improve the capacity of these firms and allow the economy to invest to its full capacity.

The liquidity effect is, however, a double-edged sword. While rising property prices alleviate credit constraints for property owners, falling property prices can amplify the adverse effect through the interaction between the credit constraint and balance sheet conditions. An initially constrained investor will find it more difficult to access loans, as fewer loans are available in the credit market. The investor either has to give up the investment project or borrow at very high costs. Similarly, an initially unconstrained investor may find himself no longer able to finance new projects on the initial terms and conditions. Rising funding costs and limited accessibility force both groups of investors to cut back the scale of their projects.

### **3.2 The wealth effect**

The argument for the wealth effect goes back to the permanent income hypothesis of the life cycle model. According to this hypothesis, the level of household consumption is determined by permanent income, which is the present value of all future incomes of the household. Given that housing and equity are the two most important financial assets for an average household in most industrial countries, with housing typically the greater of the two, an increase in house prices implies that



household wealth increases. As a result, owner-occupiers may reduce their savings and increase their expenditure.

The strength of the aggregate wealth effect, however, is uncertain and depends on several factors. First, it depends on whether the house price gains are perceived to be permanent or temporary. Second, the size of the wealth effect is also related to the home ownership rate in the economy. Rising house prices tend to increase the wealth of homeowners but make houses less affordable for those households that are planning to purchase their own homes. First-home buyers need to save more for higher mortgage payments and their consumption actually drops when house prices increase. Third, the ability of households to consume capital gains from houses depends on the flexibility of the housing financing system. In other words, whether refinancing is permitted, on what terms and at what cost - these are the main financial factors that determine the magnitude of the wealth effect. For example, an important channel through which households extract consumption from house wealth is the mortgage equity withdrawal (MEW) mechanism, which is mainly based on refinancing. In most euro area countries (except the Netherlands), MEW has been almost entirely absent, as the mortgage market is not very competitive, the cost of refinancing is high and households are rather reluctant to extract equity from their housing stock. In sharp contrast, MEW has been very prominent recently in Australia, the Netherlands, Sweden, the United Kingdom and the United States. In 2002, cash-out refinancing pumped an estimated USD 97 billion from home equity back into the economy in the United States, providing important support for consumer confidence and private consumption. Similarly, the ratio of MEW to disposable income in the United Kingdom hit a very high level of 6.7% by end-2002 (Graph 7).

### **3.3 Challenges for the monetary authorities**

The link between property prices and aggregate demand suggests that the monetary authorities can benefit from monitoring developments in property markets. The view that policymakers should respond to excessive increases in property values which are manifestations of excess demand in the economy as a whole has received much sympathy within central bank circles. In particular, monetary policymakers need to identify the sources and nature of property price fluctuations in order to understand their implications for price stability and the general economy, and then to formulate the appropriate policy response. However, in practice, critical issues arise, suggesting that implementation is not an easy task.

First, it is often not straightforward to identify “excessive” property price inflation at an early stage. Lack of reliable data, diversity in valuation methods and unpredictability of market movements make it difficult for policymakers to design an early warning signal of asset price imbalances in the property market with a comfortable degree of confidence.

Second, it is technically difficult to predict the exact effects of monetary policy on the property market and on the macroeconomy. In many cases the monetary authorities find themselves in a dilemma, as price stability in the goods market and in the asset market (including the real estate market) may call for different policy responses. For example, in recent years many industrial countries have witnessed booms in housing markets, at the same time as macroeconomic performance was sluggish and inflation rates were very low. The coexistence of strong house price inflation and low inflation in the goods market has posed a serious dilemma for policymakers. The tightening consistent with stability in the housing market may risk excessive deflation in the goods market and a subsequent negative impact on an already weakened macroeconomy. On the other hand, the build-up of household debt, which has mainly been a result of low interest rates, has increased household indebtedness and may finally impair the ability of households to continue servicing their debts without adjustments in their expenditure.

On balance, whether the monetary authorities are able to use monetary policy to contain asset market imbalances remains debatable. The above two problems, namely “when to do it” and “how to do it”, need to be resolved before the monetary authorities can refine their policy framework to deal with asset market imbalances.

## 4. Real estate prices and financial stability

Bank lending is the primary source of real estate funding; not surprisingly, there are close connections between real estate prices and bank credit. On the one hand, sharp falls in property prices can lead to a large-scale deterioration in asset quality and in the profitability of the banking industry, particularly for those banks that are deeply involved in property or property-related lending businesses. They also undermine the value of bank capital, reducing the banks' lending capacity. On the other hand, banks' lending attitude has important implications for property prices. Bank credit to property buyers and constructors may change the balance between the demand and the supply side and cause property prices to fluctuate.

The linkage between property prices and bank credit is confirmed by empirical evidence based on the VAR analysis (see Appendix) in a number of countries. Graphs 5 and 6 show that increases in property prices often lead to expansion of bank credit and this impact is notably high in some countries. Recent studies by Hofmann (2001) and Davis and Zhu (2004) suggest that bank credit and property prices are positively related in the long run. They further point out that the impact of property prices on bank credit is significantly positive, yet the impact in the reverse direction is less clear.

### 4.1 Risks for banks

Movements in real estate prices can have a substantial impact on banking performance. In particular, falling property prices may lead the banking sector into distress via various channels, eg through increases in bad loan expenses in real estate loans, or through a deterioration in the financial conditions of borrowers and banks themselves, or indirectly through a contraction in financial transactions and in economic activity.

First of all, real estate lending is one of the most important components of bank loans. In most developed countries it accounts for one third, sometimes even more than half, of total bank loans. Declines in real estate prices imply a lower return in the property industry and hence real estate loans are more likely to default. This reduces the profitability of bank lending and increases the banks' bad debt expenses as well.

The complexity of the credit risk channel increases given the prevalent use of collateralised lending in real estate loans. On both residential and commercial property markets, mortgage loans are often collateralised by the underlying property. Nevertheless, the use of a low LTV ratio does not necessarily shelter banks from loan losses. When property prices decline sharply, even ratios that were initially considered to be very conservative may turn out to be insufficient. In particular, when a high LTV ratio is used in combination with the market value (defined as the expected price if the target asset was traded on the date of valuation), it could be very risky for mortgage lenders because default risk could be extremely high during a downward phase.

The credit risk exposure of property loans also depends largely on the usage of these loans. Residential mortgage loans are usually considered to be very safe, as a home is more like a consumption good and the repayment of these loans often comes from household income, which is relatively stable. By contrast, loans to developers and constructors for commercial purposes are much riskier. The repayment of these loans is backed by the sale prices or rents generated from the property upon its completion. Declines in property prices imply a deterioration in the financial position of developers and constructors; therefore they are not able to borrow new funds that are essential for the completion of the project. When the property under construction is left unfinished, the value of collateral drops close to zero and the commercial mortgage loan is deemed to default. In fact, increases in non-performing loans in the commercial property sector have been a major contributor to a number of banking crises, such as the financial distress in the early 1990s in many industrial countries and the 1997 East Asian crisis.

The credit risk, however, is not confined to the real estate sector. Because real estate assets are also widely used as collateral for other types of loans, fluctuations in property prices would have a broader impact on the banking industry through the balance sheet effect as noted above. When real estate prices fall, a typical borrower is more likely to face financial constraints in the form of reduced borrowing capacity. These constraints restrict the scale of new investment and reduce the profitability of corporate firms. As a result, the credit risk exposure of other types of bank loans increases as well, exacerbating the fragility of the banking sector.

This credit risk channel and its interaction with financial constraints become even more complex under certain conditions. One example is that the banks' lending criteria are arguably procyclical. Banks tend to underestimate the default probability of property-related loans in a real estate boom for various reasons, including poor risk management practices, poor data and perverse incentives linked to the safety net. This "disaster myopia", as defined by Herring and Wachter (1999), can be a major contributor to the build-up of asset price inflation and increases in banks' credit risk exposure. Another worrisome situation occurs when one bank or a particular type of financial institution has extremely high concentration in the real estate sector, as exemplified by the US thrift institutions and the Japanese "Jusen". This concentration of property-related risk turned out to be very dangerous in both cases. The collapse of property prices easily dragged down these specialised institutions, and generated systemic risk for the whole financial system.

In addition to the credit risk effect, declines in property prices would also lead to a reduction in bank profitability via indirect channels. During the downward phase of property markets, banks' capital base is weakened because of increasing provisions and declines in the value of fixed assets. As a result, banks' lending capacity is limited and inevitably their interest income will fall. Moreover, as construction and borrowing activity shrink, banks' fees and commission income from real estate related transactions decline. Finally, as noted above, declines in property prices may generate a negative feedback on the overall economic conditions. This type of risk, because of its nature, is more difficult to hedge and is likely to affect the sector as a whole.

Table 1  
Banking profitability at different stages of property cycles:<sup>1</sup> 1979-2001

	Return on equity		Return on assets		Loan loss provisions (% of total loans)		Memo: Number of years	
	Up swing <sup>2</sup>	Down swing	Up swing	Down swing	Up swing	Down swing	Up swing	Down swing
Australia	12.44	9.61	1.27	0.85	–	–	9	7
Belgium	12.22	12.31	0.37	0.36	0.32	0.62	15	6
Canada	18.71	17.24	0.98	0.90	0.72	0.71	10	10
Finland	6.75	6.30	0.46	–0.02	0.41	0.23	15	8
France	11.07	1.77	0.41	0.04	0.56	1.04	7	7
Germany	10.86	12.74	0.51	0.60	0.63	0.87	12	11
Italy	15.21	12.61	0.99	0.71	0.88	1.16	9	9
Japan	17.67	–3.65	0.48	–0.13	0.06	0.70	13	10
Netherlands	16.34	14.41	0.73	0.51	–	–	15	8
Norway	15.13	–37.78	0.87	–0.72	0.24	2.47	14	8
Spain	10.50	7.89	0.96	0.75	0.81	1.30	13	10
Sweden	15.82	11.53	0.86	0.60	0.49	0.15	12	11
Switzerland	10.96	9.26	0.70	0.54	–	–	12	11
United Kingdom	21.47	15.64	1.05	0.67	–	–	13	5
United States	17.03	16.02	1.34	1.12	0.90	0.87	14	9
Average	14.15	7.06	0.80	0.45	0.55	0.92		

<sup>1</sup> Aggregate property prices are constructed as a weighted average of real house prices and real commercial property prices. <sup>2</sup> "Up (down) swing" refers to the years when real aggregate property prices in the country concerned increase (decrease).

Sources: OECD; BIS; author's calculations.

Table 1 computes the average levels of banking profitability and loan loss provisions during the upward phase and downward phase of property markets in a number of industrial countries. On average, the profits of banks almost halve and loan loss provisions nearly double in “bad” years. A striking example is Norway, where bank performance was dramatically affected by property market conditions. Similarly, it is widely believed that the large exposure of the banking industry to the real estate sector and the collapse of land prices have been at the heart of Japanese banking problems, contributing to the increase in non-performing loans in the banking sector and distorting the performance of the real economy.

In sum, given the large effect of property prices on bank profitability, booms and busts in real estate prices have important implications for financial stability. Even if large swings in property prices do not necessarily bring the banking sector into distress, they do feature in a number of banking crises in industrial and emerging market countries alike (see Herring and Wachter (1999)). Typical examples in recent decades are Spain in the late 1970s and early 1980s, the Nordic countries in the late 1980s, Mexico in the early 1980s and mid-1990s, Japan in the whole past decade, Thailand in 1994-97 and a number of other episodes (see Hilbers et al (2001)). An important observation is that the financial system is more vulnerable to property market movements in financially liberalised economies where effective prudential regulation is not fully developed. After financial liberalisation, lending rates tend to be driven down as a result of the entry of new financial institutions, intensified competition among lenders, and removal of interest rate control and administrative control on credit growth. As net interest margins shrink, banks come under pressure to search for new opportunities and may tend to underestimate the risk of new loans. Especially if an effective prudential regulation system is not in place, excessive competition can easily lead to a build-up of financial imbalances. The unwinding of financial imbalances at a later stage triggers the onset of a banking crisis.

## 4.2 Implications for risk management

Risk management is at the heart of all financial activities. It is crucial for managers and financial regulators to measure accurately the credit risk exposure of banks and to make sure that such risk does not jeopardise the stability of the financial system. In the current revision of the capital adequacy framework by the Basel Committee on Banking Supervision (BCBS), the main theme is to improve measurement of the credit risk exposure of banks.

Given the important share of real estate loans and property-related loans in bank portfolios, banks need to have a clear understanding of the impact of property market movements on their balance sheets. However, owing to lack of reliable data and the heterogeneity of property markets, the task is typically a difficult one.

The difficulty arises first from the regional and sectoral differences mentioned above. For example, real estate loans can have different maturities; they can be granted at fixed or floating interest rates; and the levels of household debt and debt service burden vary across countries. All these features make property assets non-comparable across national boundaries. To understand the risk involved in individual loans, including default risk and prepayment risk, requires a thorough knowledge of local markets and market dynamics. These national differences imply that the risk weights, which are used to decide the level of economic capital, should vary across countries and differ between residential and commercial mortgage loans. Even within the same category of residential mortgage loans (in the same country), the credit exposure for principal residence and that for second-home investors can be quite different in the event of a housing price decline.

Default correlations add another layer of complexity. The correlation is relevant in at least three dimensions. First, mortgage loans tend to have a substantial systematic component in that the default correlation is high. Although mortgage loans on average have a lower default probability, the defaults usually come together, when a national market falls into distress. This high correlation is particularly important in small economies, where the national market offers only limited diversification opportunities. By contrast, default correlations will tend to be lower in large countries with more regional economic profiles.

The second dimension is the relationship between probability of default (PD) and loss-given-default (LGD). While most credit risk models, including those underlying the Basel Accord, treat PD and LGD as independent, empirical evidence suggests a strong positive correlation between these two variables. This result is not surprising, as default rates are usually higher during economic downturns. Such periods also tend to go hand in hand with depressed property prices. The procyclical relationship

between the two variables raises questions about the market practice of assuming a zero correlation, as the latter would underestimate the expected loan losses in bad times.

The final dimension relates to the potential for cross-country diversification. Cross-border real estate investment has traditionally been considered a strategy to achieve diversification benefits, and has been on the increase in the past decade. However, empirical evidence (Graph 8) suggests that global commercial property markets have become more integrated since the mid-1980s, even though a significant diversification benefit from global housing markets is still present. Case et al (2000) find that the high correlation across national commercial property markets links strongly to effects of changes in GNP, suggesting that real estate investments are akin to a bet on fundamental economic variables that are correlated across countries. Ignoring the trend of global market convergence will also lead to an underestimation of the capital reserves that are needed for a sound banking system.

## **5. Final remarks**

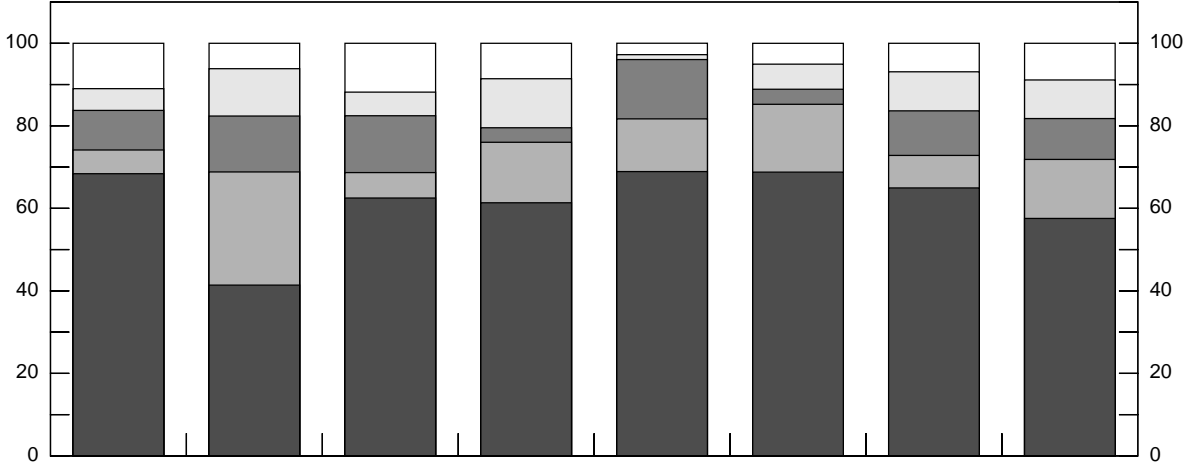
The nature of real estate price dynamics and their relationship with financial stability and monetary policy are much debated questions among academics and policymakers alike. They pose important challenges for risk management, financial regulation and policy design. These issues may not be fully resolved in the near future, mainly because of the complexity of the market and varieties of market functioning. To a large extent this is a consequence of inadequate data and weak analysis. The collection of reliable and comparable data on property markets has proved very difficult, restricting the scope of meaningful analysis. Looking forward, there is a need for action aimed at improving the quality of property data and enhancing the comparability of national statistics across countries.

Graph 1

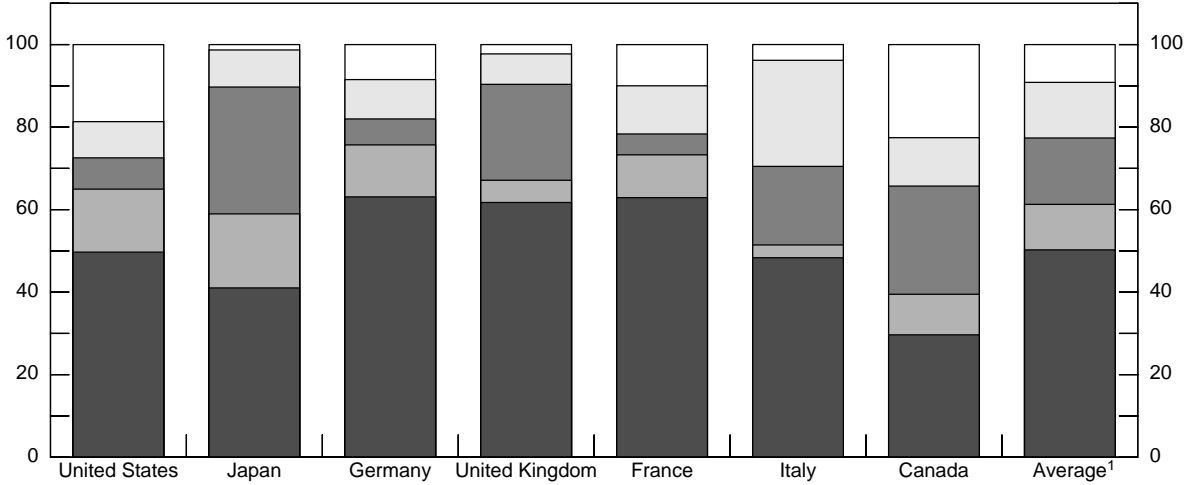
**Contribution of different factors in explaining the variation in property prices**

Property prices    Real GDP    Bank credit    Equity prices    Real short-term interest rates

**Residential property prices**



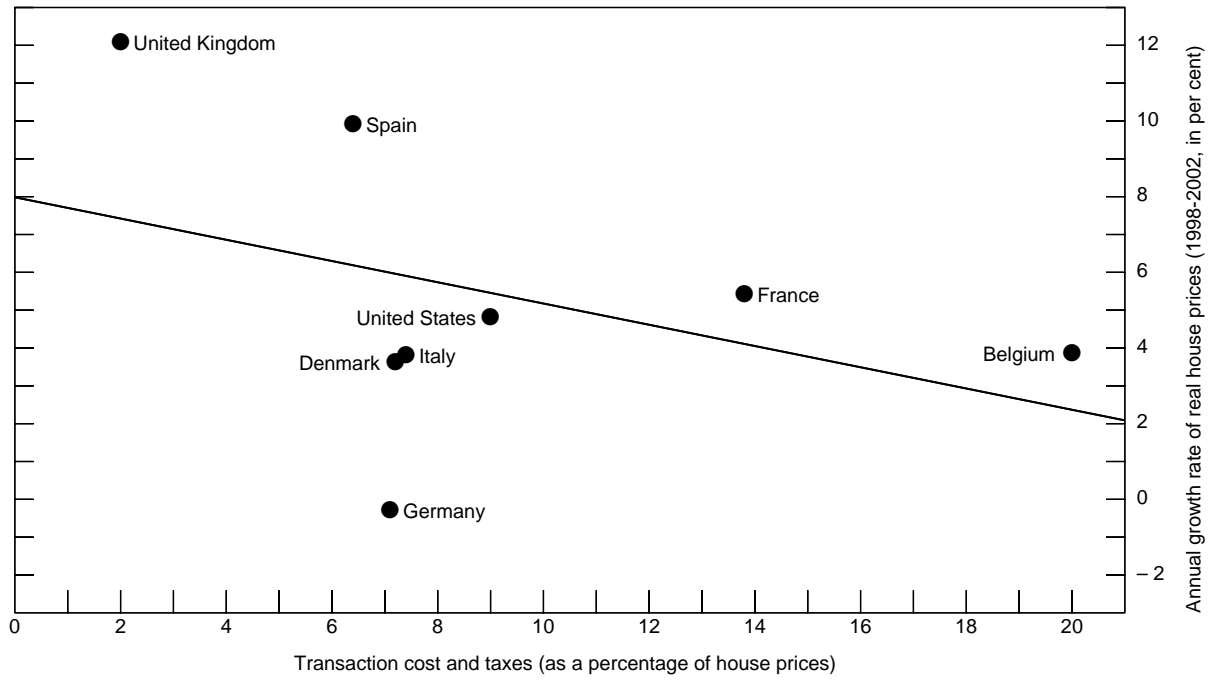
**Commercial property prices**



<sup>1</sup> Of the G7 countries plus Australia, Belgium, Denmark, Finland, Ireland, the Netherlands, Norway, Spain, Sweden and Switzerland.

Source: Author's calculations.

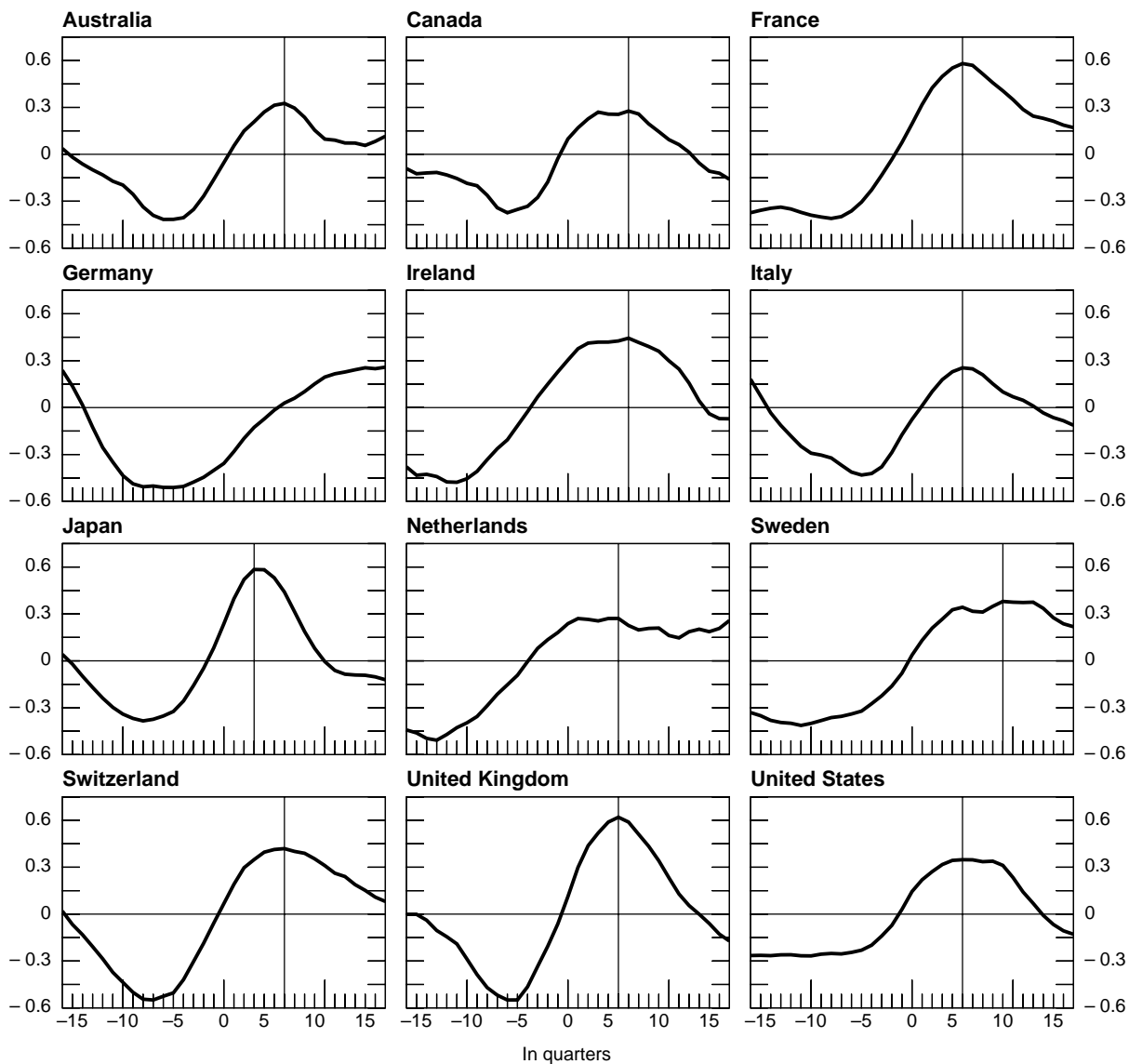
Graph 2  
Transaction cost against house price variation



Sources: Maclennan et al (1998); national data.

Graph 3

**Lead-lag correlation between real residential property prices and real equity prices<sup>1</sup>**



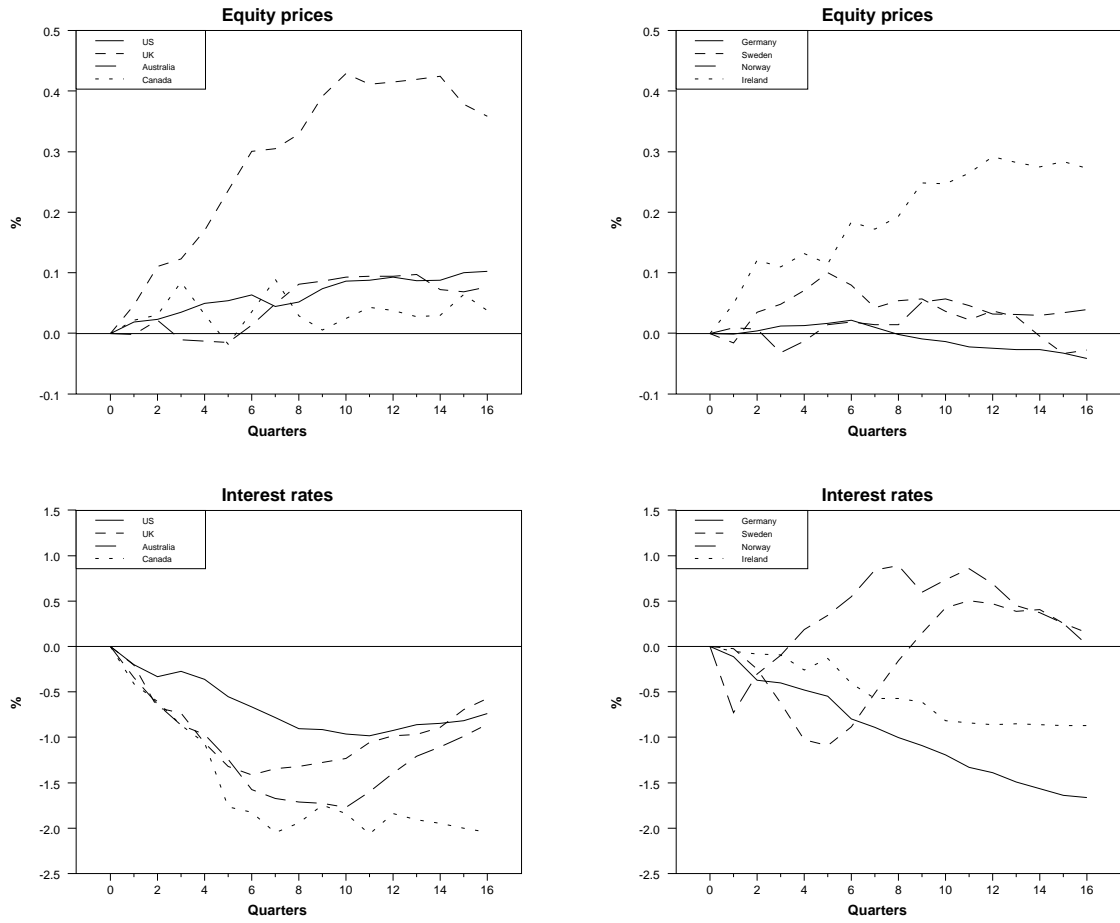
<sup>1</sup> Based on the detrended ratio of both series. The vertical line indicates the time of maximum correlation (for Germany, after 16 quarters). The x-axis refers to the number of quarters that equity prices lead (positive values) or lag (negative values) residential property prices.

Source: Author's calculations.



Graph 4

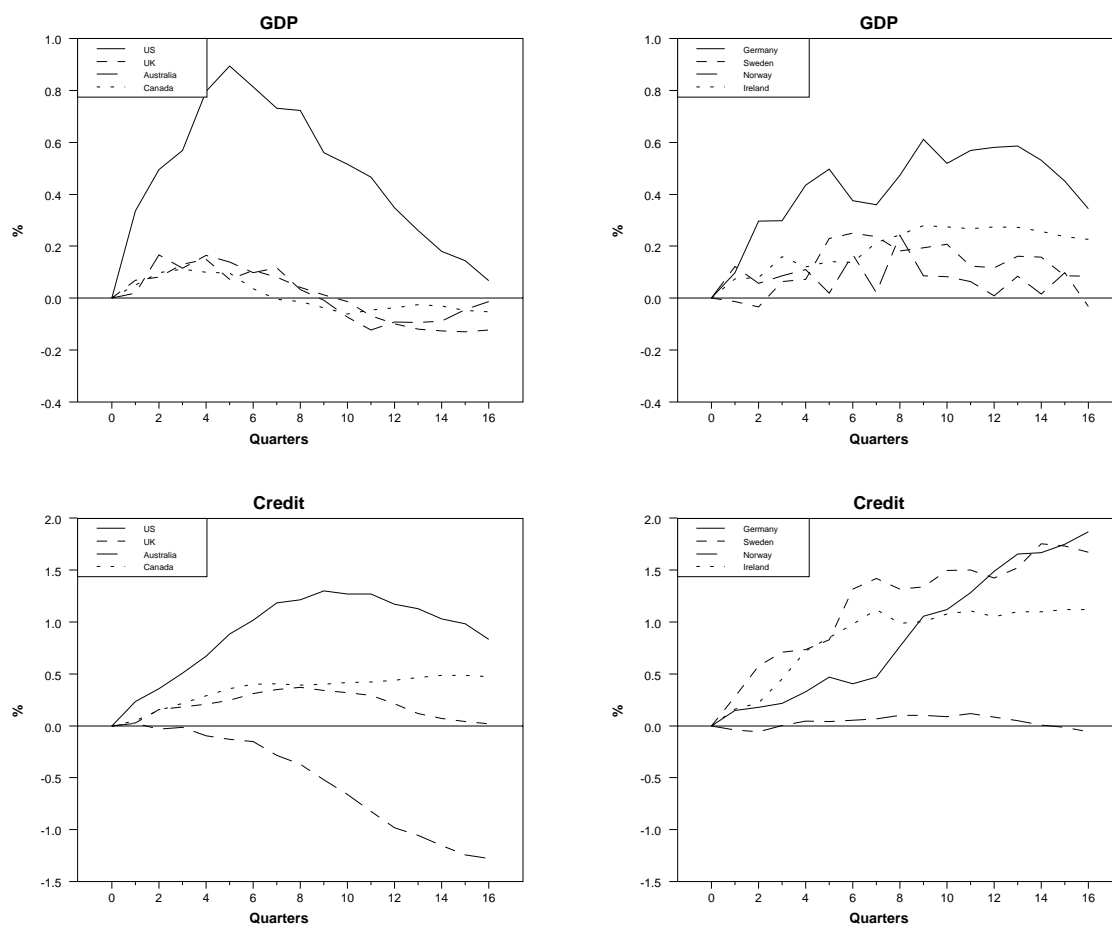
Cumulative responses of house prices to a 1% shock in:



Source: Author's calculations.

Graph 5

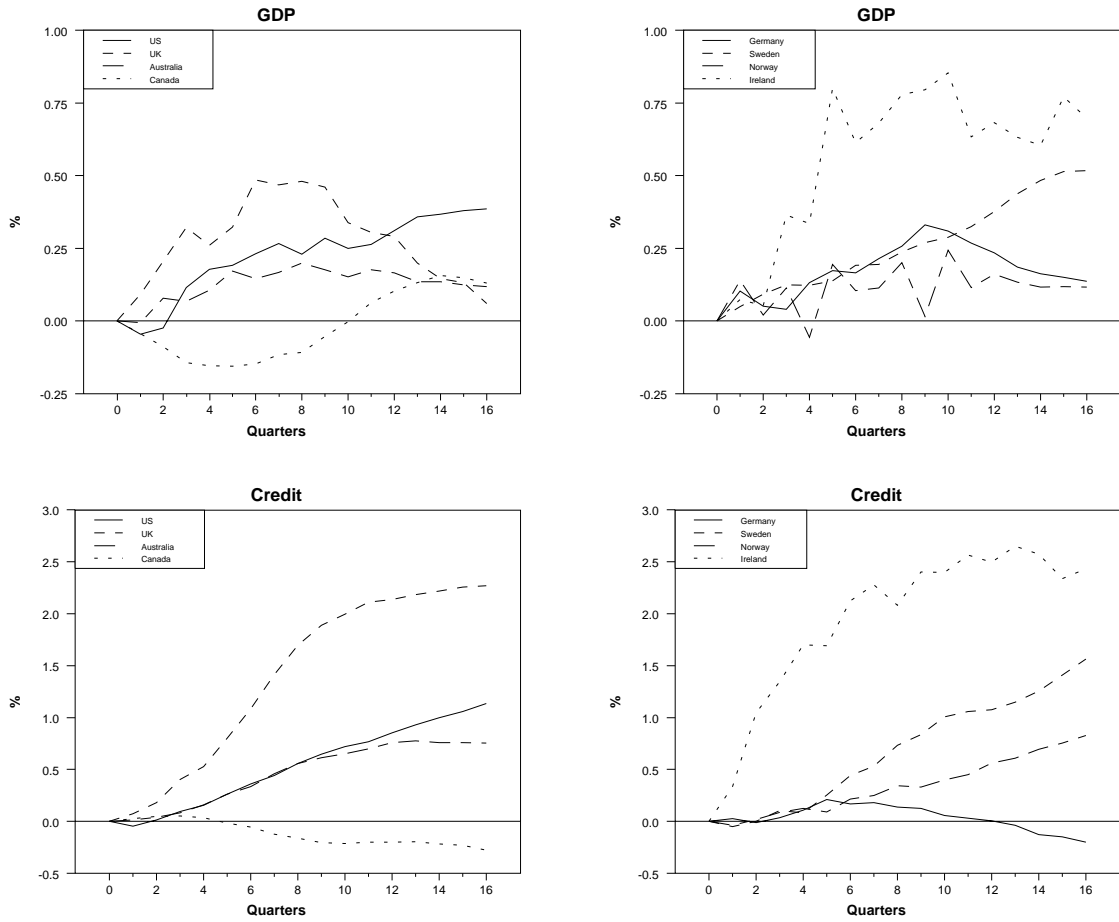
Cumulative responses to a 1% shock in house prices



Source: Author's calculations.

Graph 6

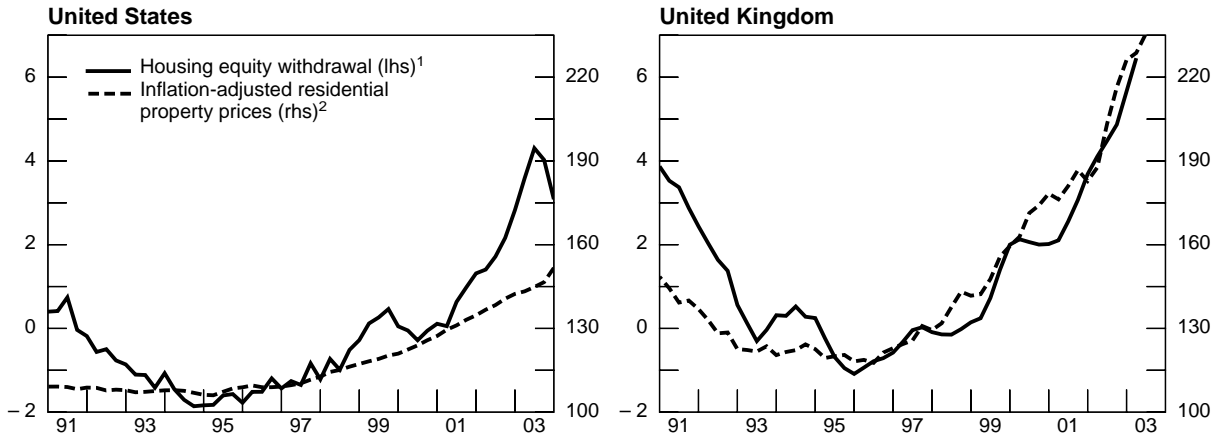
**Cumulative responses to a 1% shock  
in commercial property prices**



Source: Author's calculations.

Graph 7

**Housing equity withdrawal  
and residential property prices**



<sup>1</sup> Change in housing finance less households' investment in housing as a percentage of household disposable income; three-quarter moving average. <sup>2</sup> 1985 = 100.

Sources: Bank of England; Board of Governors of the Federal Reserve System; national data.

Graph 8

**Rolling average correlation of  
global property markets**



The sample comprises 17 countries: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States. The average correlation is calculated in two steps. First, I compute the correlation matrix of property price series (either real house prices or real commercial property prices) in the 10-year window (year  $t-9$  to  $t$ ). In the second step, the average of all bivariate correlations is defined as the world average.

## Appendix: The VAR framework

A standard VAR system is the reduced form of a linear dynamic simultaneous equation model in which all variables are treated as endogenous. This framework is employed in this paper to study the joint behaviour of property prices (either house prices or commercial property prices), national income, short-term interest rates, bank credit and equity prices.<sup>3</sup> Each variable is regressed on a number of lags (eight quarters in this study) of itself and of all other variables in the information set.

The VAR model is estimated for each country. In the next step the aim is to provide some quantitative estimates of the dynamic interaction among the variables of interest. To do this, I orthogonalise the estimated reduced-form model to identify the effect of the innovations of the variables in the system in isolation from each other. In this paper the identification uses Sims' lower triangular ordering (the standard Choleski decomposition), and the ordering of the variables is: GDP, bank credit, property prices, equity prices and interest rates.

The justification of the ordering is as follows. Real GDP is considered to affect all other variables within the same quarter, but it does not respond contemporaneously to innovations in any of the other variables. And the interest rate is ordered last because policymakers may react quickly to all innovations but it usually takes a while for the policy to become effective. These assumptions are fairly standard in existing literature. The trickier part is the ordering among bank credit, property prices and equity prices. The logic of the current ordering<sup>4</sup> is: (1) equity prices can respond immediately to shocks in other variables; (2) property prices are relatively more sticky than equity prices; (3) financing conditions (bank credit) may affect property prices contemporaneously, but there is a lag between the changing property prices and their effect on bank credit, owing to decision lags and loan processing time.

Based on the identifying assumptions embodied in the specified ordering of the variables, the key outputs of the VAR model are the variance decomposition and impulse responses. The variance decomposition is able to break down the variance of the forecast error for each variable into components that can be attributed to each of the endogenous variables. In addition, the impulse response functions are computed and the results show the interrelationship between any two of the variables of interest. With a model of five variables, this model generates 25 solutions. Therefore, only a few key results are presented here (Graphs 1, 4, 5 and 6).

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<sup>3</sup> All variables are in real terms. Except for interest rates, all of them are measured as first log differences (equivalent to percentage changes) because the series in levels are non-stationary.

<sup>4</sup> I also experimented with other orderings and the results do not change significantly.

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# Housing price bubbles - a tale based on housing price booms and busts<sup>1</sup>

Thomas F Helbling<sup>2</sup>

## I. Introduction

The recent stock market boom-bust cycles in industrial countries have rekindled the debate on the role of asset price fluctuations as a source of economic and financial instability and on their role in the formulation of monetary policy objectives and strategies (eg, Bordo and Jeanne (2002), Bernanke (2002), Cecchetti et al (2000), or Bernanke and Gertler (2000)).

At the current juncture, the focus has shifted from equity price to housing price bubbles, given striking recent price increases in this asset class in a number of industrial countries (IMF (2003)). However, large price increases – which will be referred to as booms – are only a sufficient but not necessary conditions for bubbles. Historically, many episodes of large asset price increases did not end in crashes – or busts, as they are frequently referred to. Similarly, some of the largest asset price busts were not preceded by booms. The purpose of this paper is to establish the main empirical regularities of housing price booms and busts in industrial countries over the last 30 years – the focus on booms and busts obviates the need to measure or explain “bubbles”, which, as noted below, remains highly controversial. In particular, the paper will address the following questions:

- How frequent were housing price booms and busts? How often did housing price booms end in busts?
- What were the real consequences of housing price booms and busts? Were busts always associated with severe implications for economic activity? Were the implications of housing price boom-bust cycles different from that of other housing price cycles?
- What was the relationship between housing price boom-busts and interest rates? Were credit market conditions and housing price booms related?

With this focus, the paper aims to contribute cross-country evidence on an issue that has been addressed mostly from a national perspective only.<sup>3</sup> The value added of cross-country evidence is that it allows for the analysis of a much larger set of extreme events, as the number of asset price booms and busts in any particular country tend to be limited over a period of some 30-40 years. While policy issues are not addressed directly in the paper, the results will bear on the appropriate conduct of policies since the benefits of policy actions aimed at avoiding excessive asset price movements depend on the probability of asset price busts after a boom on the one hand and on the real and financial effects of busts on the other.

Some limitations to the analysis should be kept in mind before conclusions are drawn. The empirical regularities are derived by association using event analysis rather than by causal analysis. Also, the number of housing price booms and busts found in a sample of housing prices for 14 industrial countries for the period 1970-2001 is relatively small (20 or less). Finally, the paper focuses on housing prices only, mostly because of space limitations. Nevertheless, while housing prices and other

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<sup>1</sup> This paper draws on Chapter II of the April 2003 *World Economic Outlook* (IMF (2003)) and on Helbling and Terrones (forthcoming). Both of these references analyse both equity and housing price booms and busts. The views presented in this paper are those of the author and should not be attributed to the International Monetary Fund.

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<sup>3</sup> While several studies have documented the effects of asset price busts, they typically cover the experience of only particular countries. For instance, Ito and Iwaisako (1995) and Okina and Shiratsuka (2003) study the Japanese case, Carmichel and Esho (2003) document the Australian experience, and Mishkin and White (2003) study the American experience. Only Bordo and Jeanne (2002) have studied equity and housing price booms and busts for a panel of industrial countries. Bordo and Lowe (2002) examine the relationship between financial crises and asset price booms in a cross-country context.



asset prices developments are connected given some substitutability between the two asset classes, the linkages between housing and equity price booms or busts are not stable. Events in the two asset classes do not always overlap and there is no evidence of stable lead-lag relationships in the timing of events (Helbling and Terrones (2004)). This, together with the importance of housing assets in household wealth, also provides some substantial justification for the paper's narrow focus.

## II. Housing price booms and busts

Asset price bubbles refer to situations when asset prices exceed their fundamental value by seemingly large margins. While used frequently, the bubble concept is highly contentious, given strong disagreement about measurement and the analytical foundations. Differences in opinion regarding the measurement of bubbles concern the assumptions and models needed to quantify the unobserved expected future values of the fundamentals on which the fundamental asset price depends.<sup>4</sup> Disagreement on what explains bubbles revolve around the question whether they are just "rational" gambles or systemic problems that may require policy intervention.<sup>5</sup>

Despite the many unresolved issues and debates about asset price bubbles, there is widespread agreement that many periods of financial instability and crises in the past were associated with equity or real estate price boom-bust cycles, that is, large increases in asset prices and subsequent sharp drops (eg, Kindleberger (2000)). Given the experience of past episodes, large asset price increases are frequently taken as signals for a bubble in the making while large price decreases are considered evidence for a bubble burst.

In this spirit, this paper identifies large and persistent increases (booms) and decreases (busts) in the broad markets for residential housing. Our data set includes quarterly aggregate housing price indices for 14 industrial countries for the period 1970-2002. Given large variation in inflation rates, both over time and across time, inflation-adjusted, real housing price indices (using the CPI as a deflator) are used.

Drawing on methods developed in business cycle analysis, the procedure used to identify equity and housing price booms and busts involves the following two steps:

- *Determination of asset price cycles.* Turning points in the level of broad real equity and housing price indices define cycles in those prices. Bull and bear markets are the asset market equivalents of expansions and recessions. For example, during a bear market, which begins in the quarter after a peak quarter and ends in the trough quarter, prices generally fall. Following Pagan and Sossounov (2003), the turning points were determined using a slightly modified Bry-Boschan cycle dating procedure.<sup>6</sup>
- *Identification of booms and busts.* Based on the full set of bull and bear market episodes, booms (busts) were identified as those episodes with large price increases (decreases). To qualify as large, a price change had to be in the top (bottom) quartile of all recorded peak-peak (peak-trough) price increases (decreases) in the sample. Hence, one fourth of all bull and bear markets are considered booms and busts. The cutoff value of the top (bottom) quartile for the identification of booms and busts is, of course, arbitrary. Helbling and

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<sup>4</sup> For example, McGrattan and Prescott (2001) argue that contrary to conventional wisdom, pre-crash stock prices in 1929 were not over- but undervalued according to their model.

<sup>5</sup> According to one view, the willingness of investor to buy assets at higher prices than justified by fundamentals must reflect "rational" gambles, as investors choose to speculate on future price increases even though they are aware of the bubble and the risk that may burst (eg, Flood and Garber (1994)). Others see bubbles as the outcome of a multitude of factors that change from episode to episode, including psychological factors such as exuberance, financial frictions arising because incomplete information and uncertainty about future events, biased expectations, unwarranted regulatory or tax incentives, and expansionary monetary policy (eg, Allen and Gale (1999), Kindleberger (2000), or Shiller (2000)).

<sup>6</sup> The dating algorithm identifies turning points in the log-level of real equity and housing prices by first searching the input data for maxima and minima in five quarter data windows and then picking pairs of adjacent, locally absolute maxima and minima that meet the rules for the minimal duration of cycles (five quarters) and phases (two quarters). Box 3.1 in the April 2002 *World Economic Outlook* explains business cycle concepts and measurement issues in more detail.

Terrones (forthcoming) examine the sensitivity of the main results with regard to this and other methodological choices and find that they are generally robust.

Peak-to-peak increases were used to identify booms since some of the larger trough-to-peak increases in the sample largely reflect corrections of earlier busts without any increase above trend. Unfortunately, however, using this metric for the identification of booms reduced the number of housing price cycles available, since the first turning point in many housing turned out to be a peak in the mid-1970s. Given relatively few housing price cycles in our sample, this was a matter of considerable concern, and the paper also uses cumulative housing price increases for the eight quarters up to a peak as a metric for the identification of booms.

It is worth noting that the two-step procedure does not require booms to be followed by busts, as the two types of events are determined independently.<sup>7</sup> This is appropriate, since the association between boom-bust cycles and bubbles is empirical only.<sup>8</sup> However, the overall number of booms and busts is the same (except for differences in initial observations), given that they are determined by the number of asset price cycles found in the sample.

In the sample, some 75 housing price cycles were picked up by the procedure. A typical cycle lasted about four years. During the bull market phase, which lasted not quite three years, real housing prices increased by about 11% (cumulative). In the subsequent bear market phase, which lasted just about one year, prices fall by about 6%. Hence, over a full cycle, inflation-adjusted prices increased, which is consistent with trend increases in housing prices that reflect quality improvement, demand for housing space that is increasing with per capita income, and other factors such as land scarcity.

Against this background, housing price increases in a boom were substantially higher, about 32% on average (Table 1). To qualify as boom, prices had to increase by at least 15% (peak-to-peak increases) or 19% (cumulative eight quarter increase up to a peak). The first metric also suggests that boom phases tended to last somewhat longer than regular bull market phases at about four years. Using price increases in the top quartile to identify booms yielded either 16 or 18 booms in the sample, that is, roughly one and a half booms per country in the sample over 30 years. However, two countries, namely Spain and the United States, did not experience a boom during the sample period.<sup>9</sup>

During housing price busts, inflation-adjusted housing prices fell by about 27%, that is, roughly five times as much as during a regular bear market (Table 2). Strikingly, with about four years, busts lasted much longer than average bear markets. As in the case of booms, our quartile-based approach implies roughly one and a half busts per country over three decades or one bust in 20 years. However, the experience across countries varied considerably. Three countries, the United States, Belgium, and New Zealand, did not record any housing price crashes during 1970-2001.<sup>10</sup> Others, including the United Kingdom, Sweden, and Switzerland experienced three busts. These differences may again reflect country-specific developments and factors, including regulations and financial system characteristics (eg, fixed rate versus flexible rate mortgages).

There is a strikingly low number of housing price boom-bust cycles in our sample if the peak-to-peak metric for booms is used. Only six out of the 16 booms ended in a bust (Figure 1), suggesting an unconditional probability of a boom ending in tears of not quite 40%. Moreover, quite strikingly, a bust after a below-average increase in housing prices during the bull market phase is almost as likely to occur as one after a boom. On the other hand, if the cumulative housing price increase for the eight quarters up to a peak is used as a metric, roughly two thirds of all booms ended in a bust (Figure 2). Moreover, with this metric, most episodes with below-average prices during bull markets were also characterised by small, that is, below-average price decreases.

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<sup>7</sup> Bordo and Jeanne (2002) also use a procedure whereby booms and busts are determined independently.

<sup>8</sup> Allowing for disconnect is appropriate from a theoretical perspective as well, as bubbles need not burst.

<sup>9</sup> The analysis is based on completed housing price cycles only. At end-2001, some of the housing price bull markets or booms that began in the mid to late 1990s were still ongoing.

<sup>10</sup> In Belgium and New Zealand, the absence of a bust may reflect shorter series for the housing price indices. For the United States, there is evidence of regional housing price busts despite the absence of country-wide busts (eg, Chaplin et al (1997)).

Table 1

**Housing price bull markets and booms**

Median over all events in category

Metric	Number	Price change (percent)	Duration (quarters)
<b>Peak-to-peak increases</b>			
All bull markets	62	2.1	...
Booms only	16	32.7	16
1970s	4	51.0	
1980s	7	28.4	
1990s	5	30.4	
<b>Cumulative eight-quarter increases up to peak</b>			
All Bull Markets	71	8.2	8
Booms only	18	31.7	8
1970s	6	37.3	8
1980s	10	31.2	8
1990s	2	19.2	8
<i>Memorandum:</i>			
<i>Trough - peak increases</i>	62	11.3	11

Source: Author's calculations.

Table 2

**Housing price bear markets and busts**

Median over all events in category

	Number	Price change (percent)	Duration (quarters)
All Bear Markets	76	-5.7	5
Busts only	20	-27.3	16
1970s	9	-27.2	19
1980s	10	-30.1	16
1990s	1	-21.2	21

Source: Author's calculations.

How does the price behaviour during boom-bust cycles compare to other bull and bear markets (Table 3)? Median price declines in the bust phase are very close to those for all busts, implying that the bust phase of combined boom-bust cycles is not very different from that of other busts. Regarding price increases during the boom phase, the difference with regard to the general median in the category depends on the metric. According to the first metric, the price increases during booms in boom-bust cycles tend to be large compared to other booms while according to the second metric, the difference in price increases is relatively small. Overall, these results suggest that the notion of large price increases being reflective of exuberance needs to be considered with some caution. Rapid price increases over a short period appear to be better but obviously still imperfect predictors of bubbles than those occurring over a longer time period.

Table 3  
**Housing price boom-bust cycles**  
 Median over all events in category

Boom metric	Number	Price change (percent)	Duration (quarters)
<b>Peak-to-peak increases</b>			
Boom	6	64.2	17
Bust		-31.6	16
<b>Cumulative eight-quarter price increases up to peak</b>			
Boom	12	29.4	8
Bust		-30.1	16
<i>Memorandum:</i>			
<i>Peak-to-peak increases</i>			
<i>Other booms</i>	10	23.2	16
<i>Other busts</i>	14	-26.5	16
<b>Cumulative eight-quarter price increases up to peak</b>			
<i>Other booms</i>	6	23.7	8
<i>Other busts</i>	8	-21.2	14

Source: Author's calculations.

### III. Housing price booms and busts and economic activity

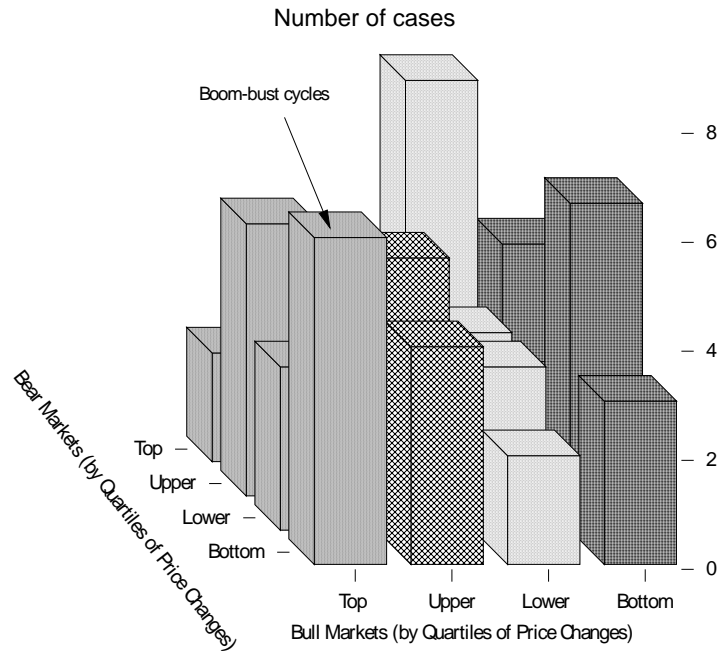
Asset price booms and busts are generally assumed to have strong impact on the real economy. In particular, there is a presumption that the asset price movements are mirrored in the profile of economic activity, given the impact of asset prices on financial positions of firms and households, which in turns affects their savings and investment decisions through a variety of channels.<sup>11</sup> In addition, there is a presumption that the duration and magnitude of the increase in asset prices matter because they raise the vulnerability of the financial positions of households and firms to shocks (eg, Kindleberger (2000)). Accordingly, the magnitude of the declines in aggregate demand and output during the bust should vary inversely with the magnitudes of the price increase during the boom.

Are these presumptions relevant for housing price booms and busts? Does it matter whether busts were preceded by a boom? Following standard event study methodology, the behaviour of real GDP before and after a housing price bust (the event) is used as a yardstick to assess the effects of housing price busts and housing price boom-bust cycles on economic activity.<sup>12</sup> More specifically, the paper studies the median of the GDP growth rates associated with the selected booms and busts for 12 quarters before, during, and 12 quarters after a housing price peak (Figure 3).

<sup>11</sup> There are four main channels through which asset prices affect aggregate demand: (i) household wealth, which influences consumption; (ii) the market value of the capital stock relative to its replacement value, which influences fixed investment; (iii) balance sheets of financial intermediaries, other firms, and households; (iv) capital flows which affect demand through the real exchange rate. Prominent among these balance sheet mechanisms are the financial accelerator (asset prices determine values of collaterals) and the bank (insurance) capital channel. The latter operates through the effects of asset prices on intermediaries' equity positions, which in turn determine the amount of their intermediation services (eg, the amount of bank lending). Finally, large asset price change can also affect confidence and expectations.

<sup>12</sup> This methodology has been widely used in the literature to study a variety of events, including currency crises, debt crises, banking crises, current account reversals, and stabilisation programs, among others (eg, Freund (2000), Bordo and Jeanne (2002), Mishkin and White (2003) and Gourinchas et al (2001)).

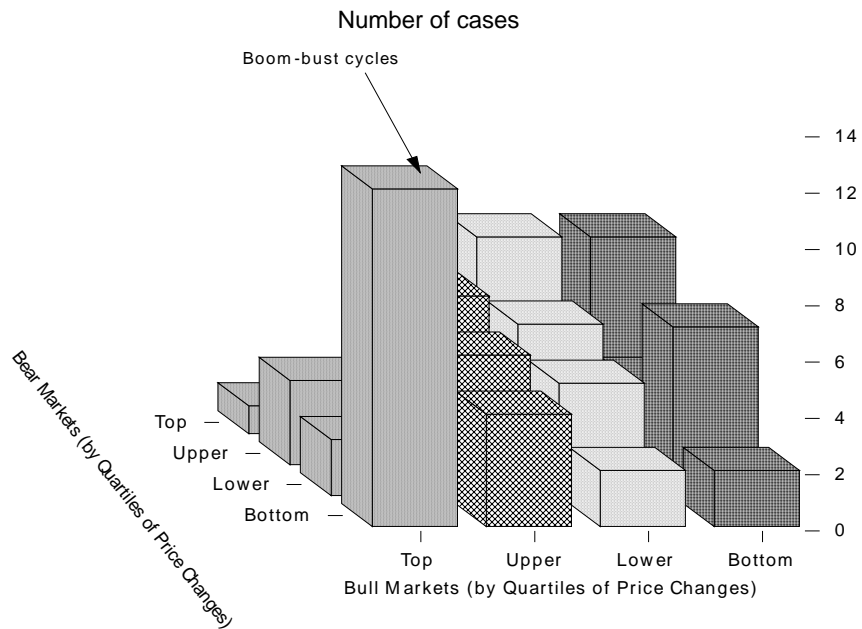
Figure 1  
**Housing price bull and bear markets with peak-to-peak boom metric**



Note: The figure shows the combinations of market constellations for broad housing prices according to quartiles. Booms are defined by price changes in top quartile for bull markets while busts are defined by price changes in the bottom quartile.

Source: Author's calculations.

Figure 2  
**Housing price bull and bear markets with cumulative eight quarter increase boom metric**



Note: The figure shows the combinations of market constellations for broad housing prices according to quartiles. Booms are defined by price changes in top quartile for bull markets while busts are defined by price changes in the bottom quartile.

Source: Author's calculations.

The evidence from the busts in the sample clearly suggests that housing price busts in industrial countries were associated with substantial negative output gaps, as real GDP growth decreases noticeably. On average, the output level three years after the beginning of a housing price bust was about 8% below the level that would have prevailed with the average growth rate during the three years up to the bust (about 6% if the average growth rate for all housing price bull markets were used).

The lower panel of Figure 3 shows the effects on economic activity of housing price bear markets more generally. Comparing output behaviour by quartiles of the price declines corroborates the notion that housing price busts are different when it comes to their association with economic activity. The output level three years after the beginning of a bear market in the lower middle quartile (that is, price declines in the quartile immediately above that for busts) is roughly where it would have been with the average growth rate during the three years prior to a bust, suggesting that regular housing price bear markets should not be of great concern to policymakers or investors.

In terms of timing, the beginning of the output slowdown after a housing price bust coincided roughly with the beginning of the bust itself. This is consistent with the finding that all but one housing price bust were associated with recessions (that is, declines in the level of economic activity), as the decline in prices began about three quarters before the fall in economic activity, that is, the level of real GDP (GDP growth rates begin declining about three to four quarters before the actual recession sets in).<sup>13</sup> As noted in Helbling and Terrones (forthcoming), the fall in output growth rates during busts typically reflects declining growth rates in all key components of private domestic absorption.

Combined housing price boom-bust cycles are of particular interest for reasons noted above. In the top panel of Figure 4, the median output behaviour during housing price boom-bust cycles is compared to that for other busts using both boom metrics applied in the paper. The median decline in output growth rates appears larger in the case of boom-bust cycles compared to other busts. After three years, the output loss is more than 7% for both boom metrics (loss relative to the output level if average growth rates during bull markets had prevailed). Nevertheless, the median output loss of about 5% for other busts is large enough for them to remain a matter of great concern.<sup>14</sup> Another striking difference is the pre-peak behaviour. In boom-bust cycles, GDP growth accelerates noticeably during booms while in for other cases, such a pattern is absent. This observation is consistent with the notion of overheating during booms.

Another issue concerns the indicator properties of housing prices as leading indicators for economic activity more generally. In the lower panel of Figure 4, output behaviour during boom-bust cycles is compared to that during booms followed by a regular bear market. Clearly, output behaviour is strikingly different, reinforcing the notion of regular housing price bear markets being associated with more benign output responses. This also highlights the problems of using large, persistent housing price increases as leading indicators.

#### **IV. Housing price boom-busts, monetary policy and the financial system**

Recent attention has focused on two aspects of the relationship between housing price booms and busts and the financial system. The first one concerns the relationship with interest rates. It has been argued that the striking housing price increases in some countries in recent years were a response to the sharp decreases in interest rates, as central banks eased their monetary policy stance during the downturn. The upper panel in Figure 5 shows the profile of nominal short-term interest rates before, at, and after peaks for housing price busts, comparing all busts with those preceded by a boom and those preceded by regular bull markets. Monetary policy tightening appears to have played a role in triggering housing price busts after booms, as short-term rates typically increased toward the end of a boom and remained high into the first year of a bust. This evidence reflects the fact that most housing

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<sup>13</sup> It is worth noting, though, that not all recession during the sample period were associated with housing price busts. (See IMF (2002)).

<sup>14</sup> Naturally, formal testing is problematic given the few observations for each subgroup. Nevertheless, it should be noted that the difference in median output behaviour for the two types of busts is not statistically significant if the standard deviation for the entire sample of busts is used (see Helbling and Terrones (forthcoming), for details).

price boom-busts in the sample occurred during either the late 1970s and early 1980s or the late 1980s, when reducing inflation was an important policy objective. The disinflation increased the real burden of debt, which exposed inflation-related overinvestment and associated financial frailty.<sup>15</sup> The chart also suggests that interest rates were declining in the early stages of booms - a trend which would be even more recognisable if real rather than nominal interest rates had been used - a fact that highlights that favourable liquidity conditions tend to coincide with housing market booms. In contrast, there is no apparent linkage between short-term interest rate changes and other housing price busts.

Another crucial relationship is that between credit and housing price booms and busts. Borio and Lowe (2002) note that asset price booms tend to go hand-in-hand with credit booms. This partly reflects normal behaviour of credit, which tends to be procyclical. However, credit booms in conjunction with asset price booms also reflect the amplification of the real economy effects through the financial accelerator and other supply side mechanisms.<sup>16</sup> Finally, credit booms have also been associated with financial deregulation, particularly if the latter was not accompanied by adequate strengthening of regulatory and supervisory frameworks and appropriate macroeconomic policies. This was found to have been an important factor behind some of the housing price boom-busts of the 1980s, as substantial steps in that domain were taken in many industrial countries in the late 1970s and early to mid-1980s (eg, Drees and Pazarbasioglu (1998), Allen and Gale (1999), and BIS (2003)).

The evidence shown in the lower panel of Figure 5 confirms that credit booms tended to coincide with housing price boom-bust cycles but not with other housing price bull markets followed by a bust. In the former, private credit, as a percent of GDP, increased rapidly during booms before falling some time into the bust.

This finding is consistent with results discussed in IMF (2003), where the important link between housing price busts and credit markets was highlighted. Housing price busts had strong and fast adverse effects on the banking system and its capacity to lend, which, in turn, likely explains the relatively strong impact on economic activity. Moreover, in some cases, banks were affected by solvency problems after housing price busts. Indeed, according to the chronology of banking crises reported by Eichengreen and Bordo (2002), all major banking crises in industrial countries during the postwar period coincided with housing price busts.

## V. Conclusions

The recent equity price bust has been a forceful reminder of how dramatic asset price reversals and their implications can be. This paper examined the main empirical regularities of housing price booms and busts in 14 industrial countries during 1970-2001. The evidence suggests that while housing price busts are infrequent events, they nevertheless occur frequently enough to be of great concern to policymakers and investors alike. Like other asset prices, housing prices do sometimes decline, especially when they are adjusted for general consumer price increases, notwithstanding frequent claims to the contrary. However, booms and busts are not as closely connected, as it is widely believed. Depending on the metric used to identify booms, only between two fifths and two thirds of all housing price booms in the sample ended in a bust. The paper also established that large housing price increases over several years need not be good indicators of forthcoming busts. Relatively rapid increases over a short period of two years or less appear to be better but still imperfect indicators.

Housing price busts coincided with sharp slowdowns in economic activity and, in all but one case, with outright recessions. They are thus costly from a welfare point of view. The paper also showed that the

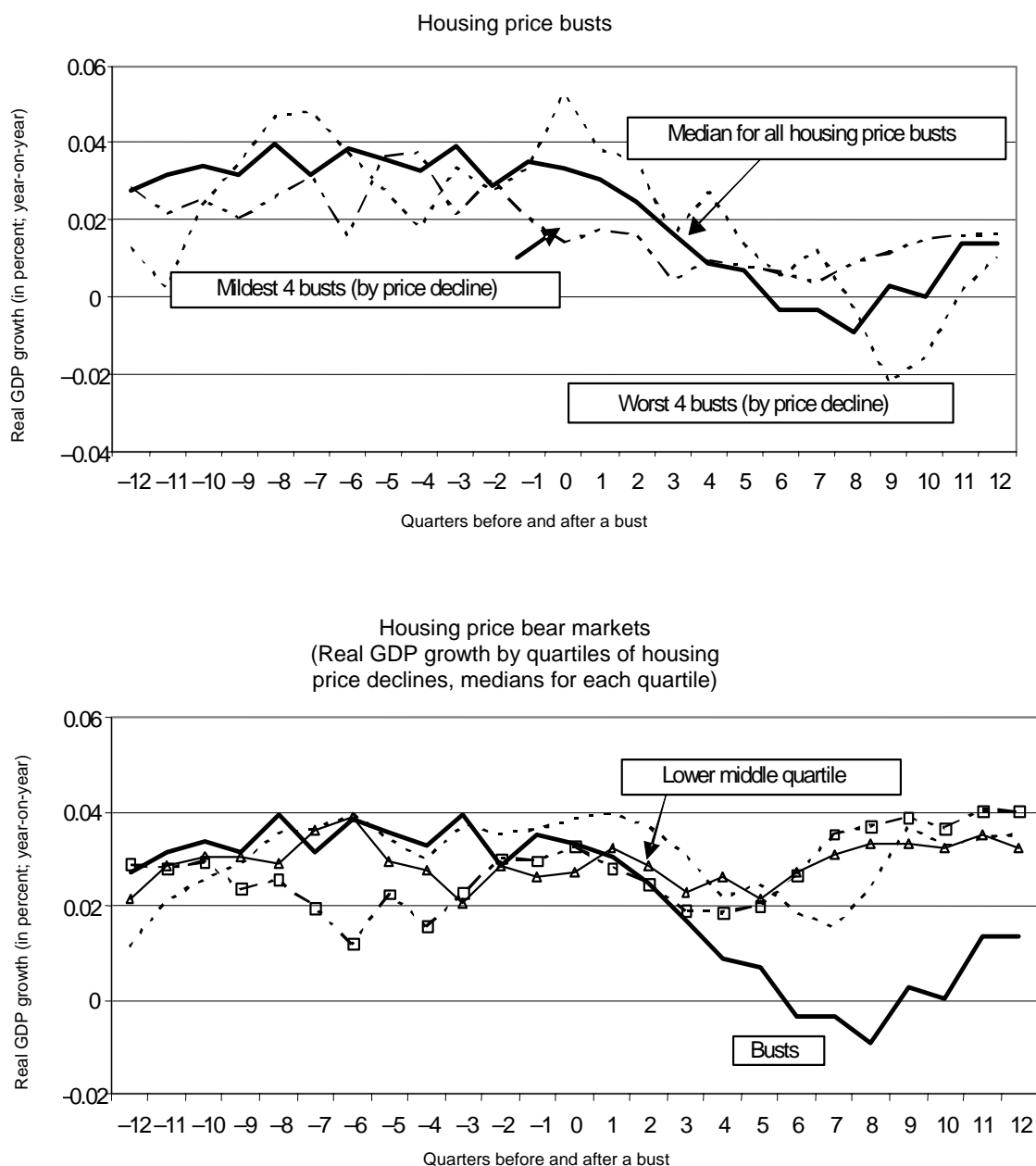
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<sup>15</sup> Schwartz (1995) argued that sustained inflation encourages speculative investments, especially in real assets, because investors expect rising prices, which reduces the real value of their borrowing but not of their investments.

<sup>16</sup> The financial accelerator refers to the interaction between a borrower's net worth, which depends in part on asset prices, and the costs and availability of external funds relative to internal funds (cash flow from operations). A decrease in net worth increases the relative costs of external funds while an increase reduces these costs. Another important supply channel is the bank (insurance) capital channel, which operates through the effects of asset prices on intermediaries' equity positions, which in turn determine their supply of intermediation services (eg, the amount of bank lending). See Bernanke (1993) and Bernanke et al (1999) for surveys on how the financial sector transmits and amplifies shocks to the economy or asset prices.

downturns in economic activity tend to be more severe in the case of boom-bust cycles, although output gaps in the case of busts that were not preceded by booms were also substantial. Housing price busts after boom were associated with prior monetary policy tightening, reflecting the fact that most boom-busts occurred during either the late 1970s and early 1980s or the late 1980s, when reducing inflation was an important policy objective. Housing price booms were generally associated with credit booms while credit typically declined during busts. Overall, the main empirical regularities discussed in this paper underscore the need for policymakers and market participants to be cognisant of the risks associated with housing price booms and busts. They suggest that despite obvious limitations, housing prices should be monitored when it comes to assessing macroeconomic conditions and prospects or financial vulnerabilities.

Figure 3  
**Housing price declines and economic activity**



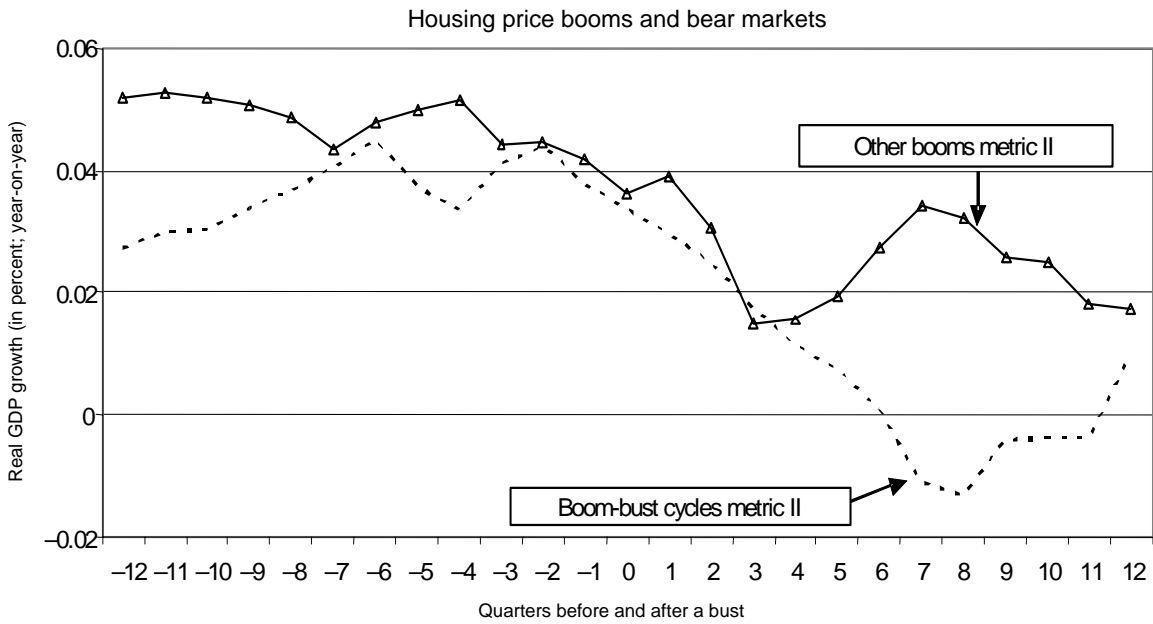
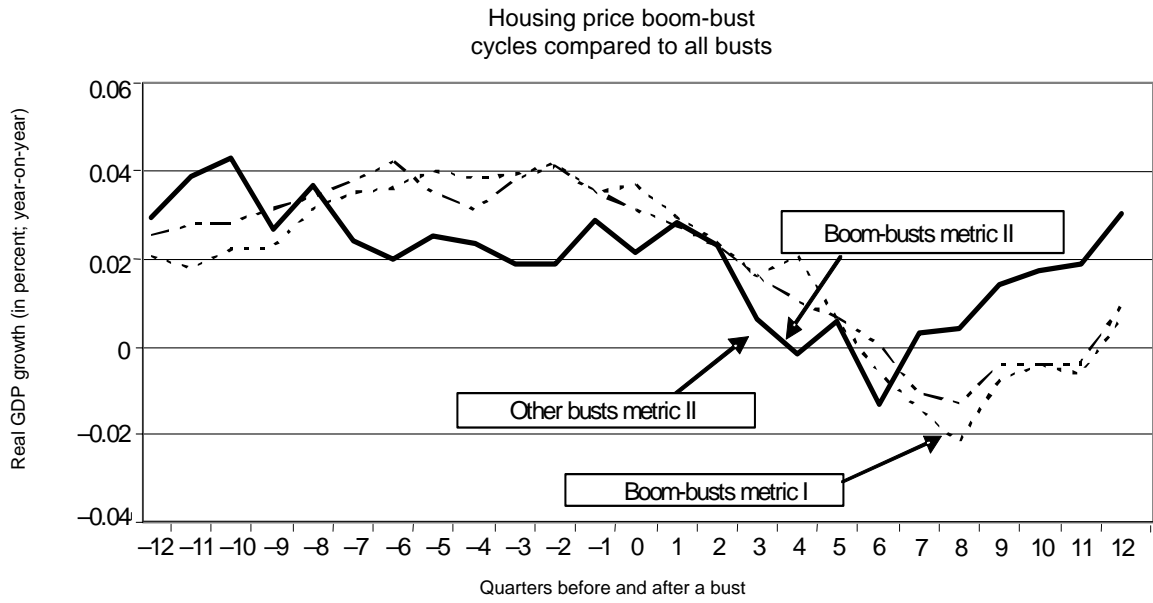
Source: Author's calculations.



Figure 4

### Housing price boom-busts and economic activity

Medians over all events in categories

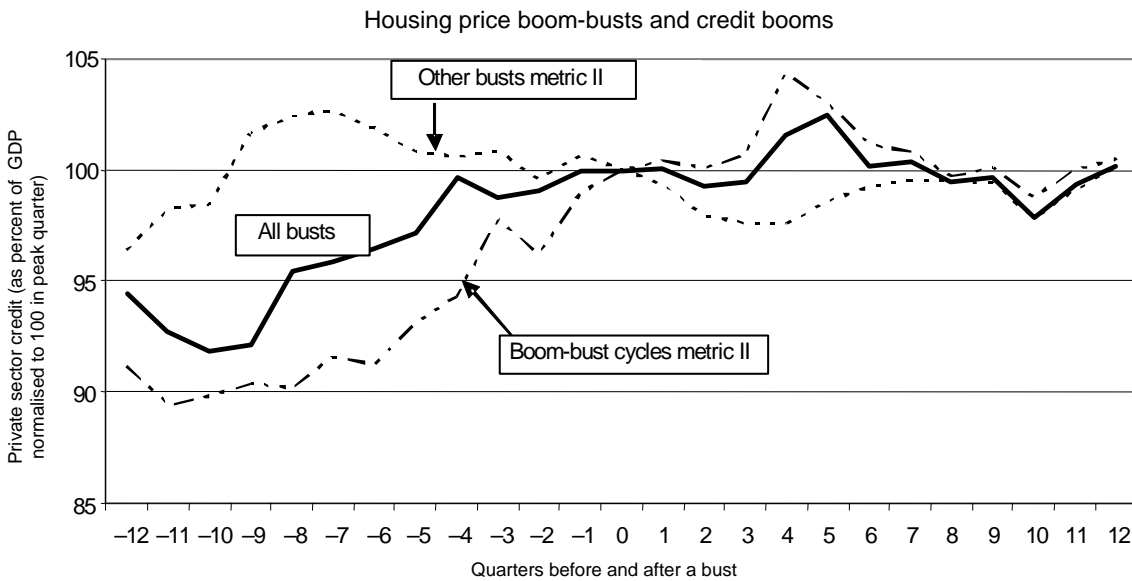
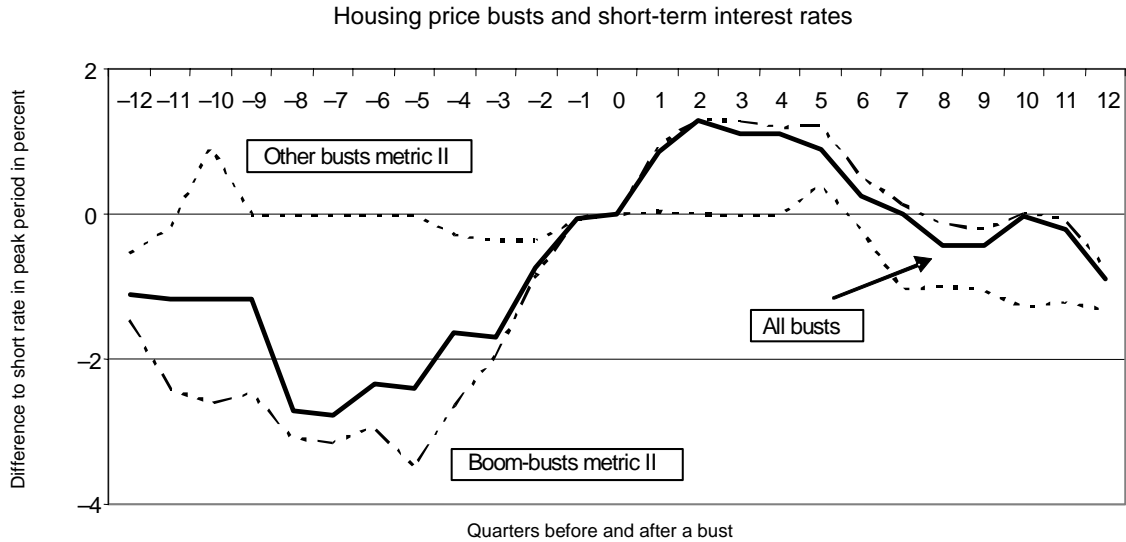


Source: Author's calculations.

Figure 5

**Housing price busts, monetary policy  
and the financial system**

Medians over all events in categories



Source: Author's calculations.

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# The asset price bubble in Japan in the 1980s: lessons for financial and macroeconomic stability<sup>1</sup>

Shigenori Shiratsuka

## Abstract

This paper reviews the implications of asset price fluctuations for financial and macroeconomic stability, based on Japan's experience of the asset price bubble. That experience was characterised by euphoria, that is, excessively optimistic expectations with respect to future economic fundamentals, which lasted for several years before dissipating. Policymakers are unlikely to make an appropriate policy response without full knowledge of the nature of asset price hikes or an accurate forecast of potential growth rates. In any policy response, it is deemed important to assess the sustainability of financial and macroeconomic stability.

Keywords: Asset price bubble; Financial stability; Macroeconomic stability, Sustainability.  
JEL Classification Codes: E31, E44, E58, E63, G18.

## I. Introduction

In this paper I discuss the implications of asset price fluctuations for financial and macroeconomic stability, based on Japan's experience in the late 1980s.

A look back over Japan's experience since the late 1980s shows that the emergence and bursting of the bubble played an important role in economic fluctuations in this period. This experience clearly indicates that both financial and macroeconomic instability are closely related to large fluctuations in asset prices, and raises the question of what is the appropriate way to treat asset prices in macroeconomic policymaking.

What should be noted regarding Japan's experience is that the enthusiasm of market participants, together with the inconsistent projection of fundamentals, contributed to a large degree to maintaining temporarily high asset prices at that time. Such enthusiasm is often called euphoria,<sup>2</sup> excessively optimistic but unfounded expectations for the long-term economic performance, lasting for several years before dissipating.<sup>3</sup>

In this context, it is crucial to accurately analyse what asset price fluctuations imply and to accurately evaluate how expectations illustrated in such fluctuations are sustainable. In retrospect, the prevailing expectations in Japan in the late 1980s were that the country was entering a new era of economic development, reflecting optimistic expectations for potential growth. It was thus excessive optimism rather than consistent projection of fundamentals that mainly supported temporarily high asset prices. As a result, the increase in asset prices during this period failed to provide sufficient evidence with

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<sup>1</sup> This paper was prepared for the IMF-BIS conference on Real Estate Indicators and Financial Stability, held at the IMF in Washington DC on 27-28 October 2003. The paper is based on my past research with many co-authors, including Kunio Okina, Makoto Saito, Tokiko Shimizu and Masaaki Shirakawa. I would like to thank the staff of the Institute for Monetary and Economic Studies of the Bank of Japan for their helpful comments. The views expressed here are mine and do not necessarily reflect the official views of either the Bank of Japan or the Institute for Monetary and Economic Studies.

<sup>2</sup> Kindleberger (1996) employs the concept of euphoria to describe the financial history of major asset price bubbles. Shiller (2000) uses the term "irrational exuberance" to describe a similar phenomenon. Garber (2000), however, argues against the explanation of bubbles from the viewpoint of mass psychology.

<sup>3</sup> It is important to note that euphoria is completely different from a rational bubble as modelled in Blanchard and Watson (1982). The rational bubble is expressed as a divergence from economic fundamentals and the probability of its bursting is recognised among economic agents and thus incorporated into asset price formation.

which to assess whether this rise was the consequence of the advent of a new economy or just euphoria.

This paper is organised as follows. Section II summarises the characteristics of the asset price bubble in the late 1980s by reviewing Japan's experience of asset price booms in the postwar period. Section III verifies the lessons of asset price bubbles regarding financial and macroeconomic stability. Section IV discusses policy implications regarding how to deal with major fluctuations in asset prices in macroeconomic policymaking. Section V examines policy implications in a more practical manner by conducting a case study exercise based on Japan's macroeconomic conditions in the late 1980s. Section VI concludes.

## II. Japan's asset price bubble in the late 1980s

In this section I summarise the characteristics of the asset price bubble in the late 1980s, based on Japan's historical experience of asset price inflation in the postwar period.

### A. Japan's asset price fluctuations in the post-WW II period

Figure 1 plots major financial and economic indicators, including asset prices such as stock and land prices in the postwar period. The figure plots stock prices and land prices as indicators for asset prices (first panel), the consumer price index, the domestic wholesale price index, and the GDP deflator as indicators of the general price level (second panel), the growth rate of real GDP, and the unemployment rate as indicators for demand-supply conditions (third panel), and M2+CDs and nominal GDP (last panel).

The figure shows Japan experienced three major boom-bust cycles in asset prices in the postwar period: (1) the *Iwato* boom in the second half of the 1950s; (2) the boom of Prime Minister Tanaka's "remodelling the Japanese archipelago" project; and (3) the *Heisei* boom in the late 1980s to early 1990s.

First, at the time of the *Iwato* boom, when Japan's economy entered the so-called "high economic growth period", asset prices increased rapidly, reflecting an improvement in fundamentals due to technological innovations. The real economic growth rate exceeded 10% per annum, driven mainly by investment demand due to technological innovations that replaced the post World War II reconstruction demand. On the price front, consumer prices rose while wholesale prices remained generally stable, thus leading to the so-called "productivity difference inflation".

Second, during the period from the "remodelling the Japanese archipelago"<sup>4</sup> boom to the first oil crisis, asset prices increased and then the general price level sharply rose due to the excessively high growth of the money stock and oil price hikes stemming from the first oil crisis. In the meantime, real economic growth rapidly declined, marking an end to the high economic growth period.

Third, in the *Heisei* boom, asset prices increased dramatically under long-lasting economic growth and stable inflation. Okina et al (2001) define the "bubble period" as the period from 1987 to 1990, from the viewpoint of the coexistence of three factors indicative of a bubble economy, that is, a marked increase in asset prices, an expansion in monetary aggregates and credit, and an overheating economy. The phenomena particular to this period were stable CPI inflation in parallel with the expansion of asset prices and a long adjustment period after the peaking of asset prices.

The decline in asset prices was initially regarded as the bursting of the asset price bubble, and an amplifying factor of the business cycle. Although the importance of cyclical aspects cannot be denied,

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<sup>4</sup> Kakuei Tanaka, who became Prime Minister in 1972, effected extremely aggressive public investment based on his belief (remodelling the Japanese archipelago) that it was necessary to resolve overpopulation and depopulation problems by constructing a nationwide shinkansen railway network, which led to an overheated economy.

further declines in asset prices after the mid-1990s seem to reflect the downward shift in the trend growth rate beyond the boom-bust cycle of the asset price bubble (Figure 2).<sup>5</sup>

## **B. Mechanism behind the emergence and expansion of the bubble**

Focusing on the third episode above, the bubble was generated by the complex interaction of various factors as a process of “intensified bullish expectations” (Figure 3).

The intensified bullish expectations are clearly observed in the increased equity yield spread during the period from the late 1980s to the early 1990s (Figure 4). As reported by Okina et al (2001), the expected growth rate of nominal GDP computed from the equity yield spread in 1990 is as high as 8% with the standard assumption based on the discount factor. However, in view of the low inflation at the time, it was unlikely that the potential growth rate of nominal GDP was close to 8%. Hence, it would be more natural to infer that the high level of the yield spread in 1990 reflected the intensification of bullish expectations, which were not sustainable in the long run.

The intensified bullish expectations were certainly grounded in several interconnected factors. The factors below are often pointed out as being behind the emergence and expansion of the bubble:

- aggressive behaviour of financial institutions
- progress of financial deregulation
- inadequate risk management on the part of financial institutions
- introduction of the Capital Accord
- protracted monetary easing
- taxation and regulations biased towards accelerating the rise in land prices
- overconfidence and euphoria
- overconcentration of economic functions in Tokyo, and Tokyo becoming an international financial centre

Focusing on monetary factors, it is important to note the widespread market expectations that the then low interest rates would continue for an extended period, in spite of clear signs of economic expansion. The movement of implied forward rates from 1987 to 1989 (Figure 5) shows that the yield curve flattened while the official discount rate was maintained at a low level.<sup>6</sup>

## **III. Adverse effects on financial and macroeconomic stability**

In this section, I selectively examine the lessons of Japan’s asset price bubble in terms of financial and monetary stability. I take up three points below: (i) the build-up of risks during the period of bubble expansion; (ii) the vulnerability of the bank-based financial system; and (iii) the weakened effects of monetary easing.

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<sup>5</sup> The bursting of the asset price bubble not only triggered the materialisation of adverse effects but also amplified them as time passed, thereby making structural adjustment more difficult. This incomplete economic adjustment to major changes in a relative price system resulted in the downward shift in growth trend in the 1990s, thereby amplifying the asset price decline beyond the boom-bust cycle.

<sup>6</sup> The implied forward rate is the future interest rate estimated from market rates with a different time to maturity. For example, the implied forward rate for three years ahead gradually increased from June 1987. As the BOJ conducted a slightly tighter monetary operation from September 1987, it rose to a level over 6% in the autumn. However, expectations of higher interest rates receded after the worldwide plunge of stock prices in October of the same year, and the implied forward rate decreased to around 5%. After the spring of 1988, the stock market gradually recovered and the economy once again showed clear signs of expansion. Nevertheless, the rate basically remained flat at around 5% towards the spring of 1989.

## A. Build-up of risks during the period of bubble expansion

The first lesson is that risks of financial and macroeconomic instability build up during asset price booms and materialise as an aftermath of asset price declines and recessions.<sup>7</sup> In the light of Japan's experience, it seems to be a characteristic that the effects of a bubble are asymmetrically larger in the bursting period than in the expansion period.

A rise and fall in asset prices, which contain an element of a bubble, influence real economic activity mainly through two routes: (i) consumption through the wealth effect, and (ii) investment through a change in the external finance premium due to changes in collateral and net asset values.<sup>8</sup> As long as asset prices are rising, they influence the economy in a favourable way and the adverse effects are not thoroughly recognised.

However, once the economy enters a downturn, the above favourable cycle reverses, thereby leading to a severe reaction. The harmful effects of a bubble will emerge, exerting stress on the real side of the economy and the financial system due to an unexpected correction of asset prices. If intensified bullish expectations which previously supported the bubble are left unchecked, the expansion and subsequent bursting of the bubble will become more intense, affecting the real economy directly or, by damaging the financial system, indirectly.

Looking at the land price problem from the viewpoint of the stability of the financial system, it was the risk brought about by the sharp rise in land prices and the concentration of credit in the real estate and related industries that were insufficiently perceived. During the bubble period, real estate was generally accepted as collateral. However, if the profitability of businesses financed by secured loans is closely related to collateral value, such loans become practically unsecured since profits and collateral value move in the same direction.

In fact, Shimizu and Shiratsuka (2000) show a simple numerical exercise, which is based on an analytical framework of value-at-risk (VaR) and enables us to sufficiently predict the magnitude of non-performing loans held by Japanese banks in the 1990s ("stress testing"). The exercise estimates the aggregate credit risk inherent in the loan portfolio of Japanese banks during the bubble period by assuming sufficiently prudent scenarios for the probability of bankruptcy, the concentration of credit and the future fluctuation of collateral prices (see Figure 6 for the scenario for land price fluctuation, and Table 1 for the estimation results).<sup>9</sup>

It should be noted, in this context, that the interaction of risks takes various forms, and such aggregate risks are not merely the simple sum of risks recognised by individual economic agents. It might well be the case that insufficient recognition of the interaction of various risks in the economy leads to an excessive concentration of risk. It is thus deemed important to recognise the risk profile of the economy as a whole, which might adversely affect sound financial and economic conditions from the medium- to long-term viewpoint.

Moreover, the effect of asset price fluctuations is asymmetric, with a stronger effect in the case of an asset price decline, because the collapse in asset prices has adverse effects on the stability of the financial system. Changes in cash flow and asset prices arising from cyclical movements in firms' net worth tend to affect agency costs and credit conditions, thereby influencing firms' investment behaviour. It is important to note that the capital base functions as a buffer against future risks and losses. Although this function is not clearly recognised as long as the economy is expanding smoothly, the adverse effects of having an insufficient capital base will materialise once the outlook for economic expansion changes.

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<sup>7</sup> See Borio et al (2001) for further discussion on this point.

<sup>8</sup> Bernanke et al (1996) refer to the amplification mechanism of initial shocks through changes in credit market conditions as the "financial accelerator".

<sup>9</sup> It should be noted that the analytical framework of Shimizu and Shiratsuka (2000) focuses on the changes in collateral values of bank loans, among various risk factors for bank loan portfolios. This approach is thus effective in the case of late 1980s Japan, whose financial system heavily depended on bank lending secured by real estate. Financial systems vary between countries in terms of the relative weights of bank lending and other features.

## **B. Vulnerability of a bank-based financial system**

The second lesson is that the vulnerability of Japan's banking system to very large and unexpected shocks increased significantly in the late 1980s.<sup>10</sup>

In a financial system, banks play a buffer role against short-term shocks by accumulating internal reserves when the economy is sound and absorbing losses stemming from firms' poor business performance or bankruptcy during recession. Even though some risks cannot be diversified only at a particular point in time, such risks can nevertheless be diversified over time. In order to achieve a more efficient allocation of risks in the economy, it is deemed important to have not only markets for cross-sectional risk-sharing but also sufficiently accumulated reserves as a buffer for intertemporal risk-smoothing.

Such a risk-smoothing function of the banking sector, however, is difficult to maintain under financial liberalisation and more intense competition from financial markets. Intertemporal smoothing requires that investors accept lower returns than the market offers in some periods in order to obtain higher returns in others. Investors, however, would opt out of the banking system and invest in the financial markets, thereby deteriorating banks' internal reserves. As a result, a risk-smoothing function is lost easily and suddenly once the economy encounters a shock that erodes banks' net capital to the extent that it threatens their soundness.

In fact, during the bubble era, gradual financial deregulation led to a reduction in the profitability of the banking sector in Japan (Figure 7), thereby deteriorating the risk-smoothing function in the banking sector. Against the background of financial liberalisation, fund-raising by major firms had been rapidly liberalised since around 1980, while banks were only allowed to enter the securities business gradually. Thus banks were very concerned that major firms would become less dependent on them for funding. In the meantime, since interest rates on deposits had gradually been liberalised, banks forwent the rent as they accepted deposits with regulated interest rates. Moreover, banks aggressively extended loans to small and medium-sized enterprises against real estate collateral as well as real estate related loans at low interest rates (Figure 8). In retrospect, such aggressive lending at low interest rates seemed to have caused financial institutions to take excessive risks compared with their profit outlook.

In this connection, two points should also be noted. First, a bank-based financial system, like Japan has, absorbs more risks from households than a market-based financial system does. Risk allocation in the economy thus would have been very different if the economy had had a market-based financial system even under a similar course of financial and economic development. Second, a bank-based financial system tends to magnify the adverse effects of the bursting of bubbles on real economic activity due to the longer time lag before their materialisation.

## **C. Weakened effects of monetary easing**

The third lesson is that the effectiveness of the central bank's monetary easing is substantially counteracted when the financial system carries problems stemming from the bursting of a bubble.

Although it is difficult to give a direct answer to the above question, the quantitative growth of financial indicators suggests that the current monetary easing phase is different and unusual compared with past experiences. First, from a quantitative aspect, Figure 9 shows that the monetary base (which represents the liabilities of the BOJ) has been recording marked growth, while the money supply (M2+CDs) has been growing at a low rate and bank loans have been declining. Second, on the fund allocation front, Figure 10 indicates that while loans to manufacturing industries, which are believed to carry relatively high profitability, had declined throughout the 1990s, loans to the real estate industry followed an increasing trend until 1998.

The above observation suggests the possibility of two mechanisms. First, an increase in non-performing loans erodes the net capital of financial institutions, resulting in a decline in risk-taking ability (credit crunch). Second, even though firms become unprofitable, financial institutions continue

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<sup>10</sup> Baba and Hisada (2002) discuss the characteristics of Japan's financial system in detail.



lending to them to prevent losses from materialising (forbearance lending).<sup>11</sup> Under such circumstances, loans to unprofitable firms become fixed and funds are not channelled to growing firms, holding down economic activity.

Moreover, monetary easing alone was unable to offset amplified shocks beyond the boom-bust cycle of asset price fluctuations. Nagahata and Sekine (2002) showed that the positive impacts of lowering interest rates worked, although such easing impacts were offset by the negative impacts of deteriorated balance sheet conditions at the firms as well as banks.

As a related issue, it should be stressed that, once a financial system tumbles into a critical situation, the boundary between monetary and prudential policies becomes extremely ambiguous.<sup>12</sup> Money market operations under financial crises have a larger burden of liquidity management in various markets, in addition to a standard role as a starting point of monetary policy transmission.

More precisely, during financial crises, financially stressed banks tend to have serious difficulties not only with lending, but also arbitraging and dealing. This hampers the transmission mechanism from the policy-targeted rate to longer-term rates, resulting in segmentation among various financial markets. Thus, it could be extremely important for a central bank to intervene in various financial markets to fix segmented markets, thereby restoring market liquidity and the proper transmission mechanism.

#### **IV. Risk management perspectives**

In this section, I turn to the policy implications of how to deal with major fluctuations in asset prices in macroeconomic policymaking. I would emphasise the importance of risk management perspectives in order to deal with the possibility of a bubble in a pre-emptive manner.<sup>13</sup>

##### **A. Risk assessment of the economy**

A starting point of the risk management of the economy is how to accurately assess risks with a view to the future risk of financial and macroeconomic instability. The critical point in the risk assessment is the judgment on the possibility of structural changes in the economy or entering a “new economy”. As evidenced by the experience of Japan’s bubble period, it is difficult to deny such a possibility with the contemporaneously available information under euphoric expectations. This makes it crucially difficult to identify whether the increases in asset prices being observed are really a bubble or not in the very process of the expansion of a bubble.

Policymakers in the above situation are faced with two different kinds of risk. When productivity rises, driven by changes in economic structure, strong monetary tightening based on the assumption that the economic structure has not changed would constrain economic growth potential. On the other hand, a continuation of monetary easing would allow asset price bubbles to expand if the perception of structural changes in the economy was mistaken.

This issue can be regarded as similar to a problem of statistical errors in the test procedure of statistical inference. A type I error (the erroneous rejection of a hypothesis when it is true) corresponds to a case where (though a “new economy” theory may be correct) rejecting the theory means the central bank erroneously tightens monetary conditions and suppresses economic growth potential. A type II error (failure to reject a hypothesis when it is false) corresponds to a case in which a bubble is mistaken as a transitional process to a “new economy”, and the central bank allows inflation to ignite.

Given that one cannot accurately tell in advance which of the two statistical errors policymakers are more likely to make, it is deemed important to consider not only the probability of making an error but

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<sup>11</sup> Sekine et al (2003) provide empirical evidence on the possibility of forbearance lending in Japan in the 1990s.

<sup>12</sup> See Saito and Shiratsuka (2001) for details on this point.

<sup>13</sup> Greenspan (2003) points out that monetary policymaking under uncertainty involves a crucial element of risk management.

also the relative cost of each error. In this regard, Japan's experience suggests that making a type II error is fatal compared with a type I error when faced with a bubble-like phenomenon. For monetary policymaking at that time, it seemed pragmatic to flexibly adjust the degree of tightening while paying due attention to not only a type II error but also a type I error.

## **B. Sustainability of sound financial and economic environments**

In assessing the risks in the economy, I should stress the importance of the viewpoint of the sustainability of sound financial and economic environments.

Taking monetary policy as an example, the relevant question in practice is how to define price stability so that it supports a sound financial and economic environment as a basis for sustainable economic growth. There seems to be a consensus that the best thing monetary policy can do to foster sustainable economic growth is to deliver predictably stable prices in the long term. However, a consensus has yet to be reached as to how to transform such a conceptual definition into a practice of monetary policy as regards the practical interpretation of price stability.

In this context, Shiratsuka (2001) classifies views regarding price stability into two: "measured price stability" and "sustainable price stability". The first definition of "measured price stability" emphasises the importance of maintaining a specific rate of inflation measured by a specific price index at a particular point in time. This enables one to specify price stability numerically so as to set a tolerable target range for the inflation rate, such that price stability corresponds to a rate of inflation from 0 to 2%.

The second definition of "sustainable price stability" considers price stability to be important as a necessary condition for maximising economic stability and efficiency.<sup>14</sup> In this case, price stability pursued by a central bank is not necessarily equivalent to maintaining a specific rate of inflation measured by a specific price index at a particular point in time. This is because such indicators are influenced by various temporary shocks and measurement errors.<sup>15</sup> An important yardstick for price stability is whether the stabilisation of public expectations regarding inflation is attained.<sup>16</sup>

It seems most practically feasible for a central bank to deal with asset price bubbles from the viewpoint of contributing to the sound development of the economy through the pursuit of price stability. However, it might be the case that achieving low measured inflation in the short term does not necessarily ensure sustainable stability of the economy.

## **V. Assessment of intensified bullish expectations**

In this section, I examine policy implications, discussed in the previous section, in a more practical manner by conducting a case study exercise about Japan's macroeconomic conditions in the late 1980s.

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<sup>14</sup> Mieno (1994), the former Governor of the BOJ, stated during his lecture at the Kisaragi-kai in May 1994 that "price stability does not mean the stability of price indices. Real price stability can be achieved when such stability is backed by medium- to long-term, well-balanced, and sustainable economic growth."

<sup>15</sup> For example, it might be the case that statistically measured inflation is highly volatile at a glance, while most of the effects are just temporary. Conversely, it might also be the case that measured inflation remains stable, even though the changed underlying inflation trend is offset by temporary shocks. To deal with this problem, Shiratsuka (1997) and Mio and Higo (1999) empirically show that the trimmed mean estimator, which excludes the impacts of items located on both the tails of cross-sectional distribution of inflation, adequately adjusts for the impact of temporary shocks, and could well be a quite useful and powerful indicator with which to gauge the changes in underlying inflation fluctuations.

<sup>16</sup> In this context, FRB Chairman Greenspan refers to price stability as being a state of the economy in which "economic agents no longer take account of the prospective change in the general price level in their economic decision making" (Greenspan (1996)).

## A. Taylor rule

I first take up the Taylor rule as a possible guidepost for a central bank to deal with asset price fluctuations in a pre-emptive manner.

In the most basic formulation, the Taylor rule considers that the operational target level of the interest rate should be determined according to the divergence of the inflation rate and output gap from their equilibrium level (Taylor (1993)). The standard interpretation of the Taylor rule is that a central bank has two objectives on the level of economic activity, inflation and output gap, whose relative importance is evaluated by the coefficients of each objective variable. However, if we regard the output gap as a proxy of future inflationary pressure, the Taylor rule can be interpreted as a rule that responds to current and future price developments.<sup>17</sup>

Within the framework of the Taylor rule, Bernanke and Gertler (1999) argue that it is possible for a central bank to deal with potential inflationary pressure in a pre-emptive manner. This is because effects of asset price fluctuations are included in changes in the current output gap.<sup>18</sup> They present simulation results that the BOJ should have been able to achieve better performance if it had pursued a Taylor-type rule that discards asset price fluctuations (Figure 11). In fact, their policy rule points to the need for rapid tightening by raising the interest rate from 4% to 8% in 1988, despite focusing only on the inflation and output gap.

Okina and Shiratsuka (2002, 2003) point out, however, that Bernanke and Gertler's (1999) conclusion depends crucially on their treatment of the consumption tax in compiling a core inflation rate (Figure 12). They show that the spike of the policy rate in 1998, observed in Bernanke and Gertler (1999), disappears when they adjust for the introduction of the consumption tax (3%) in April 1989. They conclude that it was difficult for the BOJ to pursue rapid monetary tightening in 1988 as Bernanke and Gertler pointed out, if one considers that one-time price increases induced by an introduction of the consumption tax should not be offset by monetary tightening.

## B. Output gap and trend growth

Given the above argument on the Taylor rule, I next examine two components of the Taylor rule, output gap and inflation, in turn.

The assessment of potential GDP differed according to whether one adopted the optimistic expectations at the time or accepted the potential growth rate based on the benefit of hindsight that such expectations were nothing more than euphoria. In the case of euphoria, the perceived potential output path shifts upwards as economic expansion prolongs, resulting in the underestimation of inflationary pressure in view of the output gap. Conversely, in the case of a rational bubble, an output gap is assessed based on recognition that the potential output path remains unchanged. Thus, market participants correctly recognise fundamental values of asset prices as well as the sustainability of currently overvalued asset prices, which leads to the same judgment reached with the benefit of hindsight, that the asset price increase was entirely the result of euphoria.<sup>19</sup>

What typically bears out this point is, as illustrated in Figure 13, the evaluation of the real GDP growth path on a real-time basis. 1987 Q1 marks the bottom of the yen appreciation recession prior to the bubble period. At this point, when one plots a linear trend line from 1977 Q4 to 1987 Q1, it

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<sup>17</sup> For example, Meyer (2000) states that the Taylor rule depends on two central bank objectives, inflation and output gap, as well as being pre-emptive in nature in the sense that the output gap is a leading indicator of inflation. In addition, interpreting the inflation rate and output gap as variables in the Taylor rule, Goodhart (1999) states that these two variables are core variables in forecasting future inflation.

<sup>18</sup> Bernanke and Gertler (1999) argue that “[by] focusing on the inflationary or deflationary pressures generated by asset price movements, a central bank can effectively respond to the toxic side effects of asset booms and busts without getting into the business of deciding what is a fundamental and what is not”.

<sup>19</sup> In this context, Meyer (2000) states that a major challenge for US monetary policy at that time (as of March 2000) was determining how “to allow the economy to realise the full benefits of the new possibilities while avoiding an overheated economy”. He also emphasises the importance of possible changes in aggregate supply and trend growth in the evaluation of inflationary pressure.

approximately corresponds to a trend of 3.5% growth. However, from 1987 Q1 to mid-1991, real GDP expanded following a trend line of 5% growth.

Given the above argument, it is deemed crucial that the risk of committing a type II error increases as economic expansion prolongs. This is because continued economic expansion gradually makes it difficult to recover the cyclical and trend components from the data.

### **C. Inflation**

In the bubble period, the CPI was extremely stable until around 1987, but started to rise gradually in 1988 (Figure 14). The year-on-year increase in the CPI, adjusted for the impact of consumption tax, continued to rise after April 1989, and it reached 2% in April 1990 and 3% in November 1990.

From the viewpoint of “measured price stability”, two evaluations are possible: (1) prices eventually rose substantially towards the end of the bubble period, compared with the recent level of inflation; and (2) price stability had not been undermined in comparison with the figure before the bubble period. The difference between the two evaluations, so to speak, boils down to the question of what can be regarded as a tolerable rate of inflation. There can be a variety of answers to this question.

From the viewpoint of “sustainable price stability”, however, it can be seen that Japan’s economy experienced deflation as a result of the emergence of the bubble economy in the second half of the 1980s. Thus, as Okina et al (2001) point out, it could be safely claimed that Japan’s economy did not succeed in maintaining price stability after the bubble period. In other words, the experience of the bubble period seems to suggest the importance of “the sustainability of price stability over a fairly long period”.

### **D. Money supply and credit**

Finally, I examine the development of monetary aggregates. During the bubble period, the large increase in money supply and credit also signalled the need for an early increase in interest rates.

In fact, while the BOJ expressed concern over the increase in money supply from a relatively early stage,<sup>20</sup> such concern was ultimately not taken seriously. The major reason for this was lack of a common understanding, including on the part of the BOJ, as to what kind of problems might be occasioned by the massive expansion of money supply and credit.

At that time, concern over the large increase in money supply was mainly based on the view that such an increase would eventually result in inflation. However, prices did not rise even though money supply increased. As a result, it was widely argued that the statistical relationship between money supply and prices had become unstable and this argument gradually prevailed. In addition, the ongoing deregulation of deposit interest rates was often mentioned as a reason for the statistical instability.

Based on Japan’s experience, when money supply and credit show a very large upswing, we should pay close attention to such movements in the conduct of monetary policy on the presumption that such large fluctuations may indicate the possibility of undesirable developments in economic activity.

## **VI. Concluding remarks**

This paper has reviewed the implications of asset price fluctuations for financial and macroeconomic stability, based on Japan’s experience of the asset price bubble in the late 1980s.

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<sup>20</sup> As pointed out in Okina et al (2001), the BOJ had already voiced concern over the massive increase in money supply and the rapid rise in asset prices in the summer of 1986. The concern of senior BOJ officials is expressed in the term “dry wood” (easily ignitable inflation) which was often heard at the time.

A critical point is that Japan's asset price bubble was based on excessively optimistic expectations with respect to the future, which might be described as euphoria with the benefit of hindsight, rather than a rational bubble. Under continued price stability, the perceived potential output path shifted upwards as economic expansion prolonged, resulting in the emergence of euphoria and underestimation of inflationary pressure in view of the output gap. However, the increase in asset prices during this period also failed to provide sufficient evidence with which to assess whether this rise was the consequence of the advent of a new economy or just euphoria.

After all, policymakers are unlikely to make an appropriate policy response without full knowledge of the nature of asset price hikes or a correct forecast of potential growth rates. In any policy response, it is deemed important to assess financial and macroeconomic stability from the viewpoint of sustainability. It should be noted, however, that no rules exist regarding how to accurately recognise the risk profiles in the economy. In fact, Kindleberger (1995) points out that there are no cookbook rules for policy judgment, and it is inevitable that policymakers are required to make a discretionary judgment.<sup>21</sup>

Table 1  
**The credit risk of the loan portfolio of city banks (end-March 1990)**

In trillions of yen

	Bankruptcy probability (observation period)	Assumption about portfolio diversification	Scenario for the future fluctuation of collateral prices	Amount of credit risk	
					<i>Of which: Concentration risk<sup>1</sup></i>
1	Bankruptcy probability (1985-89)	Average diversification	Constant	2.7	1.6
2	Default probability (1985-89)	Average diversification	Constant	5.0	2.7
3	Default probability <sup>2</sup> (1990-94) assuming deterioration of the credit situation of the construction, real estate and finance-related industries	Average diversification	Constant	14.9	6.0
4	Same as above	Average diversification	Deviation from the theoretical value is eliminated in five years	17.5	6.9
5	Same as above	Credit concentration in the real estate and finance-related industries is assumed ( $\alpha: 0.1 \rightarrow 0.3$ )	Same as above	22.8	10.5

Source: Table 2 in Shimizu and Shiratsuka (2000).

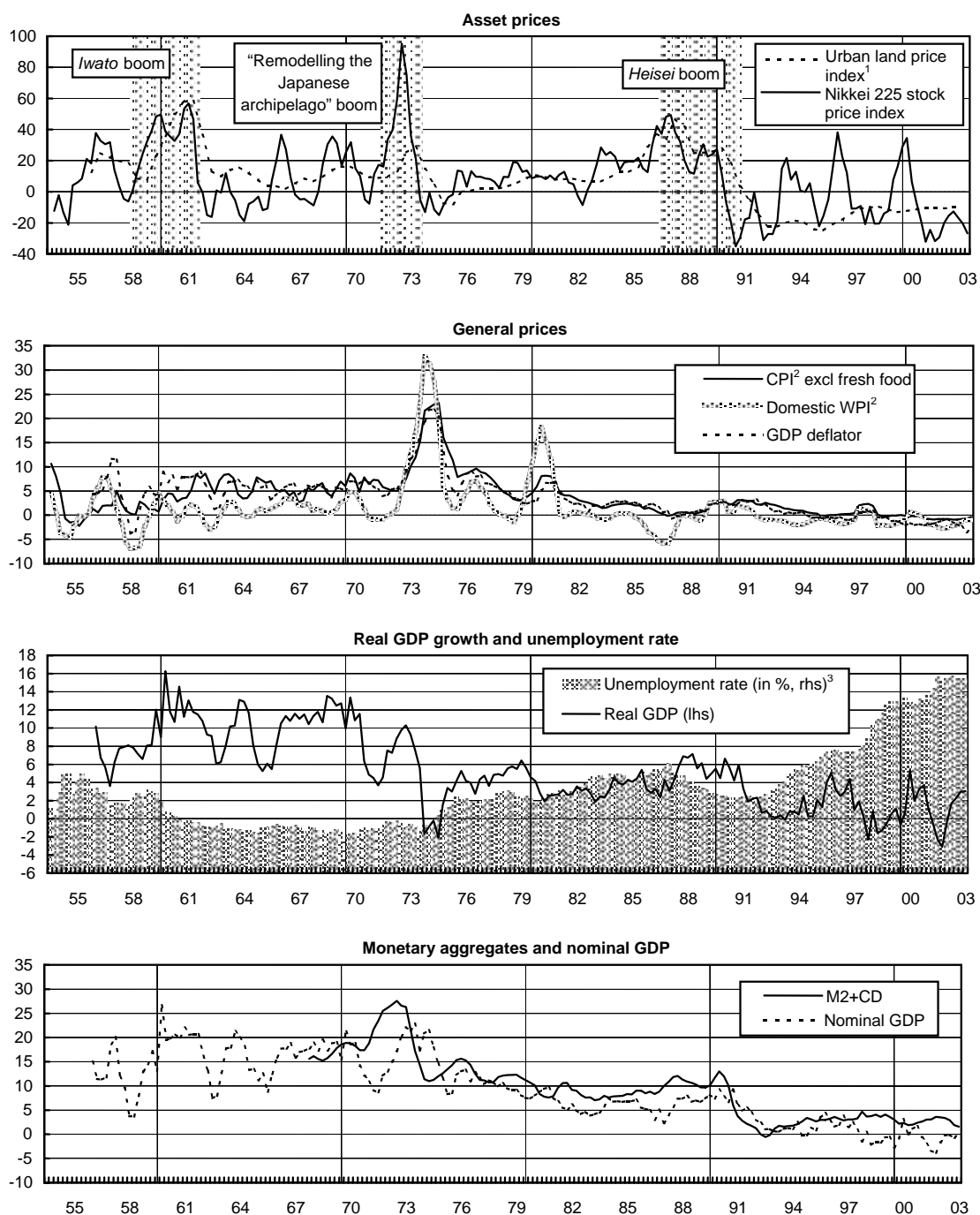
<sup>1</sup> The amount of risk when dynamic risk is assumed to be zero. <sup>2</sup> The following increases for the default probability are assumed: for the construction industry, from 0.0% to 0.40%; for the real estate industry, from 0.0% to 0.59%; and for the finance-related industry, from 0.0% to 7.49%.

<sup>21</sup> Kindleberger (1995) on this point: "When speculation threatens substantial rises in asset prices, with a possible collapse in asset markets later, and harm to the financial system, or if domestic conditions call for one sort of policy, and international goals another, monetary authorities confront a dilemma calling for judgment, not cookbook rules of the game."

Figure 1

**Asset prices, general prices and economic environment**

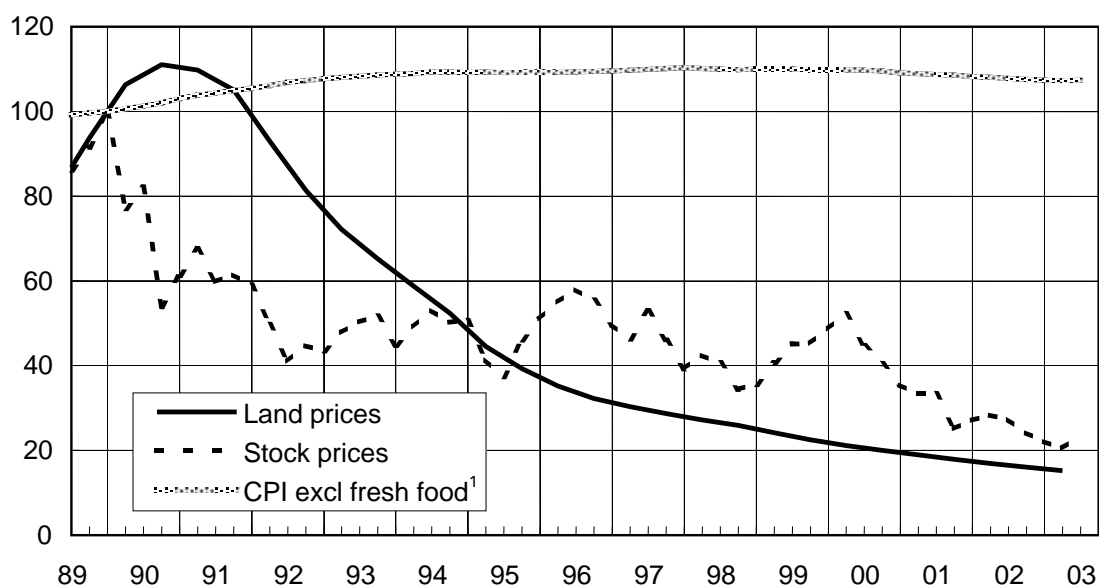
Year-on-year changes, in per cent



<sup>1</sup> Based on commercial land prices in six major cities. <sup>2</sup> Regarding CPI before 1970 and domestic WPI before 1960, the pre-war base series are connected with the current series. <sup>3</sup> Seasonally adjusted.

Source: Bank of Japan, *Financial and Economic Statistics Monthly*.

Figure 2  
**Asset price deflation**  
 1989 Q4 = 100

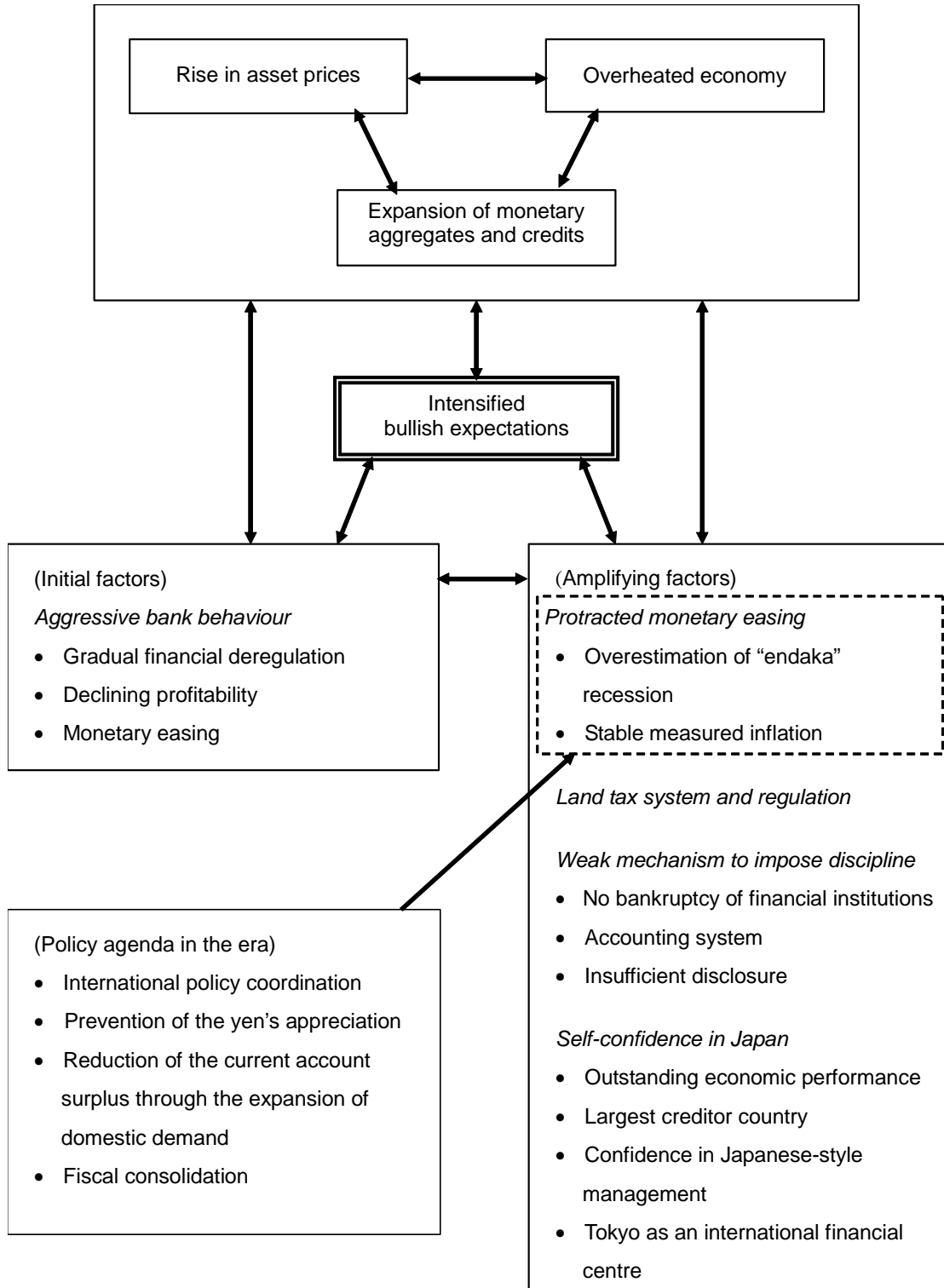


<sup>1</sup> Seasonally adjusted using X-12-ARIMA with options of (0 1 2) (0 1 1) ARIMA model and level shifts in April 1989 and April 1997 when the consumption tax was respectively introduced and subsequently hiked.

Sources: Bank of Japan, *Financial and Economic Statistics Monthly*; Ministry of Public Management, Home Affairs, Posts and Telecommunications, *Consumer Price Index*; Japan Real Estate Institute, *Urban Land Price Index*.

Figure 3

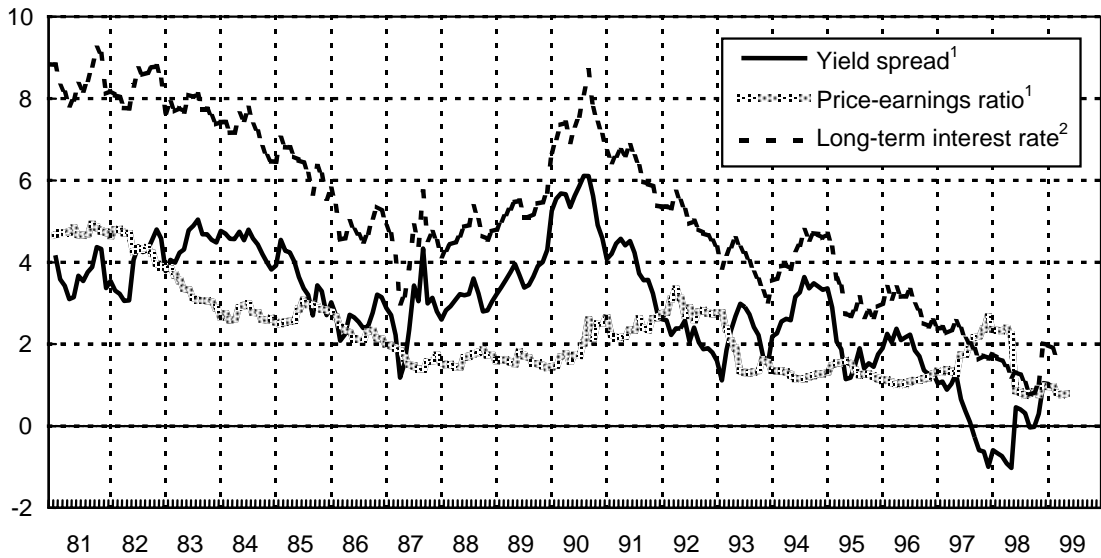
**Illustration of bubble economy in Japan**



Source: Figure 13 in Okina et al (2001).



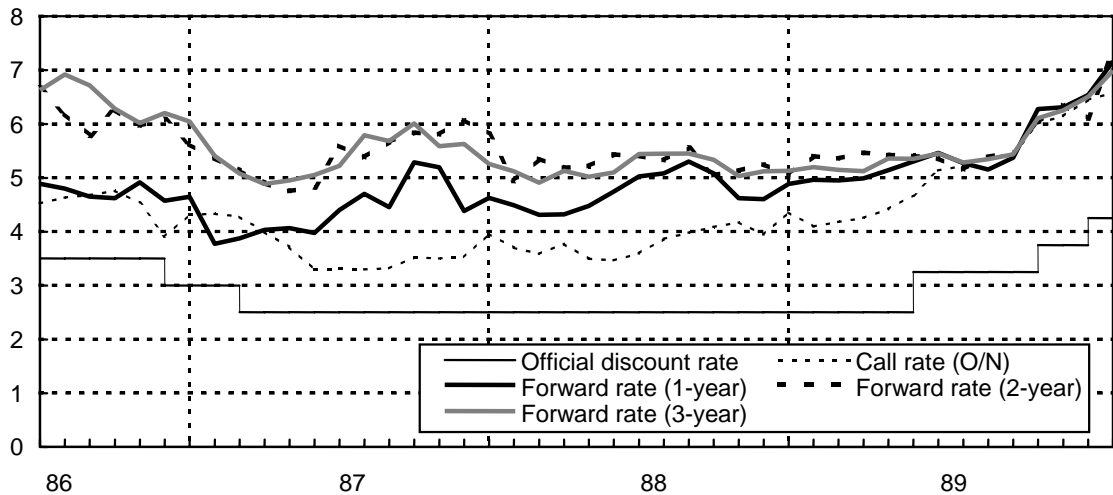
Figure 4  
**Equity yield spreads**  
 In per cent



<sup>1</sup> Computed on TOPIX basis. <sup>2</sup> Ten-year JGB rate at end of each month.

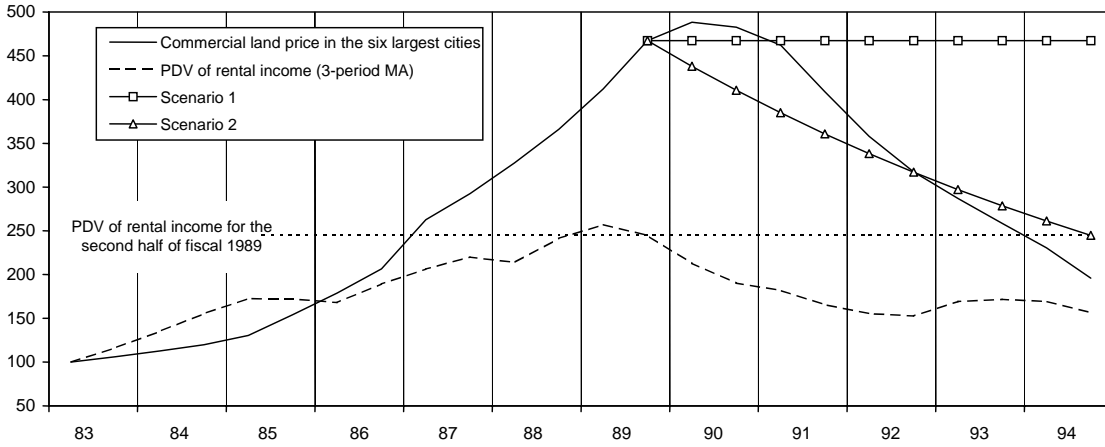
Source: Bank of Japan, *Financial and Economic Statistics Monthly*.

Figure 5  
**Implied forward rates**  
 In per cent



Source: Bank of Japan, *Financial and Economic Statistics Monthly*.

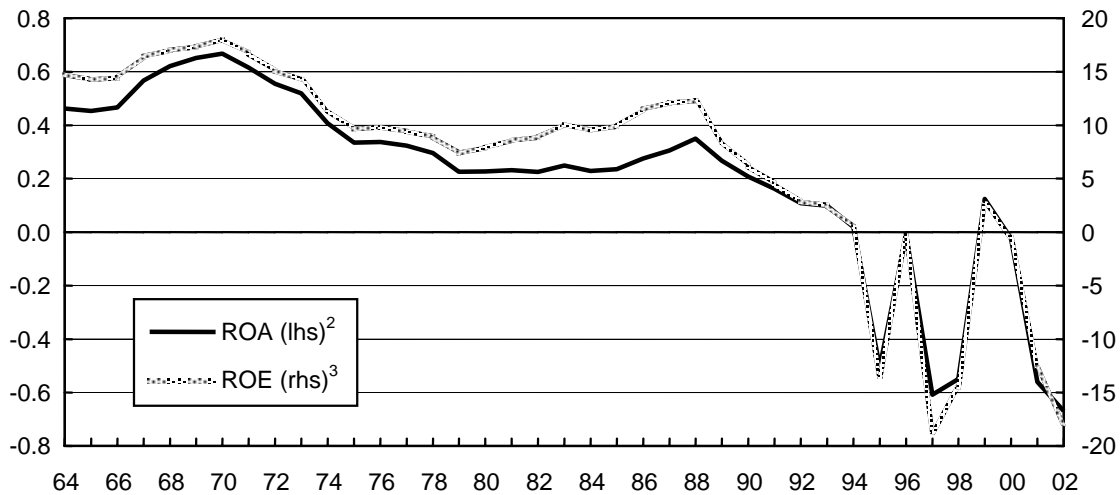
Figure 6  
**Scenarios for land price fluctuations**  
 First half of fiscal 1983 = 100



Notes: 1. It is assumed for price fluctuations after the second half of fiscal 1989 that the price will fall at a constant rate so as to eliminate the deviation from the present discounted value in five years. 2. The present discounted value land price is calculated by assuming that (i) total rental income from office space remains constant as a percentage of GDP, (ii) the rate of growth of rental income is equal to the rate of potential economic growth and the expected rate of inflation (with perfect foresight over a one-year horizon), and (iii) the risk premium is 2.3% (given by the difference between the rate of nominal GDP growth for fiscal 1981-9 and the yield spread).

Source: Figure 1 in Shimizu and Shiratsuka (2000).

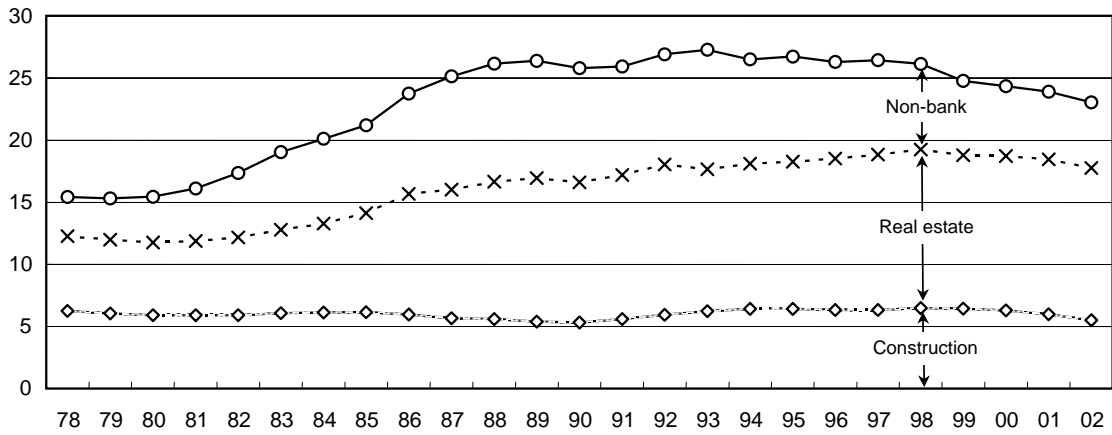
Figure 7  
**Profitability of Japanese banks<sup>1</sup>**  
 In per cent



<sup>1</sup> Domestically licensed banks (summation of city banks, regional banks, regional banks II, trust banks, and long-term credit banks). <sup>2</sup> (Profit for the Term) / (Total Assets – Acceptance and Guarantees). <sup>3</sup> (Profit for the Term) / (Total Stockholders' Equity).

Source: Japanese Bankers Association, *Financial Statements of All Banks*.

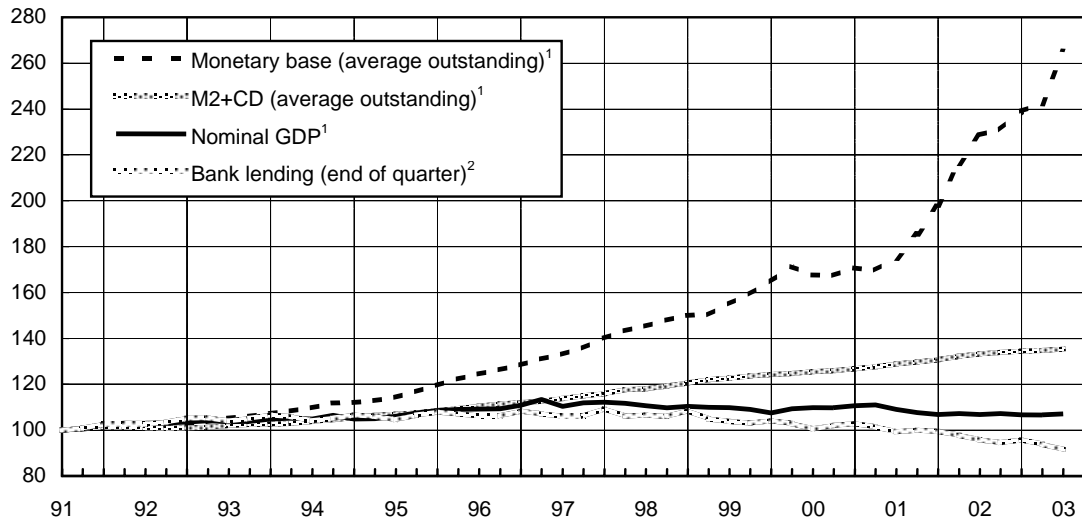
Figure 8  
**Bank lending to real estate related industries<sup>1</sup>**  
 In per cent



<sup>1</sup> Real estate, construction and non-banks.

Source: Bank of Japan, *Financial and Economic Statistics Monthly*.

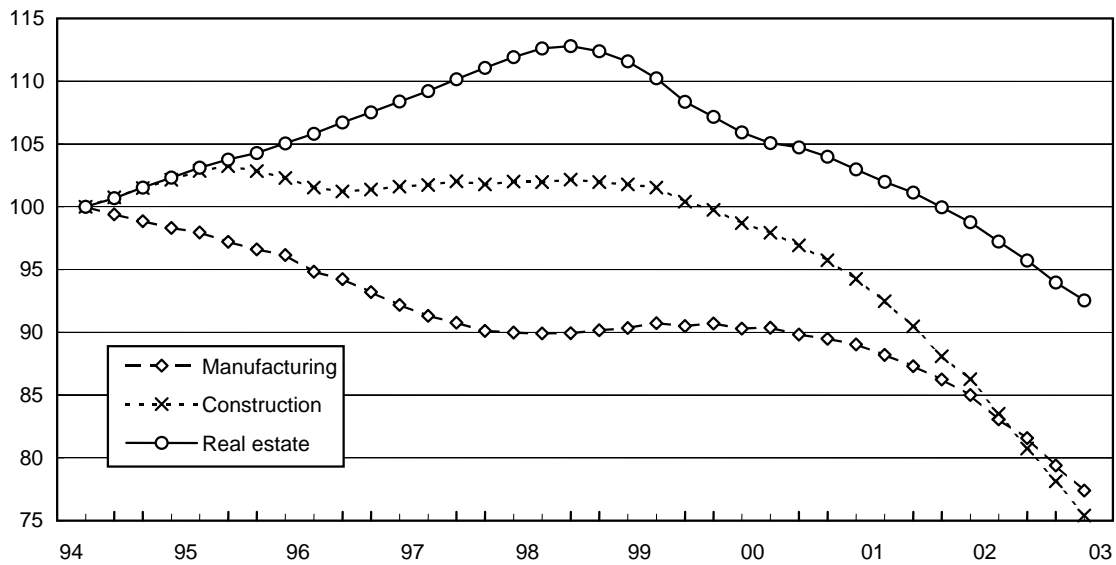
Figure 9  
**Monetary aggregates**  
 1991 Q2 = 100



<sup>1</sup> Seasonally adjusted. <sup>2</sup> Seasonally non-adjusted.

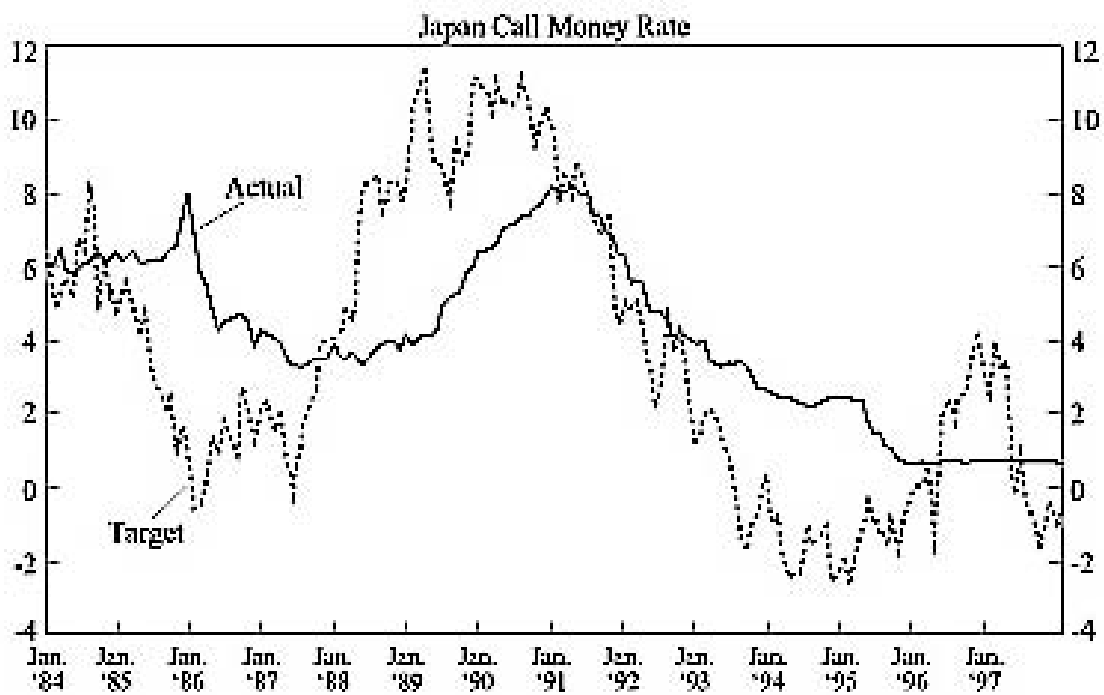
Sources: Bank of Japan, *Financial and Economic Statistics Monthly*; Cabinet Office, *Annual Report on National Accounts*.

Figure 10  
**Loans outstanding by industries (to be updated)**  
 1994 Q3 = 100



Source: Bank of Japan, *Financial and Economic Statistics Monthly*.

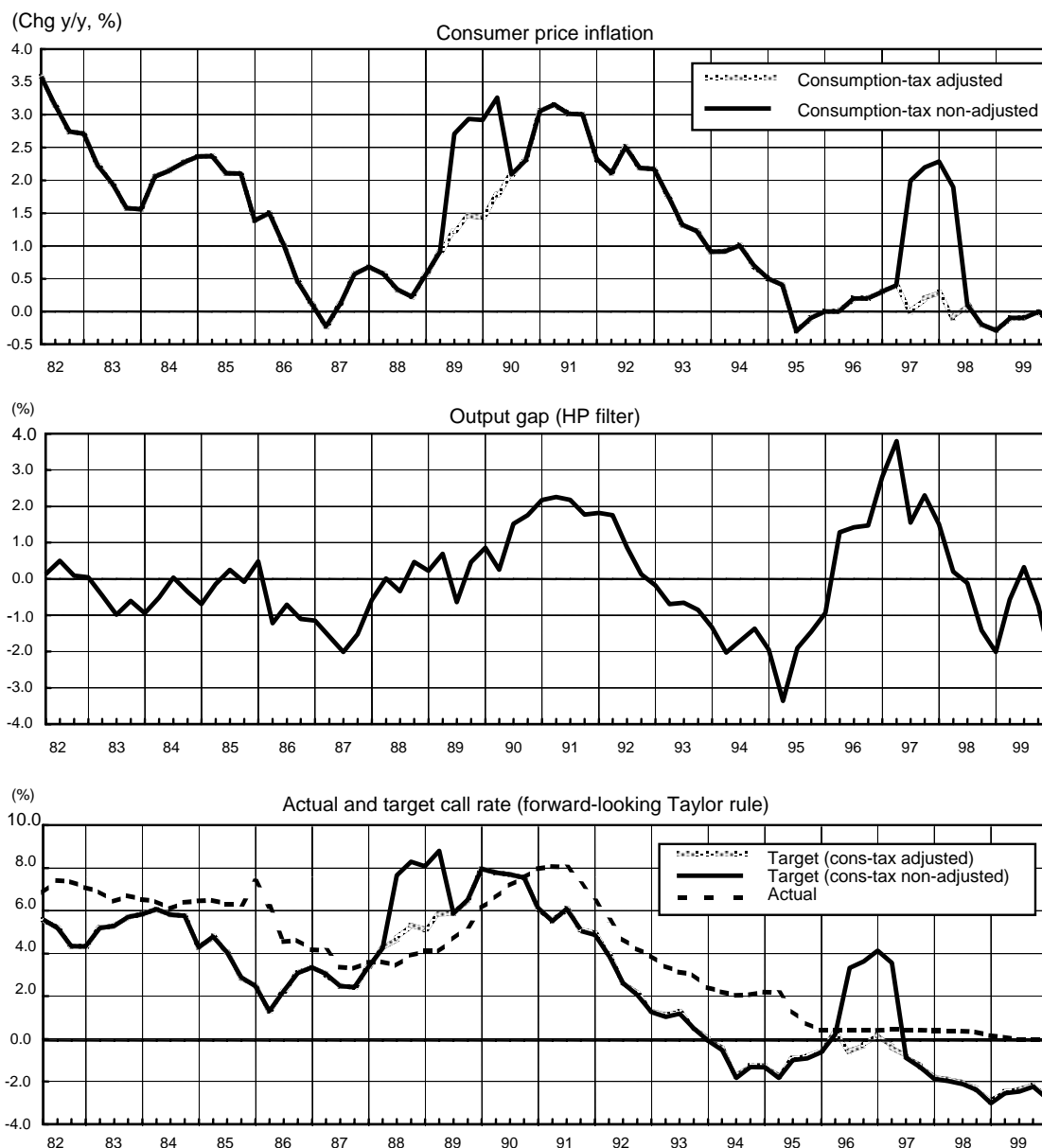
Figure 11  
**Taylor rule: Bernanke and Gertler's estimation**



Source: Bernanke and Gertler (1999).

Figure 12

Taylor rule: Okina and Shiratsuka's estimation



Notes: 1. Output gaps are computed as the difference between actual and HP-filtered series for real GDP. HP-filtered series computed for the sample period from 1955 Q2 to 2000 Q4 with the smoothing parameter  $\lambda = 1,600$ . 2. Taylor rule defined as  $R_t = r_t^* + \pi^* + \alpha \times (\pi_{t+4} - \pi^*) + \beta \times (Y_t - Y^*)$ :

$r_t^*$ : equilibrium real short-term interest rate at period  $t$

$\pi^*$ : targeted rate of inflation

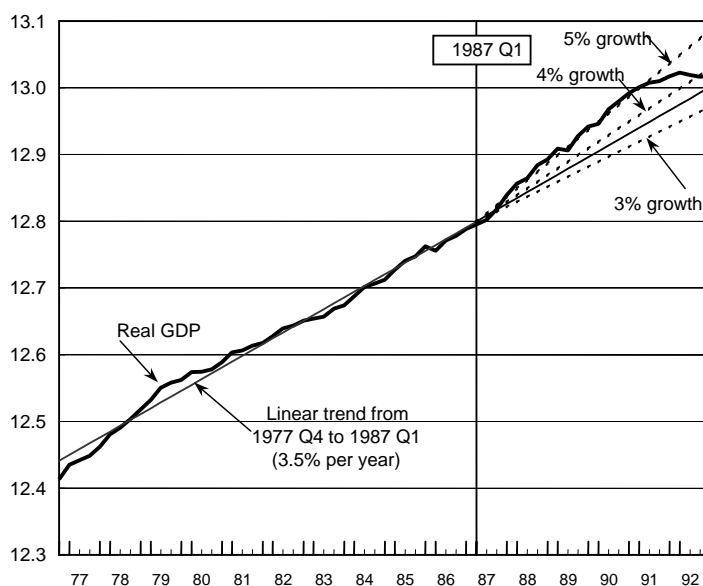
$R_t$ : uncollateralised overnight call rate at period  $t$

$\pi_{t+T}$ : rate of consumer price inflation at period  $t$

$Y_t - Y^*$ : output gap at period  $t$

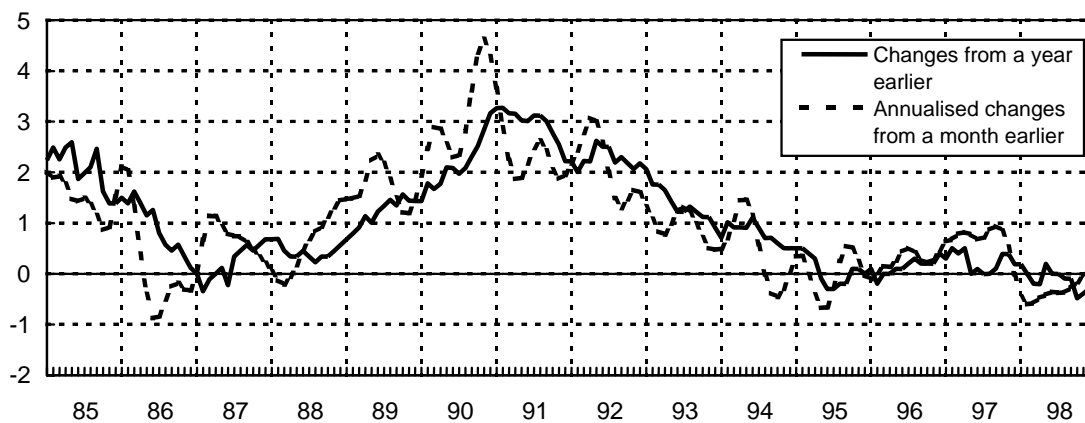
Sources: Okina and Shiratsuka (2002), Charts 6 and 7.

Figure 13  
**Impact of trend shift in real GDP**  
 Millions of yen in logarithms



Source: Cabinet Office, *Annual Report on National Accounts*.

Figure 14  
**Price development**  
 In per cent



Notes: 1. Figures are adjusted for the impact of consumption tax. Regarding the CPI, annualised changes from a month earlier are computed from a seasonally adjusted series applied using X-12-ARIMA with the following options:

Estimation period: from January 1980 to December 1998

ARIMA model: (0 1 1)(0 1 1)<sub>12</sub>

Level adjustment: April 1989 (introduction of consumption tax) and April 1997 (consumption tax hike)

Sources: Management and Coordination Agency, *Consumer Price Index*.

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# Obtaining real estate data: criteria, difficulties and limitations

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Ever since a major section in its 60th Annual Report, the Bank for International Settlements has collected data on residential and commercial property prices. These have been consistently published in “raw” form in its Annual Reports, or been used for various studies in the BIS Economic or Working Papers series, and, more recently, the Quarterly Review. This paper examines the criteria used for collecting such data, the difficulties encountered in compiling them as well as their limitations.

## Introduction

In June 1989, the Bank for International Settlements (BIS), in its 59th Annual Report,<sup>2</sup> correlated, in graphical form, the p/e ratio of the Tokyo stock market with the inflation-adjusted price of commercial real estate (land) in six major Japanese cities, noting that Japanese corporations held, at the time, a considerable amount of land. A year later, the BIS devoted a whole section on property markets in its Annual Report,<sup>3</sup> and this was to lead to fairly regular annual publication of the data it had collected in this field. By also correlating both residential and commercial property prices with equity prices in the same section, it was the forerunner for its work on aggregate asset prices.<sup>4</sup> This paper examines the criteria behind collecting and evaluating the data for these real estate data, the difficulties encountered in compiling them as well as the various limitations to the data.

## The criteria

There are, generally speaking, for most areas of international data collection, six criteria which need to be satisfied from a statistical viewpoint:<sup>5</sup> regular availability, representativeness, homogenous comparability, unbroken and unchanging description, length of series and data frequency.<sup>6</sup> In a perfect world, data would be always available for all countries under review, have identical measurement parameters, not have any breaks in series, go back to an identical (distant) starting point and, finally, be available on a monthly basis. Alas, the art of statistics (at least in this field) has been to overcome the imperfections found in the real world!

Indeed, the IMF established, in 1996, the Special Data Dissemination Standard (SDDS) to “guide members that have, or that might seek, access to international capital markets in the provision of their economic and financial data to the public. Both the General Data Dissemination System (GDDS)<sup>7</sup> and

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<sup>2</sup> BIS (1989): Chapter IV, pp 81-2, *59th Annual Report*, June.

<sup>3</sup> BIS (1990): Chapter IV, “Property markets”, pp 102-10, *60th Annual Report*, June.

<sup>4</sup> See also “Experience with constructing composite asset price indices” by the author later in this volume.

<sup>5</sup> Such a viewpoint may, incidentally, differ from that of an economist who is involved in a one-off piece of research.

<sup>6</sup> Timeliness is also, usually, an important, if not the most important, criterion for a statistician, but it is not considered here due to the nature of the data. It should nevertheless not be ignored, since even real estate data which is several years out of date is of limited use.

<sup>7</sup> Established in 1997 (author).

the SDDS are expected to enhance the availability of timely and comprehensive statistics and therefore contribute to the pursuit of sound macroeconomic policies; the SDDS is also expected to contribute to the improved functioning of financial markets.” The subsequent creation, also by the IMF, of the Data Quality Reference Site (DQRS) is intended to, *inter alia*, “foster a common understanding of data quality”.

## Regular availability

First and foremost, data of some sort must be available, and, equally important, be regularly updated. It is therefore only of limited use to the statistician to find a (one-off) piece of research containing data: the best that can be hoped for is that the original data sources are given and that such data can be provided by these sources on a regular basis. Unfortunately, for international institutions such as the BIS, such data collection often has to rely on the goodwill and understanding of a commercial data provider or real estate association, and experience has shown that it is here that the greatest likelihood in the disruption in the flow of data can occur.<sup>8</sup> What sort of data is ideally sought is often tempered by what is found.

By the early 1990s, the BIS had already managed to contact several national statistical institutions and private real estate associations<sup>9</sup> and was able to publish data illustrating the development in residential and commercial real estate for more than a dozen capital cities.<sup>10</sup> Although this was an important starting point, the obvious disadvantages of such a localised focus required further work.<sup>11</sup> In addition, the close correlation between office rents and commercial property prices observed in the 1970s and the early 1980s ended with the office property boom observed in many countries in the late 1980s (and the equally dramatic subsequent decline less than a decade later). The Bank therefore approached other data providers, or went back to its earlier sources, to enquire what else was available.

## Representativeness

Data should be representative of present day values, but this is indeed a delicate issue. Just as it is no longer relevant in the industrial countries to include the price of a horse in its consumer price index under the sub-category transport, the price of a house will no longer include an outside toilet,<sup>12</sup> but will probably have several bathrooms, of which at least one may be en suite. Similarly, today’s offices will have IT facilities which were in the realms of science fiction a generation ago. Such “upgrades” to indices is common and correct, but what is seen to be representative in one country may well not be the case in another. With 80% home ownership in Spain, for example, any property survey will reveal a very different distribution of types of dwellings to one conducted in a country like Switzerland, where the majority of the population chooses to remain in rented flats. The distribution of the price of these dwellings will also vary accordingly and affect a resultant global index. Equally, amenities will differ

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<sup>8</sup> Caused, for example, by a change in company policy or by the takeover by another company with a different data dissemination policy.

<sup>9</sup> *Inter alia*, National Association of Realtors (United States), National Land Bureau (Japan), Ring Deutscher Makler (Germany), Building Societies Association and Department of the Environment (United Kingdom), Associazione Italiana Consulenti Immobiliari (Italy), AN-HYP (Belgium) and Richard Ellis Ltd (for most commercial property prices).

<sup>10</sup> Brussels, Frankfurt, London, Madrid, Milan, New York, Paris, Stockholm, Sydney and Tokyo. For housing prices, Los Angeles and Toronto were also available, and, for office rents, Amsterdam and Lisbon.

<sup>11</sup> For example, commercial property in capital cities are likely to have higher architectural standards, greater functionality and larger, more luxurious meeting room facilities than equivalent property in the provinces. They will therefore command disproportionately higher prices which, in turn, are more volatile than would otherwise be the case in a nationwide coverage. Companies’ needs are also subject to greater change, again reflected in commercial property price changes, than is the case for potential homeowners.

<sup>12</sup> Although this was still common in the United Kingdom in the 1950s.

widely: considering the same two countries, the latter will require insulation and heating to keep out the cold in winter, whilst the former will need to provide insulation, and, increasingly, air-conditioning, to keep out the summer heat. Even within a country, what is representative in one region is not at all in another: the majority of housing in the North of England - a traditionally industrial region in the United Kingdom - is terraced, but detached houses are the standard in the South-West - a part of the country to which many retire.

## Comparability

It is unlikely that data for a group of countries will be, in all aspects, comparable. First, as explained above, that which is considered to be representative in one country may not be so in another.

Secondly, the method used to collect data may vary and influence the result. For example, a survey can be conducted by approaching those real estate agents who are members of a national guild: this is unlikely to represent, in some countries, the majority of transactions. Alternatively, the registered lending agencies may be asked for information on housing based on the mortgages they grant: here, cash transactions would escape the net. Notaries could also be approached in those countries where their services are mandatory in finalising property transactions: in order to keep fees down, however, part of the agreed price may be paid in cash and another, lower, price communicated to the notary. Finally, government agencies may provide data, but their original source may be any of the above or be a result of calculations stemming from tax returns.<sup>13</sup>

Thirdly, as hinted earlier, the focus may vary considerably. From a macro-economic viewpoint, and, in particular, for the BIS's recent work on a set of indicators to predict financial crises, a nationwide coverage of property prices is clearly the most desirable. However, especially for commercial property, this is not always available,<sup>14</sup> so that, for several countries, the BIS has to fall back on data relating to prime property in a capital city's centre.<sup>15</sup> Nevertheless, the appearance in recent years of nationwide data<sup>16</sup> indicates that a commercial property price index typically has 80% of the total drawn from property in that country's capital.

Fourthly, even a nationwide index can differ in the way in which it is compiled. A simple average of the prices paid in the individual regions may be taken (Canada) or a weighted average (based on, for example, the population) of the regional survey results (Australia). The index may be the price paid by area rather than unit: this often makes sense for commercial property, but is also occasionally true for residential property (eg France, Italy, Spain).

Finally, there is no guarantee that an index is being compiled at all, but that the series is expressed in, for example, national currency. Indeed, this may well be preferable, since there is a clear loss of information in a simple index.<sup>17</sup> Although this is unavoidable for cross-country comparison,<sup>18</sup> data providers would be advised to keep their series in as "original" a state as possible.

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<sup>13</sup> For example, in Switzerland, a tax (the "Handänderungssteuer", literally, change-of-hands tax) is levied on each sale of second-hand property, which is based on the sale price, so that an average price is simple to calculate. However, none is levied on new property which, in an under-developed property market (relative to demand) as currently exists in Switzerland, forms a substantial proportion.

<sup>14</sup> Available in the sense that they also satisfy the other criteria.

<sup>15</sup> For example, as provided by Jones Lang LaSalle. These data, however, are also available for a number of Asian-Pacific cities, of which they are, to the best of my knowledge, the sole providers on a collective basis.

<sup>16</sup> Calculated by, for example, Investment Property Databank Ltd.

<sup>17</sup> For example, a table showing the price of a "standard" dwelling (or, better, the price per square metre) for a group of countries in a given year is clearly better than a simple index value which can, at best, only show the relative position - dependent on the base year chosen - or growth rate from that base year.

<sup>18</sup> This raises an interesting point: no attempt has, to my knowledge, been made in comparing exchange-rate-adjusted data. As the BIS has always concentrated on inflation-adjusted property prices, one would assume that exchange rate changes are at least partly taken into account. However, price indices adjusted by either nominal or real (ie inflation-adjusted) effective exchange rates may reveal some interesting differences.

Kennedy and Andersen<sup>19</sup> extended the BIS's coverage of residential property prices to 15 countries but, more importantly, moved from indices of capital cities to nationwide ones.<sup>20</sup> With one exception (Japan: land), the indices referred to real estate (ie the price of building and land). This also reflects the data situation today, but even now, as then, the indices vary in their composition of flats, terraced or detached houses, single or multiple-occupied dwellings etc.

## Continuity

This important criteria, for continuous assessment, requires little explanation, but it is, in reality, one of the most common problems facing statisticians. Apart from the possibility (see "Availability" above) that a source may "dry up" and need to be replaced by another which will almost certainly differ in definition (if not frequency, which is another problem, see below), data from the same source may suddenly change. One reason may be that the source is itself not the primary collector of data, but either the collator or just simply the disseminating body.<sup>21</sup> To be fair, breaks in series often herald an improvement in the data, becoming either more encompassing or moving to a higher frequency (or both). "Splicing" with the previous series, however, remains a difficult problem.

## Length of series

This problem is often linked to the previous criteria, since a radical break in series can, if no splicing can be done, considerably shorten a previously lengthy series. Also, when data providers and, by proxy, the Bank, embark on an extended country coverage, it is usually not possible for them to (re)construct a historical series. A table showing the last five years does not, in this respect, pose the same problem as attempts to graph price developments since the 1970s or to carry out historical research analysis (see also below).

## Frequency

Precisely in this area of historical analysis, data frequency tends to pose little problem, since most research is done over a fairly long time horizon. Generally speaking, property prices are not thought of as being particularly volatile from one quarter to the next, so that annual data are sufficient. However, a higher frequency is desirable when such indices are used as indicators for monetary or financial stability. In this case, experience has shown that quarterly data best serve the purpose.<sup>22</sup>

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<sup>19</sup> Neale Kennedy and Palle Andersen (1994): "Household saving and real house prices: an international perspective", *BIS Working Paper*, no 20, January.

<sup>20</sup> With the exception of Germany, which was the simple average of four cities (Berlin, Frankfurt, Hamburg and Munich). This has since been replaced by a nationwide index, based on 60 cities.

<sup>21</sup> This is true, for example, of an increasing amount of the residential property price data used by the BIS. The majority of the countries are now taken directly from its Data Bank, which receives the data from national central banks. They in turn are commonly not the primary sources of this information, but have the data supplied them by the various sources discussed earlier. As a consequence, third-party dissemination can be problematic.

<sup>22</sup> As can be seen from the Table in the Appendix, the majority of residential property price data are quarterly, whereas most commercial property price data are still annual. Perhaps surprisingly, and indeed problematic given their economic size, residential property prices for Japan, Germany, France and Italy are only available at a lower frequency.

## Summing up

As Borio and Lowe (2002) conclude,<sup>23</sup> “The first is *more and better data*. There is, in particular, a remarkable dearth of data on real estate prices, despite their proven role in the genesis of financial crises and, increasingly, in influencing the business cycle. Data gathering has so far been largely left to the initiative of private firms, which naturally tailor the data to their own requirements. Given the ‘public good’ properties of the data, there seems to be a good case for official authorities to put efforts into this area.”

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<sup>23</sup> Claudio Borio and Philip Lowe (2002): “Asset prices, financial and monetary stability: exploring the nexus”, *BIS Working Papers*, no 114, July.

## Appendix

The table below show the countries for which the author, in his capacity as statistical analyst, maintains, respectively, residential and commercial property price data, their frequencies, unit (or base period) and start date. Many of the series contain “splices” (see above); where such a link is tenuous (but not necessarily impossible), alternatives are given. Series in square brackets are no longer in use, while those marked with an asterisk are not yet in active production and should be treated with caution.

The Bank’s Data Base, referred to earlier, is supplied many other series on residential property prices for nationally-relevant different property types by the reporting central banks; the country coverage does not exceed, however, the list below. In addition, the table only shows data which are felt to best meet the requirements cited in the paper.

Table 1  
Real estate prices maintained by the author

Country	Residential property			Commercial property		
	Frequency	Unit/base period	Start date	Frequency	Unit/base period	Start date
Australia	Quarterly	Fiscal 1989 (89Q3-90Q2)	1960 Q1	Quarterly	AUD/m2	1968 Q1
Austria <sup>1</sup>	Semi-annual	1986	1987 H1	-		
Belgium	Quarterly	1953	1981 Q1	Annual (Brussels)	1980	1980
	Annual	1953	1960	Annual (Brussels) <sup>2</sup>	1980	1970
Canada	Monthly <sup>3</sup>	CAD	1980 M1	Quarterly (Toronto)	1985	1985 Q1
	Quarterly	1980 Q4	1970 Q1			
China	Annual*	CNR/m2	1987	Annual*	CNR/m2	1987
Denmark	Quarterly	1980	1970 Q1	Annual (Copenhagen)	1984 Q3	1982
				[Semi-annual] <sup>2</sup>	1980 H2	1965 H1
Euro area	Annual	2000	1991	-		
Finland	Quarterly	1983	1978 Q1	Annual	pcpa	1998
	Annual	1970	1970	Annual (Helsinki)	EUR/m2	1971
France	Semi-annual	EUR/m2	1995 H1	Annual	EUR/m2	1986
	Annual	1997	1960	Annual (Paris)	1980	1980
Germany	Annual Annual <sup>2</sup>	2000 DEM/m2	1975	Annual	pcpa	1996
			1971	Annual (Frankfurt)	1980	1980
				Annual (Frankfurt) <sup>2</sup>	1980	1971
Greece	Quarterly*	1997	1997 Q1	-		
Hong Kong	Monthly	1999	1993 M1	Quarterly	1999	1988 Q1
	Quarterly	1999	1980 Q1			
Ireland	Quarterly	IEP	1976 Q1	Quarterly	1982	1994 Q4
	Annual		1970	Annual	1982	1982
Italy	Semi-annual	EUR/m2	1988 H1	Annual (Milan)	1983	1983
Japan	Semi-annual	1990 M3	1955 H1	Semi-annual	1990 M3	1955 H1
Korea	Monthly*	1995	1986 M1	-		
Malaysia	Annual*	1990	1988	-		
Netherlands	Monthly	EUR	1976 M1	Annual	pcpa	1995
	Annual	1980	1965	Annual (Amsterdam)	1980	1980
				Annual (Amsterdam) <sup>2</sup>	1980	1970

Table 1 (cont)

## Real estate prices maintained by the author

Country	Residential property			Commercial property		
	Frequency	Unit/base period	Start date	Frequency	Unit/base period	Start date
New Zealand	Quarterly Quarterly	1999 Q3 Fiscal 1971 (71Q3-72Q2)	1989 Q4 1962 Q2	Semi-annual	NZD/m2	1980 H1
Norway	Quarterly Annual Annual	2000 2000 1969 (?)	1991 Q1 1980 1970	Annual Annual (Oslo) Annual (Oslo) <sup>2</sup>	pcca 1990 1980	2000 1990 1970
Portugal	Monthly	1988 M1	1988 M1	Annual*	pcca	2000
Singapore	Quarterly	1998 Q4	1988 Q2	Quarterly	1998 Q4	1988 Q2
South Africa	Monthly <sup>3</sup>	2000	1980 M1	Annual	pcca	1995
Spain	Quarterly Annual (Madrid)	EUR/m2 ESP	1987 Q1 1975	Annual* Annual (Madrid)	pcca 1980	2001 1980
Sweden	Quarterly	1980	1970 Q1	Annual Annual (Stockholm) Annual (Stockholm) <sup>2</sup>	pcca 1980 1980	1984 1980 1970
Switzerland	Quarterly	1970 Q1	1970 Q1	Quarterly	1970 Q1	1970 Q1
United Kingdom	Quarterly Monthly	2001 Q1 1983	1968 Q2 1983 M1	Annual [Monthly]	1980 1986 M12	1970 1986 M12
United States	Quarterly [Monthly]	1980 USD	1975 Q1 1968 M1	Quarterly	1977 Q4	1977 Q4

<sup>1</sup> Vienna only; discontinued at end-2002. <sup>2</sup> Confidential proprietary data. <sup>3</sup> Seasonally adjusted.

# Performance measurement and real estate lending risk

Rupert Nabarro<sup>1</sup> and Tony Key<sup>2</sup>

## 1. Introduction

Real estate's complicity in financial crises has been recognised as far back as the South Sea bubble (Kindleberger (2001)). In the late 1990s, the "Asian Crisis" added many more graphic illustrations to the history of interlocking credit booms and real estate price bubbles in the upswing, followed by the prolonged and damaging impacts of prolonged real estate slumps on the capital adequacy of banks, the availability of credit, and general economic growth.

Through the last decade, the dangerous interdependence between real estate cycles and financial systems has been extensively documented in the real estate literature (for general reviews, see Renaud (1995), Herring and Wachter (1999), European Central Bank (2000), Quigley (2001), Mera and Renaud (2000)). Among real estate specialists, there is a fair degree of consensus as to how positive feedback loops from real estate markets to bank lending generate systemic risks, and how those risks may be amplified by failings in bank governance or financial regulation. At the extreme, real estate has been accorded a fundamental and primary role in Japan's protracted financial crisis and economic stagnation through the 1990s (Mera (2000)).

As long-time observers of the real estate industry, with no qualifications to comment on banking or international finance, our primary point of interest is the real estate cycle itself. Since, in mature economies, real estate (widely defined to incorporate construction, management, rental flows) may account for as much as 15% of GDP, it is like any other major activity in industry in which destabilising booms and slumps are undesirable. Given the lumpiness and long-term nature of real estate investment, the misallocation of resources through bursts of irrational exuberance and subsequent under-utilisation may indeed be especially undesirable.

Within the real estate domain, our primary interest is in the linkage between information and the functioning of the market. On that issue, this paper picks up the policy prescription to be found at the end of most previous reviews of the subject - the suggestion that better monitoring and understanding of real estate markets can make an important contribution to avoiding financial crises in future.

The paper is organised in three parts. Section 2 is a discussion of the linkage between real estate cycles and debt finance. It is intended as a synthesis rather than any advance on existing depictions, and is set out primarily to identify those points of the process on which improved information might, in principle, offer the most effective counter-cyclical tools. In the course of that search, we also make some broad comparisons of the violence of the real estate cycles across a range of markets.

Section 3 moves on from the "what is to be monitored" to "how can we most effectively monitor". Based on experience from a range of countries, it explains how a reliable and cost-effective system of performance measurement and monitoring can be set up, and suggests how such a system impacts upon the behaviour of the real estate sector.

## 2. Real estate cycles and lending cycles

This section first sets up the "standard model" of connected real estate and bank lending cycles, which run through initial rental triggers to swings in real estate values and development rates, and then into

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the balance sheets of both borrowers and lenders. For brevity, we will call this phenomenon the “real estate credit cycle”. Appendix Table 1 lists the main recent instances of such cycles, with clean-up costs running from 1% to over 30% of GDP. These examples have provided the case studies from which the authors cited in the introduction have drawn the consensus analysis which we also follow.

## 2.1 The credit cycle

In schematic form (below), the standard model can be split into four major elements - economic drivers in the first column, and the fundamental real estate cycle, and bank lending to real estate set out in the second and third columns. These tendencies may be taken to apply in all markets in all periods. A reading of the literature suggests that the most severe and disruptive real estate credit cycles have come about in the presence of other conditioning factors summarised in the fourth column - factors destabilising the structure of real estate capital markets, or failures in the way in which they are regulated.

Table 1

### Real estate cycles and banks

The economy	Real estate	Banking	Added factors
Early upswing: low interest rates, rising demand.	High vacancy. Flat rents from last cycle Falling vacancy rents rise, yields fall. Building upswing. Supply shortages, spike in rents, fall in yields. Boom in development starts.	Low r/e debt.	Pro-cyclical planning/ development controls/ taxation. Slack monetary policy/credit controls. Failures in regulation and supervision. Financial deregulation. Emergence of non-bank financial intermediaries.
Upswing quickens. Rapid rise in demand. Upturn in inflation.	Vacancies rise, rents tail off, yields rise.	Value of bank assets and collateral on existing r/e loans improves. Rising loan book. Competition raises LTV, reduces margins. Ballooning loan book.	
Economic peak. High inflation and rising interest rates. Demand contracts.	Spike in building completions. Rents plummet, yields rise. Fire sales by distressed borrowers and banks.	Value of assets and collateral falls. Bad debts rise. Credit squeeze. Foreclosures and work outs.	
Recession.			

To amplify the schematic picture, the following paragraphs work through its main elements. For illustration, Figures 1 to 6 plot the evolution of a classic real estate credit cycle, the boom and bust in the London office market of the late 1980s/early 1990s. This market does not provide a dramatic example of financial crisis (which was mild and well contained), but is a case for which all the main parameters of the cycle can be tracked reasonably well.

The fundamental driver is fluctuation in the growth rate of the economy - the business cycle - and the amplification of those swings in property demand into larger fluctuations in rental prices. This is a simple cobweb or hog-cycle effect, familiar to students of introductory economics. It is generated by the inevitable planning and construction lag between demand and supply for additions to the real estate stock. In the London case, an economic upswing coupled with deregulation and restructuring of financial markets (known locally as the Big Bang), drove a surge in employment in Financial and Business Services (FBS). From 1985 to 1989, the employment growth was four times its average over the previous 15 years; in 1988 the 56,000 rise in employment was six times that long-run average.

Converted to floorspace (assuming 13 m<sup>2</sup> per new job), net new demand for office stock in that peak year would have been 728,000 m<sup>2</sup> against a long-run average of 117,000 m<sup>2</sup>.

Surging demand was followed by an upswing in new office construction. Through the five years to end-1990, the rate of development (measured by value of building contracts adjusted for building cost inflation) was 2.6 times its average over the previous 15 years. In the peak year for building starts - 1998 - development was 3.6 times that long-run average. After lagging the employment upswing in the mid-1980s, most of the development catch-up came in 1987, with double the rate of construction starts of 1985.

At the peak, development starts were quite closely tuned to the turning point in employment growth. Development dropped by 28% between 1988 and 1990 while FBS employment was still expanding, albeit at a reduced rate of 11,000 jobs a year. But, allowing for a completion lag of two years (as shown in Figure 1), the boom in starts through 1987-1988 translated into a peak in completions in 1989-90 as employment growth weakened, before heading for a net loss of 70,000 jobs through 1991-92.

Rental and capital values (Figure 2) form the price signals which mediate between demand and development. In real estate markets, the stickiness of rental prices which prevent market-clearing in the short run (Grenadier (1995)), and supply lags which create cobweb effects in the long run, can create particularly abrupt movements in real estate asset values.

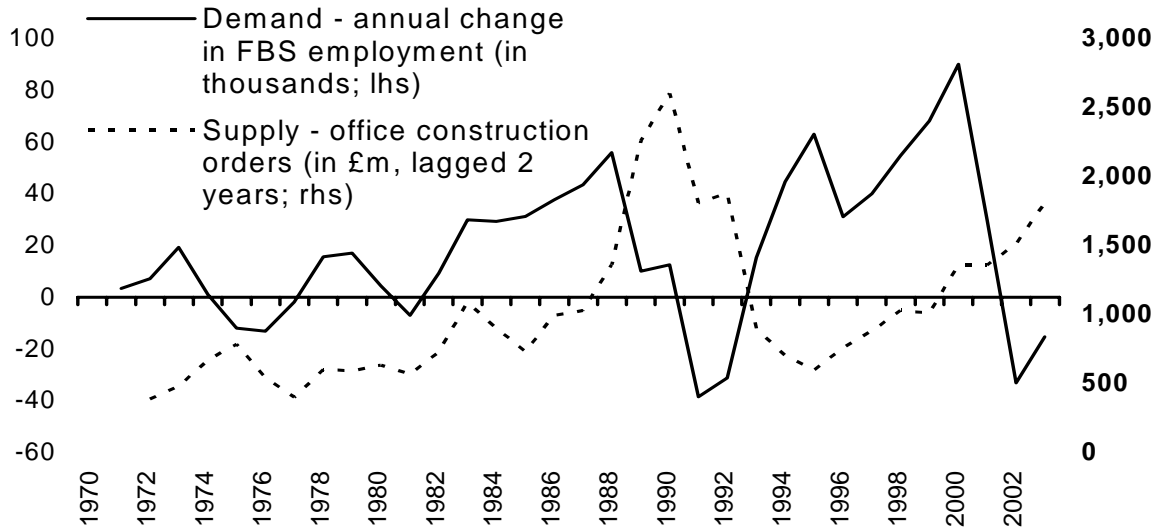
As the chart illustrates, the initial surge in London FBS employment and office demand in the middle-1980s had little impact on rental or capital prices. Through the first two years of the employment surge, rental values rose by only 2%-3% per year, rising to 7% in the third year, as the hike in demand was absorbed by surplus stock left over from the previous recession. In real terms, rental values fell through those three years. Rental value growth ran ahead of inflation only as market slack was absorbed, hitting 14% in 1986 then rising abruptly by 30% in 1987 and 27% in 1988. In micro-economic terminology, the initial rise in demand was absorbed by market slack at a rental reservation price, followed by a rental spike when occupancy reached the capacity of the existing stock and new supply became totally inelastic through the period of the development lag.

Under these conditions, an earlier price-moderating supply response may not occur because there is no strong rental signal in the early phases of the upswing. Indeed, if initial rental prices have fallen well below the minimum required to support new development (the cost of construction and finance plus the opportunity cost of sites set by the next-best use), a development upturn may be delayed until the rental spike at full-occupancy (Hendershott (1995)).

Yield pricing may add a further stage of amplification to the cycle in real estate capital values. If the rental upswing is interpreted as a signal of higher long-run rental growth, a mark-down in yields would raise capital values further over the spike in rental values. Figure 2 shows this factor did not apply to London offices in the late 1980s. Yields moved very little, and the shift in capital values did no more than track the rental spike. (In fact, since bond yields fell by 100 basis points from 1986 to 1988, it is more likely than rental growth expectations were being revised down rather than up.)

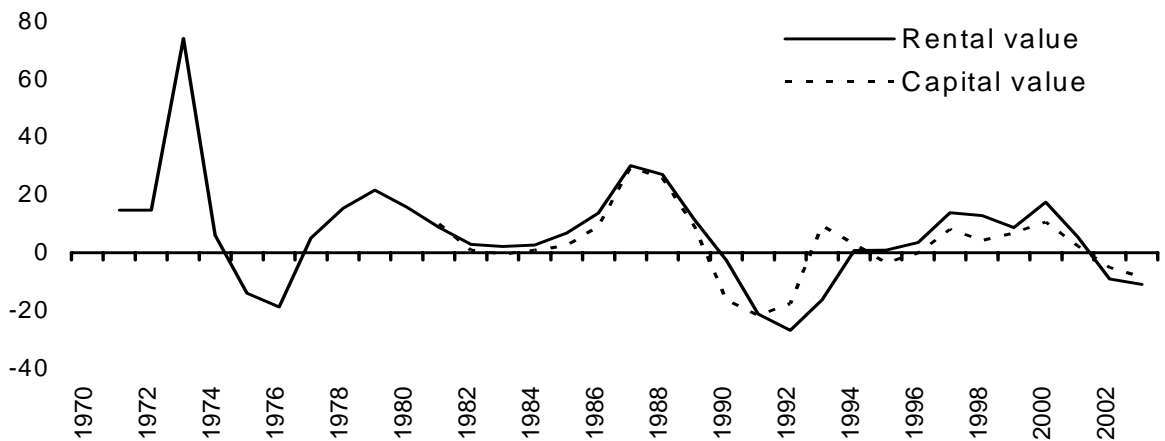
The downswing of the real estate cycle depicted in the charts needs little elaboration. FBS employment swung from a gain of 99,000 through 1987-88 to a loss of 70,000 in 1991-92. Office development completions reach an historic peak in 1990 and ran on at a high level through the employment slump, before collapsing to 40% of the peak level in 1993. Rental values fell by 3% in 1990, despite continued modest growth in FBS employment, then by a cumulative 50% over the following three years.

Figure 1  
**London office demand/supply indicators**



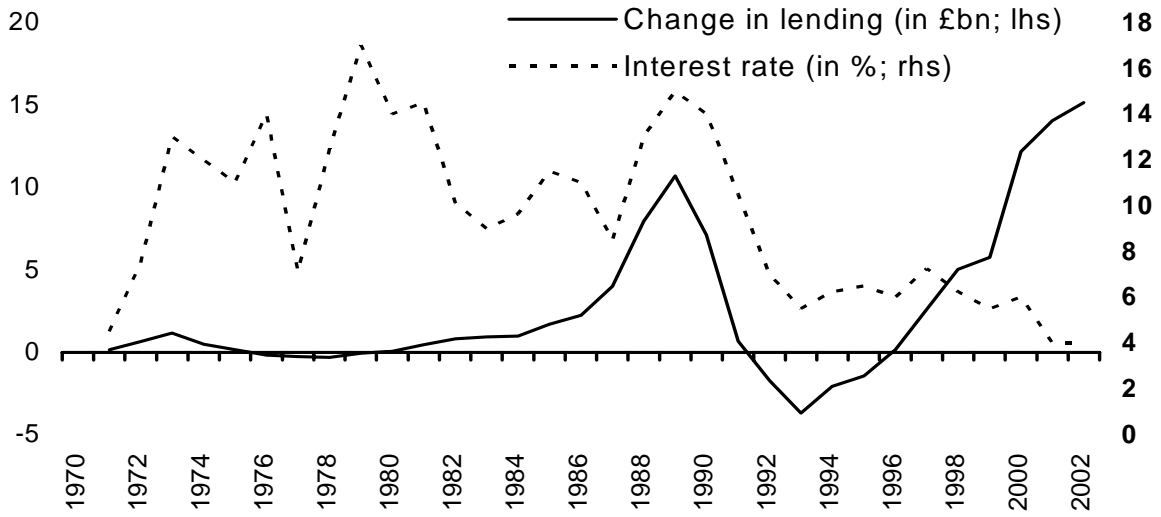
Source: UK Office for National Statistics.

Figure 2  
**London office market rentals and capital values**  
 Annual percentage changes



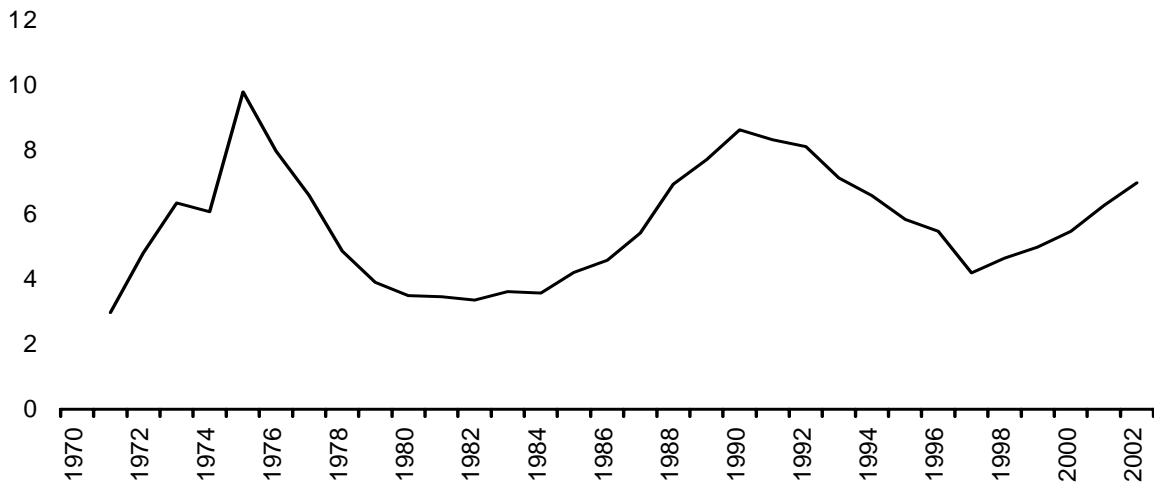
Source: IPD.

Figure 3  
**UK bank lending on real estate and interest rate**



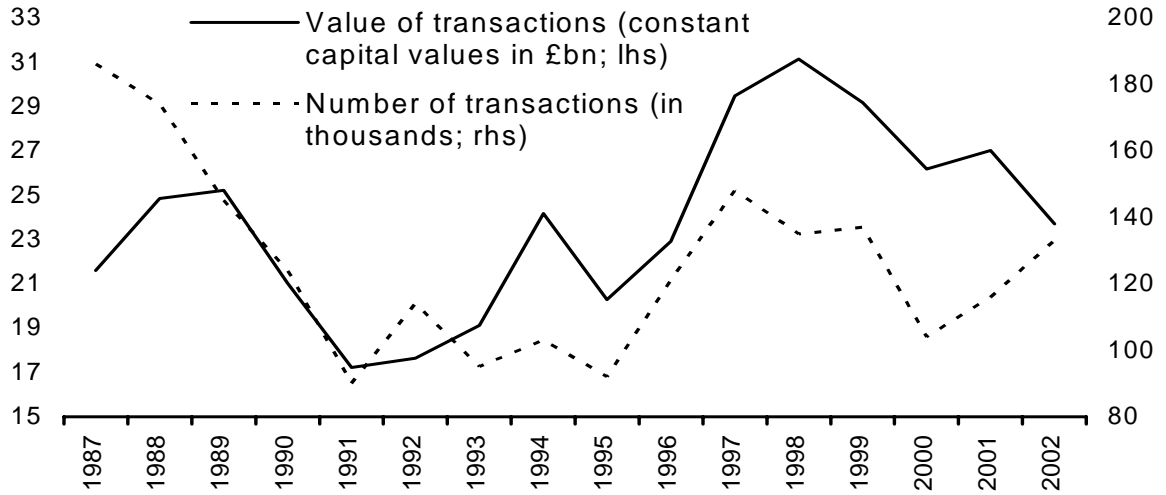
Source: Bank of England.

Figure 4  
**UK real estate lending**  
 As a percentage of total bank lending



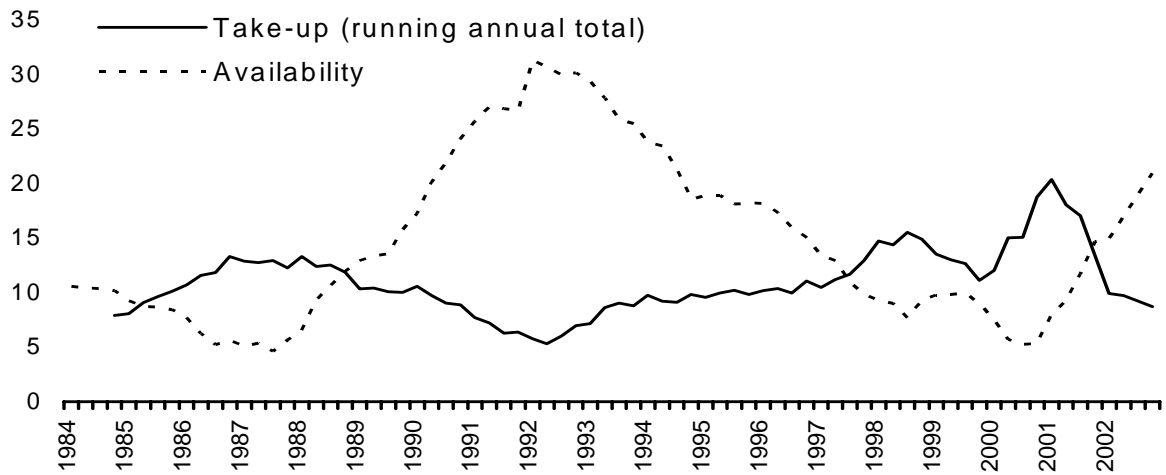
Source: Bank of England.

Figure 5  
**England and Wales commercial market liquidity**



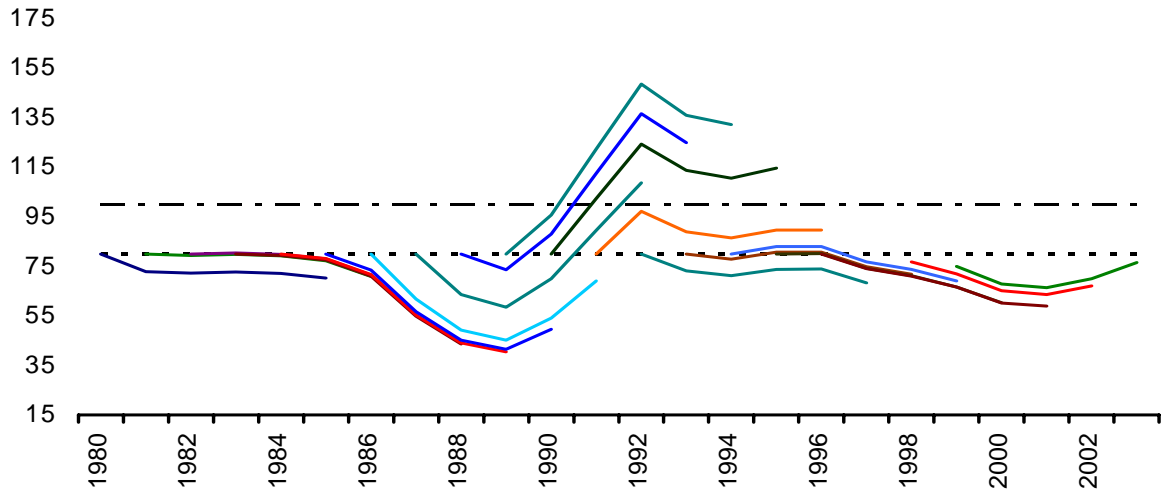
Source: UK Inland Revenue.

Figure 6  
**Central London office take-up and availability**  
 In millions of sq ft



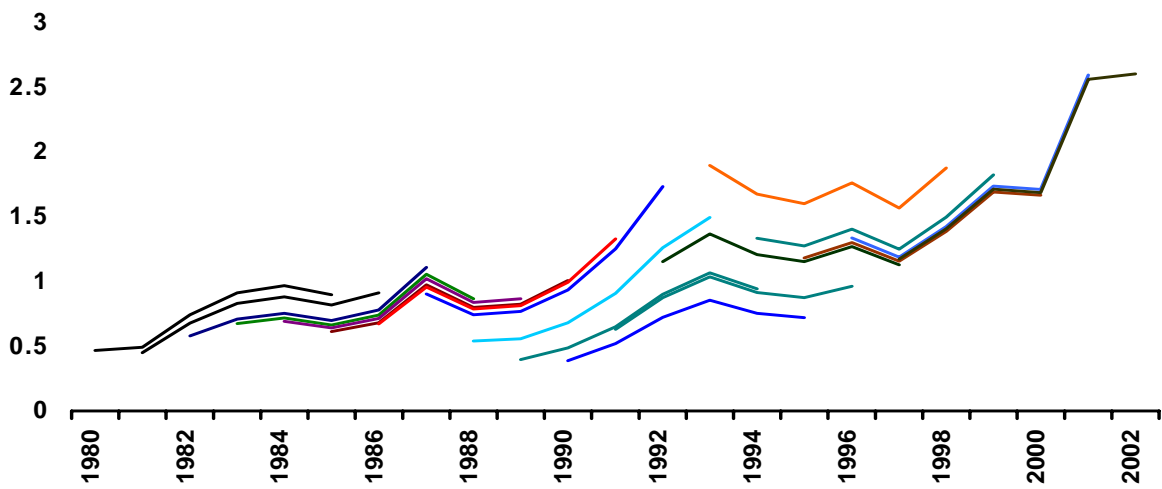
Source: CB Richard Ellis.

Figure 7  
**London office loan to value**  
 By year of origination



Sources: UK Office for National Statistics; IPD estimates.

Figure 8  
**London office debt service coverage**  
 By year of origination



Sources: UK Office for National Statistics; IPD estimates.

Yields moved out in the first year of rental fall, but moved in again by roughly the same amount in the final year of rental decline. As in the upswing, therefore, changes in yields added little to the severity of the rental cycle, with a peak to trough fall in capital values close to 50%.

Mechanical and ex-post descriptions of real estate cycles may convey the implication that they are fairly predictable. Quite apart from the unpredictability of the macroeconomic demand-side drivers, the internal mechanics of cycles are highly sensitive to many initial conditions. The extent of initial vacancy, the relationships between the reservation price in a slack market, the rent at minimum replacement cost, and the costs of construction and finance will all influence the path of rentals and building through an individual cycle. (A glance at the later sections of the London office market charts is enough to show that, despite a larger demand surge, the building cycle of the late 1990s has had a very different character.)

The literature on real estate cycles, furthermore, adds more counts on which successive rental cycles may be highly irregular and unpredictable. An interaction between development lags of around 2-3 years and a classic business cycle in demand of 4-5 years may result in a tendency for alternating strong and weak development cycles, with major booms created gluts which satisfy much of the demand in a subsequent cycle. Short-period demand-supply cycles may also interact with longer-period asset-replacement cycles, or longer waves in urban and technological development. In the long-run, evidence from the United Kingdom suggests that major, classic cycles like that described in the London office market may be fairly low-frequency events, interspersed with long periods in which cycles are muted or quiescent (Barras (1994)).

Real estate cycles are linked into the banking system through the asset prices determined by both rental prices and capitalisation rates. The standard model of real estate credit cycles suggests debt flows and lending rules may add a further layer of amplification to the fundamental real estate cycle. An upswing in rentals and asset prices, first of all, improves the credit quality of existing loan books collateralised against real estate: their loan to value (LTV) ratios, debt service coverage ratios (DSC), default rates and losses on default will all improve, and reduce the risk in the banks balance sheets. To the extent that banks themselves are significant owners of real estate, they will see a more direct improvement in their balance sheet positions.

An increased capacity to lend comes at a point when further lending to real estate looks particularly attractive, as projects realised in the early stages of the upswing show high profits and sound loan quality. Through an upswing, as rental and capital prices accelerate, demand from real estate owners seeking to borrow against the rising values of their assets, or developers seeking to launch new projects, will encounter banks with a high capability and willingness to lend. Both the strong trends in real estate prices and competition between lenders may, indeed, lead them to relax lending criteria - higher LTV and lower DSC ratios, reduced margins and so on.

Though UK statistics do not run to specific figures on lending against London offices, Figure 3 shows how overall bank lending to real estate companies responded to the real estate cycle. In 1980, total real estate debt stood at GBP 2.2 billion - a low point reached following a debt burn-off in the mid-1970s. By the end of the decade, debt had multiplied by a factor of 17. In 1989 alone, the GBP 11 bn rise in debt was more than five times the total of outstanding loans at the start of the 1980s. Banks had more than doubled their exposure to real estate - to 9% of total lending in 1990 - although this was still a little way off the peak reached in the previous cycle.

Though there are no rigorous measures of the lending terms on which this balloon of debt was being advanced, accounts of the period are replete with descriptions of the "generosity" of banks toward property, with non-recourse lending and off-balance sheet financing taken as commonplace (Goobey (1993)).

At this point, there is the risk of a purely speculative cycle fed by feedback between rising asset prices and rising availability of credit which in turn increases the demand for real estate assets. A purely speculative market, which has become detached from the fundamentals of demand and supply in the occupier market, might be indicated by an extreme divergence between rental prices and asset values - in other words, a fall in capitalisation rates is unlikely to be supported by long-term rental prospects. In the London market, positive feedback did not extend quite this far. Yield pricing effectively endorsed heady rates of rental appreciation as durable, rather than temporary as they appear with the benefit of hindsight.

Positive feedback loops between real estate asset prices and bank credit are, of course, likely to turn sharply negative around the peak of the economic cycle. At the macro-economic level, interest rates

may be rising to choke off overheating, increasing the cost of variable rate debt or the ultimate refinancing cost of fixed rate debt. Within the real estate market, occupancy and rentals stop growing and may fall, while capitalisation rates are rising. Falling real estate asset prices and/or incomes push loans into technical default. Forced disposals by distressed borrowers, foreclosures on non-performing loans by banks, bankruptcies among developers whose schemes have failed to find occupiers and whose lines of credit have been cut off may all contribute to the classic downward spiral in asset prices and availability of credit. Given a severe impact of real estate losses and provisions on banks' capital adequacy, a credit-crunch limits lending to all forms of borrowers, and itself deepens the economic downturn.

In the London office market, the deceleration and downswing was rapid. After coming off the peak in 1989, rental values fell by 3% in 1990, and capital values by 16%, with further falls of 43% and 36% respectively through the following two years. Financing and refinancing difficulties were exacerbated by a rise in short-term interest rates from 8.5% in 1987 to 15% in 1989 - although the hike was fairly short-lived, with rates back down to 5.5% by 1993. Despite the crash in the market (reflected, though less dramatically, throughout the other UK property markets), real estate debt continued to rise until well into the downturn, growing by GBP 8 bn (24%) through 1989 and 1990 when the real estate downturn was well-established. A further twist to the tail of distressed borrowers came with a fall in market liquidity (Figure 5), with a 50% fall in the number of commercial property transactions between 1987 and 1991.

The progress of the cycle can also be tracked through the direct measures of market conditions typically produced by brokers. Figure 6, for example, shows that rates of take up fell by nearly two-thirds from peak to trough, while the combined fall in demand and surge in supply raised availability by a factor of six.

The denouement to the story of the London office market was, as would be expected, disastrous for the UK real estate industry. There was a string of bankruptcies among developers and traders - most notably that of Olympia & York, developers of Canary Wharf. Ten-year rates of return on UK real estate investment fell below the risk-free rate in 1991 for the first time in their history, and stayed there almost to the end of the decade. Institutional weightings in real estate were slashed from 12% in 1989 to 5% ten years later. Rental and capital values for London offices are, a decade on from the slump, still around 30% below their 1989 levels in *nominal* terms.

Despite the severity of the collapse, the impacts on the banking sector were, in this case, serious but not critical. There were no bank failures (as there were at the equivalent point in the 1970s), and no government-assisted bail outs. All major lenders were, unsurprisingly, drawn into protracted work outs - again most notably at Canary Wharf, taken over by a consortium of its lenders - which hauled back outstanding real estate debt by GBP 9 billion (13%) through the first half of the 1990s. Although the most exposed UK lenders were undoubtedly seriously strained by the scale of their real estate write-downs and provisions, the shocks were absorbed internally, without any public intervention or bail-outs.

## 2.2 Impacts on loan quality

Taking data used in the last section, we can estimate how the quality of loans advanced against London offices changed through the cycle. Figure 7 shows how a five-year loan originated each year at 80% loan to value (LTV) ratio would have changed in collateralisation through its life, assuming the underlying property followed IPD's average London office capital value. For simplicity, no provision is made for either amortisation or total outstanding value of debt including interest charges. Using IPD figures to represent the underlying asset simulates a loan against institutional grade properties, largely let, and secured by upward-only rent reviews.

The chart highlights the "comfort zone" for lenders in the run up to the cycle. All loans advanced before 1987 - only a year from the market peak - would have at least maintained the initial LTV ratios. Those issued in 1987 would have shown a 100% LTV in 1992. Loans issued in 1989 would have deteriorated to an average LTV of 150% by 1992. On average, all loans originated between 1987 and 1991 would have been in breach of initial lending terms at some point in their life. On average, all loans issued from 1987 to 1990 would have been in technical default - LTVs of more than 100% - at some point in their life.



An extension of this simulation to loans against each of the individual IPD properties in the Central London office market suggests that 96% of all loans issued in 1989 would have been in technical default by 1992, with an average loss on default against original advances of 30%.

This measure suggests a far larger disaster for borrowers and lenders than turned out to be the case. A simulation of the debt service coverage ratio (DSC) for loans originated each year (Figure 8) helps explain why. Here we have estimated the DSC for loans at 80% LTV assuming variable lending at 150 bp above short-rates, given the initial income cover provided by average income return on IPD London offices at the point of origination, and changes in that cover generated by average net income growth through the life of the loan.

Given the crash in rental values through the slump, the results may seem counter-intuitive. Throughout the 1980s, the balance between real estate income return (averaging 6%) and borrowing costs (averaging 13% and never below 10%) held initial DCS's on our assumptions to levels between 0.5 and 1 - ratios which would certainly not be held as prudent in today's market. In an inflationary environment, lending assumed rental and capital appreciation would cover the advances. Even for loans originated at the peak of the cycle saw no more than a mild deterioration from their initial DSC ratios (inadequate though they may have been). Even advances at the peak of the cycle achieved *improved* DSC ratios from their initial condition through the life of the loan.

The UK's long leases and upward-only rent reviews - clearly an international anomaly, and now in a process of decay - gave lenders a far larger degree of comfort on income security than would apply in other markets. This underpinning meant that average net incomes fell by no more than 2% in the worst year of the slump, and by no more than 8% between 1991 and 1995. That stability in income for investment (clearly not development) properties, coupled with a halving in floating-rate interest charges from 15.5% in 1990 to 1993 meant that income cover eased through the worst years of the slump, and encouraged long debt work outs rather than fire sales and the lenders' preferred solution to market stress. (Even for fixed rate loans, DSC ratios would have remained constant for loans issued at the peak of the cycle.)

The plot of DSC's also gives a very clear illustration of the dramatic shift in character of real estate lending in the 1990s from that in the 1980s. With, in 2002, London office income returns at 6.5%, and borrowing rates at 5.5%, a loan at 80% LTV against the average let property offers an initial DSC ratio close to 1.5. Rising incomes and falling borrowing costs since the mid-1990s have set DSC ratios on recent advances rocketing - and provided the primary point on which bankers can claim that even more spectacular rises in real estate debt since the mid-1990s is well-secured. (Whether or not that claim survives the prospect of higher interest rates and soft lettings markets when those advances need to be refinanced remains to be seen.)

### **2.3 Some international comparisons**

The London office market has been used as an exemplar of the real estate credit cycle because it is one for which a fairly full set of the relevant indicators is available. As an exemplar, it lacks the drama of a real banking crisis as conclusion. Where such a crisis did occur in the early 1990s, accounts tend to stress the extreme movements in real estate asset values as an ineluctable cause.

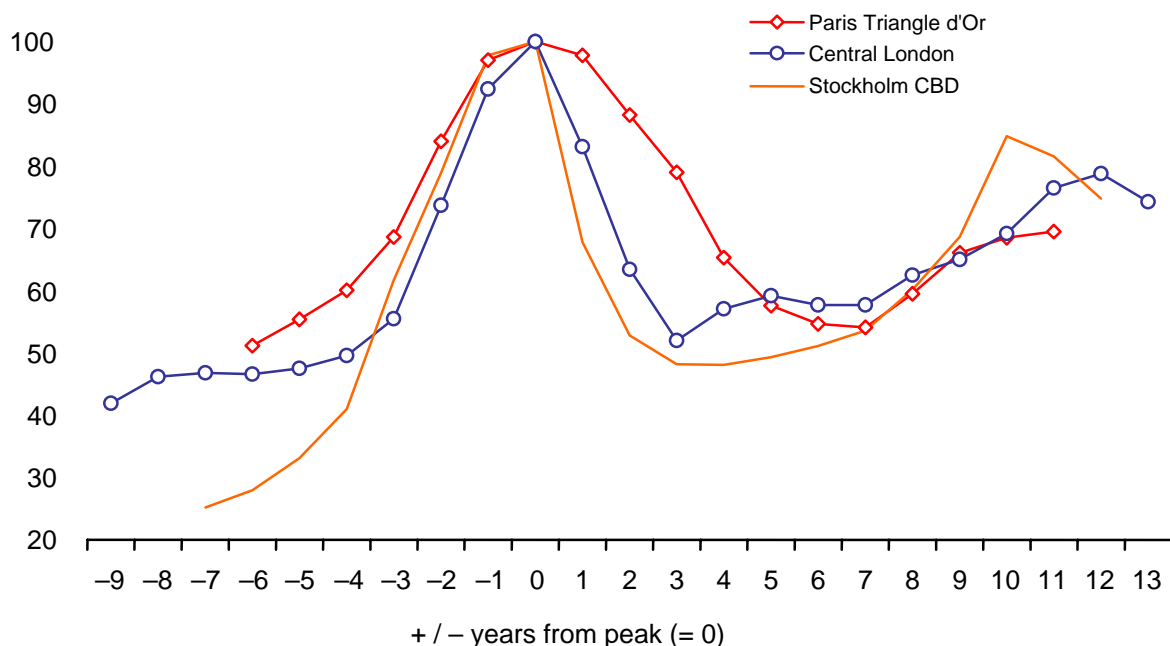
Figure 9 compares the movements in office capital values in two other European markets, aside from Central London, where there were much more severe knock-on effects on the banking system - a systemic crisis in Sweden, more contained but serious problems centred on Credit Lyonnais in France. For the dominant core office markets in each country, capital values are indexed to 100 at their peak year (falling in 1989 in London, 1990 in Stockholm and 1991 in Paris). It does not appear that the range in severity of financial problems across the three countries were a simple product of differences in the amplitude of their real estate cycles. In the run-up to the peak, all three markets saw asset values rise by at least 100%. Though with differences in duration, their downswings saw around 50% wiped off peak capital values.

As others have observed, whether or not real estate cycles ramify into financial crises depends less on their severity than on a range of conditioning or contributory factors (Herring and Wachter (1999)). Within the real estate domain, history is likely to be particularly important. Where there has been a long run of rising real estate asset values, without significant shocks within the recall of market actors and lenders, "disaster myopia" is more likely to take hold in the upswing of a major cycle. In this respect, the United Kingdom had the advantage of a major London office development cycle and banking crisis in the early 1970s to restrain market exuberance (perhaps evident in stable rather than

falling yields through the upswing), and sharpen the attention of bank regulators. It is also highly probable that shorter leases in Sweden and France did not afford the same coverage to debt charges as in the United Kingdom.

Figure 9  
**IPD office capital values**

Index peak year = 100



### 3. The role of performance measurement

A description of the real estate credit cycle has been given at some length not primarily for its intrinsic interest, but to establish the point that there are many indicators which can be used to track the course of real estate markets, their linkages with fundamental economic drivers and with real estate credit. As other analyses have concluded, at least with the benefit of hindsight, simple monitoring key indicators for real estate markets and the banking system could go a long way towards increasing sensitivity to the risks of real estate credit cycles.

The policy prescriptions suggested in the literature may be classified under three main headings:

- First, improved monitoring and understanding of real estate markets themselves - to pick up phenomena such as spikes in development rates, rental values and asset values.
- Second, improvements in the breadth and depth of real estate capital markets, to create a range of investment vehicles and investor interests to diversify the exposure to risk flowing from the cycles, and reduce the probability of liquidity collapses in market downturns.
- Third, improvements in the governance and oversight of lenders to cut out bad lending practices.

The remainder of this paper will focus on the first two of these points, in particular the multiple contributions of well-founded performance measurement systems to both greater transparency and greater maturity in real estate capital markets. The next section sets out the essential features of a robust performance measurement system for real estate markets, followed by the effects we believe such systems can have on the behaviour of those markets.

### 3.1 Real estate performance measurement

Objective measurement of real estate markets is, of course, much harder to achieve than for the other asset classes which dominate the base of institutional and private investor portfolios. Real estate markets lack a central “trading floor” through which transactions information flows (despite the growing use of internet-based information and trading systems for both leasing and capital transactions). Even if a central location through which deals were realised existed, the low liquidity and high heterogeneity of non-residential real estate makes it implausible that transactions flows alone can give a consistent and reliable picture of fundamental trends in the market. Information which is available to actors in the market - either as principals or intermediaries - is, moreover, commonly regarded as commercially sensitive, creating barriers to information-sharing and a suspicion (unjustified or otherwise) that what information is released by such participants is open to manipulation to serve their own interests.

Under these conditions, we believe a credible real estate performance measurement system has to rest on the following central principles:

- Drawing its primary data from the most comprehensive and accurate store of information on real estate markets - the building by building records of major real estate investors who uniquely have a strong interest in complete, accurate cash flow and value information across a large fraction of the property stock.
- Credibility in the marketplace arising from an independent status, and strict adherence to an “open standard” on control of data quality, rigour in performance measurement, and objectivity in interpretation.
- A close engagement with major investors and intermediaries in the market to secure a commitment to data sharing, and an industry-wide effort to define measurement standards.

The fundamental need, in mature real estate markets, for systems with these characteristics is demonstrated by the fact that they have emerged in almost 20 countries, by a variety of routes, and in the majority of cases within the last 10 years (Table 2). In the main, these services are operated by Investment Property Databank, a UK-based commercial provider (in association with local partner organisations in most countries, often involving trade associations of property owners). Those originating from other sources - PCA in Australia, KTI in Finland, NCREIF in the USA - are based on industry associations rather than a commercial service. Though the financing basis varies, all providers follow the same approach on the essential features listed above.

In terms of procedure, these systems again share a common approach:

- A large-scale data-assembly process, drawing large volumes of building-level information from the accounting, management and valuation systems of property owners at least once a year - a process which inevitably involves some commitment of resources from both the suppliers and processors of data, though at costs which can increasingly be reduced by automated data transfer.
- An intermediate stage of quality control and data processing, with a wide range of controls to trap errors and ensure consistency in reporting, and to build up from individual building records measures of real estate performance which can be sub-divided by building type, owner, location etc.
- The delivery of outputs ranging from “headline” indices of overall real estate returns for comparison with equities, bonds and other investments through the analysis of components of those returns (capital appreciation, income return, rental values and incomes, yields and yield movements) for individual markets, to benchmarking and portfolio analytic services to individual real estate investors.

Generally,<sup>3</sup> the charges made for the outputs of these systems are sufficient to cover their costs of operation.

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<sup>3</sup> Further information on the methods and outputs of these performance measurement services is available from [www.ipdindex.co.uk](http://www.ipdindex.co.uk), [www.ncreif.org](http://www.ncreif.org), <http://www.kti.fi/eng>, <http://www.propertyoz.com.au>, and <http://www.propertynz.co.nz>.

Table 2

**Real estate performance measurement systems**

Country	Supplier	Index starts in:	No of investments
Australia	Property Council of Australia	1985	n/a
Canada	Investment Property Databank	1984	1,000
Denmark	Investment Property Databank	2000	1,700
France	Investment Property Databank	1986	3,600
Germany	Investment Property Databank	1996	3,600
Ireland	Investment Property Databank	1984	330
Italy	Investment Property Databank	..	370
Finland	Finnish Institute for Real Estate Economics	1998	2,200
Netherlands	Investment Property Databank	1976	6,700
New Zealand	Property Council of New Zealand	1989	320
Norway	Investment Property Databank	2000	350
Portugal	Investment Property Databank	2000	250
Spain	Investment Property Databank	2000	250
South Africa	Investment Property Databank	1995	1,900
Sweden	Investment Property Databank	1983	2,400
Switzerland	Investment Property Databank	..	1,600
United Kingdom	Investment Property Databank	1971	14,000
United States	National Council of Real Estate Investment Fiduciaries	1978	3,800

**3.2 Applications: market monitoring**

Section 2 used IPD rental and capital value series on one market - London offices to track the real estate cycle. This is a specific illustration of a general case: a robust and widely-based performance measurement system brings to real estate markets the transparency which equity and bond indices convey to other asset classes.

This benefit accrues at all levels. A top level "all-property" index provides for each national market the basis for comparison of returns and risks across asset classes, and the inputs to quantitative models of asset allocations across asset classes. Similarly, on a global scale, a headline index allows the comparison of performance characteristics across countries, and the basis for international portfolio diversification increasingly being pursued by major investors.

Within national markets, performance measurement is the basis for the on-going analysis of markets that drives development and investment decisions, and for econometric forecasting of rental values, yields, capital values and returns. In the United Kingdom, where real estate performance measurement is perhaps most extensive and most widely used, the IPD system can track the key components of value and return over more than 20 years from all-property level down to (for example) individual retail markets in 170 cities and towns, and within major cities down to individual streets and postal codes. Table 3 is an example a standard performance history, for offices in the West End of London.

Table 3

**UK IPD West End office performance 1981-2002**

Annual percentage changes (for the continuous yield index, 1988 = 100)

	Total return	Income return	Capital growth	Rental value growth	Yield impact	Income structure residual	Equivalent yield	Continuous yield index
1981	16.7	5.9	10.8	7.4	4.3	-1.3	7.6	95.8
1982	4.8	5.5	-0.7	1.2	-3.6	1.7	7.7	99.4
1983	3.8	5.8	-2.0	-0.3	-2.5	0.8	7.9	102.0
1984	7.1	6.4	0.7	2.8	-2.1	0.0	8.1	104.2
1985	9.8	6.8	3.0	5.8	-2.3	-0.4	8.1	106.6
1986	15.6	6.9	8.7	11.6	-0.9	-1.9	8.2	107.5
1987	37.7	7.4	30.3	29.1	4.3	-4.4	7.9	103.1
1988	45	7	38	40	3	-6	8	100
1989	20.8	4.9	15.8	18.1	0.4	-2.8	7.5	100.0
1990	-9.2	4.3	-13.5	-2.4	-12.4	1.0	8.6	114.1
1991	-18.1	5.3	-23.4	-22.9	-12.6	9.2	9.8	130.6
1992	-13.0	7.3	-20.3	-28.1	-7.1	12.9	10.4	140.5
1993	20.5	10.6	9.9	-14.0	21.4	5.5	8.6	115.8
1994	13.3	8.1	5.2	1.0	7.7	-3.6	8.1	107.5
1995	5.1	7.2	-2.1	3.7	-2.4	-3.3	7.8	110.2
1996	9.7	7.4	2.3	5.5	0.0	-3.2	7.7	110.1
1997	17	7	9	14	3	-8	7	107
1998	13.1	6.9	6.3	12.9	-0.1	-6.6	7.4	107.1
1999	16.0	6.9	9.1	11.5	0.6	-3.1	7.4	106.4
2000	19.0	6.7	12.3	20.0	-2.5	-4.7	7.6	109.2
2001	7.8	6.1	1.6	4.9	-2.1	-1.1	7.8	111.5
2002	2.3	6.0	-3.7	-8.3	2.7	2.1	7.6	108.6

Performance measurement systems, though primarily focused on equity rather than debt-financed investments, can be adapted to cast light on the relative levels of risk in development as against let properties, in the market risks of different types of building and location, and the specific risk arising from the deviation of individual buildings from market averages.

Figure 10 indicates overall returns and risks for let properties and development properties in the Central London office market. Overall, developments have a mean return above let buildings (11.3% p.a. against 9.9% p.a.), with close to double the risk (a standard deviation of 21.6% p.a. against 13.4% p.a.). For a specific period, Figure 11 shows the building specific risk around the market average for let properties, showing that 25% of properties saw capital values fall by more than 60% against the average of 40%. These results (allied with further indicators for rental values and capital values), built into forecasting models, can provide input to simulations of loan security for different types of lending, different markets, and different numbers of loans.

Figure 10

**IPD Central London offices -  
let versus development properties**

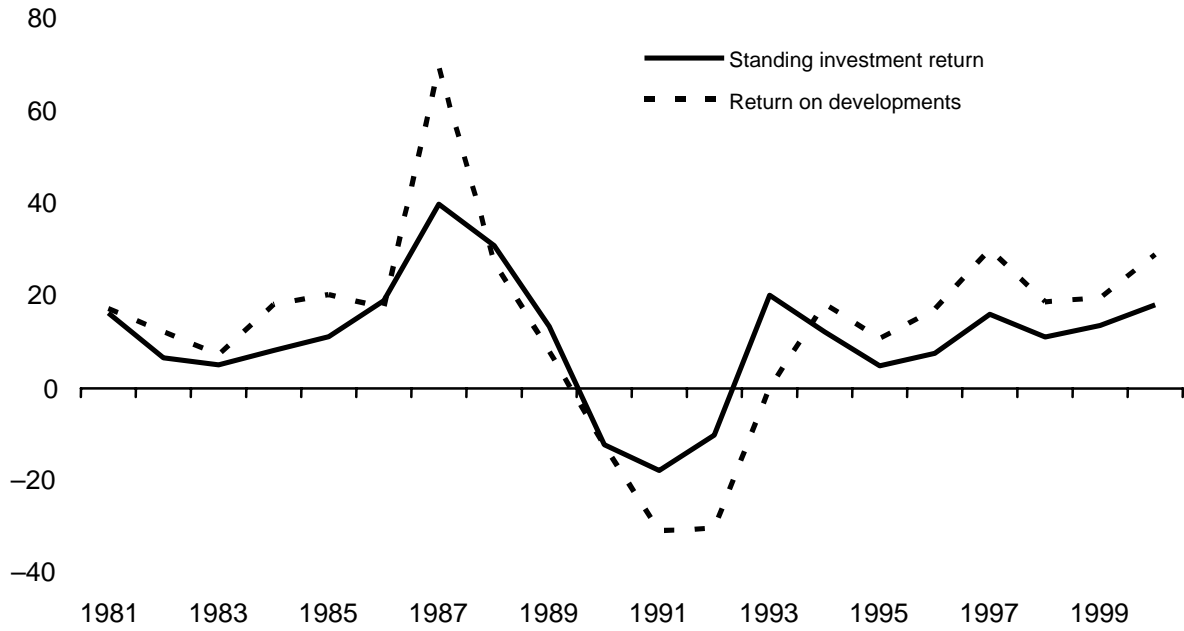
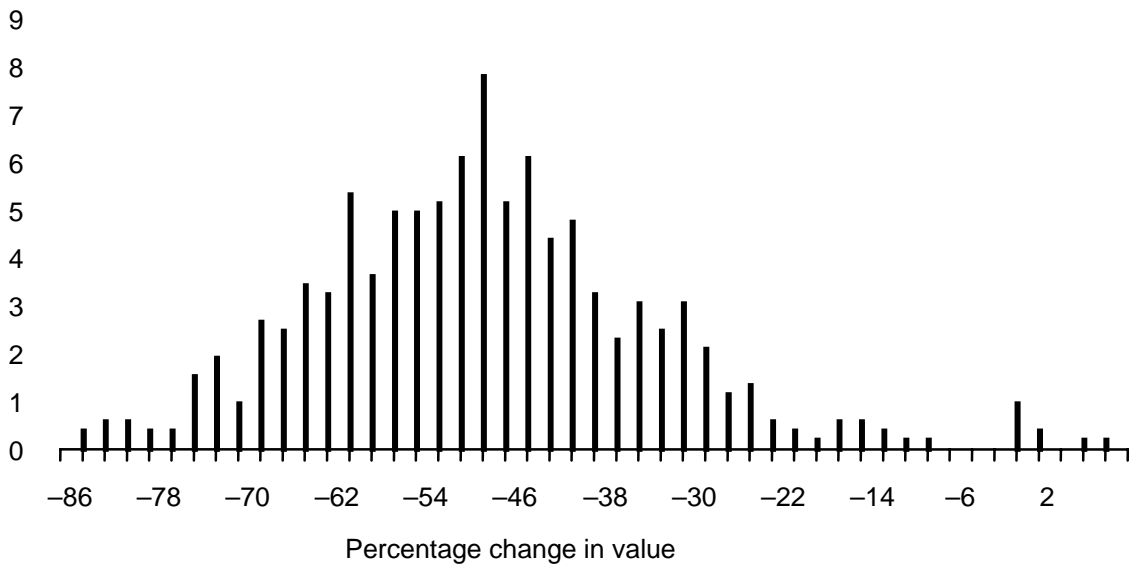


Figure 11

**IPD Central London offices -  
distribution of capital growth**

As a percentage of total building, 1989-92



### 3.3 Performance measurement and professional practice

Benefits from performance measurement to the quality of professional practice are most obvious in investor relations and fund management. As in any asset class, the existence of general market performance indices and manager benchmarks can provide the foundation for decisions on manager selection, and a rational basis for performance-related rewards. These can be regarded as part of the outputs of a performance measurement system.

There are less obvious but equally important benefits from performance measurement on the input side of the process, and in particular on the quality of appraisals (in UK terminology, valuations). Unreliable or inconsistent appraisals undermine the foundations of investment or lending in real estate. Even in many of the more mature European real estate markets, the appraisal industry is not subject to standards of educational qualification, professional accreditation or regulation, or testing in courts as in the United States and the United Kingdom.

In these countries, the establishment of performance measurement systems has given a strong impetus to the codification, standardisation and scrutiny of appraisal practice. In the development phases, it has typically been the case that panels of investors and appraisers have been formed to produce guidelines for the appraisals to be supplied to the system - covering methodology, the required qualifications of appraisers, and the supporting evidence to be supplied. In countries such as the Netherlands, Sweden, and France, this has been the first time that standardised appraisal guidelines have been adopted across the investment industry. In these guidelines, specific appraisal methods (whether income capitalisation, discounted cash flow or comparable sales) are of less concern than adherence to an underlying principle of open market value, consistency of practice across investors, and the provision of sufficient supporting evidence (current and prospective cash flows, yields applied) to justify the calculation of value.

The beneficial interplay between performance measurement and appraisal practice does not end with codification. The process itself raises the status of regular appraisals of entire portfolios. Where previously such appraisals may have been conducted only to meet accounting or regulatory requirements, with performance measurement they become a principal basis for investment decisions, client reporting and (perhaps) the determination of performance related rewards. As with any information source, increased usage of the data for real management decisions will raise the attention paid to the appraisal process by both investors and valuers.

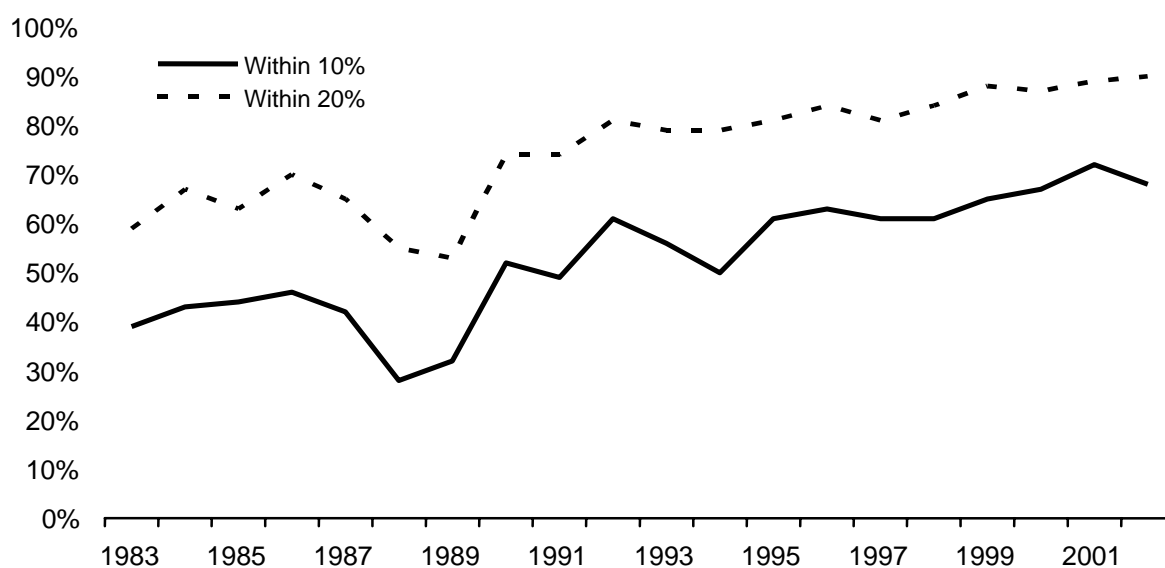
Even beyond that, a performance measurement system is in itself a tool through which many features of appraisals themselves can be documented and analysed. At a descriptive level, IPD's records give a unique account of how appraisals are done in different markets, and the assumptions on which the calculations of value rest.

Fuller analysis can extend the scrutiny of appraisals to key industry issues like the "accuracy" of appraisals measured against subsequent sales prices (Mokrane (2002)). In several countries, performance measurement systems are being actively used by the appraisal profession to increase transparency, raise confidence and improve practice in the appraisal process. Even in the United Kingdom, where appraisal standards are long-established and highly regulated, the Carsberg Committee of The Royal Institution of Chartered Surveyors has recommended that annual reviews of appraisal ranges and accuracy against sales prices should be drawn from IPD's performance measurement records, to produce a rigorous assessment of appraisal accuracy (illustrated in Figure 12), and "benchmarks" against which further improvements in practice can be measured.

In short, credible and consistent appraisals are a critical input to a reliable real estate performance measurement system. But the creation and operation of such a system itself creates both strong pressures and a mechanism through which the appraisal process becomes more transparent, credible and consistent.

Figure 12

**Percentage of UK valuations within 10% and 20% of their sale price**



### 3.4 Performance measurement and capital markets

Broader and deeper real estate capital markets clearly have a role to play in reducing the risk of real estate credit cycles. Widening the range of investors and vehicles through which they can invest may make it more likely that there will be differing views on the market through the cycle, and that capital will continue to be available through downswings in the market. A narrow base of local institutional capital and bank debt undoubtedly contributed to the depth of the early 1990s crisis in some markets (eg Sweden). Inflows of foreign investment also played an important role in recapitalising distressed markets in other countries (eg German investors into the United Kingdom, and US investors into France) in trough of that cycle.

For real estate lenders, the possibility of securitisation through Mortgage Backed Securities (MBS) offers a direct means of reducing exposure to the real estate cycle. Some commentators suggest that the transparency and discipline of the large CMBS market created in the US since the early 1990s may account for the absence of a serious debt-funded overbuilding through the “missing” real estate cycle of the late 1990s (Zhu (2002)). Others suggest that derivative instruments would offer a mechanism through which the risks of real estate cycles could be more accurately priced and diversified (Shiller (1998)).

The possibility of broadening and deepening capital markets in these ways depends to varying degrees on the existence of robust, generally accepted measures of real estate investment performance. At its broadest, improved information on investor returns is, in principle, likely to increase the volume and reduce the cost of capital by removing uncertainty. On an international scale, for example, some global investors have made the existence of real estate indices and local benchmarks a pre-condition for investment in a national market.

More specifically, the availability of standardised performance measurement and benchmarks has become essential infrastructure for effective markets in investment vehicles, either public or private. In Europe, the European Public Real Estate Association (EPRA) and the European Association for Investors in Non-Listed Real Estate Vehicles (INREV) have followed the long-standing example of the US National Association of Real Estate Investment Trusts (NAREIT) in placing an emphasis on codes of performance measurement, standardised investor reporting and robust indices high on their agenda.



Derivative instruments, opening the way to hedging and diversification of risk from market principles to wider public markets, are the final stamp of maturity and sophistication in any investment market. They are also the ultimate test for a real estate performance measurement system, since regulators and capital markets have to accept the credibility and reliability of the indices on which derivatives rest.<sup>4</sup>

### 3.5 Adaptation to emergent markets

In summary, experience from a large and growing number of countries demonstrates the feasibility of building credible real estate performance measurement systems. The ramifications of such systems go well beyond the immediate function of market monitoring - which can be served by less extensive systems such as the rent and yield "barometers" typically produced by firms of brokers. In the most mature markets, performance measurement systems have been a powerful agent not only for establishing overall market performance, but also for increased transparency and sophistication in fund management, appraisal practice, and the structure of capital markets. We would argue that the *process* of establishing and operating a sound performance measurement system, and not just the outputs of the system, makes an important contribution to those benefits.

It has been easiest to set up performance measurement systems in markets where there is a well-established base of long-term equity investors (especially institutional investors) who can provide both the source data for a system and the demand for its services. Regular open-market appraisals, conducted to a high professional standard, might be regarded as the second necessary pre-condition for such a system.

For transitional and emergent real estate markets, the risks of real estate credit cycles are likely to be greater. Faster economic growth raises the rate at which stocks of real estate have to be incremented, and the severity of any downward shock on growth rates and market surpluses. At the same time, national and local government agencies may be anxious to maintain a ready supply of real estate to support growth and inward investment, and less inclined to support real estate values through planning controls.

In the absence of one or both of a developed institutional market and a strong appraisal practice, it may appear that the approach to real estate performance measurement set out in this paper is premature. It is certainly the case that a system cannot aim for the same extent of market coverage and length of time series as in more mature markets, so that the performance measurement *outputs* of the system are less valuable.

A performance measurement culture is, however, already spreading to relatively immature real estate markets in developed economies - such as Southern Europe and Japan. In these instances, the base and demand for performance measurement is likely to arise either from overseas investors, or through the creation of new real estate investment vehicles such as unitised funds or listed trusts, which require international standards of measurement and benchmarking. In their early stages, the *process* benefits of these performance measurement systems - establishing a commitment to market transparency, setting standards for accounting and appraisals - are as strong as in more mature markets. They establish the information infrastructure and industry culture from which longer-term improvements in maturity will flow - perhaps surprisingly quickly. Given the presence of significant international investment across many emergent markets in Central and Eastern Europe and South East Asia, and the strong interest in the creation of information-driven investment vehicles in those markets, the initial basis for viable performance measurement exists in a much larger number of countries than are currently covered.

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<sup>4</sup> In this area, the United Kingdom has a well-established lead through Property Index Certificates and Property Index Forwards, based on IPD's UK Monthly Index and which have been available since the mid-1990s - the first ever synthetic instrument in real estate.

## 4. Summary

The paper has aimed to establish three main points.

First, through an account of the UK real estate credit cycle of the late 1980s/early 1990s, to demonstrate that the key elements of such cycles can be quite easily tracked. Ramps and spikes in indicators of fundamental real estate demand, rental and capital pricing, and volumes of lending look like valuable warning indicators of rising real estate credit risk. As applied in Section 2, general real estate market information can be adapted to estimate market and specific risk for real estate lenders.

Second, we suggest that real estate performance measurement systems can play a critical role in the development of mature real estate markets. This goes beyond their primary ostensible purpose as an information source for direct participants in the real estate market. The process of creating performance measurement systems itself lends impetus to improvements in real estate management, and especially to the quality and credibility of appraisals.

Third, performance measurement systems create the primary information inputs on which broader and deeper real estate capital markets can be based. Ultimately, the solution to real estate credit risks is not the rationing of credit by regulators. Given the highly unpredictable nature of the real estate cycle, and its changes in character from one cycle to the next, such interventions will run a high probability of mis-timing. A market-based solution rests in an improved understanding and pricing of real estate risk, and the availability of instruments which allow those risks to be appropriately distributed. In the long-run, the greatest value of credible measures of real estate values and returns will rest on their critical role in the development of these markets.

## Appendix 1: Real estate and banking crises - a selective listing

Financial crisis/stress	Consequences	Contributory factors
1973-75 UK secondary banks. Speculative development boom, largely in London offices.	Rash of failures and weakness among secondary banks. Bail out by group of clearing banks at a total cost of GBP 1.2 billion, equivalent to half their shareholder's equity, or 1.5% of GDP.	Preceding planning restrictions on supply. Extreme credit boom. Financial intermediaries.
1984-91 USA Savings and Loans. Speculative development boom in South West.	1,400 savings and loans, 1,300 banks failed. Clean up costs estimated at USD 180 bn, 3.2% of GDP.	Inexperienced lenders through deregulation of savings and loans. Moral hazard through deposit insurance.
1987-93 Norway. Bank crisis.	State took control of three largest banks with 85% of banking system assets. Recapitalisation costs estimated at 5%-8% of GDP.	Combined oil boom and problem real estate loans.
1991 Swedish banks. Lending boom for domestic and overseas investment/development.	Two of six major banks, 22% of banking system assets, insolvent. Three further banks in difficulty. Non performing real estate in special vehicles. State recapitalisation costs estimated at 4%-6% of GDP.	Deregulation of domestic and international investment. Credit boom. Financial intermediaries.
1991-94 Finland. Savings bank crises.	State took control of three banks accounting for 31% of bank deposits. Non performing real estate in special vehicles. Recapitalisation costs estimated at 11%-15% of GDP.	As Sweden.
1990s-ongoing Japan. Systemic banking crisis.	Non performing loans estimated at up to 25% of GDP. Bank nationalisations, closures, mergers. Clean up costs by late 1990s around 12% of GDP. Liquidation of intermediaries (Jusen) at a cost of USD 6.3 bn.	Long preceding land price boom. Special real estate financial intermediaries (Jusen). Moral hazard through state support for large banks.
Mid-1990s France. Bank crisis.	Stress bordering on insolvency in several major banks. Range of government support measures, final costs estimated at the equivalent of 1% of GDP.	Unreliable valuations. Bank exposure to real estate through shareholdings in development and construction subsidiaries.
1997-2000 Asian crisis, Malaysia, Thailand, Korea ...  Systemic banking crises linking asset price and real estate bubbles with foreign capital flows.	Malaysia: two banks insolvent, non-performing loans 25-35% of banking system assets.  Thailand: state intervention in 70 finance companies and six banks. Non-performing loans 46% of total loans. Net losses equivalent to 42% of GDP.  Korea: Two banks nationalised, 5 closed, 7 under special supervision. Non-performing loans 30-40% of total. Fiscal costs estimated at 34% of GDP.	Long preceding land price booms. Extreme credit booms and deregulation of international capital flows. Financial intermediaries (especially Thailand).

Source: Mostly from Barth, Caprio and Levene, *Banking systems around the world*, World Bank.

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# The availability and usefulness of real estate data in eastern Asia - a user's perspective

Boaz Boon

## Executive summary

The challenges of sourcing useful real estate data in eastern Asia are rather similar to that in other parts of the world, ie, transparency of the data collection process, which includes consistency, reliability, adequacy and timeliness. Users of these data need to know its strengths and weaknesses. More often than not, users have to use appropriate proxies in line with relevant research questions to help them make a call on the market. The risks of using spurious data and thus spurious research findings can be mitigated by the proper sourcing and usage of relevant data. This paper aims to help users mitigate development and investment risks by identifying good sources of useful data in Singapore, Kuala Lumpur and Shanghai, as part of eastern Asia.

## 1. Eastern Asia

Eastern Asia is defined as East and Southeast Asia. According to the Asian Development Bank, this region comprises China (including Hong Kong and Taiwan), South Korea, and the Southeast Asian economies like Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. This region houses about two billion people (one third of the world's population), occupies 14 million sq km (3% of world's land area), and produced about 20% of the world's GDP in 2000. Its GDP grows at an average of 6.4%, faster than the world's average of 4.8% in 2000. In addition, this region is likely to produce four of the seven world mega cities of the near future.

### Rising mega cities<sup>1</sup>

- Beijing (China)
- Delhi (India)
- Guangzhou (China)
- Mumbai (India)
- Santiago (Chile, Latin America)
- Shanghai (China)
- Shenzhen (China)

## 2. Real estate data

Real estate market analysis is used to provide potential developers and investors a certain level of comfort before embarking on the development or investment in a particular area within a given time frame. It provides the bigger picture perspective and thus would cover the economy of the area, the supply, demand, rental and yield of the real estate sector in question.

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<sup>1</sup> Sources: JLL; CapitaLand Research.

After the real estate market analysis, the developer or investor could drill down to the project-level analysis. This would comprise cash-flow and benchmark analysis of the particular project vis-à-vis competitors.

Real estate data is required in both real estate market analysis as well as project analysis. This paper will focus on the real estate market analysis perspective to highlight the challenges in the availability and usefulness of real estate data in three selected cities in eastern Asia ie, Singapore, Kuala Lumpur (Malaysia) and Shanghai (China).

Real estate market analysis requires the following types of variables. The list is not exhaustive but it helps to highlight the challenges of sourcing and usage of such data.

Table 1  
Types of data

No	Generic category	Variables
1	Economy	GDP, Inflation, Retail sales index, FDI, Unemployment rate, Interest rate, Exchange rate, Forecast of economic indicators, Sovereign credit risks
2	Politics	Political risks
3	Demography	Population size, Per capita income, Household size, Household income, Living space per capita, Demographic forecasts
4	Real estate information	Existing stock, Historical and forecast of supply, Demand, Vacancy, Rental, Yields and total returns, List of sales transactions and buyers' profile

### 3. Asking relevant research questions

Before we begin any collection of data, it is vital to ask relevant research questions. Relevant questions will ensure the following:

- (a) Discipline in data collection - types and amount of data;
- (b) Appropriateness of analytical methodologies and tools;
- (c) Focus on the agreed research roadmap; and
- (d) Efficiency and effectiveness in the research process.

Market researchers are tempted to collect as much information as possible just in case they are needed at a later stage. However, in practice, there is a constraint in resources like time and money. Hence, starting with the relevant question will help in the collection of the relevant types and amount of information. It is always important to formulate the research questions together with the clients to ensure there is understanding and acceptance. Otherwise, the entire research process might be a waste of resources.

Understanding the research question will also help the researcher to source data that could be used in appropriate analytical methodologies. Also, certain qualitative information, such as business sentiment, needs to be quantified before analysis.

### 4. Usefulness of data

*Secondary data sources:* Most real estate market analysis in eastern Asia use secondary data. Therefore, the users of such data need to test the usefulness based on their consistency, reliability, adequacy and timeliness. If data collected do not pass these tests, then the usefulness of such data would be limited. If the analysts ignore the impediments of the data, the research findings might be flawed or spurious.

*Consistency:* Consistency implies the same definition of data used throughout a particular time-series. If the definition is changed but ignored, the time-series will be flawed. Hence, it is important for analysts to understand the definitions and compare like with like.

*Reliability:* Reliability refers to reproducibility or replication of estimates. If the analyst uses two or more techniques to measure the same value (ie, population) and the estimates are close together, the estimates are judged to be reliable. Reliability also implies accuracy and validity. Both accuracy and validity of data should be checked for each group of data being studied. The data must reflect accurately what is taking place. Validation is the process of checking to make sure proper procedures were followed in collecting, organising, and analysing the data. Data that have been validated are considered more accurate because more is known about their origin and characteristics. Consequently, more confidence can be placed in the use of validated data.

*Adequacy:* Adequacy of data refers to the length of the time-series. If the time-series is too short, it is difficult to understand the historical market behaviour and thus difficult to make reasonable forecasts.

*Timeliness:* The data must reflect the time period that governs the analysis. If current demand is the issue, then 2000 take-up rate is not timely.

## **5. Challenges faced in eastern Asia**

The three cities chosen as examples are Singapore, Kuala Lumpur (Malaysia) and Shanghai (China). Singapore is the best so far as the availability and usefulness of public data is concerned.

### **5.1 Singapore**

Singapore is a city-state. Hence, the country data is equivalent to the city-specific data. Economic, political and real estate data produced by the public agencies, such as the Department of Statistics (DOS) and the Urban Redevelopment Authority (URA) are consistent, adequate, reliable, and timely. A summary of the availability and usefulness of data is shown in Appendix 1. However, data pertaining to demography (eg, household size, household income, living space per capita) are produced during the census of population, which has a five-year interval. Nevertheless, such data are not highly volatile, and thus an analyst could still use the data with a reasonable level of comfort.

Even though data in the public domain are good, real estate data for specific market segment still have to be sourced from private research houses. Examples are supply, demand, rentals, capital values and yields of investment grade office, retail, residential and industrial space. The performance of specific market segments are tracked differently by different research houses. Hence, the analyst needs to be comfortable with the basket of goods used by the research house and the method by which data are collected before sourcing the data for analysis.

An example of the appropriate market segment is this. If the analyst were to focus on prime retail shopping space, he needs to know if the basket of goods used by the research house accurately reflects the prime shopping space in the Orchard Road belt and distinguish that from the prime retail suburban malls next to MRT stations in the suburb. If the research house only tracks the performance of the Orchard Road prime retail malls, the data might not be useful because it would have missed out an important market segment, ie, prime suburban, which attracts much investment interest in Singapore.

Therefore, analysts need to be careful when comparing different time series sourced from different research houses.

### **5.2 Kuala Lumpur (Malaysia)**

Kuala Lumpur (KL) is the capital city of Malaysia, and the only city in Malaysia worth noting so far as international real estate investors are concerned. However, there are no city-specific data available in the public domain. Hence, analysts must use country-wide or state-wide economic and demographic data to function as proxy to the KL city-specific performance trend. This is far from ideal.

To mitigate this problem, analysts could source KL city-specific real estate data from private research houses. Again, the analyst has to understand the definitions of such data and need to ascertain if they reflect the market segment accurately. A summary of the availability and usefulness of the data for the KL real estate market is shown in Appendix 2.

### **5.3 Shanghai (China)**

The Chinese government knows the challenges in data collation and it has taken steps to adopt better methodologies. But this could take a long time. Hence, analysts need to use proxies carefully.

Real estate market analysis of Shanghai needs to use Shanghai-specific data. This is available in the Shanghai Municipal Statistics Bureau Shanghai Statistical Yearbook. A summary of the availability and usefulness of data used for Shanghai real estate market analysis is shown in Appendix 3.

Like all the other cities, data on specific market segments can be sourced from private research houses. But the analyst has to know the basket of goods that reflect the market segment. This is particularly important in Chinese cities, like Shanghai. For example, the market segment for international grade 'A' office should not be confused with buildings that are merely local grade "A". A mixture of these will dilute the performance of the buildings defined as international grade "A". The analyst might even make a wrong judgment call when recommending to clients to buy or sell.

Furthermore, in such a big city like Shanghai, the analyst needs to know the locations of the buildings within the basket of goods reflecting the market segment. If the analyst focuses on the entire Shanghai city, and the basket of goods only reflects the buildings in Puxi and not in Pudong, the analyst must know that his research findings are based on the generalisation of the performance of buildings within Puxi and applied generally across Shanghai. He needs to highlight this caution to his clients.

### **5.4 Inter-city comparison**

The greater challenge comes when the analyst needs to compare real estate performances across cities in eastern Asia. For example, how do the performances of the office market in Shanghai compared with that in Hong Kong SAR and Singapore? Not only must the analyst ensure that he is using similar definitions of the market segment for comparison, he needs to ensure that the computations of the city-specific data are treated similarly. Otherwise, his research findings will be spurious.

So far, there is only one research house that meets the strict requirements of data comparability across cities in eastern Asia. This set of data is expensive and is produced by the Jones Lang LaSalle Real Estate Intelligence Service. The definitions of their data are shown in Appendix 4. For confidentiality, their data cannot be provided in this paper.

## **6. Conclusion - the world of second best**

There is pervasive information asymmetry in real estate, that is to say, analysts are bombarded with this challenge of incomplete information. Usually, practitioners deal with the issues and situations the best they can, and move on. Real estate is a unique, heterogeneous, long-lived asset involving cross-disciplinary fields. As fundamental real estate researchers are grafting well-established principles in information economics with the unique features in real estate so as to shed new light on extant issues, practitioners will try to source and use consistent, reliable, adequate and timely data to help them make a call on the market as best as they can. As for eastern Asia, there are reliable sources of useful real estate data. However, the analyst needs to do due diligence to ensure the data reflects the market segments he is dealing with.



## Appendix 1(a): Singapore

Variables	Main source of information	Usefulness			
		C	A	R	T
<b><i>Economic</i></b>					
GDP	Department of Statistics, Singapore (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retail sales index		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Foreign direct investment	Economist Corporate Network (Regional Strategic Quarterly Forecast)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Unemployment rate	Ministry of Manpower, Singapore (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interest rate	Monetary Authority of Singapore (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exchange rate		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forecast of economic indicators	Economist Corporate Network (Regional Strategic Quarterly Forecast & Asia-Pacific Executive Brief)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sovereign credit risk indicators eg foreign debt/GDP, reserves/imports and Moody/ S&P ratings	UBS Warburg (Asian Economic Indicators)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><i>Political</i></b>					
Political risks	Economist Corporate Network (Regional Strategic Quarterly Updates, Asia-Pacific Economic Brief & Country Monitor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><i>Demographic</i></b>					
Population size	Department of Statistics, Singapore (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Per capita income	Department of Statistics, Singapore (Yearbook of Statistics)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Household size	Department of Statistics, Singapore (Census of Population 2000)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Household income		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Living space per capita		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Forecast of demographic indicators	Asian Demographics (Weekly Demographic Insights)	<input type="checkbox"/>		<input type="checkbox"/>	

**Appendix 1(a):  
Singapore (cont)**

Variables	Main source of information	Usefulness			
		C	A	R	T
<b>Real estate market information</b>					
<b>All sectors (Residential, Office, Retail &amp; Industrial)</b>					
Existing stock	Urban Redevelopment Authority, Singapore (Real Estate Information System - Web-based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historical supply		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historical demand		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historical vacancy		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historical rental		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historical price/capital value		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historical yields	CB Richard Ellis (Singapore Real Estate Quarterly Research Report)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potential supply (except residential)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Office (Grade "A")</b>					
Historical and forecast of demand, supply, vacancy, rental, capital value, yields and total returns	Jones Lang LaSalle (Real Estate Intelligence Services)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Residential</b>					
Potential supply	Urban Redevelopment Authority, Singapore (Real Estate Information System - Web-based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
List of sales transactions		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyers' profile - nationality		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Note: Criteria used to measure the usefulness of information sources are Consistency (C), Reliability (R), Adequacy (A) and Timeliness (T).					

## Appendix 1(b): Sources for information on Singapore

Economic indicators	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Singapore (<a href="http://www.singstat.gov.sg">www.singstat.gov.sg</a>)</li> <li>– Ministry of Manpower, Singapore (<a href="http://www.mom.gov.sg">www.mom.gov.sg</a>)</li> <li>– Ministry of Trade &amp; Industry, Singapore (<a href="http://www.mti.gov.sg">www.mti.gov.sg</a>)</li> <li>– Ministry of Finance, Singapore (<a href="http://www.mof.gov.sg">www.mof.gov.sg</a>)</li> <li>– Monetary Authority of Singapore (<a href="http://www.mas.gov.sg">www.mas.gov.sg</a>)</li> <li>– Singapore Tourism Board (<a href="http://www.stb.gov.sg">www.stb.gov.sg</a>)</li> <li>– Asian Development Bank (<a href="http://www.adb.org">www.adb.org</a>)</li> <li>– The World Bank Group (<a href="http://www.worldbank.org">www.worldbank.org</a>)</li> <li>– International Monetary Fund (<a href="http://www.imf.org">www.imf.org</a>)</li> <li>– United Nations Conference on Trade and Development (<a href="http://www.unctad.org">www.unctad.org</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Ministry of Trade &amp; Industry (Economic Survey of Singapore, Quarterly)</li> <li>– Monetary Authority of Singapore (Macroeconomic Review, Biannually)</li> <li>– Economist Corporate Network (Regional Strategic Quarterly Forecast &amp; Asia Pacific Executive Brief)</li> <li>– UBS Warburg (Asian Economic Indicators)</li> </ul> <p><i>Other information providers (Subscription basis)</i></p> <ul style="list-style-type: none"> <li>– Bloomberg LP</li> <li>– Thomson ONE Analytics (contains analyst reports on Singapore economy)</li> <li>– Factiva (contains information from newspaper, magazines and reports)</li> </ul>
Politics	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Institute of Policy Studies (<a href="http://www.ips.org.sg">www.ips.org.sg</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Economist Corporate Network (Regional Strategic Quarterly Updates, Asia-Pacific Economic Brief &amp; Country Monitor)</li> </ul>
Demographic indicators	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Singapore (<a href="http://www.singstat.gov.sg">www.singstat.gov.sg</a>)</li> <li>– Asian Development Banks (<a href="http://www.adb.org">www.adb.org</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Singapore (Yearbook of Statistics &amp; Census of Population 2000)</li> <li>– Asian Demographics (Weekly Demographic Insights)</li> <li>– Economist Corporate Network (Regional Strategic Quarterly Forecast)</li> </ul>
Real estate market information	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Urban Redevelopment Authority of Singapore (<a href="http://www.ura.gov.sg">www.ura.gov.sg</a>)</li> <li>– Housing &amp; Development Board, Singapore (<a href="http://www.hdb.gov.sg">www.hdb.gov.sg</a>)</li> <li>– Central Provident Fund Board, Singapore (<a href="http://www.cpf.gov.sg">www.cpf.gov.sg</a>)</li> <li>– Real Estate Developers' Association of Singapore (<a href="http://www.redas.com">www.redas.com</a>)</li> <li>– CB Richard Ellis (<a href="http://www.cbre.com.sg">www.cbre.com.sg</a>)</li> <li>– Chesterton International (<a href="http://www.chesterton.com.sg">www.chesterton.com.sg</a>)</li> <li>– Colliers International (<a href="http://www.colliers.com/singapore">www.colliers.com/singapore</a>)</li> <li>– Cushman &amp; Wakefield (<a href="http://www.cushwakeasia.com">www.cushwakeasia.com</a>)</li> <li>– DTZ Debenham Tie Leung (<a href="http://www.dtz.com.sg">www.dtz.com.sg</a>)</li> </ul>

**Appendix 1(b):  
Sources for information on Singapore (cont)**

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Real estate market information (cont)	<p><i>Websites (cont)</i></p> <ul style="list-style-type: none"><li>– Jones Lang LaSalle (<a href="http://www.joneslanglasalle.com.sg">www.joneslanglasalle.com.sg</a>)</li><li>– Jones Lang LaSalle Hotels (<a href="http://www.joneslanglasallehotels.com">www.joneslanglasallehotels.com</a>)</li></ul> <p><i>Publications</i></p> <ul style="list-style-type: none"><li>– Urban Redevelopment Authority of Singapore (Property Market Information)</li><li>– CB Richard Ellis (Singapore Real Estate Research Report, Quarterly)</li><li>– Jones Lang LaSalle (Singapore Quarterly Property Market Review, Singapore Property Market Monitor, Asia Pacific Property Digest &amp; Asia Pacific Property Investment Guide)</li></ul> <p><i>Other information providers (Subscription basis)</i></p> <ul style="list-style-type: none"><li>– Jones Lang LaSalle (Real Estate Intelligence Services)</li><li>– Thomson ONE Analytics (contains analysts' reports on property sector)</li></ul>
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**Appendix 2(a):  
Malaysia (Kuala Lumpur)**

Variables	Main source of information	Usefulness			
		C	A	R	T
<b><i>Economic</i></b>					
GDP	Asian Development Bank (Key Indicators 2003)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unemployment rate		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External trade		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exchange rate		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interest rate	Bank Negara Malaysia (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Foreign direct investment	Economist Corporate Network (Regional Strategic Quarterly Forecast)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Forecast of economic indicators	Economist Corporate Network (Regional Strategic Quarterly Forecast & Asia-Pacific Executive Brief)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-performing loan	Ernst & Young (Non-Performing Loan Report: Asia 2002) - Ad hoc report			<input type="checkbox"/>	<input type="checkbox"/>
Sovereign credit risk indicators eg foreign debt/GDP, reserves/imports and Moody/S&P ratings	UBS Warburg (Asian Economic Indicators)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><i>Political</i></b>					
Political risks	Economist Corporate Network (Regional Strategic Quarterly Updates, Asia-Pacific Executive Brief & Country Monitor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><i>Demographic</i></b>					
Population size	Department of Statistics, Malaysia (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demographic characteristics (Age distribution, etc)	Department of Statistics, Malaysia (Population & Housing Census 2000)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Forecast of demographic indicators	Asian Demographics (Weekly Demographic Insights)	<input type="checkbox"/>		<input type="checkbox"/>	

**Appendix 2(a):  
Malaysia (Kuala Lumpur) (cont)**

Variables	Main source of information	Usefulness			
		C	A	R	T
<b><i>Real estate market information</i></b>					
<b><i>Investment grade office &amp; luxury residential</i></b>					
Historical and forecast of demand, supply, vacancy, rental, capital value, yields and total returns	Jones Lang LaSalle (Real Estate Intelligence Services)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><i>Luxury residential</i></b>					
Affordability index	Straits-GK Goh Research Sdn Bhd (Analysts' reports on Malaysian residential market)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Note: Criteria used to measure the usefulness of information sources are Consistency (C), Reliability (R), Adequacy (A) and Timeliness (T).					

## Appendix 2(b): Sources for information on Malaysia (Kuala Lumpur)

Economic indicators	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Malaysia (<a href="http://www.statistics.gov.my">www.statistics.gov.my</a>)</li> <li>– Ministry of Domestic Trade &amp; Consumer Affairs (<a href="http://www.kpdnhq.gov.my">www.kpdnhq.gov.my</a>)</li> <li>– Malaysian Industrial Development Authority (MIDA) (<a href="http://www.mida.gov.my">www.mida.gov.my</a>)</li> <li>– Bank Negara Malaysia (<a href="http://www.bnm.gov.sg">www.bnm.gov.sg</a>)</li> <li>– Asian Development Bank (<a href="http://www.adb.org">www.adb.org</a>)</li> <li>– The World Bank Group (<a href="http://www.worldbank.org">www.worldbank.org</a>)</li> <li>– International Monetary Fund (<a href="http://www.imf.org">www.imf.org</a>)</li> <li>– United Nations Conference on Trade and Development (<a href="http://www.unctad.org">www.unctad.org</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Malaysia (Monthly Statistical Bulletin, Yearbook of Statistics &amp; Business Expectation Survey of Limited Companies)</li> <li>– Bank Negara Malaysia (Monthly Statistical Bulletin, Quarterly Bulletin &amp; BNM Annual Report)</li> <li>– Economist Corporate Network (Regional Strategic Quarterly Forecast &amp; Asia Pacific Executive Brief)</li> <li>– UBS Warburg (Asian Economic Indicators)</li> <li>– Ernst &amp; Young (Non-Performing Loan Report: Asia 2002)</li> </ul> <p><i>Other information providers (Subscription basis)</i></p> <ul style="list-style-type: none"> <li>– Bloomberg LP</li> <li>– Thomson ONE Analytics (contains analyst reports on Malaysia economy)</li> <li>– Factiva (contains information from newspaper, magazines and reports)</li> </ul>
Politics	<p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Economist Corporate Network (Regional Strategic Quarterly Updates, Asia-Pacific Economic Brief &amp; Country Monitor)</li> </ul>
Demographic indicators	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Malaysia (<a href="http://www.statistics.gov.my">www.statistics.gov.my</a>)</li> <li>– Asian Development Banks (<a href="http://www.adb.org">www.adb.org</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Department of Statistics, Malaysia (Yearbook of Statistics, Malaysia &amp; Population &amp; Housing Census 2000)</li> <li>– Asian Demographics (Weekly Demographic Insights)</li> <li>– Economist Corporate Network (Regional Strategic Quarterly Forecast)</li> </ul>
Real estate market information (Kuala Lumpur)	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– CH Williams Talhar &amp; Wong (<a href="http://www.wtw.com.my">www.wtw.com.my</a>)</li> <li>– Cushman &amp; Wakefield (<a href="http://www.cushwakeasia.com">www.cushwakeasia.com</a>)</li> <li>– DTZ Debenham Tie Leung (<a href="http://www.dtzresearch.com">www.dtzresearch.com</a>)</li> <li>– Jones Lang LaSalle Hotels (<a href="http://www.joneslanglasallehotels.com">www.joneslanglasallehotels.com</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– National Property Information Centre (Property Market Report &amp; Property Overhang Quarterly Report)</li> <li>– CH Williams Talhar &amp; Wong (WTW Market Report)</li> <li>– Cushman &amp; Wakefield (Kuala Lumpur Office Snapshot)</li> <li>– DTZ Debenham Tie Leung (Property Times)</li> <li>– Jones Lang LaSalle (Asia Pacific Property Digest &amp; Asia Pacific Property Investment Guide)</li> </ul>

**Appendix 2(b):  
Sources for information on Malaysia (Kuala Lumpur) (cont)**

Real estate market information (Kuala Lumpur) (cont)	<i>Other information providers (Subscription basis)</i> <ul style="list-style-type: none"><li>– Jones Lang LaSalle (Real Estate Intelligence Services)</li><li>– Bloomberg LP</li><li>– Thomson ONE Analytics (contains analysts' reports on property sector) Factiva</li></ul>
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### Appendix 3(a): Shanghai

Variables	Main source of information	Usefulness			
		C	A	R	T
<b>Economic</b>					
GDP	Shanghai Municipal Statistics Bureau (Shanghai Statistical Yearbook)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Inflation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unemployment rate		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
External trade		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retail sales		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Foreign direct investment		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Forecast of economic indicators	Economist Corporate Network (Regional Strategic Quarterly Forecast & Asia-Pacific Executive Brief)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business Confidence Index	Shanghai Municipal Statistics Bureau (Official website)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-performing loan	Ernst & Young (Non-Performing Loan Report: Asia 2002) - Ad hoc			<input type="checkbox"/>	<input type="checkbox"/>
Interest rate	UBS Warburg (Asian Economic Indicators)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exchange rate		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sovereign credit risk indicators eg foreign debt/GDP, reserves/imports and Moody/S&P ratings		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Political</b>					
Political risks	Economist Corporate Network (Regional Strategic Quarterly Updates, Asia-Pacific Executive Brief & Country Monitor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Demographic</b>					
Population size	Shanghai Municipal Statistics Bureau (Shanghai Statistical Yearbook)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demographic characteristics (age distribution, etc)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Income per capita		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Living space per capita		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Household formation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Appendix 3(a): Shanghai (cont)

Variables	Main source of information	Usefulness			
		C	A	R	T
<b>Demographic (cont)</b>					
Household characteristics (size, income distribution, etc)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forecast of demographic indicators	Asian Demographics (Weekly Demographic Insights)	<input type="checkbox"/>		<input type="checkbox"/>	
<b>Real estate market information</b>					
<b>Overall property sector</b>					
Construction statistics	Shanghai Real Estate Trading Centre (Official website)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
New completions		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Registered area for sales		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Registered area sold		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Mortgage amount		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Resettlement statistics		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Buyers' profile (income bracket, floor area requirement, nationality)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Investment grade office &amp; luxury residential</b>					
Historical and forecast of demand, supply, vacancy, rental, capital value, yields and total returns	Jones Lang LaSalle (Real Estate Intelligence Services)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Luxury residential</b>					
Affordability Index	Bank of China (Ad hoc report on Shanghai residential market)		<input type="checkbox"/>	<input type="checkbox"/>	
Note: Criteria used to measure the usefulness of information sources are Consistency (C), Reliability (R), Adequacy (A) and Timeliness (T).					

### Appendix 3(b): Sources for information on Shanghai

Economic indicators	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Shanghai Municipal Statistic Bureau (<a href="http://www.stats-sh.gov.cn">www.stats-sh.gov.cn</a>)</li> <li>– The Peoples' Bank of China (<a href="http://www.pbc.gov.cn">www.pbc.gov.cn</a>)</li> <li>– Soufun (<a href="http://www.soufun.com">www.soufun.com</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Shanghai Municipal Statistic Bureau (Shanghai Statistical Yearbook)</li> <li>– Economist Corporate Network (Regional Strategic Quarterly Forecast &amp; Asia Pacific Executive Brief) - <i>China statistics</i></li> <li>– UBS Warburg (Asian Economic Indicators) - <i>China statistics</i></li> <li>– Ernst &amp; Young (Non-Performing Loan Report: Asia 2002)</li> </ul> <p><i>Other information providers (Subscription basis)</i></p> <ul style="list-style-type: none"> <li>– Thomson ONE Analytics (contains analyst reports on Shanghai economy)</li> <li>– Factiva (contains information from newspaper, magazines and reports)</li> </ul>
Politics	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Shanghai Municipal Government (<a href="http://www.sh.gov.cn">www.sh.gov.cn</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Economist Corporate Network (Regional Strategic Quarterly Updates, Asia-Pacific Economic Brief &amp; Country Monitor) - <i>China information</i></li> </ul>
Demographic indicators	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Shanghai Municipal Statistic Bureau (<a href="http://www.stats-sh.gov.cn">www.stats-sh.gov.cn</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Shanghai Municipal Statistic Bureau (Yearbook of Statistics &amp; Shanghai Fifth Population Census 2000)</li> <li>– Asian Demographics (Weekly Demographic Insights) Economist Corporate Network (Regional Strategic Quarterly Forecast) - <i>China information</i></li> </ul>
Real estate market information	<p><i>Websites</i></p> <ul style="list-style-type: none"> <li>– Shanghai Real Estate Exchange Centre (<a href="http://www.shfdz.gov.cn">www.shfdz.gov.cn</a>)</li> <li>– SouFun (<a href="http://www.soufun.com">www.soufun.com</a>)</li> <li>– CB Richard Ellis (<a href="http://www.cbre.com.cn">www.cbre.com.cn</a>)</li> <li>– Colliers International (<a href="http://www.colliers.com/china">www.colliers.com/china</a>)</li> <li>– Cushman &amp; Wakefield (<a href="http://www.cushwakeasia.com">www.cushwakeasia.com</a>)</li> <li>– DTZ Debenham Tie Leung (<a href="http://www.dtzresearch.com">www.dtzresearch.com</a>)</li> <li>– Jones Lang LaSalle (<a href="http://www.joneslanglasalle.com.cn">www.joneslanglasalle.com.cn</a>)</li> <li>– Jones Lang LaSalle Hotels (<a href="http://www.joneslanglasallehotels.com">www.joneslanglasallehotels.com</a>)</li> </ul> <p><i>Publications</i></p> <ul style="list-style-type: none"> <li>– Shanghai Municipal Housing, Land and Resources Administration Bureau &amp; Shanghai Municipal Statistical Bureau (Shanghai Real Estate Market)</li> <li>– Shanghai Real Estate Exchange Centre (Shanghai Real Estate, Shanghai Land, Shanghai Housing, Shanghai Property Market &amp; Shanghai Quarterly Property Market Analysis)</li> <li>– SouFun (Shanghai Quarterly Property Market Report)</li> <li>– Jones Lang LaSalle (China Property Market Monitor, Greater China Property Index, Asia Pacific Property Digest &amp; Asia Pacific Property Investment Guide)</li> <li>– CB Richard Ellis (PRC Market Index Brief)</li> <li>– DTZ Debenham Tie Leung (Property Times &amp; Property Market Review)</li> </ul>

**Appendix 3(b):  
Sources for information on Shanghai (cont)**

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Real estate market information (cont)	<i>Publications (cont)</i> <ul style="list-style-type: none"><li>– Cushman &amp; Wakefield (Shanghai Office Snapshot)</li><li>– Bank of China (Ad-hoc report on Shanghai residential market)</li></ul> <i>Other information providers (Subscription basis)</i> <ul style="list-style-type: none"><li>– Jones Lang LaSalle (Real Estate Intelligence Services)</li><li>– Thomson ONE Analytics (contains analysts' reports on property sector)</li><li>– Factiva</li></ul>
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## **Appendix 4(a): Definitions of property submarkets**

### **(A) Investment grade offices**

The office stock tallied in this report is defined by two elements: quality of the property and its geographical location.

#### ***Quality of the property***

Investment grade offices are defined according to their structural/physical qualities. The following aspects of a premise are examined for the purpose of classifying investment grade office premises:

- Overall internal and external finishes
- External façade, lobby, and circulation areas
- Layout of floor plate
- Air-conditioning
- Lift services for passengers and goods deliveries
- Building management
- Parking facilities
- Accessibility

The above classification criteria are applied in assessing office buildings in all the markets that are examined in this report. As such, any building included in our calculation of office stock would meet the above criteria and therefore would be of comparable quality from market to market.

#### ***Geographical location***

Investment grade offices are geographically defined by the developed and developing business districts in each city. Generally, the districts can be categorised into Central Business Districts (CBD) and decentralised districts.

### **(B) Central Business District (CBD) offices**

Investment Grade Office space in the main or traditional business centre(s) of a metropolitan area.

#### ***Beijing CBD***

The Beijing CBD includes the following districts:

- Chaoyang: Along East Third Ring Road
- Dongcheng: Along East Changan Street and Jianguomenwai Street
- Xicheng: Fuxingmennei Street and Finance Street

#### ***Shanghai CBD***

Shanghai CBD is sub-categorised into two centres east (Pudong) and west (Puxi) of Huangpu River:

- (1) **Puxi:** The Puxi CBD includes four districts:
  - Huangpu: Along Nanjing Road East and Yanan Road East
  - Jingan: Along Nanjing Road West and Yangan Road Central

- Luwan: Along Huai Hai Road Central
- Hongqiao: Along Yanan Road West

(2) **Pudong:** The Pudong CBD comprises the Lujiazui Finance and Trade Zone.

### ***Hong Kong SAR CBD***

The Hong Kong SAR CBD is sub-categorised into four districts:

- Central: Along Queen's Road Central and Des Voeux Road Central, including the fringe area of Admiralty in the east and Connaught Road Central in the west
- Wanchai/Causeway Bay: Eastward of Central along Hennessy Road and Gloucester Road
- Tsimshatsui: The tip of Kowloon Peninsula south of Austin Road
- Hong Kong SAR East: Bounded to the west by Hing Fat Street, including North Point & Quarry Bay

### ***Manila CBD***

The Manila CBD comprises the Makati CBD: bounded by Sen. Gil Puyat Avenue, EDSA and Amorsolo, encompassing Ayala Triangle, Salcedo and Legaspi Villages.

### ***Bangkok CBD***

The Bangkok CBD includes:

- CBD South: Sophraya / Surawongse / Silom / Sathorn / Charoenkrung / Rama IV Areas
- CBD North: Wireless / Lang Suan / Rajdamri / Phayathai / Rama IV / Sarasin / Ploenchit / Rama I Areas

### ***Kuala Lumpur CBD***

There are two major business districts in the CBD: Golden Triangle (GT) and the CBD in Kuala Lumpur CityCentre:

- GT: Stretches along Jalan Ampang, Jalan Sultan Ismail, Jalan Bukit Bintang and the Kuala Lumpur City Centre (KLCC) site
- CBD: The older commercial area at the heart of the city (known as the Central Planning Area as defined in the Federal Territory Kuala Lumpur Comprehensive Development Plan no 1040 & 1041)
- Decentralised: Fringe of offices at Damansara Centre & Bangsar Pantai

### ***Singapore CBD***

The Singapore CBD is sub-categorised into three districts:

- Core CBD (Raffles Place): Including Raffles Place and China Square, bounded broadly by Boat Quay, South Bridge Road, Cross Street, Cecil Street and Collyer Quay
- Core CBD (Shenton Way): Bounded by Maxwell Road, Cecil Street, Shenton Way, Raffles Quay and Collyer Quay
- Marina Bay: Bounded by Nicoll Highway, Raffles Avenue and Republic Boulevard

### ***Jakarta CBD***

The Jakarta CBD is comprised of the **Golden Triangle**, which stretches along the triangular area formed by Jalan H R Rasuna Said, Jalan Jenderal Sudirman (up to the southern tip of Jalan M H Thamrin) and Jalan Jenderal Gatot Subroto.

### **(C) Luxury residential properties**

Luxury residential properties refer to high-end luxury residential premises such as apartments, condominiums, detached or semi-detached housing that are located in traditional prime areas.

#### ***Geographical location***

Beijing:	Dongcheng, Chaoyang and Shunyi
Shanghai:	Puxi (Changning, Xuhui, Jingan, Luwan, Huangpu, Zabei and Hongkou)
Hong Kong SAR:	Hong Kong SAR Island (Peak/Mid-levels/Island South)
Manila:	Makati CBD
Bangkok:	<i>CBD:</i> Sophraya / Surawongse / Silom / Sathorn / Charoenkrung / Rama IV Areas / Wireless / Lang Suan / Rajdamri / Phyathai / Rama IV / Sarasin / Ploenchit / Rama I Areas. <i>Sukhumvit:</i> Sukhumvit Soi 1 to Soi 63 / Rama IV / Petchburi Areas
Kuala Lumpur:	Ampang Hilir, Taman Tun Dr. Ismail, Damansara, Bangsar, and Bukit Tunku.
Singapore:	Districts 9, 10, and 11
Jakarta:	CBD

### **(D) Residential property type**

Condominiums:	Refers to strata-titled residential units available for sale or for sale and lease.
Apartments:	Refers to residential units for lease only, which are typically apartment buildings under single ownership.  The apartment market is relatively well defined and developed in Bangkok and Jakarta. As such, they are presented separately from the condominium market.
Detached houses:	Refers to landed properties either standalone (single family homes) or semi-detached (townhouses).

In Beijing, since a relatively well-defined market for detached housing properties (Villas) has emerged with both rental and sales activities, the Villa market in Beijing is presented as a separate market from the condominium market.

### **(E) Prime retail centres**

Prime retail centres refer to retail shopping centres/complexes built either exclusively for retail purpose or as part of a mixed-use project.

#### ***Quality of the property***

Prime retail centres are defined according to their structural/physical qualities. The following aspects are examined for the purpose of classifying prime retail centres:

- Overall internal and external finishes
- External façade and internal arcade area
- Availability of dining and entertainment facilities
- Service area for merchandise and goods deliveries
- Management of the centre
- Parking facilities
- Accessibility

### **Geographical location**

Prime retail centres are generally dispersed around the metropolitan area of a city. Prime retail centres are considered to be major shopping complexes built to international standards. Geographically we define prime retail centres by:

- Beijing: City-wide, predominantly on (but not limited to) the East Third Ring Road, East Second Ring Road, Jianguomenwai Street, Wangfujing Street and in the Finance Street area to the west of the city.
- Shanghai: City-wide, predominately on (but not limited to) Nanjing Road, Huaihai Road, Xijiahui, Hongqiao and Lujiazui
- Hong Kong SAR: *Prime retail malls:* Centres located in Central, Causeway Bay & Tsimshatsui.  
*Decentralised malls:* Centres located along the KCRC/MTRC lines.  
*High street shops:* Street front units along the main shopping thoroughfare in Causeway Bay & Tsimshatsui.
- Manila: The entire Metro Manila Area with centres generally focused in Makati CBD, Ortigas Center, Manila Bay area and Alabang.
- Bangkok: City-wide, including city centre schemes in Silom Road, Ploenchit Road and Sukhumvit Road as well as suburban area schemes.
- Kuala Lumpur: *City-centre:* Includes schemes in and close to the Bukit Bintang Precinct, in the Central Business District and Golden Triangle.  
*Suburban:* Schemes located in Bangsar, Damansara, Petaling Jaya, and elsewhere in the Klang Valley including Shah Alam.
- Singapore: *City-centre:* Quality schemes along Orchard Road corridor.  
*Suburban:* New generation shopping malls, typically located at or close to MRT stations, or elsewhere held in single ownership.  
*Marina centre:* Malls include those in the Marina Bay vicinity, as well as those in Bugis Junction and Raffles City.
- Jakarta: *City-wide:* Including schemes in the Golden Triangle CBD, and in suburban areas.



## **Appendix 4(b): Stock absorption index**

The SA Index is defined as a measure of the intensity of the absorption or take up of all of the available property stock in a market at any point in time. The total available stock is defined as the sum of vacant stocks (in the previous period) with the new stocks (in the current period).

The SA Index measures net absorption on a scale of 0-100, using the formula below:

$$\text{The SA Index} = \frac{A_t}{V_{t-1} + N_t} \times 100$$

$A_t$  = Net absorption in current period  $t$

$V_{t-1}$  = Vacant Stock in period  $t - 1$  (ie, previous period)

$N_t$  = New Stock that were completed in period  $t$

As the SA Index is a relative measure, it can be interpreted as an interval scale. Hence, not only can we use the SA Index to rank the strength of absorption across different markets, it also measures the difference in the strength of absorption between those markets.

The SA Index does not measure negative absorption because by its definition, it measures positive net absorption. Therefore, whenever absorption turns negative, the SA Index is arbitrarily set at zero. To compare cities with zero SA Index values, we suggest that vacancy rates be used in conjunction with the SA Index.

The SA Index is intended to provide an alternative way of examining the demand in the market by analysing the net absorption of space. We recognise that neither SA Index nor the Net Absorption indicators are complete by themselves when used to assess the scale of demand in any particular market. Taken together, we believe that they give a deeper understanding of the markets when comparing across different cities in the region.

# Housing valuations: no bubble apparent

Kathleen Stephansen and Maxine Koster

This analysis focuses on cross-country comparisons of housing valuations. Our main findings are:

- Housing markets have been generally strong, and in the case of the United States, a major countercyclical force. Asia shows a weaker profile.
- There does not appear to be a major misalignment in house values in the United States and the euro area. Recent central bank action in both the United Kingdom and Australia suggests rising valuation concerns. While in the United Kingdom, the economy's structural changes over the last five years should attenuate somewhat this concern (hence a gradual interest rate response), in Australia the housing cycle is seen as the central driver of the domestic economic cycle and thereby monetary policy.
- In the United States and the United Kingdom, if a housing bubble develops, we think it is more likely to be in turnover than in prices.

## Housing investment

Housing investment ratios have evolved during the past four decades (see Chart 1). In the United States, low interest rates helped housing investment run countercyclically to the 2001 recession, and in the recovery have been contributing more to gross domestic product (GDP) growth than its historical average. In the United Kingdom, housing investment remains well below its late-1980s peak despite the sharp rise in activity over recent years. The euro area displays relatively high housing investment ratios, although the ratio is lower when Germany is excluded. Germany has seen an ongoing correction from its excessively high rate of housing investment, initially fuelled by the tax incentives in the early 1990s, with the ongoing contraction having resulted in a small negative impact on total euro area GDP growth in the past two years. Excluding Germany, the euro area has received no net contribution to GDP growth from the housing sector.

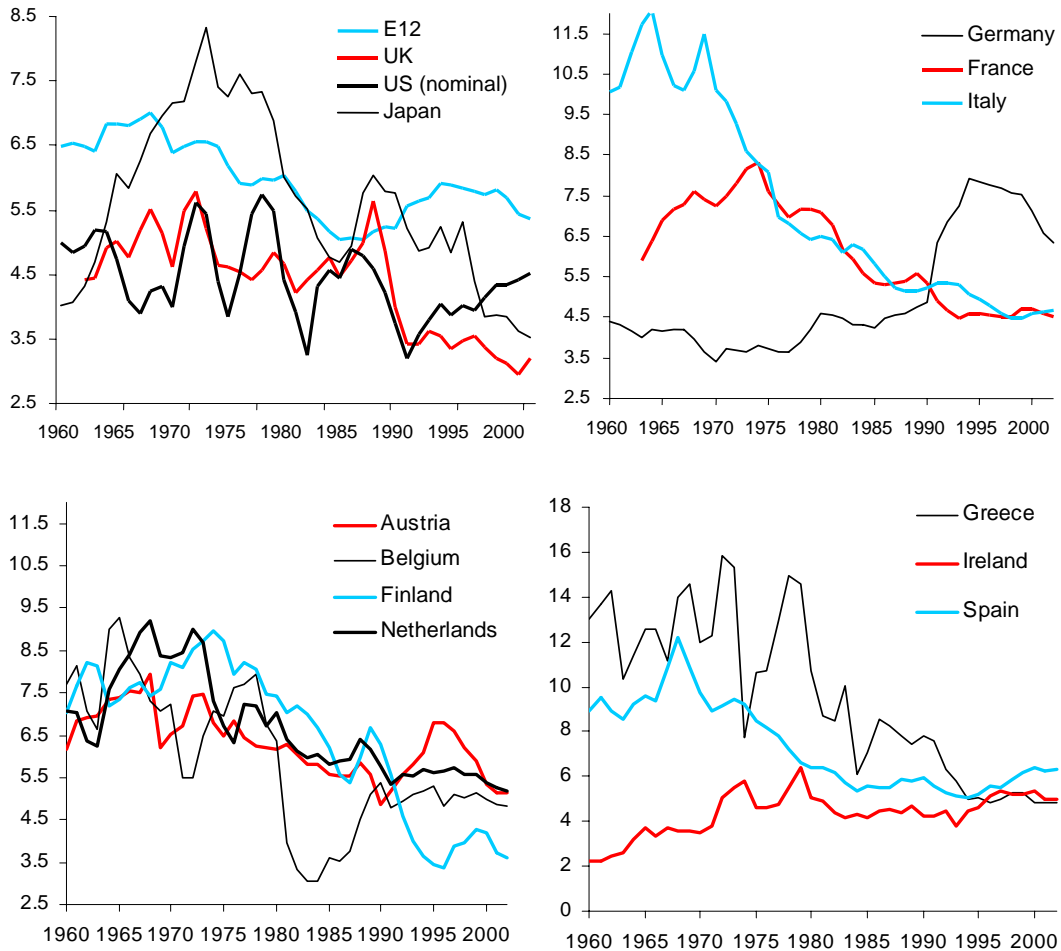
In Japan, housing investment is still adjusting from the boom in the late 1980s. Similarly, in Asia ex-China and Japan, housing investment is by and large below its share-to-GDP reached prior to the 1998 Asian crisis, with the exception of Hong Kong SAR, where the peak occurred in 1999 (see Chart 2). In Australia, dwelling investment has been a positive contributor to the domestic cycle.

## House prices/values

Aggregate house prices have risen strongly in the United States, the United Kingdom (see Chart 3) and Australia (see Chart 4) for several years now, while they are still declining in Japan and Germany, reflecting the ongoing housing investment adjustment in these two countries. The stronger housing market performances have led some observers to express the concern that housing may be in a "bubble". The concept of an asset bubble has a meaning only if there is some disparity between the price of capital and some measure of its underlying value. An international comparison of whether house prices are "appropriately" valued shows cross-country disparities, with the underlying difficulty being the availability and comparability of data. For example, property prices in Asia pertain to a narrow segment of the housing market and thus tend to be vulnerable to wide swings (see Charts 5 and 6). Corrections from 20%-plus value growth rates have occurred in the aftermath of the Asian crisis, with the exception of Indonesia, where the correction occurred more recently. Most Asian markets remain sluggish. In Australia, strong incentives during 2000-02 have contributed to a sharp rise in demand.

Chart 1

**Real housing investment as a percent of real GDP**



Sources: CSFB; OECD; national statistics.

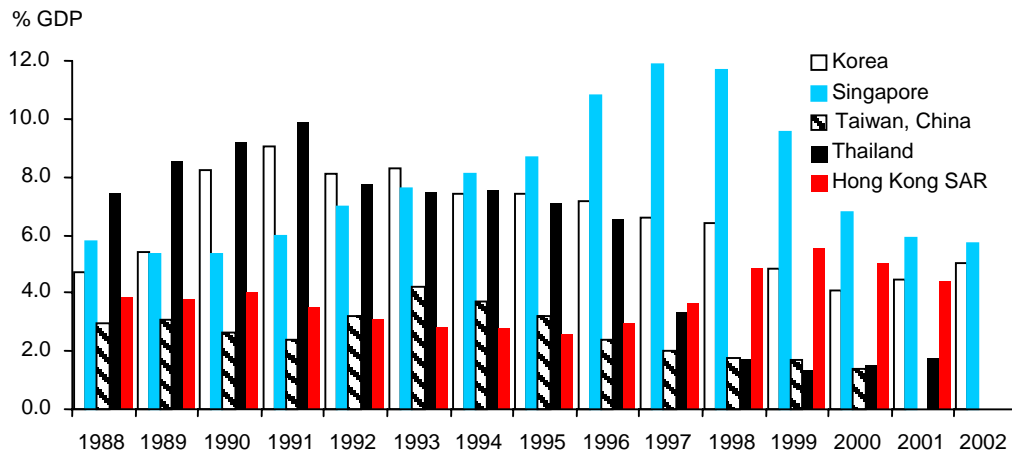
**P/E ratios**

CSFB's US economics team has used the concept of price-earnings ratio (P/E) for America's residential housing stock that is calculated by combining the flow-of-funds data on residential real estate values with the national income accounts data on the consumption of housing services. The latter is measured as actual rents paid by renters and imputed rents of homeowners. These rental payments can be thought of as the earnings of the housing stock.

The main findings of our analysis are:

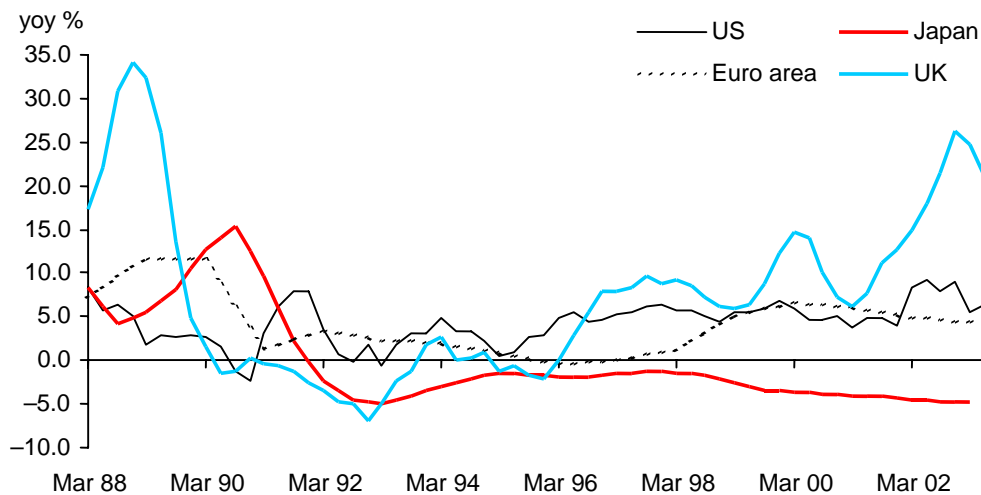
1. The moon-shot that began in 1995 shows no signs of being over just yet. Foreign capital inflows, falling interest rates, and mortgage market financial innovations have raised the residential sector's P/E ratio from 13.5 in 1995 to a new record of 16.1 as of second quarter 2003 (see Chart 7).

Chart 2  
**Asian residential construction**  
 % GDP



Sources: CEIC; CSFB.

Chart 3  
**House price growth in the G3+**



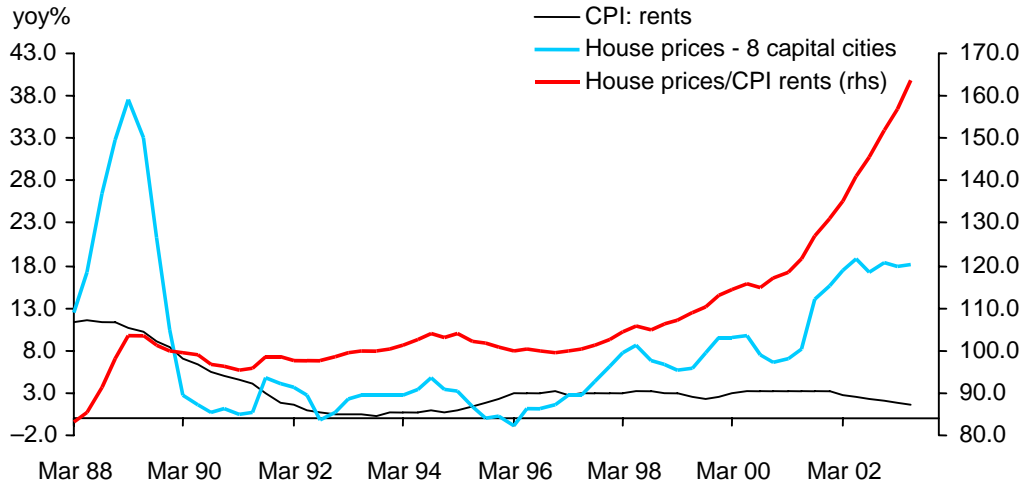
Sources: Central banks; CSFB estimates; Datastream International Limited; BIS.

2. E (ie, Earnings P/E) has a very strong tendency to grow. As long as the population is growing and the economy avoids a catastrophic depression, the amount we spend on housing (outright and by imputation) continues to go up. The speed of that rise seems to be related to inflation, but the record of the last 43 years shows not a single quarterly decline in the housing E.
3. P (ie, Price in P/E) has been, remarkably, almost equally reliable. In only three calendar quarters out of the last 43 years of data did the aggregate market capitalisation of the housing stock go down. The most severe decline in dollar terms was \$35 billion in the first quarter of 1993. This represents a mere 0.4% of the starting value. Even that dip was more than made up by a very substantial \$115 billion increase the following quarter, suggesting the possibility that the decline itself involved measurement error.

4. The evidence suggests that when P/Es in housing on an economy-wide basis get “too high” and “need to come down” the adjustment occurs by rising E’s growing into a level of P that itself is still going up, albeit at a slower pace. The adjustment is much more visible in the volume of housing turnover than in house transaction prices.
5. Local markets have shown much greater cyclical fluctuation in price than the national figures reported here.

Chart 4

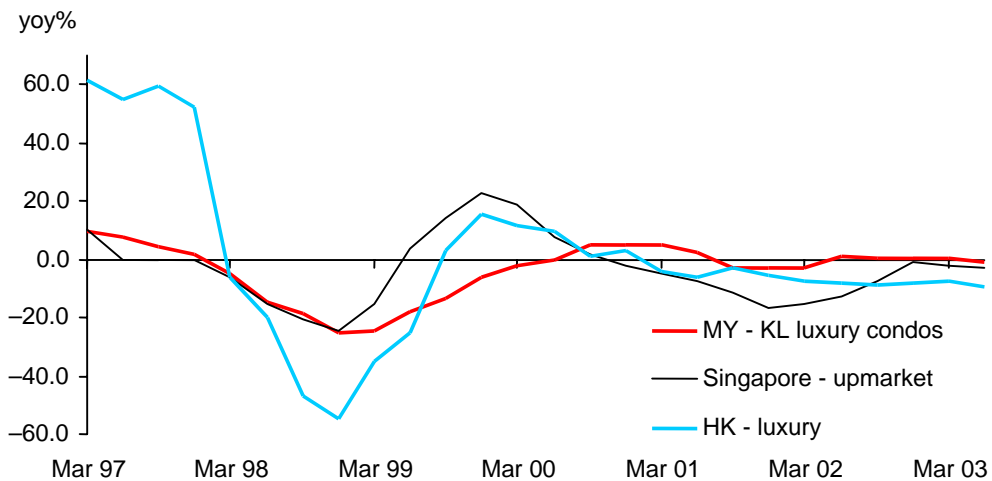
**Australia: house price environment**



Sources: ABS; CSFB; Datastream International Limited.

Chart 5

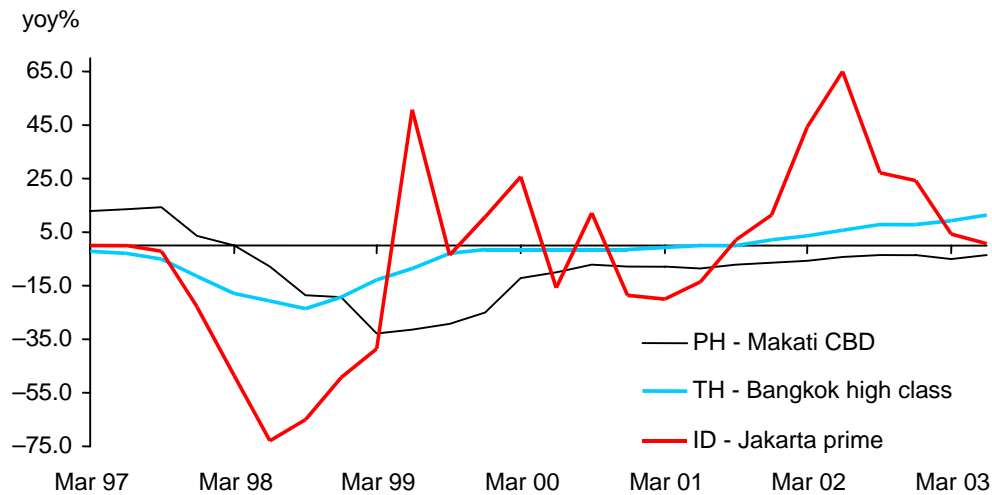
**Asia: residential property prices -  
Malaysia, Singapore and Hong Kong SAR**



Sources: CEIC; CSFB; Datastream International Limited.

Chart 6

**Asia: residential property prices -  
Philippines, Thailand and Indonesia**

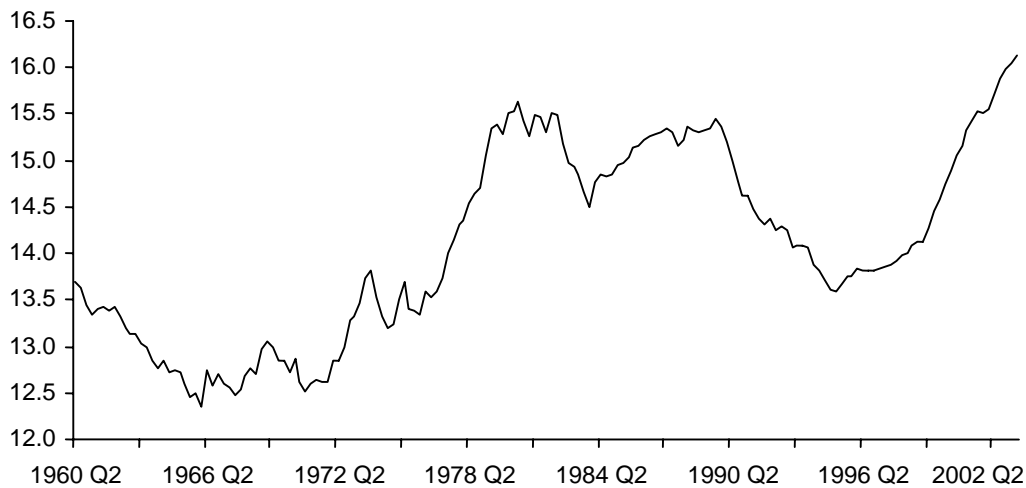


Sources: CEIC; CSFB; Datastream International Limited.

Chart 7

**A US P/E ratio for housing**

Market value of residential real estate divided by  
personal consumption of housing services

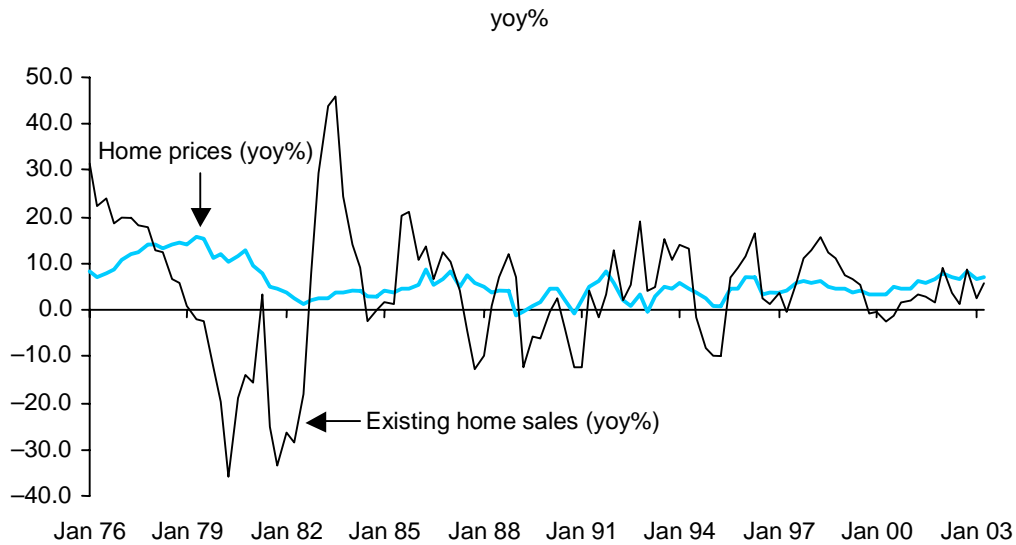


Sources: Bureau of Economic Analysis; CSFB; Federal Reserve.

6. The US housing market is distinctive in the sense that volume tends to be much more sensitive than price to changing economic conditions. There are plenty of episodes during postwar business cycle experience when housing turnover fell outright, sometimes dramatically. When interest rates rise or incomes fall, housing turnover tends to get hit hardest. Price adjustments are much less noticeable, particularly at the national level (see Chart 8).

Chart 8

**US housing turnover and home prices**



Sources: Credit Suisse First Boston; OFHEO; National Association of Realtors.

Calculating the volatility of transaction volume and transaction prices reveals that turnover is almost 25 times as volatile as price. Regression analysis suggests that housing turnover is at least twice as sensitive as housing prices to fluctuations in interest rates and cyclical variables like unemployment.

If there is a housing bubble, then, it is more likely to be in turnover than prices, at least in the United States. This suggests that any eventual housing downturn would not be associated with a mortgage credit loss catastrophe on a national scale. Losses from interest rate risk are a much bigger issue at the aggregate national housing market level.

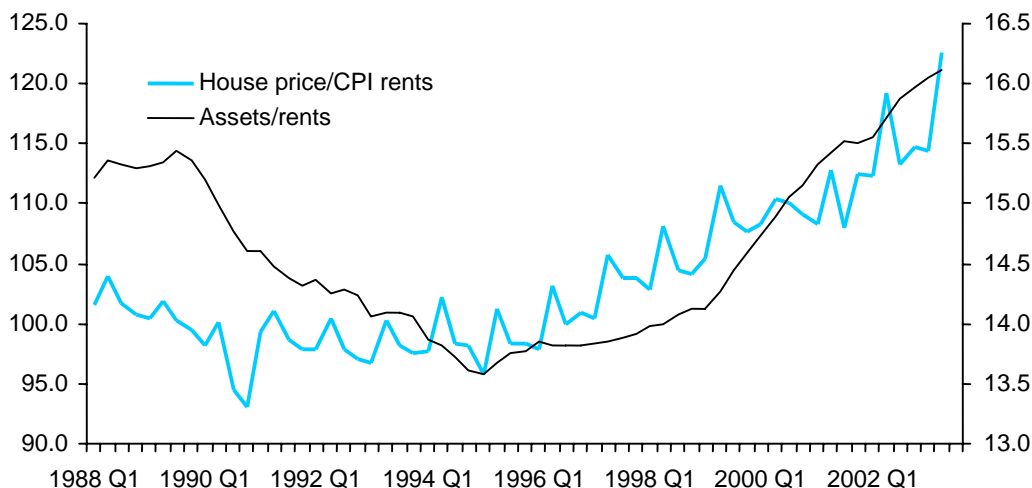
For international comparisons, data on consumption of housing services are not readily available. Tracking the long-term affordability of homes and assessing whether house prices are appropriately valued may be achieved with additional measures, one being the ratio of house prices to rents and one being the ratio of house price levels to national per capita disposable income. A P/E ratio can be calculated on the basis of house prices as a proxy for the asset values and the rent component of the consumer price index (CPI) as the proxy for earnings on the housing stock. For the United States, a similar profile to the P/E ratio derived from asset values and consumption data emerges (see Chart 9), even though the CPI data for rents (rent of primary residence), which represents a very small portion of the CPI (6% weight), have not been consistent over time, given changes in the samples used. (In 1997, the BLS started to develop a new housing sample to replace the one that had been in use since 1987, and began using it with the index for January 1999.)

Internationally, the ratio of house prices to rents has risen over time, with the exception of Japan where the ratio is declining. In the euro area, the rental market is heavily regulated and, as a result, may skew the P/E ratio based on rents as a proxy for earnings. Chart 10 does not show any major distortion in the euro area ratio, but that is because in two of the largest economies house prices are either below the rental price series (Germany) or in line (Italy). For the remainder, house prices have moved well ahead of rental prices.

The rise registered in the UK P/E ratio has been spectacular, attesting to the Bank of England's concern about overvaluation, particularly taken in conjunction with their concern that there is not a significant amount of spare capacity in the UK economy as the global economy starts to accelerate. However, structural changes in the UK economy would argue against the notion of a speculative bubble. Over the last five years, the UK economy has moved from a high inflation/high short-term interest rates economy to a low inflation/low short-term interest rate economy. The Bank of England has suggested that demand for housing has risen thanks to sustained low inflation and rising housing affordability. In a high inflation/high interest rates environment the burden of mortgage payments as a share of income tends to be tilted toward the early years of the mortgage. Admittedly this burden falls

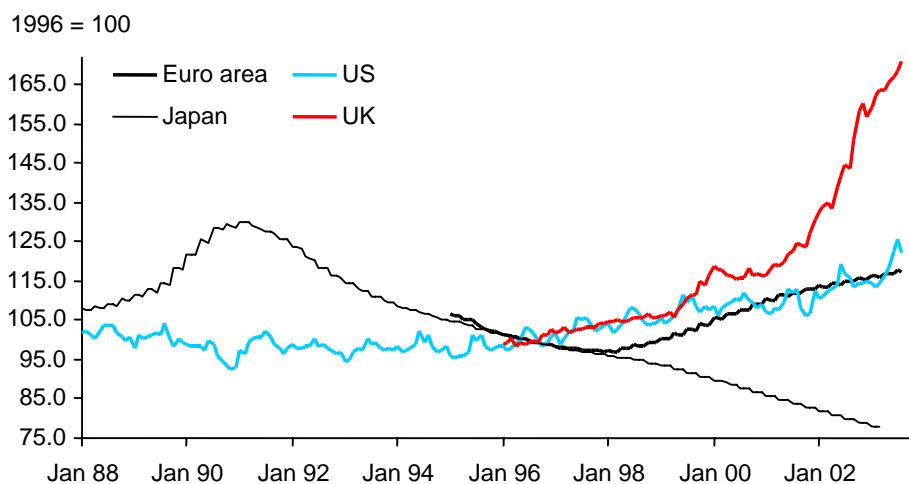
over time as inflation erodes the real value of the debt, but could bring cash flow problems for some households during the early years of the mortgage, thereby inhibiting households taking out large mortgages. A low inflation/low interest rate environment reduces this initial burden and set the stage for increased demand for mortgages. This being said, the Bank does acknowledge that not all is positive with low inflation. For example, tax advantages of owning a house relative to other assets are reduced under low inflation, as the primary residence of households is not subject to capital gains tax, a form of taxation that is more attractive when inflation is high.

Chart 9  
US comparison of P/E measures



Sources: BEA; CSFB; Federal Reserve.

Chart 10  
Ratio of house prices to rents



Sources: Central banks; CSFB estimates; Datastream International Limited; BIS.

Other factors, such as increased participation rates and higher employment, also have raised the demand for housing, while supply clearly has lagged. Barring an interest rate or labour market shock, there is little scope for forced selling and falling prices. The P/E ratio, therefore, will likely adjust down by E growing into the level of P that would be growing at a slower rate. And, similar to the dynamics

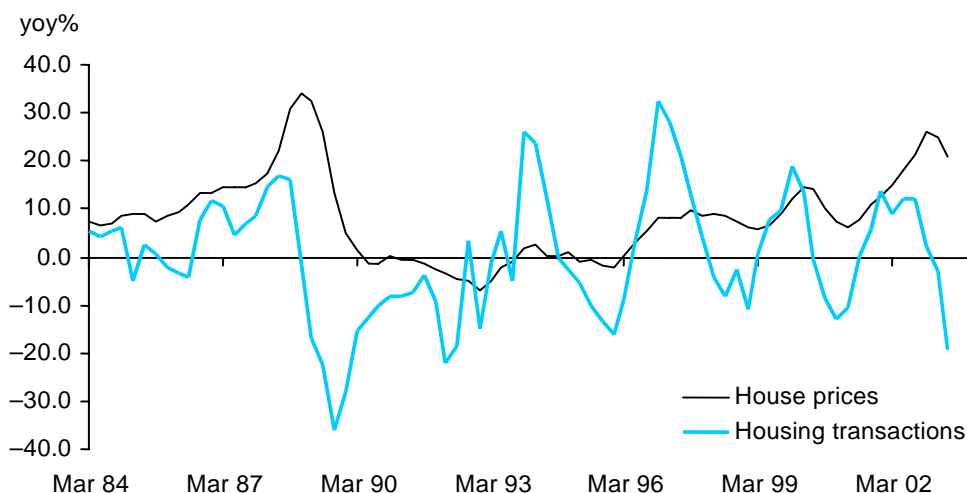


governing the US housing market, the burden of the adjustment lies in turnover rather than in prices. UK housing market turnover has already slumped this year (see Chart 11), suggesting that affordability has become stretched and new buyers are no longer willing or able to come in at these levels.

In Asia, the ratio of house prices to CPI rentals confirms what is depicted in the property values, namely that the housing sector is still adjusting to the Asian crisis shock (see Charts 12 and 13).

Chart 11

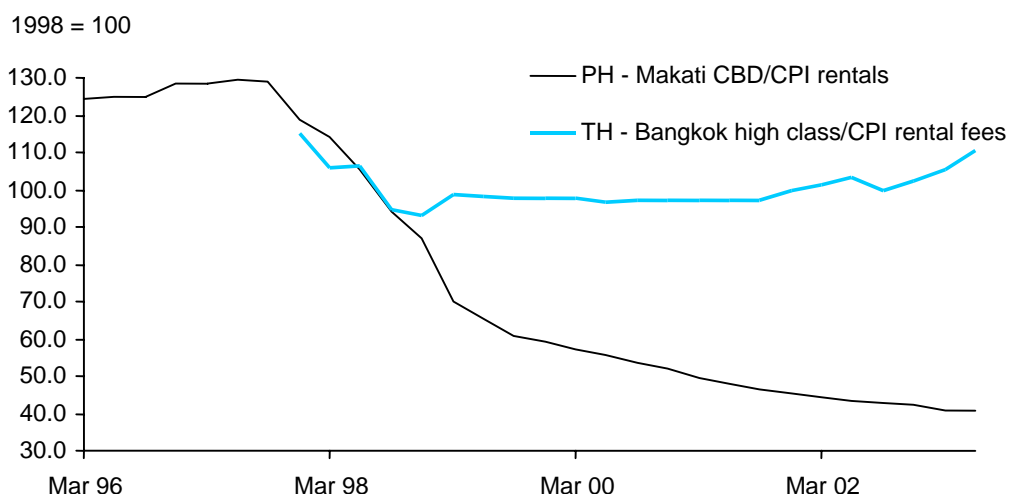
**United Kingdom: housing prices and housing...activities**



Sources: CSFB; Datastream International Limited.

Chart 12

**Asia: house prices to CPI rentals - Indonesia and Thailand**

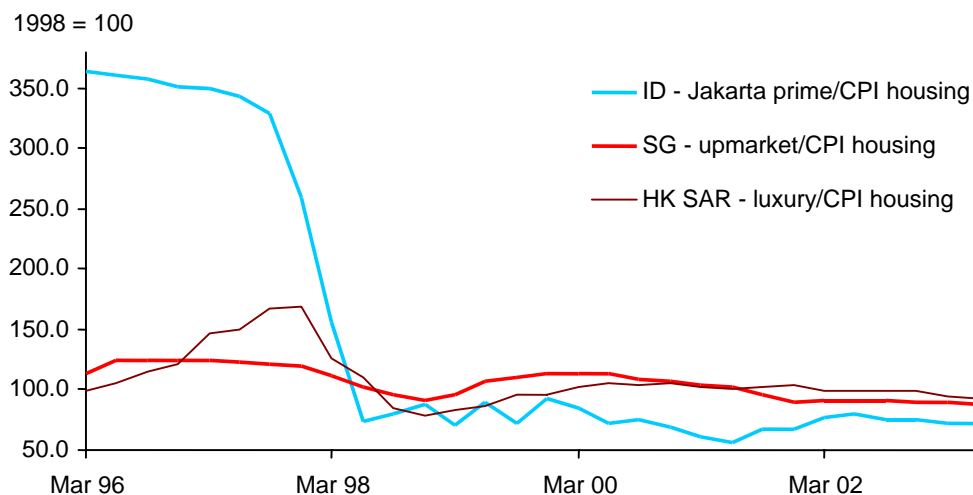


Sources: CEIC; CSFB; Datastream International Limited.

The second P/E measure, namely the ratio of prices to per capita personal disposable income, shows a rising ratio for the euro area but still slightly below its long-term average (see Chart 14). Again, this masks national disparities and arises from the historic downtrend in the German ratio. The Dutch, Irish

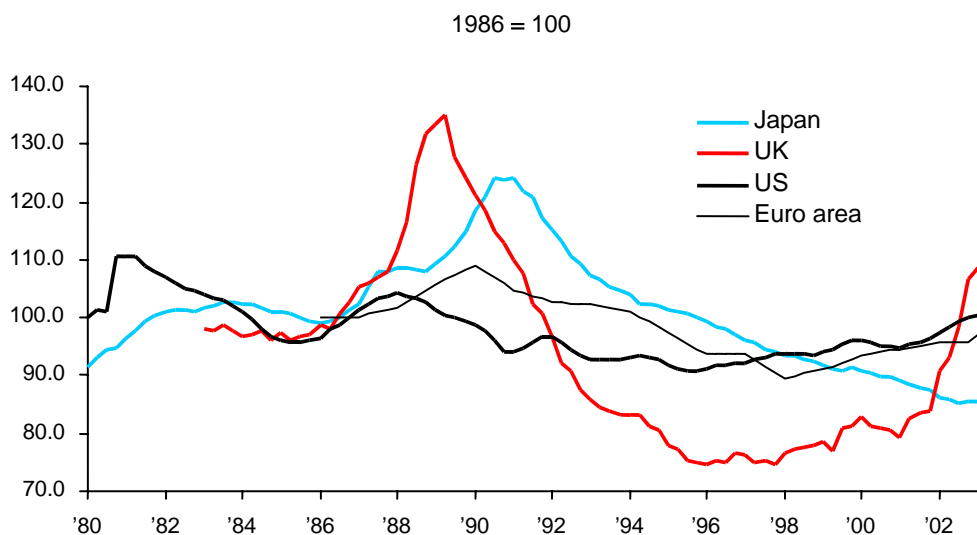
and Spanish housing markets appear highly valued in relation to personal disposable income, while, in addition to the German market, the Greek market appears inexpensively valued. Belgium, Finland, France and Italy appear moderately valued.

Chart 13  
**Asia: house prices to CPI housing -  
 Indonesia, Singapore and Hong Kong SAR**



Sources: CEIC; CSFB; Datastream International Limited.

Chart 14  
**Ratio of house prices to per  
 capita disposable income**



Sources: Central banks; CSFB estimates; BIS.

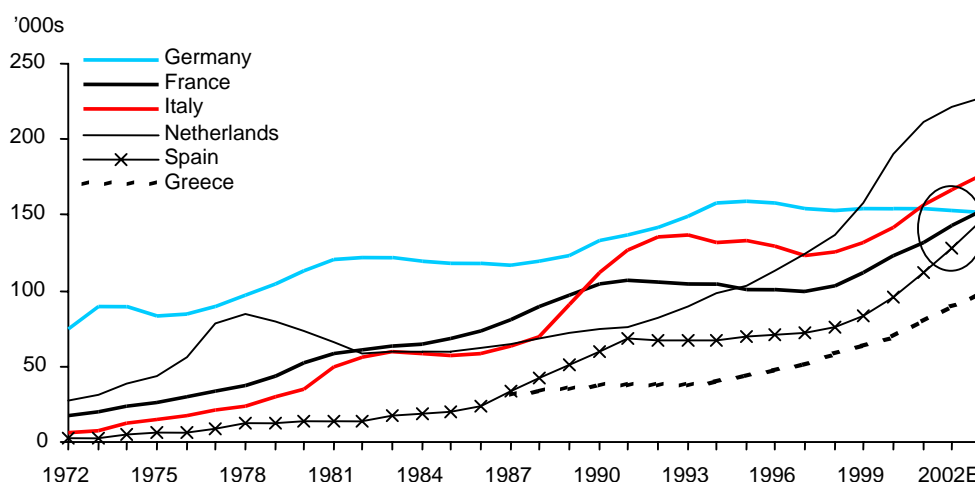
There has been a convergence in housing prices across the euro area (see Chart 15). This is mainly attributable to the convergence in per capita disposable income but is also the result of the convergence in real interest rates, following the monetary union. In dynamics similar to what we described for the United States and the United Kingdom, the fast rising markets are set to correct, with growth in housing prices slowing (for example, they have already stalled in the Netherlands), while the

markets that appear inexpensively valued (eg, Greece) could still post a rise toward the average as economic convergence proceeds. Germany is a special case, as the ratio of average German house prices to incomes has steadily declined during the past thirty years, which has enabled house price convergence to occur at the euro area level.

The ratio appears relatively stable historically in the United States and still adjusting downward in Japan. For the United States, this long-term stability contrasts with the recent rise in the P/E ratios discussed above, but generally supports the conclusion that there is no fundamental valuation problem on an economy-wide scale.

Chart 15

**Convergence of euro area house prices**

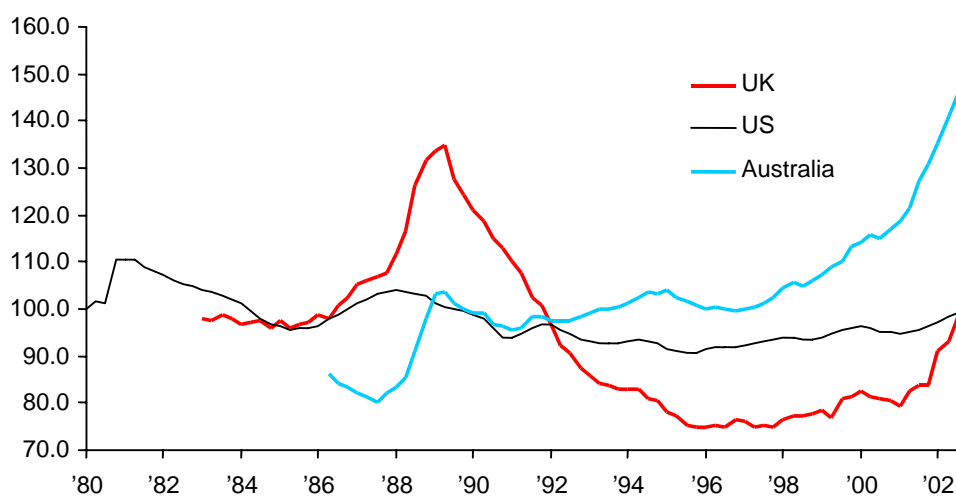


Sources: Central banks; CSFB estimates; BIS.

Chart 16

**Ratio of house prices to per capita disposable income**

1986 = 100



Sources: CSFB; Datastream International Limited; BIS.

The ratio of house prices to per capita disposable income has posted sharp rises in both Australia and the United Kingdom (see Chart 16). But while affordability had improved in the United Kingdom in the mid-to-late-1990s and is still below the late-1980s peak, in Australia the ratio has risen to a multi-year high and affordability appears very stretched (see Chart 16). This points to a downturn in residential construction, possibly by mid-next year.

## **Conclusion**

In conclusion, housing markets have been strong across major regions. In the United States and the euro area there does not appear to be a major misalignment in house values. Housing values in the United Kingdom suggest some misalignment, were it not for the economy's structural changes over the last five years. More severe signs of value misalignment have emerged in Australia and are a key driver to the shift in the monetary cycle, while Asia is still adjusting from the high pre-1998 valuations. Finally, in the United States and the United Kingdom, if there is a housing bubble, we think it is more likely to be in turnover than prices. Historically, major housing market corrections have been preceded by a sharp rise in interest rates and/or labour market shock, neither of which currently appears to be a strong possibility.

## Appendix

### **Euro area**

House prices are sourced as CSFB based on national data and the BIS house price database. The historical data uses the BIS database and it has been updated and extended with national data.

Disposable income per capita (ie, income and population data) is nominal and sourced from the OECD.

### **United Kingdom**

House prices are a simple average of the Halifax and Nationwide indices (UK banks).

Nominal gross disposable income from the household accounts is used.

### **Japan**

Nationwide residential area land prices are sourced from the Japanese real estate institute.

The ratio to rents uses the rent index from the CPI. The ratio is then indexed so that 1996 = 100.

Worker's household disposable income is sourced from the Statistics Bureau of the PM's Office.

### **United States**

The house price series is a three-month moving average of the weighted average (by number of houses sold) of average prices for existing and new one-family homes sold. The houses sold series comes from the Department of Commerce Bureau of Census and the house price series is sourced from the National Association of Realtors.

Nominal disposable personal income is sourced from the Bureau of Economic Analysis.

# Real estate indicators in Hong Kong SAR

Kelvin Fan and Wensheng Peng<sup>1</sup>

## Abstract

This paper provides an overview of available real estate indicators in Hong Kong SAR that may be used for monitoring the vulnerabilities of the banking sector and the economy to fluctuations in property prices. These include mainly two types of statistics: property prices and banks' exposure to property-related lending. The paper also reviews the nexus between property prices, the macroeconomy and the banking sector in Hong Kong SAR, drawing on studies carried out at the research department of the Hong Kong Monetary Authority in recent years.

This paper was prepared for the BIS/IMF Conference on Real Estate Indicators and Financial Stability, 27-28 October 2003. The views expressed are solely the authors' and not necessarily those of the HKMA.

## I. Introduction

International experience suggests that movements in real estate prices have important implications for macroeconomic and financial stability. In Hong Kong SAR,<sup>2</sup> the relationship between the property market and the wider economy is of particular significance for a number of reasons. First, the property market plays an important role in the Hong Kong economy. Housing is the most important form of savings for many households. In the banking sector, about half of domestic credit currently comprises mortgage loans for the purchase of private residential properties and loans for building and construction and property development. Changes in property prices and rents influence consumer price inflation, and affect Hong Kong's competitiveness as a service-based economy. Land sales and stamp duties on property transactions have also been a significant source of government revenue.

Secondly, property prices tend to be more volatile in Hong Kong than elsewhere, with a number of large swings in the past two decades. In particular, prices of various types of premises have dropped by around 60% since the collapse of the bubble triggered by the Asian financial crisis. This has resulted in significantly negative wealth and balance-sheet effects on private consumption and investment. Weak domestic demand explains why overall economic growth has been sluggish despite the strong performance of exports of goods and service in recent years. The falls in property prices have also contributed to consumer price deflation via a direct channel through declines in rentals and an indirect channel through weak demand.

Thirdly, under the Currency Board arrangements, interest rates in Hong Kong are largely determined by those in the United States and the risk premium that is required by investors for holding Hong Kong dollar (HKD) assets. Thus, monetary policy cannot be used to guard against movements in asset prices and, more generally, for macroeconomic stabilisation purposes. Regulatory policies are therefore of particular importance in maintaining financial stability. Indeed, while the difficult macroeconomic environment, including the collapse of property prices, has affected banks' profitability, the banking sector remains generally healthy. As is explained below, prudential measures by the regulatory authorities and risk controls by banks have helped limit the exposure of the banking sector to the property market, and hence its vulnerability to fluctuations in property prices.

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<sup>2</sup> Henceforth, referred to as Hong Kong.

This paper provides an overview of the various real estate indicators in Hong Kong that may be used in monitoring the vulnerabilities of the macroeconomy and in particular the banking sector to property price changes. Section II discusses two main types of real estate indicators: property prices and measures of the exposure of banks to the property sector. Section III reviews the nexus between property prices, the macroeconomy and the banking sector in Hong Kong, drawing mainly on analyses conducted by the Research Department of the HKMA in recent years. These studies help shed light on the usefulness of the various indicators for monitoring the impact of property price changes. The final section offers some concluding remarks.

## II. Real estate indicators

Statistics about property prices and banks' exposures to property lending are useful indicators for monitoring the health of the banking sector. The *Encouraged Set of Financial Soundness Indicators* proposed by the IMF includes real estate prices, and the ratios of residential real estate loans and commercial real estate loans to total loans (IMF, 2003). These indicators can serve as early warning signals of emerging asset quality problems, as the impact of property price shocks generally occurs with a lag and the size of the impact depends on banks' exposure to the real estate market. This section reviews the available indicators in Hong Kong.

### a. Property price indicators

Property market statistics in Hong Kong are mainly compiled by the Rating and Valuation Department (R&VD). The R&VD publishes a comprehensive set of price, rental, and transaction statistics for various types of private residential and non-residential premises in its *Property Market Statistics* on a monthly basis. There are two main types of price statistics: average prices and price indices. The compilation methods of these two types of statistics and their respective merits as an aggregate indicator of property price movements are discussed below.

#### **Average prices**

Average prices for various types of private properties (for residential, retail, office and factory uses) are expressed in terms of price per square metre of floor area. They are computed based on the actual transaction prices reviewed by the R&VD for stamp duty purposes. Transactions that involve a mix of property types and properties that have not yet been assessed for rateable values are excluded from the calculation. Residential properties sold subject to existing tenancies<sup>3</sup>, primary sales of residential properties,<sup>4</sup> residential properties sold under government-subsidised schemes,<sup>5</sup> and transactions involving government-owned quarters are also excluded.

Average prices are the most straightforward and simplest indicators of the central tendency of property prices of the entire population. However, this method suffers from sampling problems in that the sample of properties differs over time. In particular, average prices in a given month depend in part on the special characteristics, such as quality and location, of the premises sold during the period, which may not be representative of the overall stock. Therefore, changes in average prices between two periods may be due to change in these characteristics and may not represent the price change in the underlying population.

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<sup>3</sup> This refers to a transaction that involves a transfer of ownership of the property together with an existing rental contract of the property at the same time from the seller to the buyer. As such, the transaction price may be affected by the terms of the rental contract and may differ from that of other normal transactions.

<sup>4</sup> Real estate developers usually provide a variety of payment terms for buyers to choose. The selling prices of these primary transactions may be affected by the differences in payment terms.

<sup>5</sup> Include Private Sector Participation, Home Ownership, Buy or Rent Option, Mortgage Subsidy, Sandwich Class Housing, Urban Improvement, Flat-for-Sale and the Tenants Purchase Schemes.

## Price indices

The price indices are designed to measure changes in prices with quality kept constant. They are derived based on the same set of transaction data for computing the average prices, but using a more sophisticated statistical procedure. The compilation of the indices involves the following steps. First, component indices for different classes of residential properties or different grades of non-residential estates are derived.<sup>6</sup> The indices measure price changes by reference to the factor of sales price divided by the rateable value of a subject property rather than by reference to price per square metre as in the calculation of average prices. The rateable value of a property is an annual rental value assessed by the R&VD as the basis for charging rates.<sup>7</sup> In assessing the rateable value of a property, reference is made to open market rents for similar properties in the locality, with adjustments to reflect differences in size, location, facilities, standards of finish, and management. Therefore, by utilising the rateable values in compiling the price indices, allowance is made not only for floor area but also other qualitative differences between properties. A technical note on how the rateable value can be used to adjust the transaction prices for quality differences is provided in the Appendix.

Secondly, a composite index ( $I$ ) for a certain type of premises such as residential properties is calculated as a weighted average of the component indices, so that:

$$I = \sum I_i w_i$$

where  $I_i$  and  $W_i$  are the component index and weight for property class or grade  $i$  respectively. The weights for residential premises are based on the proportions of the numbers of transactions of the components in the current and previous 11 months, while those for non-residential premises are based on the proportions of the total floor area of the components in respect of the current and previous 11 months.<sup>8</sup> The use of 12-month rolling transaction data for determining the weights helps smooth out the volatility due to short-term fluctuations.

It should be noted that like average price statistics, the residential price indices do not include transactions of primary sales. However, transaction prices in the secondary market should be able to reflect the market trend owing to a relatively high liquidity in this segment. In recent years, the secondary market accounted for about two-thirds of the total transactions of residential premises (Chart 1). Nevertheless, the indices may be affected by outliers when the number of transactions in a particular class/grade of properties is small. In particular, the number of transactions of a certain grade of non-residential properties for a certain period may not be sufficient to represent the market prices in the whole grade. Finally, to what extent the price indices represent the underlying trends of the entire population depends importantly on whether the rateable values are able to capture all quality differences between properties.

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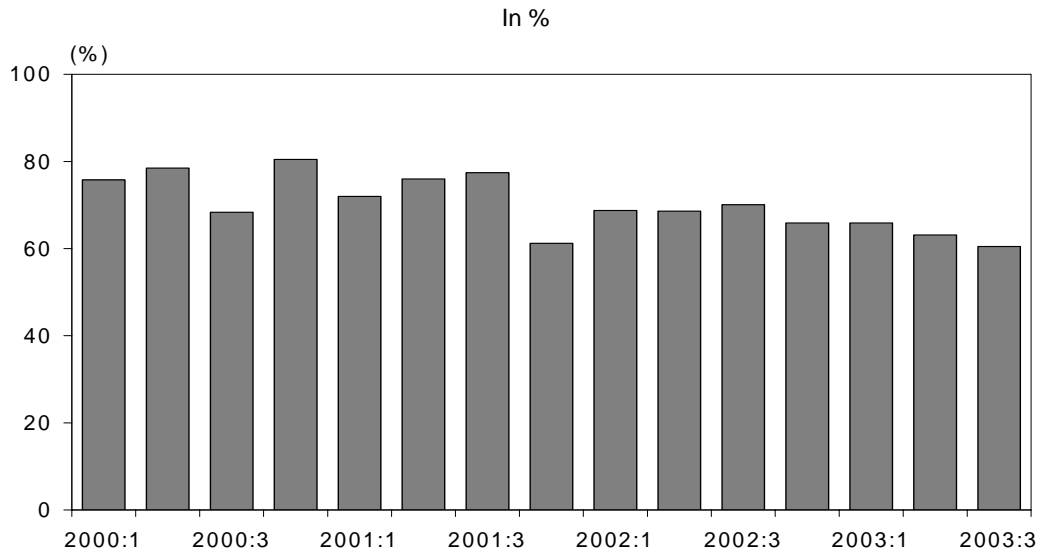
<sup>6</sup> Private residential properties are classified into classes A to E, with saleable area of less than 40 m<sup>2</sup>, 40-69.9 m<sup>2</sup>, 70-99.9 m<sup>2</sup>, 100-159.9 m<sup>2</sup>, and 160 m<sup>2</sup> or above, respectively. Private office premises are divided into grades A to C, with grade A offices having the best quality in terms of, for example, finishes, layout flexibility, size of floor plates, management services, and parking facilities.

<sup>7</sup> Rates are one of indirect taxes levied on properties, which are charged at a percentage of the rateable value. The rateable values are reviewed annually so as to reflect up-to-date information.

<sup>8</sup> In calculating the weights, numbers of transactions are used for residential properties rather than the total floor area as for non-residential properties. This is because the variety, in terms of floor area, of residential properties is relatively small compared with that of the non-residential properties.



Chart 1  
**Share of secondary market transactions in total transactions of residential properties**



Source: R&VD.

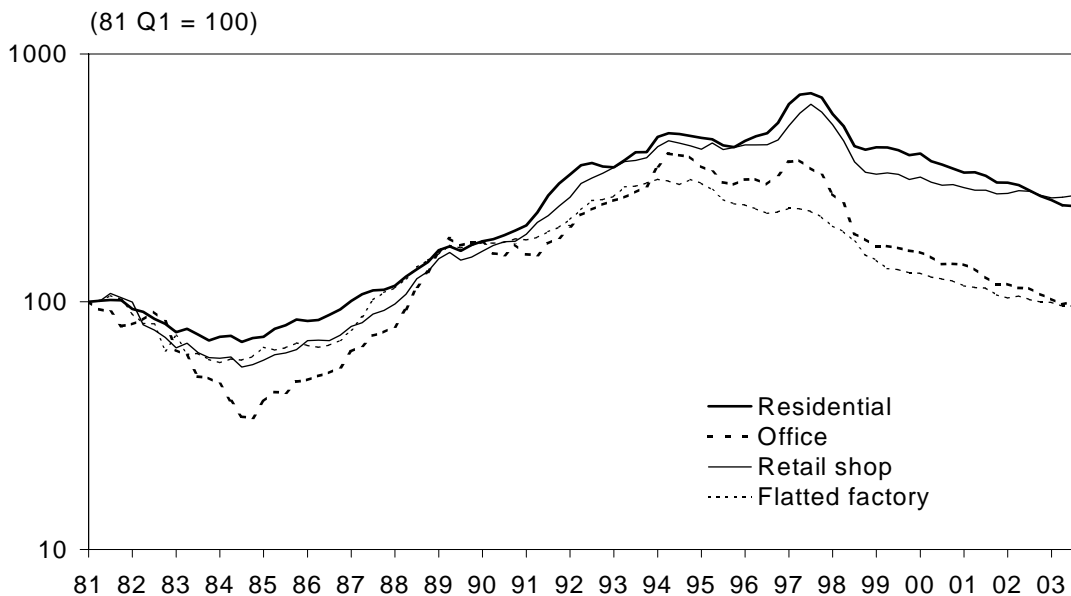
**Recent developments in property prices**

Chart 2 plots the price indicators discussed above over the past two decades. Panel A compares the levels of the price indices for various types of private properties including residential, office, retail shops and flatted factories. Panel B depicts the growth rates of these indices. Panel C compares the residential property price index with some average price indicators. A number of observations are worth noting.

Chart 2  
**Developments in property prices**

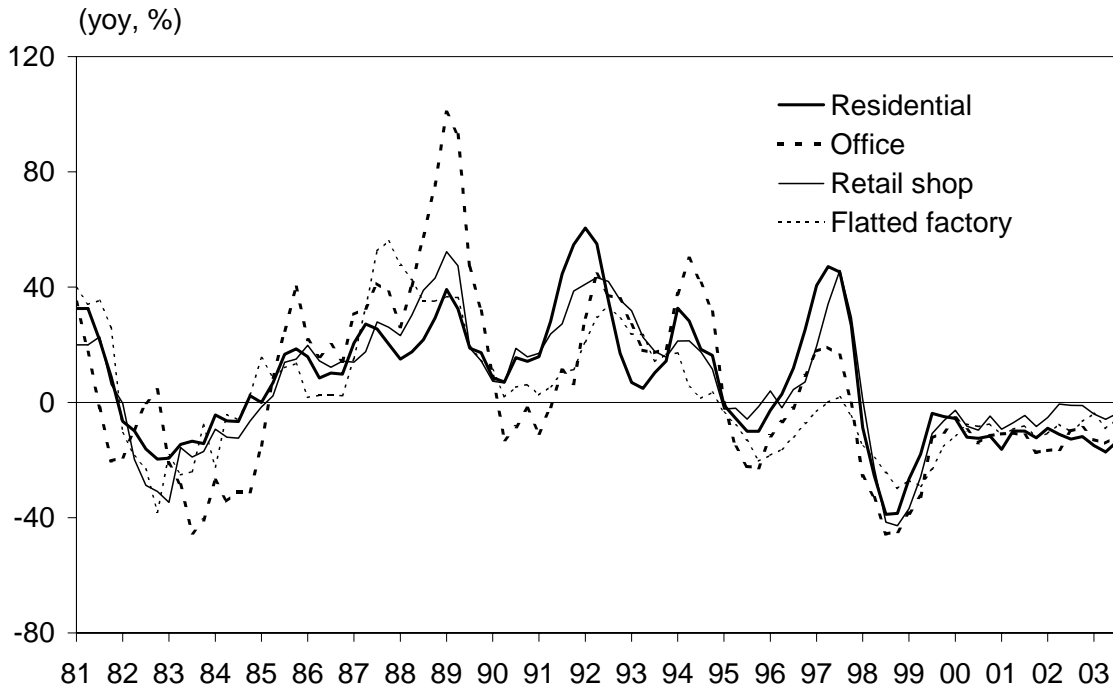
**A. Property price indices**

1981 Q1 = 100 (semi-logarithmic scale)



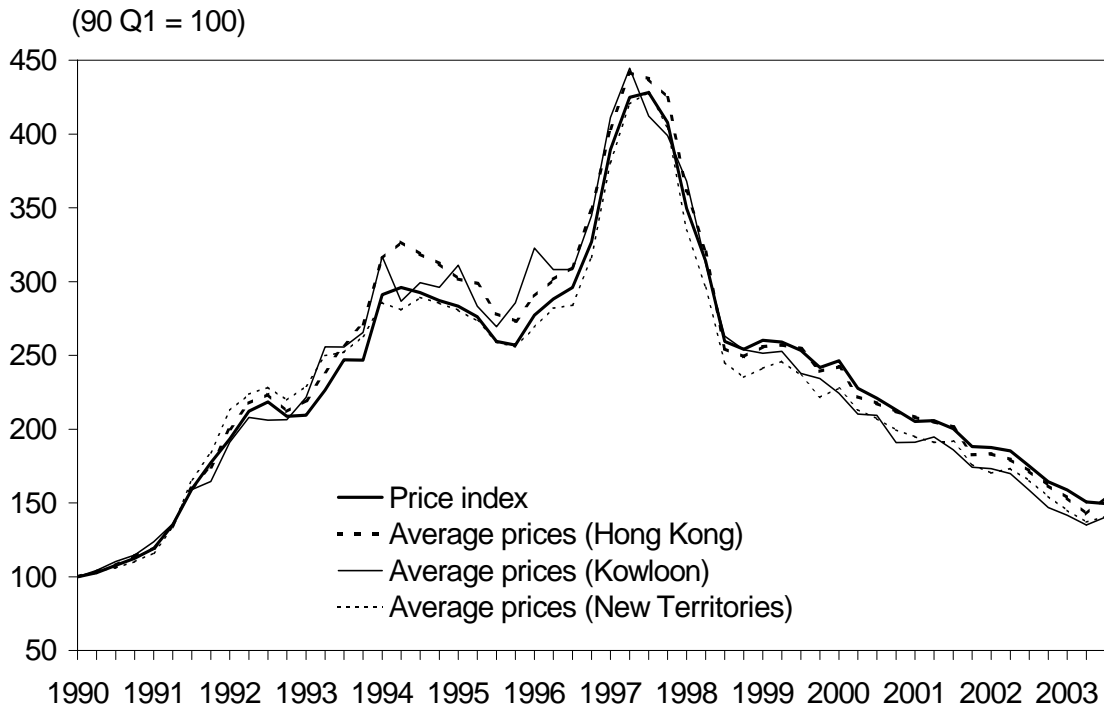
### B. Growth in property price indices

Annual percentage changes



### C. Price index and average prices for class B residential property

1990 Q1 = 100



Source: R&VD.

First, the price indices for all types of private (residential and non-residential) premises have declined sharply in recent years. The price indices for residential, retail and office properties were generally rising from the mid-1980s up to the onset of the Asian financial crisis in 1997, with a notable correction in 1994-95.<sup>9</sup> Since the burst of the bubble in 1997, prices of retail shops, residential and office properties have dropped by more than 55%, 60% and 70% respectively.

Secondly, the price index for flatted factories reached a peak much earlier than the other price indices and started to fall from the early 1990s.<sup>10</sup> This reflected a decline in demand for factories due to the relocation of Hong Kong's manufacturing sector to the Mainland of China.

Thirdly, because the levels of these indices are dominated by pronounced trend-wise increases, they obscure several episodes of sharp price fluctuations, as indicated by the growth rates of the indices. In particular, the residential price index has undergone recurrent fluctuations, reaching peaks of four-quarter growth rates of 25%-60% in 1991-92, 1994, and 1997 and troughs with declines of 10% in 1995, 39% in 1998, and 17% in 2003.

Finally, indicators of average prices have had broadly the same trends as the price indices. During Q1/1990-Q3/2003 the price index for the class B residential properties recorded an average year-on-year growth rate of 6%, compared with annual increases of 5%-6% in average prices for the same class in the three broad districts.

The large swings in property prices raise questions as to what drives property prices, and whether speculative activities lead to bubbles. There are indicators supporting the argument that a property bubble developed and burst in the 1990s.<sup>11</sup> One is the Affordability Index of Home Purchasers, which is compiled by the R&VD on a quarterly basis. The index measures the effect of changing prices, mortgage rates and household incomes on the ability of purchasers to afford a mortgage. It is derived by dividing a typical monthly mortgage repayment by the median household income.<sup>12</sup> A rise in the index represents deterioration in affordability. Having increased significantly during the boom period, the index declined sharply in the past five years (Chart 3). It has dropped by more than 70% since the second quarter of 1997, as the declines in property prices and mortgage rates outweighed the fall in median household income. The ratio of property prices to GDP shows a similar pattern, but with a smaller decline, as it does not reflect the effect of lower mortgage rates.

Another indicator is the so-called buy-rental gap, which compares the cost of purchasing and maintaining a flat to the cost of renting it. A simple measure of this is compiled by the Research Department of the HKMA, as the difference between an estimated effective funding cost and rental yield.<sup>13</sup> The buy-rental gap widened considerably in the 1990s, reaching a peak in early 1998, reflecting mainly the rise in prices which drove down rental yields (Chart 4). Thus, it was increasingly more expensive to buy than to rent a property. The widening and persistence of the positive gap was probably supported by expectations of future capital gains. The gap fell in recent years due to the decline in interest rates as well as the increase in rental yield. The latter was owing to a sharper drop in prices than in rentals. The gap has declined to negative territory since the second quarter of 2001

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<sup>9</sup> The declines between mid-1994 and late 1995 were mainly due to the implementation of a package of anti-speculative measures by the government as well as increases in interest rates.

<sup>10</sup> Flatted factories refer to premises designed for general manufacturing processes and normally intended for sale or letting by the developers. They exclude factory premises that are primarily purpose-built for specialised manufacturing processes and usually for occupation by a single operator.

<sup>11</sup> It is difficult to estimate the fair values of property prices. Peng (2002) presents two different empirical models of property prices that combine fundamental variables with the concept of speculative bubbles. Both approaches indicate a significant bubble component in property prices in the earlier part of the 1990s.

<sup>12</sup> The mortgage repayment is estimated assuming a 20-year mortgage on 70% of the purchase price for a 50m<sup>2</sup> flat. The purchase price is estimated by applying the average price for a class B residential unit. The median household income is deseasonalised.

<sup>13</sup> Specifically, the buy-rental gap is calculated as:

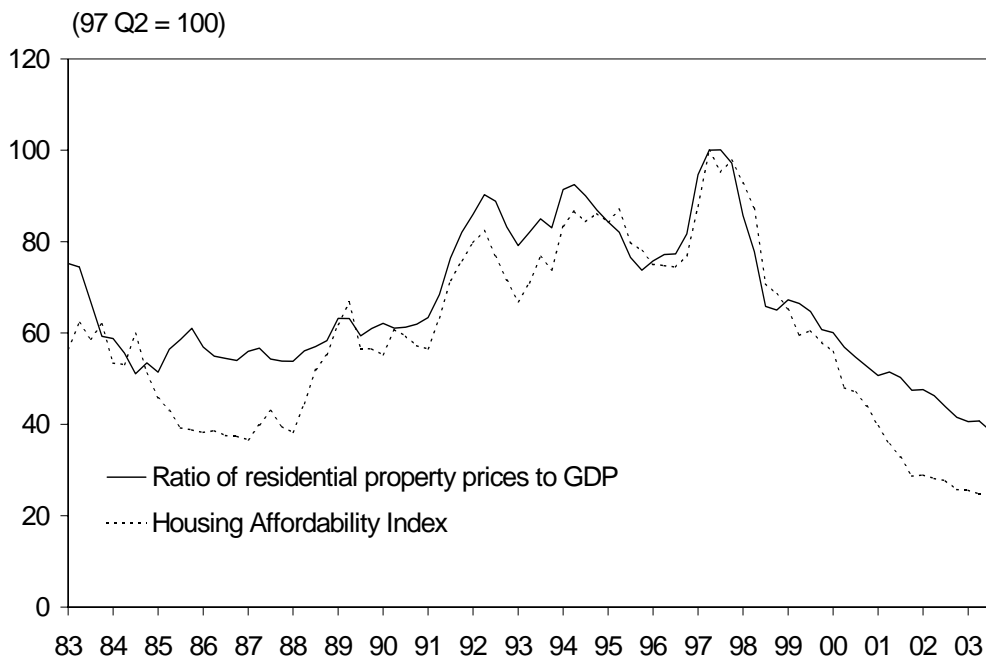
$$[((1 - \text{downpayment ratio}) \times \text{mortgage rate}) + (\text{downpayment ratio} \times \text{1-month time deposit rate})] - \text{rental yield}.$$

The terms in the square bracket represent the effective funding rate. To derive the latter, the downpayment ratio is taken as 30%, and the mortgage rate is a weighted average for new loans approved. The 1-month time deposit rate is used to represent opportunity cost of foregone interest earnings on downpayments. Rental yield refers to the average of yields on residential premises in classes A and B.

and stayed around -3.5% in recent quarters. The widened negative gap suggests incentives for households to purchase rather than rent flats, subject to expectations of future capital gains/losses.

Chart 3  
**Housing affordability**

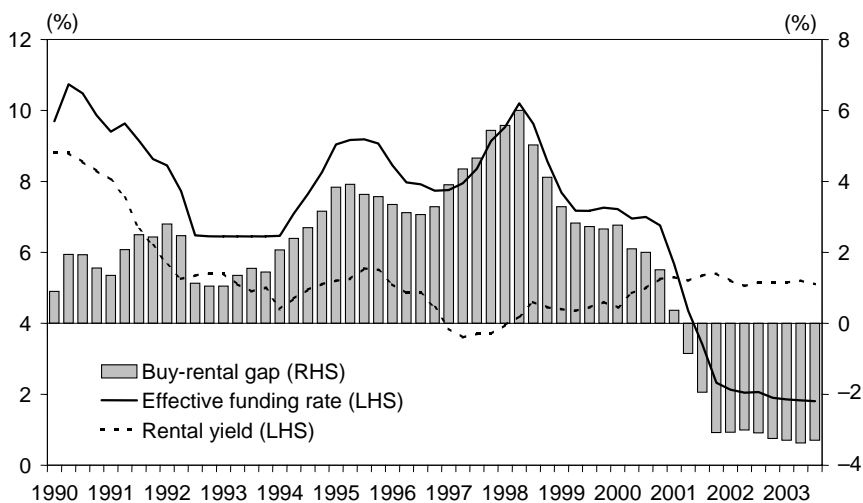
1997 Q2 = 100



Sources: R&VD; HKMA Research Department staff estimates.

Chart 4  
**Buy-rental gap**

In per cent



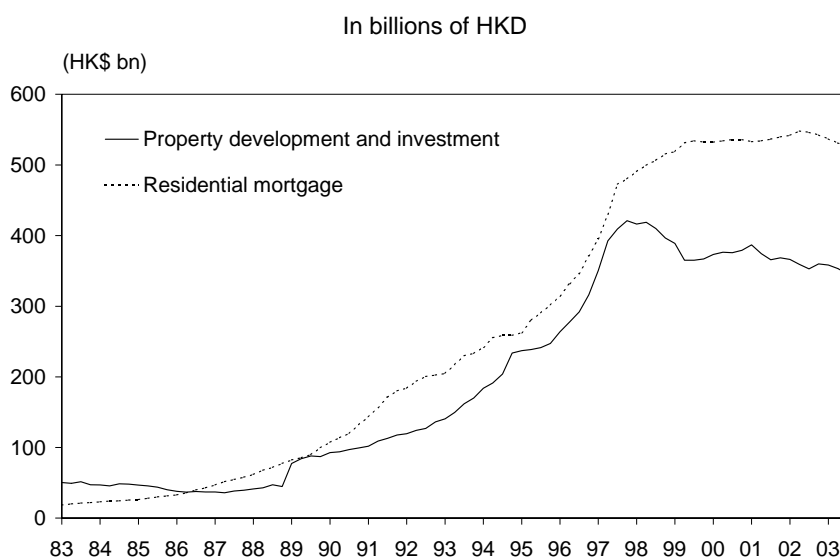
Source: HKMA Research Department staff estimates.

## b. Indicators of property lending exposure

In Hong Kong, the banking sector's exposure to the property market is mainly related to residential mortgage lending and loans for construction, property development and investment. The HKMA collects statistical information about these loans through a regular statutory return. The statistics are published on a quarterly basis by the HKMA in its statistical bulletin.

Property-related loans have increased significantly over the past two decades. Both residential mortgage loans and loans for property development and investment grew rapidly between 1990 and 1997, by an average annual rate of 227%.<sup>14</sup> Subsequently, residential mortgage loans increased at a much slower rate in 1998-2002, while loans for property development and investment dropped considerably (Chart 5).

Chart 5  
Outstanding amount of property lending



Source: HKMA.

The share of property-related lending - including both residential mortgage loans and loans for property development and investment - in total loans for use in Hong Kong also increased over the past two decades from around 30% in the mid-1980s to over 50% in 2003 (Chart 6).<sup>15</sup> The rise in recent years was mainly attributable to an increase in the share of residential mortgage lending by banks, while the share of loans for property development and investment was generally stable. It should be noted that the actual exposure is likely to be higher than is suggested by these statistics, which do not include other consumer and corporate loans extended against property collateral. Data on the latter are not available, but anecdotal evidence indicates that they are significant.

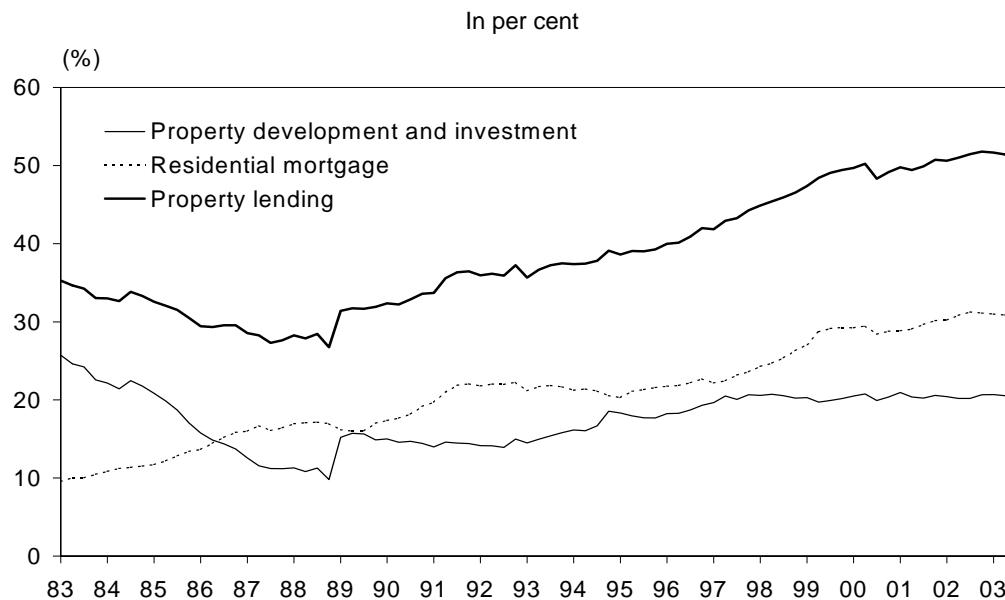
In order to contain the risks associated with excessive concentration or expansion of bank lending to the property market, a number of prudential measures have been adopted by the HKMA and the banking industry over the years. These include a guideline issued by the HKMA in 1994 to banks to maintain their ratio of property lending to loans for use in Hong Kong at about the industry average of 40%. The guideline was well observed in the aggregate during the boom period. It was withdrawn in 1998, as the property market was no longer overheated and banks were much more restrained in their

<sup>14</sup> A reclassification of loans was implemented in 1989, which explained the sharp rise in loans for property development and investment in that year. Specifically, from 1989 loans are classified according to the usage rather than the main business of the borrower as in the past.

<sup>15</sup> Loans for use in Hong Kong are those for financing economic activity in Hong Kong, but do not include those for financing import and export trades.

property lending. The increase in the ratio in recent years mainly reflected a contraction in lending to other sectors as a result of the economic slowdown.

Chart 6  
Share of property lending in total loans for use in Hong Kong



Source: HKMA.

In view of the increasing importance of residential mortgage lending in banks' loan portfolios, the HKMA also started to conduct a monthly survey on residential mortgage loans from December 1992. This is in addition to the collection of data on outstanding amounts of residential mortgage loans through the statutory return on a quarterly basis. Following rounds of enhancement, the monthly survey now collects key indicators on banks' mortgage business including value and number of new loans approved during the month, amount of outstanding loans, asset quality of mortgage loans, and interest rate spread against the best lending rate of new loans. These more frequent and more detailed statistics are useful for monitoring and assessing banks' exposure to property market developments.

Reflecting the sharp decline in property prices in recent years, there has been an increase in the phenomenon of negative equity.<sup>16</sup> The HKMA has conducted a survey to obtain information on banks' residential mortgage loans in negative equity since the third quarter of 2001. The information collected includes the number of mortgage loans in negative equity, their total outstanding value, the loan-to-value ratio breakdown, and the breakdown of interest rate spread against the best lending rate. The number of residential mortgage loans in negative equity rose substantially to over 20% of the total mortgage borrowers by the end of the second quarter of 2003, with the loan-to-value ratio averaging 127% (Chart 7). At the end of the next quarter, aggregate outstanding loans amounted to HK\$ 155 billion or 29% of total residential mortgage loans. The unsecured portion of these loans was estimated at about HK\$ 33 billion or around 6% of the total.<sup>17</sup> Nevertheless, the three-month delinquency ratio of mortgage loans in negative equity declined to 2.2%, from 2.9% in the third quarter of 2002.

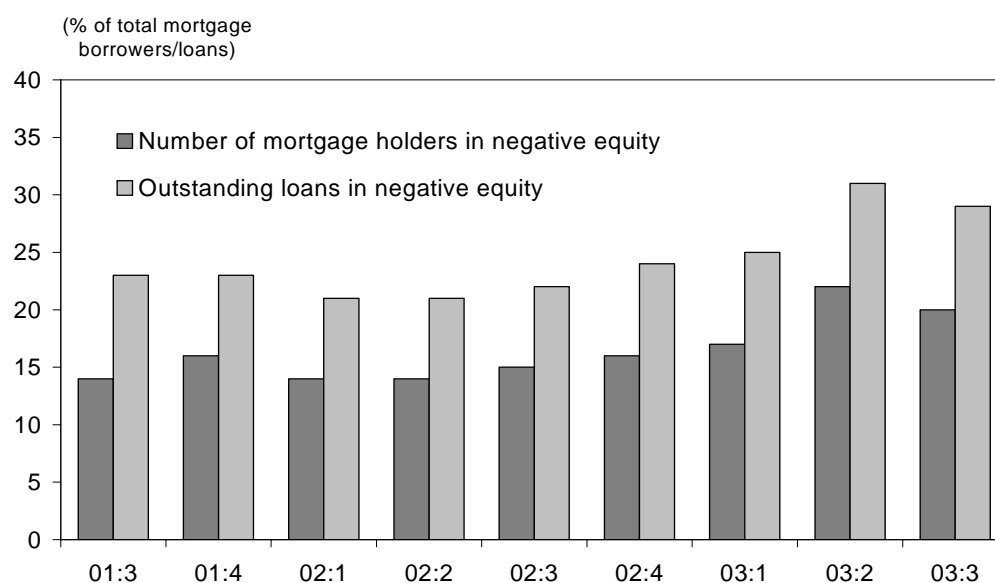
<sup>16</sup> A loan is regarded as in negative equity if its outstanding loan amount exceeds the market value of the mortgaged property.

<sup>17</sup> These figures relate only to the residential mortgage loans provided by authorised institutions on the basis of first mortgages, which do not reflect the situation of mortgage loans associated with government-funded co-financing schemes and private sector co-financing schemes.

Chart 7

### Residential mortgage loans in negative equity

As a percentage of total mortgage borrowers/loans



Source: HKMA.

## III. Property, the macroeconomy and banking performance

Fluctuations in property prices may affect the banking sector via its direct exposure to the property market and indirect effects due to the associated changes in overall economic conditions. The sharp declines in property prices in the past five years have contributed importantly to the weak economy and persistent deflation. Banks' profits have declined significantly from the pre-1997 levels, reflecting in part an increased provision for loan losses. Nevertheless, the banking sector as a whole remains healthy, with a relatively high capital ratio which averaged 15.6% at end-September 2003. This section provides a brief summary of the effects of property price declines on the economy and particularly the banking sector, based on a number of studies by HKMA Research Department staff in the past few years.

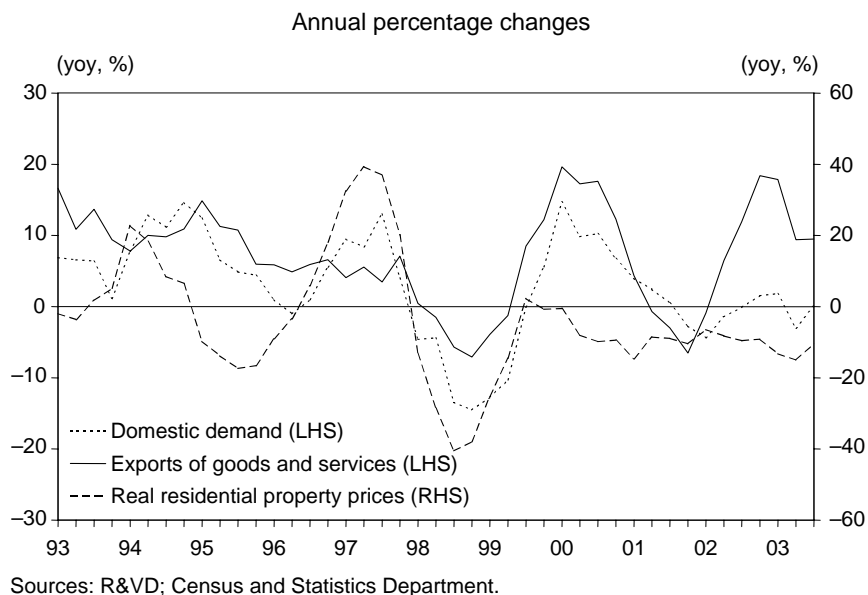
### a. Property prices and the macroeconomy

The economy is affected by fluctuations in property prices through a variety of channels. Changes in property prices can influence private consumption and investment through wealth and balance-sheet effects. The phenomenon of negative equity may have reinforced the wealth or balance-sheet effects on consumption, as households with negative equity are more likely to have responded to price declines by increasing savings to strengthen their balance sheets. Property price fluctuations also affect consumer price inflation via a direct channel through declines in rentals and an indirect channel through weak aggregate demand.

Peng et al (2001) review the various linkages between the property market and the macroeconomy in Hong Kong. In particular, the study uses a multi-equation structural model to assess the impact of property price declines on economic growth. The results suggest that declines in property prices have reduced growth by affecting private investment and, to a lesser extent, consumption spending. This has been an important reason for the weakness in domestic demand notwithstanding strong increases in the exports of goods and services in recent years (Chart 8). However, any estimate of the effects should be interpreted with caution for a number of reasons. First, there are interactions between the property sector and the rest of the economy. In particular, while weak property prices may depress growth, weakening in economic activity reduces the demand for property and therefore prices.

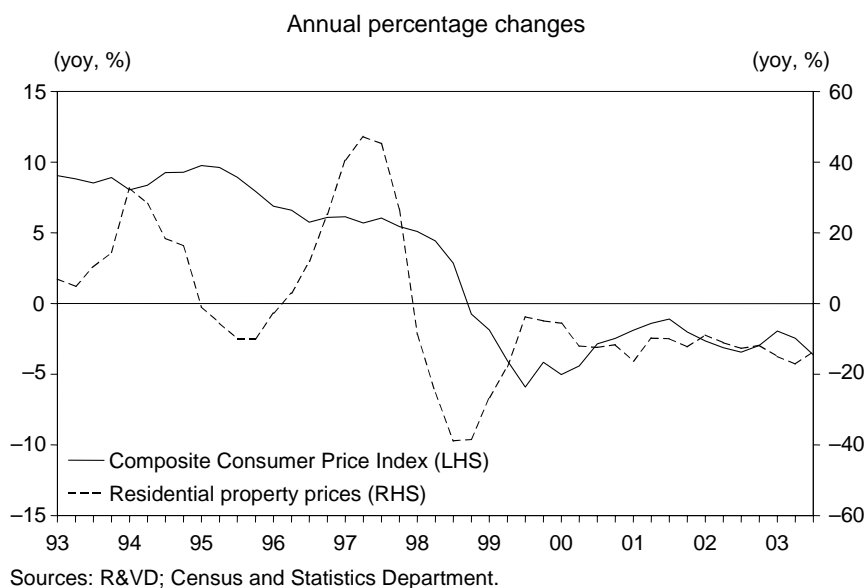
Secondly, property prices and other parts of the domestic economy are subject to common shocks such as changes in external demand, a factor particularly important for Hong Kong.

Chart 8  
**Property prices and the macroeconomy**



On an accounting basis, declines in property rentals have contributed about half of the total decline in the consumer price index (CPI) since 1998. Considering the interaction between the property market and the rest of the economy, the exact size of the contribution may be above or below this number. However, it is fair to say that property price falls have played an important role in consumer price deflation in Hong Kong (Chart 9). Ha et al (2002) estimate a model of inflation for Hong Kong, and find that domestic prices are influenced by property prices, reflecting the lagged effect of rentals which are stickier due to lease contracts, as well as weak aggregate demand.

Chart 9  
**Property prices and consumer prices**





## b. Property prices and bank lending

The widespread practice of using property as collateral for consumer and business loans in Hong Kong points to the importance of balance-sheet and credit effects. There can be significant feedback and magnification effects through the function of the financial intermediaries. In boom periods with rising asset prices, as the net worth of households and corporations increases, so do banks' balance sheet positions and lending capacity, which may foster a credit boom and which reinforces the rise in asset prices and magnifies the effects on private spending. Conversely, under generalised asset price deflation, the negative effects on households' and banks' balance sheets can become self-reinforcing, creating a credit crunch and worsening the contractionary effects triggered by the original drop in asset prices.

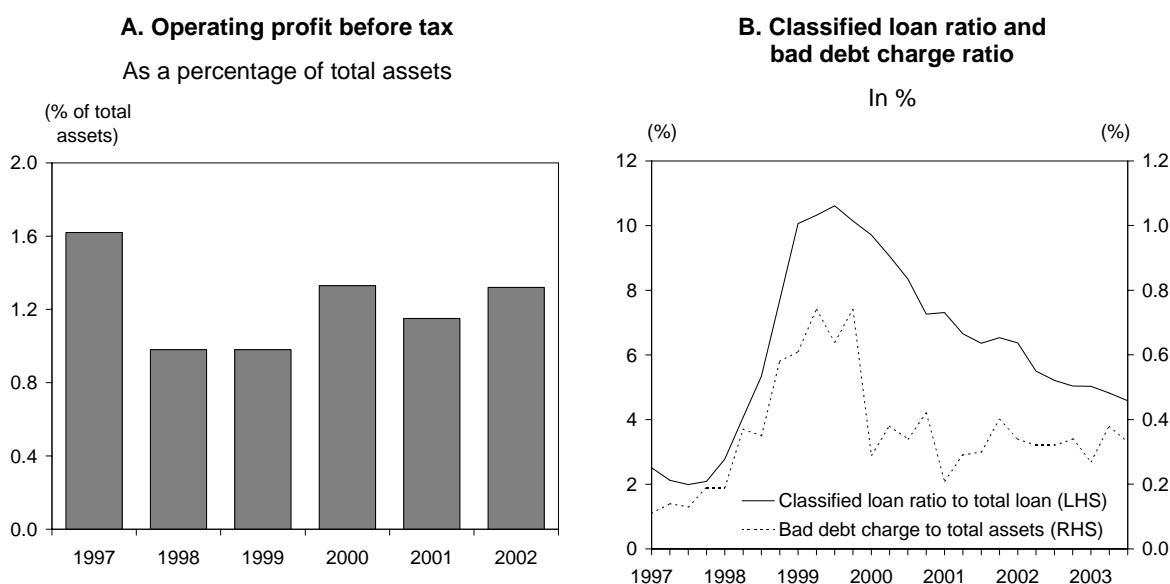
Gerlach and Peng (2002) study the nexus between output, property price and bank lending in Hong Kong. They find that bank lending appears to be mainly demand-driven and that the direction of influence goes from property price to bank credit. This implies that financial intermediaries did not play an "accelerator" role in the run-up of the property prices during the boom periods. Part of the reason would be related to the prudential regulation and risk control by banks in granting loans, which limited the responses of credit to property price changes. In particular, the study finds that the maximum loan-to-value ratio of 70%, which was adopted by the banking industry voluntarily in 1991 and later incorporated in the HKMA's guidelines on property lending, helped limit credit expansion in the bubble period.

## c. Property prices and bank profitability

Banks' balance sheets and profitability have been affected by the downturn in the economy and the property market. Retail banks in Hong Kong experienced a considerable decline in profitability following the Asian financial crisis (Chart 10A). Profitability recovered somewhat in 2000-02, but remained below its pre-crisis level. The decline in profitability was associated with a deterioration in asset quality. Specifically, the ratio of classified loans to total loans of retail banks rose substantially from around 2% in 1997 to over 10% in 1999 before falling gradually to 4.5% at the end of September 2003 (Chart 10B).

Chart 10

### Retail banks' profitability and asset quality

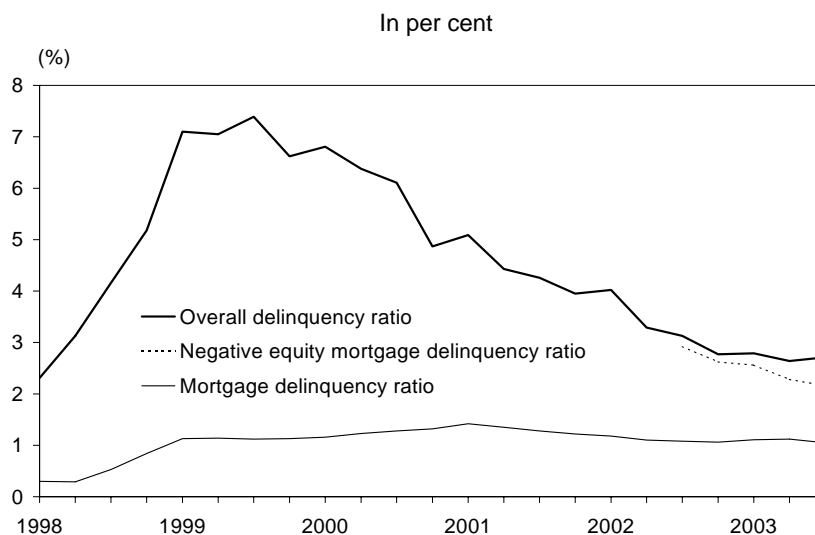


Source: HKMA.

The mortgage delinquency ratio (defined as mortgage loans overdue for more than three months relative to total mortgage loans) rose substantially from 0.3% in mid-1998 to over 1.4% in 2001 before falling gradually to below 1% in November 2003 (Chart 11). On the other hand, the ratio of rescheduled loans has been rising since the data for September 2001 were first released by the

HKMA. The continued rise in the rescheduled loan ratio suggests that banks were accommodative in restructuring mortgage loans for borrowers in financial difficulty, thereby taking the pressure off mortgage delinquencies. While the mortgage delinquency ratio has increased substantially in recent years, it remained low compared with the overall ratio of loans overdue for more than three months.

Chart 11  
Delinquency ratios



Source: HKMA.

There have been a number of studies on the determinants of bank profitability in Hong Kong, using both aggregate and bank-level data. Shu (2002) finds that declines in residential property prices, reduced economic growth, and persistent consumer price deflation have had significant impacts on banks' asset quality. A study by Jiang et al (2003) suggests that the deterioration in banking institutions' profitability in recent years was mainly attributable to the adverse macroeconomic environment in Hong Kong, particularly the persistent deflation in general prices, which was in part due to declines in property prices as discussed above. Gerlach et al (2003), using confidential supervisory bank-level data, find that banking performance is affected by macroeconomic developments with the net interest margin of smaller banks being more exposed to changes in economic conditions. The collapse of the property "bubble" has also put banks under distress due to the generally large exposure to property-related lending. However, and perhaps surprisingly, the asset quality of property-related loans is found to be *less* sensitive to changes in economic conditions including property prices than that of other types of bank lending. This is in line with the stylised fact that mortgage lending is less risky than most other bank loans.

#### IV. Conclusions

This paper provides an overview of the real estate indicators that may be useful for monitoring the vulnerability of the banking sector in Hong Kong to fluctuations in property prices. Two types of indicators are reviewed: property prices and statistics of banks' exposure to property-related lending. These statistics are published on a regular basis by the R&VD and the HKMA respectively. In view of the increasing importance of residential mortgage lending in banks' loan portfolios, the HKMA has conducted a monthly survey on residential mortgage loans to obtain higher frequency and more detailed information, which is now also published.

The sharp declines in property prices have had a significant impact on the economy and the banking sector. Banks' asset quality and profitability fell considerably in the wake of the Asian financial crisis. These indicators have rebounded in more recent years, but remained below their pre-crisis levels. Nevertheless, the banking sector as a whole has remained in a healthy position, as evidenced by the strong capital position and high asset quality and profitability relative to banks in other economies in the region.

## Appendix: The use of rateable value for adjusting quality differences between properties

This appendix illustrates how rateable values can be utilised to adjust transaction prices for differences in quality characteristics between properties.

The rateable value is an estimate of the annual rental value of a property at a reference date, assuming that the property is then vacant and to let. It is the basis on which rates, one of Hong Kong's indirect taxes on properties, are charged. In assessing the rateable value, reference is made to other open market rents agreed at or around the date of assessment, for similar properties in the locality, with adjustments to reflect any differences in size, location, facilities, standards of finish and management. The rateable value is reviewed annually by R&VD so as to reflect more up-to-date rental values of the properties.

Consider that the sale price of a property is determined by the average market price and a number of quality factors such as size, location, age, management services and facilities, etc. Algebraically, the sale price ( $P$ ) of a specific property can be expressed as:

$$P = \bar{P} + \bar{P}X_1 + \bar{P}X_2 + \bar{P}X_3 + \dots + \bar{P}X_k = \bar{P}(1 + X_1 + X_2 + X_3 + \dots + X_k) \quad (1)$$

where  $\bar{P}$  is the central tendency of the property prices in the entire population (it can be viewed as the market price of a "typical" property in the population).  $X_i$  ( $i = 1, 2, 3, \dots, k$ ) are the quality factors, which measure the deviation of the sale price of the specific property from the market price of the "typical" property due to quality differences. For example, if, other things being equal, the size of the specific property is smaller than that of the "typical" property, then the value of the quality factor for size will be negative.

Assume that the assessment of rateable value of a property is based on the same set of quality factors as in the determination of sale price, and the influence of individual quality factors on sale price and rateable value are the same.<sup>18</sup> Given these assumptions, the rateable value ( $R$ ) of the specific property can be expressed as:

$$R = \bar{R}(1 + X_1 + X_2 + X_3 + \dots + X_k) \quad (2)$$

where  $\bar{R}$  is the central tendency of the rateable values in the entire population. Thus, the factor of sale price divided by rateable value is:

$$\frac{P}{R} = \frac{\bar{P}(1 + X_1 + X_2 + X_3 + \dots + X_k)}{\bar{R}(1 + X_1 + X_2 + X_3 + \dots + X_k)} = \frac{\bar{P}}{\bar{R}} \quad (3)$$

By keeping the rateable values (and hence  $\bar{R}$ ) unchanged in consecutive periods, changes in the factor of  $P/R$  represent changes in  $\bar{P}$ , that is, the central tendency of the property prices in the entire market.

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<sup>18</sup> In reality, the degrees of influences on price and rent (rateable value) for some quality factors may not be the same. For example, the age of a property usually has a greater influence on price than rent in Hong Kong.

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# Real estate price index: a model for the Philippines

Estrella V Domingo and Reynaldo F Fulleros<sup>1</sup>

## 1. Introduction

Real estate price index (REPI) is a valuable tool for countries in assessing and valuing real properties. Valuations of real properties are used for different purposes - acquisition and disposal, mortgages, taxation, land and property management, among others. Most countries however do not have an established system of real estate prices. In fact, there is no international standard practice for real estate pricing at present.

The Philippines is in need of a real estate price index, given the shortcomings of the existing zonal valuation system of the government and the impact this has on government revenue, financial stability, land allocation and use, policies, and legislation. The present property values are found to be grossly undervalued because of the lesser understanding of valuation practices and market trends in the property industry.

The National Statistical Coordination Board (NSCB), the agency mandated to coordinate statistical matters in the country and to develop statistical frameworks and indicators, took on the task of exploring approaches to come up with a real estate price index system model for the Philippines. The general objective of the exploratory study is to help address the bigger problems of real estate valuation in the country. Specifically, the study aims to develop an appropriate REPI system. The price index should provide a consistent measure of price developments over time. It should be able to serve the needs of different users - government, banks, real estate developers/sellers, etc. In developing the appropriate price index, the study took a number of factors into consideration, such as, existing real property market conditions, availability of data, and applicability of the methodology to the country. The real estate price index system as suggested will be an evolving model since this will undergo changes or refinements as work on the index progresses.

This paper presents the steps taken to determine the methodology for compiling the real estate price index in the Philippines, required data, proposed methodology, and future activities to institutionalise the system.

## 2. Conditions of real property valuation in the Philippines

The initial step was to conduct a review of the present conditions of the real property industry and real estate valuation in the Philippines.

Land and property administration in the Philippines faces a critical problem of an inefficient and inequitable property market that constrains economic development, reduces opportunities for the poor, and discourages sustainable management of resources.<sup>2</sup>

One of the main causes of the problem is an inefficient, outdated zonal valuation system. According to a 2002 World Bank Study, such a system led to the gross under-valuation of real estate properties

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<sup>2</sup> Inter-Agency Coordinating Committee (IACC) of the Philippine Australian Land Administration and Management Project, "Land Administration and Management Report", February 2000.

greatly affecting government revenue and land allocation.<sup>3</sup> While the system itself is not wrong the implementation of the process is not perfect. The inefficiency of the process is prevalent in the provinces/municipalities.

The property market is characterised by multiple systems of valuation imposed by different government agencies. Depending on the purpose, this system resulted in two or three different pricings for the same property. These varying approaches can be traced to the multiple legislations/policies that support different purposes of land/property administration.

Real property prices in the Philippines (just like other countries) are very diverse owing to factors such as location, type, and features of the property. On an aggregate level, the mix of real estate transactions by type has a bearing on the total price. Other factors, such as, urban development, the entry of foreign investors in the property market, lower interest rates, and emergence of new housing and mortgage practices also contributed to the differences in prices.

The present state of property valuation can be attributed to outdated legislations and practices. Contributing to this sad state of real property valuation in the country is the lack of trained appraisers, and lesser understanding and appreciation on the part of local government officials on the proper pricing of real estate properties in their localities.

The property market in the Philippines is poorly informed on property movements.<sup>4</sup> There is lack of statistics/data needed for property administration and management which is a key factor in improving the property market.

All of these point to the need to establish a comprehensive property administration database and reliable REPI system to (1) serve as guide to those concerned agencies, and (2) bring about a fair efficient and effective valuation system that is comparable internationally.

### **3. Conceptual framework**

The study also looked into the scope and coverage of real estate as applied in the Philippines. It took into account the existing market conditions to determine the structure of real estate properties/ transactions which can serve as framework for the REPI.

#### **3.1 Scope and coverage**

Real estate in the Philippines encompasses: (1) the land and/or buildings or other improvements permanently attached or annexed to land, including the rights and interests thereon; (2) rural, sub-urban and urban land areas, and the development thereof, such as residential, commercial, industrial, institutional, agricultural, forest land, aqua-cultural or combinations of such rights and interests; (3) resorts, land reclamation, building or housing projects, either for individual or condominium ownership, memorial parks, recreational, townhouses, clubhouses, and other similar nature.<sup>5</sup> Given the extensive coverage of real estate, the study focused only on the most common types of agricultural, residential, and commercial properties.

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<sup>3</sup> "Real property taxation in the Philippines", a report written by Milwida Guevara, and contained in *Land taxation in practice: selected case studies*, March 2002, as case study no 8, compiled and edited by Richard M Bird and Enid Slack of World Bank.

<sup>4</sup> Property movements is a general term used to refer to any of the following: real property reclassification eg agricultural to residential; transfer of ownership eg from government to private individuals, donations, and developments/improvements to a property.

<sup>5</sup> The definition of real estate was taken from the Rules and Regulation Governing Real Estate Practice in the Philippines of the Department of Trade and Industry, defined under its Ministry Order no 39 - Rules and Regulations Governing the Licensing and Supervision of Real Estate Salesmen, Brokers, Appraisers and Consultants, and Realty Service Organisations.

### **3.2 Present classification/structure of market**

Real estate transactions in the country take the following four forms: (1) sales; (2) rental/lease; (3) donations; and (4) mortgages. These transactions apply to the different types of real estate properties as classified under government laws, rules and implementing guidelines, statistical data collection, policy uses, financing institutions, and classifications as followed by private assessors.

Valuation of real estate distinguishes between the value of the land and the value of the improvements. The latter refers to dwelling units, buildings and structures, and other structures. Land is classified by the Department of Environment and Natural Resources (DENR) according to land use as follows: (1) forest land; (2) agricultural land; (3) built-up land; and (4) other lands.

The Bureau of Internal Revenue (BIR) applies a market-based classification. The general classification adopted is as follows: (1) agricultural; (2) residential; (3) commercial; (4) industrial; (5) general purpose; (6) government land; and (7) area for priority development. Agricultural lands - are principally devoted to planting/raising of all types of crops/livestock and poultry, fishpond, and other agricultural uses including timberlands and forest land. Residential properties on the other hand, include land or buildings principally used for habitation. They are classified into residential regular and residential condominium. Similarly, commercial properties are classified into commercial regular and commercial condominiums. Industrial properties include factories, warehouses, and other structures used for manufacturing and industrial uses. General purpose land refers to rawland, underdeveloped and undeveloped areas which have potential for development into residential, commercial, industrial, institutional, etc and must not be less than 5,000 square metres. On the other hand, government lands include those owned/held by the government. And lastly, area for priority development include those areas utilised for socialised housing certified by the Housing and Land Use Regulatory Board (HLURB), Presidential Commission on Urban Poor (PCUP); and, National Housing Authority (NHA).

The National Statistics Office (NSO) in the Census of Population and Housing (CPH) provides a highly disaggregated categorisation of dwelling units (residential units) as follows: (1) by type of buildings: single house, duplex, apartment, accessoria, condominium, row house, etc; (2) improvised ("barong-barong"); (3) other housing units/natural shelter, boat, hotel, lodging house, dormitory, etc; (4) institutional units (hospital, convent, school dormitory); and (5) other collective living quarters (military camp, etc). Categorisations are also available by location or by type of use ie, commercial, industrial, and agricultural.

Other types of market segmentation that can affect pricing of properties are location, life of the asset, features of the property, social factor, and type of business in the case of commercial units. Location can be regional, provincial, city, municipality, or urban or rural. Tenurial status (ownership/operator) is also applied to group properties but for purposes other than valuation.

Properties in the Philippines are transferred through - transfer in compliance of the law (Agrarian Reform Act), donations, direct transfer from seller to buyer or through an intermediary/broker, and succession.

### **3.3 Proposed composition of the real estate price index**

In coming up with the index the structure in Table 1 is suggested as preliminary. It took into consideration the features of existing classifications, availability of data, and market requirements.

Table 1

**Real estate structure: Philippines**

Classification	Category	Sub-category	Remarks
A. Agricultural	By type of crop/type of farm A.1. Temporary crops A.2. Permanent crops A.3. Livestock A.4. Poultry A.5. Other farms By location (regional, provincial, city, municipality)	By size By age By cost	For sales and rent prices of land only
B. Forest	By type of forest land (plantation forest, public and private forest land) By location (regional, provincial, city, municipality)	By size By age By cost	Covers only rent of economic/production forest <sup>1</sup>
C. Residential	By type of project C.1. Residential regular C.2. Residential condominium By location (regional, provincial, city, municipality)	By cost By size By type of structure By number of floors By age By social category (high-end, mid-income, low-cost socialised)	Sales, mortgage and rent prices of land and improvements
D. Commercial	By type of project D.1. Commercial regular D.2. Commercial condominium By location (regional, provincial, city, municipality)	By size By type of structure By number of floors By age By cost	Rental and sales prices of land and improvements
E. Industrial	By type of project (warehouse, factory building, bank) By location (regional, provincial, city, municipality)	By type of structure By size By age By cost	Initially include only areas within Special Economic Zone

<sup>1</sup> Economic/production forest includes residual dipterocarp forest, rangelands for grazing, mangrove areas for fishpond, areas under industrial forest plantation, multiple-use zone, and buffer zones for special land uses.

## 4. Assessment of data

A basic consideration in determining the method is to know which data are available. Thus, an assessment of available data on property valuations was undertaken. Based on the initial property composition described in Part III, the results of the assessment show that the following government agencies can be tapped to provide the data requirement for the index.

### 4.1 National Statistics Office (NSO)

The NSO conducts the CPH once every 10 years. It has two components; Census of Population and Census of Housing. The 2000 CPH was the 11th population census and fifth housing census of the Philippines. The past four housing censuses covered the years 1960, 1970, 1980, and 1990. The census is designed to take an inventory of the total population and housing units in the country and to collect information on their characteristics. Specifically, the Census of Housing, a subset of the CPH, provides information on the stock of housing units, geographical location, structural characteristics,



and available facilities. With some improvements, the CPH can provide the structure of housing units by type, and by location that form the basis for the weights.

The **Family Income and Expenditure Survey** (FIES) is another survey that collects data on housing characteristics and expenditures of households on rent, and repairs and maintenance for the house. It is a triennial survey.

One element in the **consumer price index** (CPI) is rent. The rent data are collected monthly and are available at the national, regional, and provincial levels. The NSO also processes the building permits, which are administrative forms required to apply for permit to construct/repair buildings and structures.

#### **4.2 Land Registration Administration (LRA) and Register of Deeds**

The LRA through the Register of Deeds maintains records of all property titles in the Philippines. All property transfers, including mortgages, have to be registered with the Register of Deeds every time a transaction takes place. The forms that accompany property transfers carry information on the values, history, characteristics like size, location, boundaries, etc, of the property, which can be used as basis for the index. While compliance to this regulation is almost total, these forms are not processed and tabulated at present for reporting purposes because of lack of resources. There is an ongoing World Bank Project that is addressing the processing problems of the LRA forms. The issue here is confidentiality of data.

#### **4.3 Records of provincial/city/municipality assessors**

The local real estate assessors also keep their own records of property declaration forms for purposes of taxation in their respective localities. These forms are filled only when the property is first registered and assessed by the new owner, which are updated when there are reported improvements to the property. The property values are assessed upon registration and are only reassessed every time there are improvements to the property or when a change in ownership of property occurs.

The assessors do a validation check of the property declaration occasionally to determine whether the correct taxes are being collected. However, most of these assessors lack the needed training for property valuation as well as fuller understanding of existing property market conditions.

#### **4.4 Bureau of Internal Revenue (BIR)**

The BIR is authorised to determine, for internal revenue purposes, the fair market value of real properties by zones/areas, in consultation with competent appraisers from both the public and private sectors. In determining the market value of the property it requires that the value of the land asset be separated from the value of improvements. As mentioned in Part III there are seven major classes of properties followed by the BIR.

Measuring the fair market value under the system is based on records of most recent actual sales/transfers/exchanges of properties appearing in administrative documents filed with the BIR and LRA; private records of banks, realtors, appraisers, etc in the locality; and records of provincial/city/municipal assessors. However, the BIR zonal valuation system has its limitations. These limitations are as follows:

1. valuations are performed at different periods with no uniform year of conduct by municipality;
2. there is high probability of undervaluation due to political intervention;
3. there are no professional qualifications or standards for local assessors; and
4. the valuation is used for tax purposes only which does not address issues on market distortion.

The zonal valuation system can benefit from the availability of the REPI because it can give signals of wrong values in the system. Based on the results, while the values can be understated the trends were proven to be consistent with available prices. The new zonal values which benefited from the recent improvements showed higher property values.

#### **4.5 Other data sources**

The Housing and Land Use Regulatory Board (HLURB) gathers land use plans of municipalities, which include information on plans for commercial centres, markets, schools, hospitals to be built in the area. These can also be used to provide more disaggregated information about land property characteristics. However these data still need to be processed to come up with a series on stock of land.

Other land information like Geographic Information System (GIS) data produced by the National Mapping and Resource Information Authority (NAMRIA) can also be used as reference, however, disaggregation of data may not give the required classification.

The Land Management Bureau (LMB) of the DENR takes charge of all government properties (land, buildings, and structures) including the rental of government buildings and maintains records of these. The DENR also monitors forest lands through the timber licensing agreements, which can be used to provide rental values for forest lands.

The Philippine Exports Zone Authority (PEZA) administers most industrial areas and keeps records of these properties. It determines and approves rentals in industrial estate.

#### **4.6 Data problems**

- Given the results of the preliminary assessment, data required for the compilation of the REPI can come from both survey and administrative-base data. However, all the available data, specifically the administrative-base data are unprocessed and need to be organised and cleaned. Some require further processing to make them useful for the REPI. But the potential of the administrative-base data is good if the compliance and implementation of these systems are strengthened, properly monitored, and improved. There is a need to revise/restructure some of the outdated forms used to make these administrative-base data more efficient and useful.
- Surveys, on the other hand, require certain improvements to include additional information to meet the requirements of the REPI.
- The surveys and administrative-base data can be improved to complement each other. The two datasets can be used to cross-check the information collected.
- The problem of representation of the results was not adequately tackled in this report because the experimental study estimates were done on an aggregate level.

### **5. Proposed real estate price index methodology**

While the development of an appropriate model for the REPI is still a work in progress, the following preliminary approach is proposed, which will continue to be improved as more data become available and as the NSCB Staff gain more experience on real estate price indexing. The proposed methodology benefited from the results of the exploratory study on various approaches, extensive data assessment and previous experiences on land valuation.

#### **5.1 General strategy**

- The work will be done in stages. For a start, two cities will be selected as pilot areas to test the applicability of the approach, which can be replicated later in other areas once the method has been approved for adoption.
- Maximise the use of available administrative and survey data for the compilation of the REPI. Processing of administrative data will be undertaken if necessary.
- Consult with experts on the methodology and have the results validated by public officials/local assessors and private groups to ensure institutionalisation of the model.

- Undertake high-level advocacy/coordination to assure full cooperation of concerned agencies. Relatedly, institutional support has to be established to facilitate work on REPI.
- NSCB will assume the task of compiling the REPI to avoid biases in the estimates and to ensure acceptability and sustainability of the index.
- Enhance capability of compilers and users of the REPI to address the inadequacies of existing property valuation systems.
- Link with ongoing efforts to improve the land administration system to facilitate work on the REPI.

## **5.2 Data sources**

Data will come from the following administrative and survey data:

- 2000 CPH and Census of Agriculture from NSO for stock of dwelling units and housing characteristics;
- BIR zonal values tables, records of the tax declarations, reports on capital gains (sale of assets);
- LRA records on actual sales/transfers/exchanges and mortgages of real estate properties;
- CPI and FIES for prices of rent and housing expenditures on house repairs and maintenance;
- Provincial/city/municipal assessors records and data on local properties;
- NSO building permits;
- DENR statistics on rent of economic/production forest;
- LMB for records on government properties and rent;
- Private records of banks, realtors and appraisers;
- HLURB licenses to sell and land use plans by municipalities;<sup>6</sup> and
- PEZA for data on industrial properties.

## **5.3 Methodology**

### **5.3.1 Assumptions**

- that the composition/structure (property mix) of stock of real properties remains constant over a certain period of time, say five years;
- that the unit values derived from the LRA/BIR actual sales/transfer/exchanges of properties reports are representative of the sub-category where they belong; and
- that the records of stock of properties with the local assessors offices are adequate for REPI purposes.

### **5.3.2 Estimation**

#### *a. Stock of real estate properties*

To estimate the stock of real estate properties, the following data will be collected, cleaned, and processed.

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<sup>6</sup> Licenses to sell can provide information on the appraised values of properties, while information from land use plans can provide data on weights to be used in aggregating the REPI.

- Residential properties - NSO's 2000 CPH, records of provincial/city/municipal assessors, LRA records.
- Industrial properties - PEZA, Bases Conversion Development Authority, Clark Development Corporation, Subic Bay Metropolitan Authority records.
- Commercial properties - HLURB, records of provincial/city/municipal assessors.
- Agricultural land - BIR, records of provincial/city/municipal assessors.
- Other purposes - BIR, records of provincial/city/municipal assessors, and LMB.

These records are more than adequate for the REPI, except the possible under-valuation of the properties registered, which can be validated with private records of banks, realtors, appraisers, etc.

For purposes of valuing the stock of properties, the zonal valuation will initially be used, but this will be updated for inflation based on CPI rent.<sup>7</sup>

*b. Prices*

- Two levels of real estate price indices will be constructed - (1) the sales prices index, and (2) the rental prices index. Both indices will be built based on the composition set in Part III of this report.
- Initially two approaches have been identified based on available data. Prices will be estimated for each sub-category identified in Table 1. If further breakdowns in composition are required, these will be incorporated in the estimation.
- For sub-categories where actual sales/transactions data from the LRA and local assessors records are available, prices will be derived directly by dividing the actual sales or rental prices by the number of units transacted/total area transacted.
- In cases where there are no transactions that occurred in certain areas, prices or trends in prices nearby/adjoining areas can be adopted/applied.
- Rental prices, on the other hand, will use actual rental prices from the CPI. For certain commercial buildings, benchmark rental prices can be established initially based on local government records. Succeeding annual rents will be estimated using trends of rental prices of similar government buildings, which are being managed by LMB. PEZA will provide rental prices of properties located in industrial zones. Rental prices of agricultural and forest lands can be obtained from the Department of Agriculture (DA) and DENR.
- Where current sales prices data are sometimes not available for certain areas, these can be estimated through the simple hedonic - based price method using variables, such as trends of CPI rental prices, derived rental prices of commercial/industrial properties or prices of construction materials plus prices of labour. These can be validated against available real estate prices of private assessors, realtors, and banking institutions.

*c. Index*

Price estimated for each sub-category will be aggregated using the Laspeyres index method with 2000 as base year.

For illustration, consider five asset types (*k*) categorised into asset type 1, 2, ..., 5 (agricultural, forest, residential, commercial, and industrial). Each category is broken down into subcategories (*j*) (eg temporary crops, permanent crops, livestock etc under category (1) agricultural; public plantation forest and private plantation forest under category (2) forest; and, so on). These subcategories consist of different types of assets (*i*) (eg palay, corn, etc under temporary crops; citrus, banana, coconut etc under permanent crops etc). These subtypes of assets (*i*) have different prices in different locations

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<sup>7</sup> Initial exercises showed a high correlation between trends of zonal values and CPI rent.

and for different types of ownership, and size (eg palay 1, 2, 3, ...,  $n$ ; corn 1, 2, 3, ...,  $n$  etc). Thus, the REPI is generally constructed using four levels of asset categorisation.

For a four (4) - level of asset categorisation, the following steps are applied:

### Step 1

Compute price relatives (PR) for each of the asset types at the most detailed level. For asset types  $i = 1, 2, \dots, n$  of a subgroup, this is given by:

$$PR_{\text{asset type } i} = (\text{current price}_{\text{asset type } i} / 2000 \text{ price}_{\text{asset type } i}) \times 100$$

Take for example, assets under type A of the Residential sub-category. Price relatives of asset types 1 and 2 are computed as:

$$PR_{\text{asset type 1}} = (\text{current price}_{\text{asset type 1}} / 2000 \text{ price}_{\text{asset type 1}}) \times 100$$

$$PR_{\text{asset type 2}} = (\text{current price}_{\text{asset type 2}} / 2000 \text{ price}_{\text{asset type 2}}) \times 100$$

### Step 2

The price index for the third level of asset category is the weighted average of the price relatives belonging to that group, that is, for asset types  $i = 1, 2, \dots, n$  under the asset sub-category, the index given by:

$$\text{Index}_{\text{sub-category } i} = \sum (PR_{\text{asset type } i} \times W_{\text{asset type } i}) / \sum W \text{ all asset types under sub - category } i.$$

The weight ( $W$ ) used is the base year values of the asset types and is computed as the product of the base year price and its corresponding quantity in the base year such that,

$$W_{\text{asset type } i} = 2000 \text{ Price}_{\text{asset type } i} \times 2000 \text{ Quantity}_{\text{asset type } i}$$

Continuing the example in Step 1, for  $n$  assets under type A of the Residential sub-category we have,

$$\begin{aligned} \text{Index}_{\text{Residential type A}} &= \sum (PR_{\text{asset type } i} \times W_{\text{asset type } i}) / \sum W \text{ all asset types under subcategory A} \\ &= [(PR_{\text{asset type 1}} \times W_{\text{asset type 1}}) + (PR_{\text{asset type 2}} \times W_{\text{asset type 2}}) \\ &\quad + \dots + (PR_{\text{asset type } n} \times W_{\text{asset type } n})] / W_{\text{asset type 1}} + W_{\text{asset type 2}} + \dots + W_{\text{asset type } n} \end{aligned}$$

### Step 3

The aggregate index for the second level category is the weighted average of the indices for the different asset types in Step 2. The method is done as in Step 2 with the weights as the sum of the weights belonging to the second level category. For asset types under the second level category  $j$ ,  $j = 1, 2, \dots, m$ , the index is given by:

$$\text{Index}_{\text{sub-category } j} = \sum (\text{Index}_{\text{type } j} \times W_{\text{type } j}) / \sum W \text{ all asset types under sub - category } j$$

To get the aggregate index for Residential Assets,

$$\begin{aligned} \text{Index}_{\text{Residential}} &= \sum (\text{Index}_{\text{asset type } j} \times W_{\text{type } j}) / \sum W \text{ all asset types} \\ &= [( \text{Index}_{\text{type A}} \times W_{\text{type A}} ) + ( \text{Index}_{\text{type B}} \times W_{\text{type B}} ) + \dots + ( \text{Index}_{\text{type } m} \times W_{\text{type } m} )] / \\ &\quad [W_{\text{type A}} + W_{\text{type B}} + \dots + W_{\text{type } m}] \end{aligned}$$

### Step 4

The aggregate index for real estate is calculated as in Step 3 using weights corresponding to the different second level asset categories. For asset types without sub-categories, the index is automatically the index resulting in Steps 1 and 2. Thus the Real Estate Index for  $k = 1, 2, \dots, l$  asset categories is given by:

$$\text{Index}_{\text{Real Estate}} = \frac{\sum (\text{Index}_k \times W_k)}{\sum W_k}$$

The Real Estate Index with base year 2000 is given by:

$$\begin{aligned} \text{Index}_{\text{Real Estate}} = & [(\text{Index}_{\text{Agricultural}} \times \text{Weight}_{\text{Agricultural}}) + (\text{Index}_{\text{Forest}} \times \text{Weight}_{\text{Forest}}) + \\ & (\text{Index}_{\text{Residential}} \times \text{Weight}_{\text{Residential}}) + (\text{Index}_{\text{Commercial}} \times \text{Weight}_{\text{Commercial}}) + \\ & (\text{Index}_{\text{Industrial}} \times \text{Weight}_{\text{Industrial}}) + (\text{Index}_{\text{Others}} \times \text{Weight}_{\text{Others}})] / \\ & [(W_{\text{Agricultural}} + W_{\text{Forest}} + W_{\text{Residential}} + W_{\text{Commercial}} + W_{\text{Industrial}} + W_{\text{Others}})] \end{aligned}$$

## 6. Future directions

Draw up a project proposal and work program for the development and institutionalisation of the REPI model in the Philippines that will include the following activities:

### Preparatory activities

- Identify the pilot cities for the estimation of REPI.
- Set up the institutional framework for the REPI. This will include the creation of an inter-agency committee/technical working groups to facilitate the work on the REPI.
- Advocate the uses of the REPI for taxation, legislation, policy formulation, and land and property management.

### Data preparation and improvement

- Collect, clean, process, and organise data for the index.
- Address problems on data for both the administrative base and survey data. This will involve changing/improving some of the forms and compliance mechanisms.

### Estimation

- Develop the composition (property basket) for the REPI.
- Develop and improve the methodology for the REPI.
- Present the initial results and methodology for the REPI to the NSCB Executive Board for approval and endorsement to the Department of Finance and the National Economic Development Authority (NEDA). The same should likewise be presented to the different stakeholders for comments and feedbacks.

### Computerisation

- Computerise compilation and dissemination of REPI.

### Documentation

- Document the REPI model for replication.
- Develop an institutionalisation plan for REPI.

### Capability building

- Attend training on all aspects of land and property valuation to equip the compilers with the necessary skills needed to do property pricing.

# The Absa<sup>1</sup> residential property market database for South Africa - key data trends and implications

Christo Luüs<sup>2</sup>

## 1. Introduction

For most working people in South Africa (and probably in most developed countries worldwide), their house and retirement provision account for the bulk of the wealth they have accumulated throughout their working lives. The considerable extent of homeownership among South Africa's working population means that changes in residential property prices may be of particular interest and concern because of the wealth effects that could emanate from fluctuations in property values.

The aim of this paper is to give an overview of the compilation and use of the most comprehensive database on the South African residential property market. This overview is preceded by some background information on the demography, income, and other developmental issues pertaining to the country's provinces (Section 2). Key housing stock and other residential property market indicators will also be given, together with a brief overview of the operation of the mortgage finance market in South Africa (Section 3). Thereafter, a short historical overview of the development of the Absa residential property market (ARPM) database will be provided, as well as the scope of indicators being covered by the information (Section 4). Some analysis pertaining to house and land prices and size trends over time follows (Section 5). Then an attempt is made to reconcile residential property market indicators with other key macroeconomic trends, and a look is taken at the house price levels in South Africa relative to market conditions in a selection of other countries (Section 6). The paper concludes with a synopsis of some key structural issues impacting on the property market in South Africa (Section 7).

## 2. Demographic, developmental, housing stock and other key characteristics for South Africa

### 2.1 General overview: South African provinces

The Republic of South Africa covers an area of 1.2 million km<sup>2</sup> - nearly twice the size of the state of Texas in the United States. Since 1994, the country comprises nine provinces, four of which have coastlines. South Africa has eleven official languages. The home language of 55% of the population is isiZulu, isiXhosa, or Afrikaans. The *lingua franca* in most urban areas is English.

There are significant disparities in terms of human development in South Africa; not only between provinces, but also between population groups. The two smallest provinces, Gauteng and KwaZulu-Natal, account for around 40% of the country's population. Gauteng and the Western Cape generate around 56% of South African GDP. Some 55% of the population live in urban areas. Gauteng is the most urbanised province, with 96% of its people living in cities. At the other extreme, only 13% of the population of the Limpopo Province live in urban areas.

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<sup>1</sup> Absa Group Limited: One of the "big four" banking and financial services groups operating in South Africa. In March 2003, the Group reported total assets of R269bn (\$50bn at a PPP exchange rate of ZAR5,40) and earnings of R3bn (\$0,6bn). It had 33,000 employees; a network of 3,300 ATMs; and some 680 branches throughout South Africa. Foreign branches or subsidiaries operate from countries in Africa, Asia and Europe.

<sup>2</sup> Chief Economist: Absa Group Limited. Paper presented at the IMF/BIS *Conference on Real Estate Indicators and Financial Stability* held from 27 to 28 October 2003 in Washington DC, USA. The views expressed in this article are those of the author and do not necessarily reflect those of Absa Group Limited.

## 2.2 Key indicators

Table 1 contains some key indicators pertaining to the demography, income and production of South Africa's provinces in 2002.

Table 1  
Selected demographic and other indicators for South Africa's provinces

Province	Population (million)	Population growth (% pa)	Urbanised (%)	Annual household income (\$)	GGP (\$ bn)	GGP (% of total)	GGP per capita (\$)
KwaZulu-Natal	9.6	1.4	46.1	11,812	25.3	13.0	2,634
Gauteng	8.7	1.7	95.8	20,613	71.4	36.8	8,197
Eastern Cape	6.9	1.1	36.5	8,473	13.2	6.8	1,919
Limpopo	5.5	1.4	13.1	7,965	8.7	4.5	1,562
Western Cape	4.5	1.4	89.0	18,563	33.7	17.4	7,543
North West	3.8	1.3	38.2	8,885	12.9	6.7	3,418
Mpumalanga	3.3	1.7	41.7	10,002	15.6	8.1	4,811
Free State	2.9	1.0	71.7	8,404	9.5	4.9	3,242
Northern Cape	0.9	1.0	71.8	12,228	3.6	1.8	3,889
<i>South Africa</i>	<i>46.1</i>	<i>1.4</i>	<i>55.4</i>	<i>13,011</i>	<i>194.0</i>	<i>100.0</i>	<i>4,207</i>

GGP = gross geographic product. All figures are 2002 estimates US\$ amounts were calculated by applying a PPP exchange rate of R5.15 (calculation according to UBS AG, Zurich).

Sources: Stats SA; Global Insight.

South Africa's high unemployment rate, estimated at around 30% of the economically active population, clearly implies that income will be skewed, and that a significant portion of households are not able to afford even meagre housing facilities.

In fact, more than 40% of dwellings can be classified as "informal housing", whereas a further significant percentage of the "formal" housing market would presumably also be of rather poor quality.

The residential property market in South Africa comprises approximately seven million formal dwellings. There is no firm data, but the value of the residential property market in 2002 was estimated at roughly R750bn<sup>3</sup> (\$146bn at a PPP exchange rate of ZAR5.15 to the USD).

The government has succeeded in building nearly 1.5 million low-cost housing units during the period 1994 to 2003. This has provided some support to the construction sector, which suffered from surplus capacity during the late 1980s and early 1990s.

The higher end of the market (houses  $\geq 80\text{m}^2$ ) has also experienced a significant increase in activity during the past two to three years, with the number of newly built houses having increased by 24% in 2002 compared with 2001, and the number of townhouse and flat units (apartments) by 47% (see Table 2 and the table in Appendix A).

<sup>3</sup> It is estimated that around 1.5 million homes can be classified in terms of the ARPM classification, with an average price of R358,721 in 2003. Another three million properties could probably be classified under "affordable" housing, with an average price of R71,811 in 2002 (see also Section 6.1).



Table 2  
Housing in South Africa

	1995		1999	
	Number	% of total	Number	% of total
Urban housing	5,089,000	56.0	6,503,000	60.4
Formal <sup>1</sup>	3,626,000	39.9	3,824,000	35.5
Informal <sup>2</sup>	443,000	4.9	1,074,000	10.0
Traditional <sup>3</sup>	39,000	0.4	62,000	0.6
Other <sup>4</sup>	981,000	10.8	1,543,000	14.3
Rural housing	3,991,000	44.0	4,268,000	39.6
Formal	1,890,000	20.8	2,352,000	21.8
Informal	233,000	2.6	255,000	2.4
Traditional	1,302,000	14.3	1,111,000	10.3
Other	566,000	6.2	550,000	5.1
Total housing	9,080,000	100.0	10,771,000	100.0
Formal	5,516,000	60.7	6,176,000	57.3
Informal	676,000	7.4	1,329,000	12.3
Traditional	1,341,000	14.8	1,173,000	10.9
Other	1,547,000	17.0	2,093,000	19.4

<sup>1</sup> A house, flat, townhouse or unit in retirement village. <sup>2</sup> Shacks. <sup>3</sup> Ethnic huts. <sup>4</sup> Caravans, tents, etc.

Source: South African Institute of Race Relations (SAIRR).

### 3. The operation of the mortgage finance market in South Africa

#### 3.1 Home ownership in South Africa

In South Africa, property ownership rates high in the national consciousness. Many of the early battles in the country, involving the Dutch and British settlers, the Voortrekkers and the various tribes with whom they came into contact, were over land ownership. Through the 1900s, one of the biggest debates in national politics was about land tenure.

Numerous pieces of legislation regulated the ownership of land, particularly on a racial basis. One of the major tenets of apartheid was the segregation and separation of land ownership. The so-called Group Areas Act allocated separate residential areas in urban areas to the black, coloured, Indian, and white communities.

Today, home ownership for all is a major political objective and receives a lot of attention. The government has made the provision of housing a priority in its social delivery programmes and assists low-income, first-time homebuyers with a subsidy ranging between R7 800 and R23,100 (\$1,500 and \$4,400 at a PPP exchange rate).

#### 3.2 The development of the mortgage finance market in South Africa until the mid-1980s

For extensive periods during the nineteenth and twentieth centuries, home ownership in South Africa was financed mainly through building societies.

Building societies have their origins in eighteenth century Britain. The push effects of the Agricultural Revolution and the pull effects of the Industrial Revolution encouraged a mass migration of the British population to the cities and towns. This resulted in a chronic housing shortage, which the middle class traders and craftsmen were determined to overcome through the establishment of "friendly societies".

These were non-profit-making institutions that promoted thrift among their members for the purpose of procuring houses.

The British Settlers brought this concept to southern Africa and the first building societies were established in Port Elizabeth and Durban in 1855 and 1857 respectively. The first law in Southern Africa that directly controlled these institutions, the Regulation of Building Societies Act, was passed in Natal in 1858.

The early development of the movement was slow and confined to the Eastern Cape and Natal. There was neither a desire nor a need for building societies in the interior of the subcontinent until the discovery of diamonds in Kimberley (Northern Cape) in 1870 and gold on the Witwatersrand (part of the current Gauteng province) in 1886 - events that spawned urban concentrations of the population.

Whereas the very first societies mostly terminated once their objectives were reached, permanent building societies soon became established. Some of the larger building societies even survived until the late 1980s, when changes to legislation and merger activity started to affect these institutions.

One building society, the United Building Society, established in 1889, became a financial institution of significant size. For decades, it was the biggest building society in South Africa. It built up a strong capital base over the years and, in the early 1990s, was used as the merger vehicle to create South Africa's largest banking group at the time, Amalgamated Banks of South Africa Limited (Absa). One other building society and two banks were involved in this merger.

### **3.3 The role of banks since the mid-1980s**

Legislation pertaining to building societies was frequently changed and augmented over the years, with major acts passed in 1934 and 1965. Nonetheless, certain privileges afforded to and restrictions imposed on the building societies remained. For instance, special tax treatment meant that building societies could offer mortgage loans below market rates, which placed the commercial banks at a competitive disadvantage in this regard.

As part of a comprehensive inquiry into the monetary system and monetary policy in South Africa during 1982 to 1985 (the so-called De Kock Commission), it was recommended that the playing field between banks and building societies be levelled.

The restrictions placed on the way in which building societies could capitalise themselves were especially crucial. These restrictions meant that the societies could only exist as "mutual" institutions.

Changes to the legislation caused these restrictions to be removed, and most of the larger building societies opted for a listing on the Johannesburg Stock Exchange - a process which meant that they lost their "mutual society" status.

The listing process started in 1986 and the United Building Society became the first publicly listed building society. Members' accounts (which were held as so-called subscription shares) were converted into ordinary listed shares.

As the boundaries between building societies and banks started to fade and more of the building societies converted into banks or merged with existing banks, mortgage financing became an important component of banks' balance sheets. By the mid-1990s, there were no building societies in existence, although 11 had been in operation in 1984.

Currently, banks are by far the most important providers of mortgage finance for housing loans in South Africa. By June 2003, mortgage loans comprised 32% of the total loans and advances on the banks' balance sheets, and amounted to R289bn (\$52bn).

## 4. The Absa residential property market database

Currently, there are two well-known sources of systematic residential property market data in South Africa. The deeds office - where all ownership and changes in ownership of fixed property need to be registered<sup>4</sup>; and the Absa residential property market (ARPM) database, a brief discussion of which follows.

### 4.1 A short history of the ARPM database

As mentioned before, the United Building Society (UBS), which existed for more than a hundred years before merging with three other financial institutions, became a significant player in the mortgage finance market in South Africa, attaining a market share of well over a third of all residential property mortgage loans in the 1980s. With the formation of the Absa Group, this institution retained its leading role in the mortgage finance market, although inroads have been made by other banks (see Table 3).

Table 3

#### Market shares for loans and advances by South Africa's major banks<sup>1</sup>

	Absa	Nedcor	Standard Bank	FirstRand	Other	Total	Total (R mln)
Mortgage advances	31	24	21	16	8	32	288,583
Overdrafts and loans	17	7	37	30 <sup>2</sup>	9	28	251,386
Credit Cards	25	22	25	22	6	2	15,235
Instalment sales and leases	24	13	22	29	12	12	111,622
Other loans and advances	21	27	18	16	18	26	228,637
Total	24	18	25	22	11	100	
Total (R million)	211,989	164,889	223,531	193,524	101,530		895,463

<sup>1</sup> With the exception of total figures in rand, in per cent of total. As at end March, 2003. <sup>2</sup> No figure available - own estimate.

Source: South African Reserve Bank (DI900 tables).

The UBS house price database came into being at around 1981. At the time, it was decided to destroy old records of home loan applications that were kept at branches. Fresh records were sampled at all major branches throughout the country and captured onto a mainframe database. Between 1981 and 1984, a bigger sample of records was obtained from the branches and added to the database. From 1985, all loan application records were captured electronically and added to the database. Since the late 1980s, the data have been captured directly onto the mainframe system.

### 4.2 The ARPM database: Capturing, processing and variables

Currently, data are being captured directly by property valuers onto the mainframe mortgage loan database. This is done on site using a mobile device called a Q10TEC. From the mortgage loan

<sup>4</sup> Data from the deeds office suffer from two important deficiencies: (i) Data only become available after a lag of some six months; and (ii) no area size variables for properties are available, which may make comparisons between periods difficult, since it is not possible to ascertain the extent of a shifting of weights from smaller to larger properties or *vice versa*.

database, data warehouse tables are populated via an Oracle staging process. This process is performed weekly and monthly. (See Appendix B for a flowchart of the process).

By the end of August 2003, the ARPM database consisted of nearly 700,000 individual properties. Data are available in monthly time series format for both new (building loans) and existing properties. These categories are subdivided into small (80m<sup>2</sup> to 140m<sup>2</sup>), medium (141m<sup>2</sup> to 220m<sup>2</sup>), and large (221m<sup>2</sup> to 400m<sup>2</sup>) properties. For each of these categories, the following variables can be obtained on a branch/regional basis:

- Building area
- Building value
- Land area
- Land value
- Contract price (for new properties)
- Purchase price
- Value of improvements (such as fencing, patios, swimming pools)
- Sample size

In addition, data are also available for luxury homes (properties with a value in excess of R1,500,000 in constant 2002 prices) and for affordable houses (between 40m<sup>2</sup> and 80m<sup>2</sup> in size and R100,000 in value). In all, there are more than 2,000 time series of the aforementioned variables.

From the data warehouse tables, time series are generated by SAS (*Statistical Analysis System*) programs for the variables indicated above. In an attempt to ensure that data are as “clean” as possible, certain filters are applied to rid the data of outliers. Often such outliers are caused by the incorrect capturing of values. The following are the most important filters that will determine whether or not a record is included:

- Building area < 95% of land area
- 0m<sup>2</sup> ≤ land area ≤ 2,000m<sup>2</sup>
- Purchase price ≤ R1,500,000 (in 2002 rand terms; this amount is adjusted backward and forward in time by the CPI)
- 40m<sup>2</sup> ≤ building area ≤ 400m<sup>2</sup>

To avoid problems arising from the data samples for certain time series being too thin, data in the public domain are only available on a regional basis and not on a branch basis. All time series are also smoothed by an X11 seasonal adjustment process in SAS. The SAS program writes all time series data into delimited text files that can be imported into spreadsheets.

## **5. Historical trends of key residential property market indicators in South Africa**

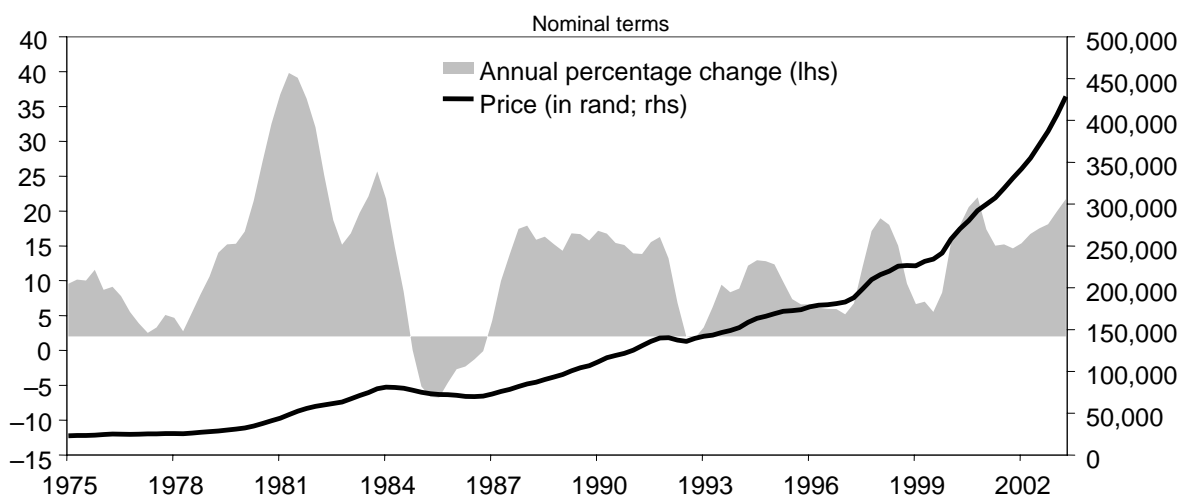
### **5.1 Nominal and real price trends**

South African house prices have increased from an average level of R23,200 in 1975 to R358,700 in 2002, representing an average annual increase of 11% (Graph 1). However, this must be seen against the background of an average annual inflation rate of 11,5% over this period. Indeed, an analysis of real house prices (Graph 2), reveals some interesting aspects of the economic and socio-political conditions that prevailed in South Africa between the late 1970s and the late 1990s.

The 1970s brought wars in the Middle East, which sent oil prices soaring and presented the world with inflationary problems. In South Africa, the 1976 Soweto student uprising had a material impact on confidence and adversely affected economic performance. From the third quarter of 1976 to the fourth quarter of 1979, house prices declined by a total of 22.4% in real terms.

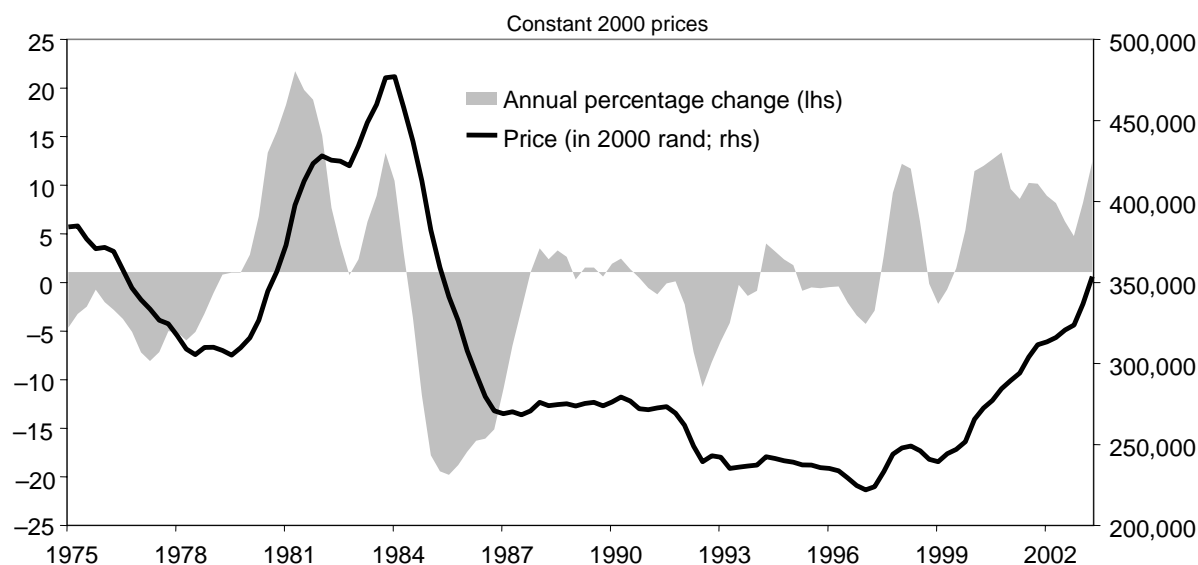
The early 1980s saw a massive loss of confidence in the dollar and concerns about spiralling inflation in most of the developed world. Consequently the gold price boomed, reaching a high of \$676 on average during September 1981, which had huge positive spin-off effects for the South African economy. At that stage, income from gold exports constituted nearly 50% of total South African export revenue. Rising incomes and a reduction in tax rates considerably boosted households' net wealth position. Improved liquidity conditions even facilitated a reduction in mortgage lending rates.

Graph 1  
Average house prices in South Africa



However, the good times were about to end when the gold price pulled back and interest rates started to increase. The property market held up quite well during 1981 through to 1983, peaking in the first quarter of 1984. But severe pressure on the balance of payments, which sent mortgage rates soaring, together with increasing political pressure from both domestic and foreign sources, caused the property market bubble to burst. During the period from mid-1984 until the end of 1987, house prices declined by no less than 42% in real terms.

Graph 2  
Average house prices in South Africa



From the end of 1986 through to the end of 1991, house prices simply kept pace with inflation. In 1992/93, confidence suffered a setback owing to uncertainty about the political future of the country. With the advent of the new democratic order in April 1994, confidence was restored and house prices recovered somewhat. However, an ongoing exodus of skilled managers and professionals during much of the 1990s served to keep the property market under pressure.

Only in 1998 did the market start to recover on the back of lower inflation and interest rates, higher economic growth, and a much improved fiscal situation. Unfortunately, contagion effects from the Asian crisis caused a massive fall in the value of the rand, which once again caused interest rates to soar by some seven percentage points during 1998.

By late 1999, the situation had more or less stabilised, and the house price boom resumed. By mid-2003, house prices had nearly doubled in nominal terms from their early 1998 values.

## 5.2 Provincial price trends

Considering the disparities in development, income and urbanisation between South Africa's provinces, it is not surprising to also find significant differences in average house prices between the regions.

It is to be expected that house prices in the poorer provinces, such as Limpopo, Mpumalanga, KwaZulu-Natal and the Free State, may be below the national average. The dwindling importance of gold mining activity has affected employment and general economic activity in provinces such as the Free State and NorthWest, although the escalation of international platinum prices has possibly more than offset the low gold-price effect in the latter province.

A province such as the Western Cape has benefited from tourism as well as from foreign buyer interest owing to the weaker rand.

Table 4  
House prices in South Africa

	Small (80m <sup>2</sup> to 140m <sup>2</sup> )		Medium (140m <sup>2</sup> to 220m <sup>2</sup> )		Large (220m <sup>2</sup> to 400m <sup>2</sup> )		All (80m <sup>2</sup> to 400m <sup>2</sup> )	
	2002 ZAR	Avg annual %ch: '92-'02	2002 ZAR	Avg annual %ch: '92-'02	2002 ZAR	Avg annual %ch: '92-'02	2002 ZAR	Avg annual %ch: '92-'02
Eastern Cape	188,700	7.8	261,418	8.4	404,570	8.9	281,237	8.9
Free State	169,805	7.3	233,117	8.3	346,138	9.5	266,224	9.5
Gauteng	249,029	8.4	345,075	9.3	546,112	9.7	397,304	10.8
KwaZulu-Natal	178,165	5.1	274,083	6.4	453,218	7.6	290,919	7.5
Mpumalanga	193,686	9.0	243,965	8.9	368,195	9.5	267,064	9.2
Northern Cape	170,487	10.6	210,877	8.6	346,143	9.9	236,656	9.8
Limpopo	184,956	8.8	241,331	7.4	358,669	8.9	259,494	8.9
North West	232,826	10.5	286,096	10.5	379,145	10.7	308,160	10.6
Western Cape	279,199	10.0	396,456	10.0	610,799	10.2	390,560	11.1
South Africa	247,468	8.9	329,623	9.1	509,092	9.6	358,904	10.2

In more localised developments, illegal cross-border inflows of foreign citizens, especially from Zimbabwe and Mozambique, have resulted in an escalation of squatting in and around cities and

caused downward pressure on formal property prices in some areas, notably certain suburbs of cities in Gauteng, Limpopo, Mpumalanga and KwaZulu-Natal.

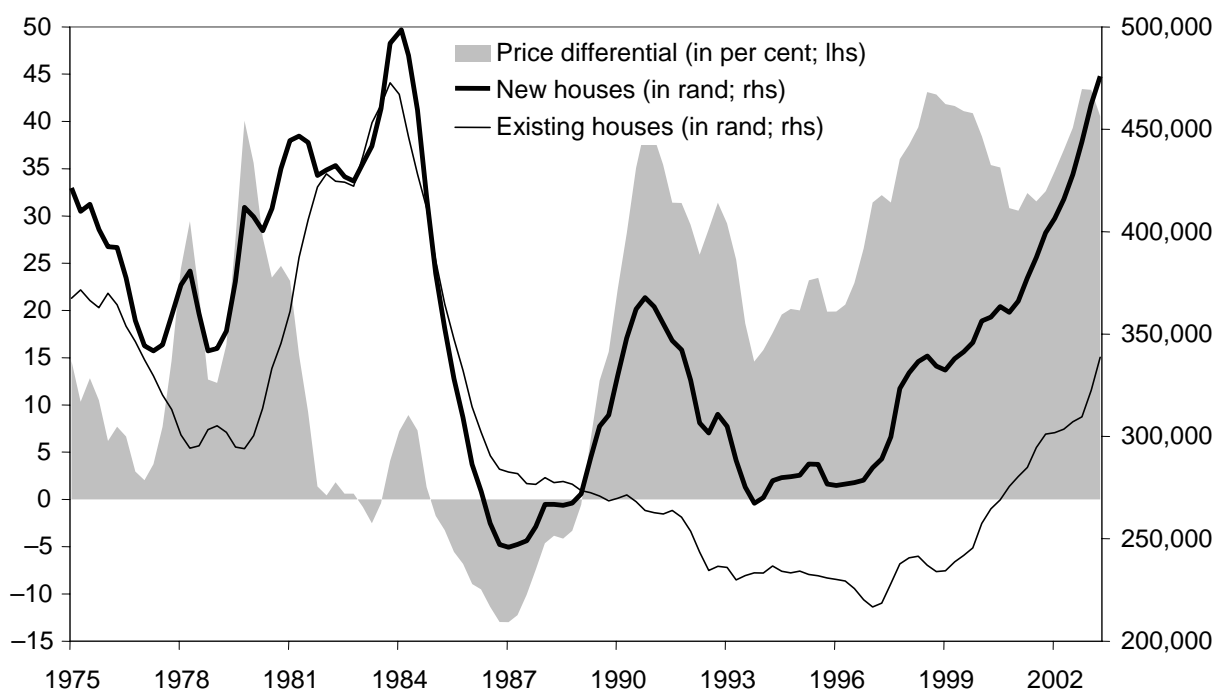
The rising numbers of informal settlements have also been aided by pressures on the agricultural sector and the consequent migration of former farmworkers to urban areas. Table 4 gives an overview of the movement of house prices in recent years in South Africa's provinces.

### 5.3 Building costs and land values

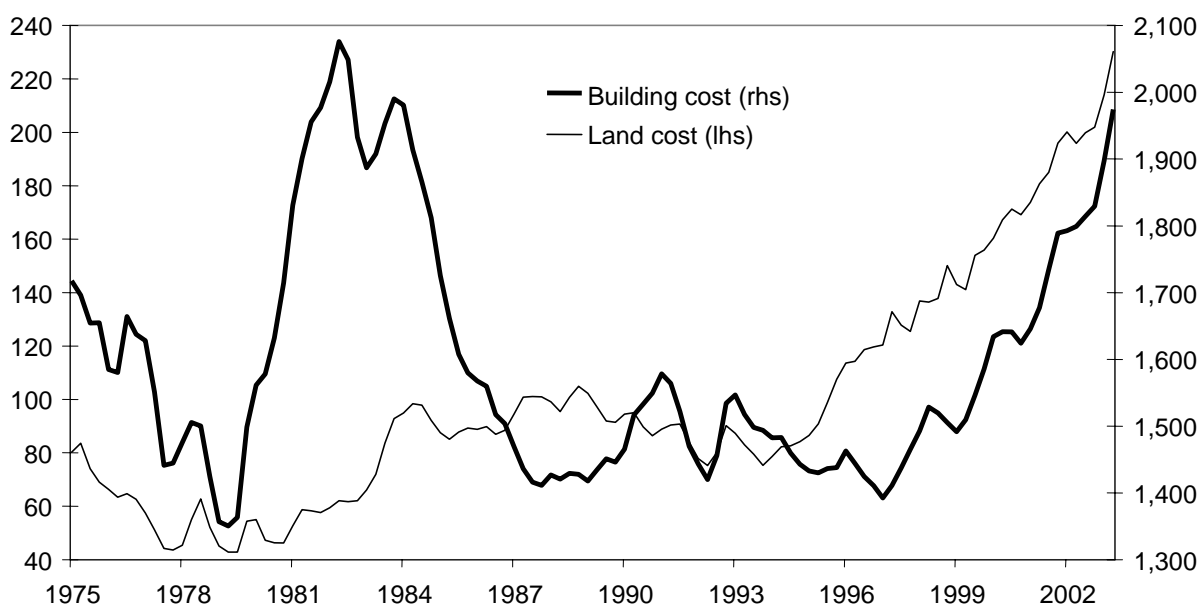
Graph 3 reflects the real price difference between new and existing houses of similar size. During the house price bubble of the early 1980s, new and existing houses cost roughly the same, but lacklustre market conditions and persistently high inflation rates during the late 1980s and early 1990s caused the price differential to become significantly positive. More buoyant market conditions have done little to reduce this differential, which has averaged between 30% and nearly 50% since 1996.

Graph 4, which depicts the building costs as well as the land costs associated with building a new house, shows that a major reason for the persistent price differential is to be found in the dramatic escalation in real land price values since 1994. The rise in land values in turn reflects the expansion of urban areas in South Africa. The development of security villages in suburban areas owing to rampant crime has contributed to the move to smaller but more expensive building plots.

Graph 3  
New vs existing house prices in South Africa



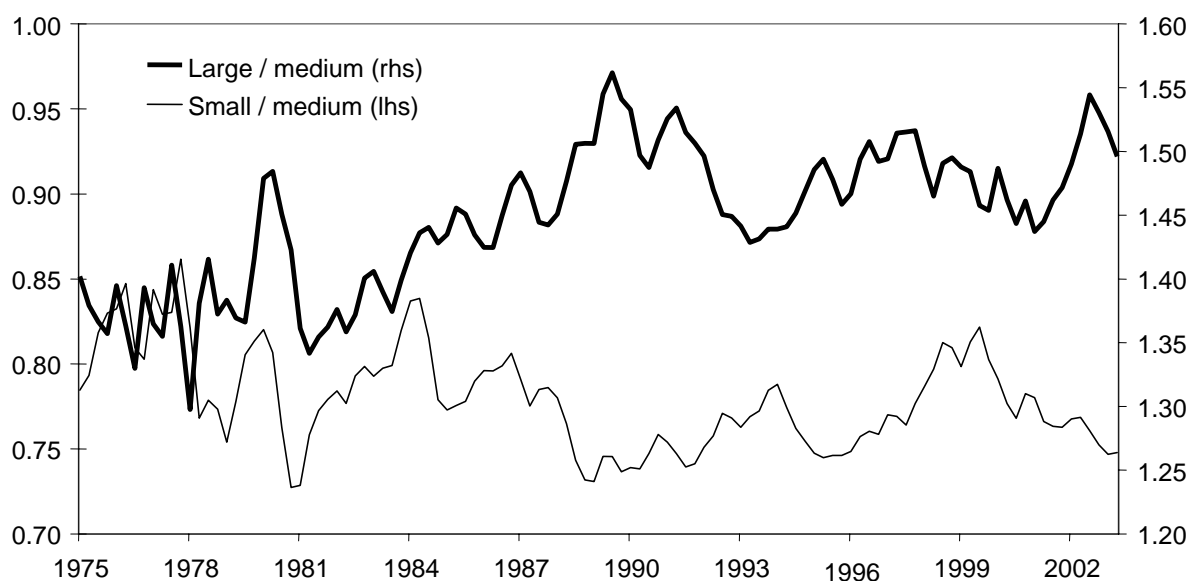
Graph 4  
**Building cost and land value  
of new houses**



#### 5.4. Size trends

Graph 5 shows the rather interesting relationship between large and small to medium-sized house prices. A comparison of this graph with Graph 1 reveals that, during periods in which nominal house prices increased sharply, the prices of houses in the large category increased more than those of medium-sized homes. The converse tended to be the case with the ratio between the small and medium-sized house prices. “Downscaling” seems to have been prevalent in periods when the property market was under pressure.

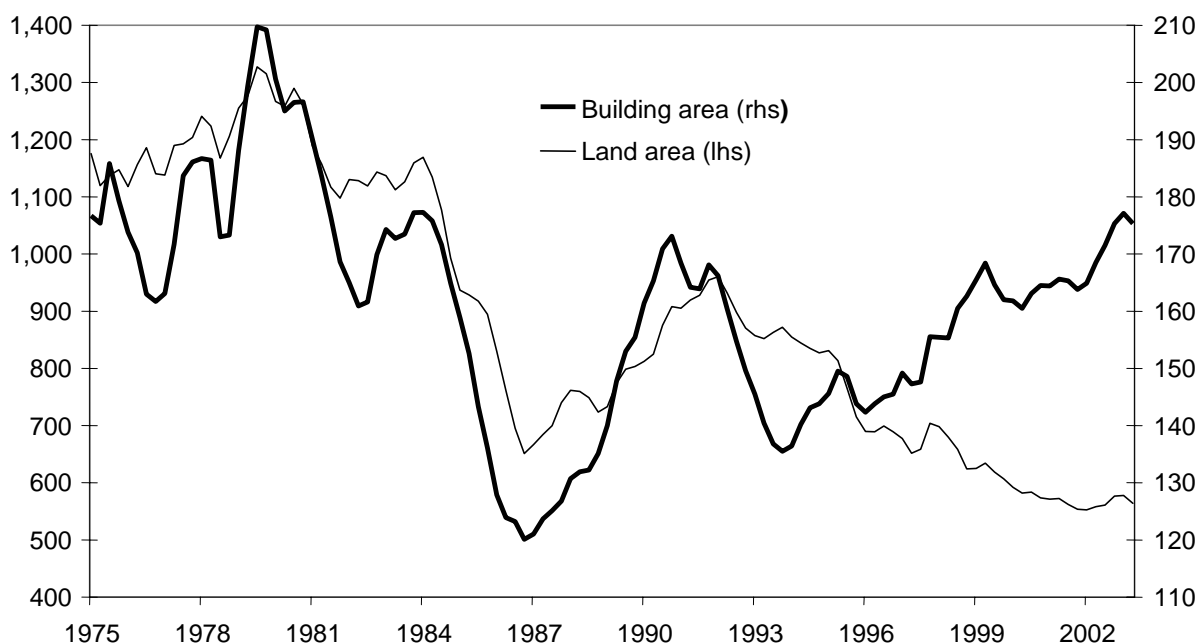
Graph 5  
**Average house prices in South Africa**  
Large and small vs medium houses





Graph 6 depicts the trends with regard to house sizes and land areas on which new houses are built. Considering the sharp escalation in land values depicted in Graph 4, it is not surprising to find that the plot sizes on which new houses are built have been shrinking over time. The average plot size in 1979 was more than 1,200m<sup>2</sup>. This declined sharply after the bursting of the property market bubble. It was only some 640m<sup>2</sup> in 1987. Average plot sizes increased again to nearly 930m<sup>2</sup> in 1991, but have since been decreasing again. They averaged only around 550m<sup>2</sup> during 2002.

Graph 6  
**Size trends of new houses in South Africa**  
 In square metres



During most of the 1970s, 1980s and first half of the 1990s, building areas followed land areas quite closely. However, they seem to have been trending in the opposite direction since the mid-1990s.

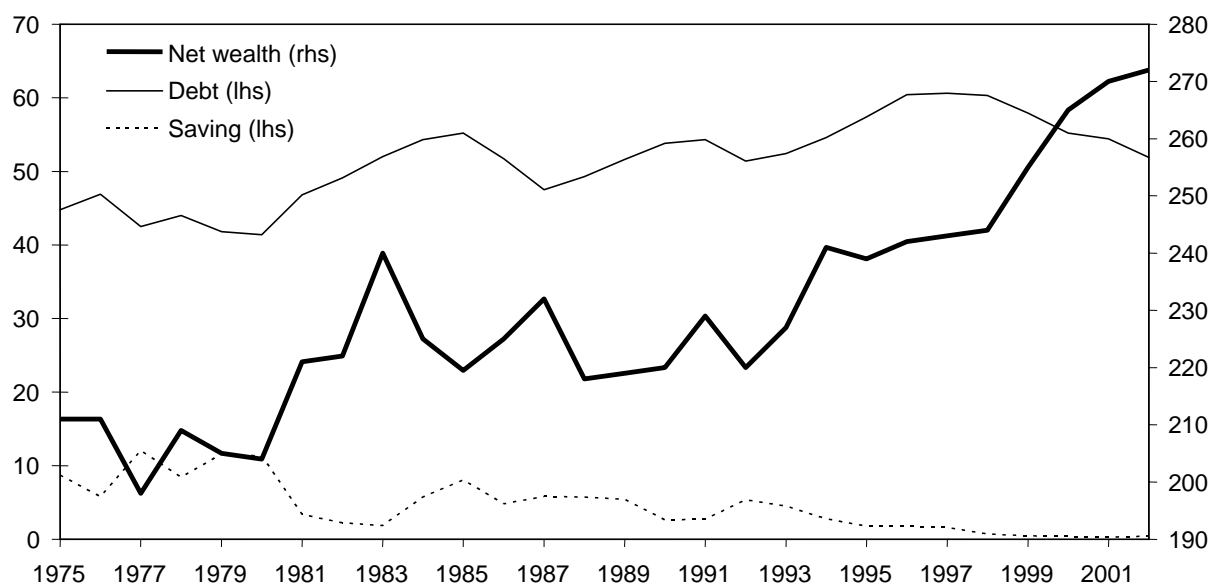
## 6. Some uses of house price time series data in South Africa

Apart from the obvious reason for interest in house price data, namely as a comparative measure when buying or selling a house, the public, analysts and regulators may also have other uses for time series data on residential property. These could include approximations of national wealth levels; analysing the investment potential of residential properties; evaluating the likelihood of property price bubbles; using property prices as indicators (leading or otherwise) of general economic activity; as an input in the compilation cost of living tables; and as an “early warning” developmental indicator, for instance to point out relative strains that could emerge in regional infrastructural development requirements. The first three of these aspects will be briefly highlighted.

### 6.1 Analysing household wealth, debt, income and savings levels

South African households have been notorious for their inability to save. According to Reserve Bank figures, household saving as a ratio of household disposable income declined to only 0.2% in 2001, rising marginally to 0.4% in 2002. These figures compare unfavourably with savings ratios of above 10% recorded in the late 1970s (see Graph 7).

Graph 7  
Household debt, saving and net wealth



Source: South African Reserve Bank.

Fortunately, increases in net wealth levels (which may be somewhat underestimated)<sup>5</sup> and a slight decrease in household indebtedness since the late 1990s, have ameliorated some of the negative consequences for households' balance sheets, which might otherwise have accompanied this deterioration in their savings levels.

## 6.2 Analysing the merits of residential property for investment purposes

Property, cash, bonds and equity can be considered the basic pillars of any well-diversified portfolio. However, a problem with direct property investment is that different properties are seldom comparable in terms of value, whereas the location and developments in the immediate vicinity of a specific property can influence its value significantly.

Nevertheless, many investors feel more comfortable with owning a tangible fixed asset, rather than "paper assets" and the gearing that may be achieved with a property investment can also be attractive to some investors.

Apart from the prospective returns, there are clearly a number of factors that ought to be considered when any investment, particularly directly in real estate, is made:

- Risk: The volatility of the return or underlying price can easily be measured for financial assets, but there are other unquantifiable risks involved in direct property investments, such as the risk of not finding suitable tenants.

<sup>5</sup> The South African Reserve Bank does not publish regular data on household wealth, presumably because figures are regarded as quite "soft". However, from time to time, mention is made of household net wealth figures. This occurred in December 2002, when Graph 7 appeared in an article (Household, debt, wealth and saving) in the SARB Quarterly Bulletin. From the net wealth figures appearing in this graph, gross household wealth can be calculated by adding debt and net wealth together (which came to an estimated R2,216bn at the end of 2002). The gross wealth will, in turn, consist of financial assets as well as tangible assets, which would also include residential property. To arrive at a very rough estimate of financial assets, the following amounts were added together (all figures from the SARB Quarterly Bulletin): individuals' deposits at banks (R175bn); unit trusts' assets at book value (R152bn); accumulated funds in pension and provident funds (R559bn); and unmatured policies relating to pension and other business at long-term insurers (R653bn). The sum of these financial assets came to R1,538bn, leaving around R680bn for tangible assets, such as vehicles, residential property and farmland.

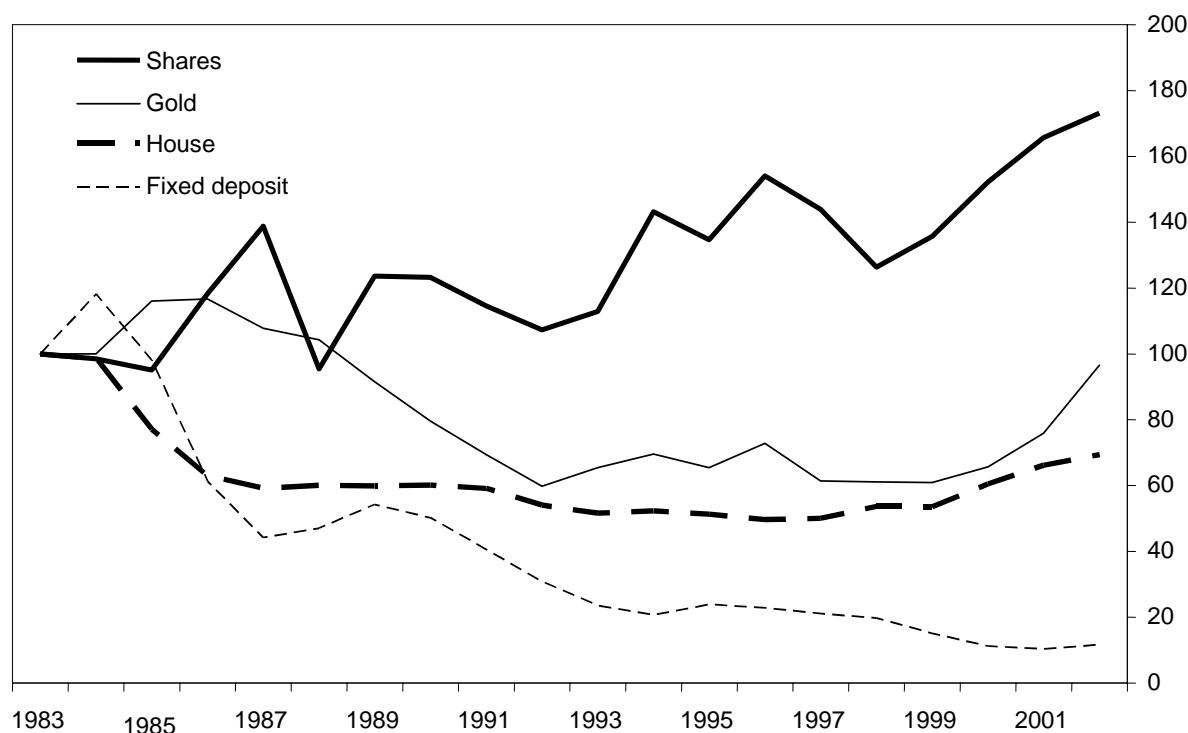
- Homogeneity: Two property investments are hardly ever directly comparable, and using national or regional price data will only approximate actual historical returns achieved on a specific investment. The same applies to investment (rental) income.
- Liquidity: How soon and with what ease can an investment be liquidated. It is well accepted that direct property investments are fairly illiquid.
- Tax implications: In South Africa, dividends are not taxed, but rental and interest income are, as are capital gains.
- Costs: These are nearly always a factor with all types investments. They can be substantial in the case of property. Such costs include transfer duties, bond registration fees and agent's commission. Maintenance and repair costs should also to be considered, but are normally deductible for tax purposes.
- Gearing: As mentioned before, this aspect could make property investments quite attractive, but sharp increases in interest rates could affect the return on the investment. In South Africa, fixed-rate mortgages are not available for terms exceeding two or three years.

Graph 8 shows the South African experience with regard to the capital growth of various asset classes over the past number of years. For ease of comparison, gross internal rates of return were calculated for all types of investments, although the above factors should evidently be considered at all times.

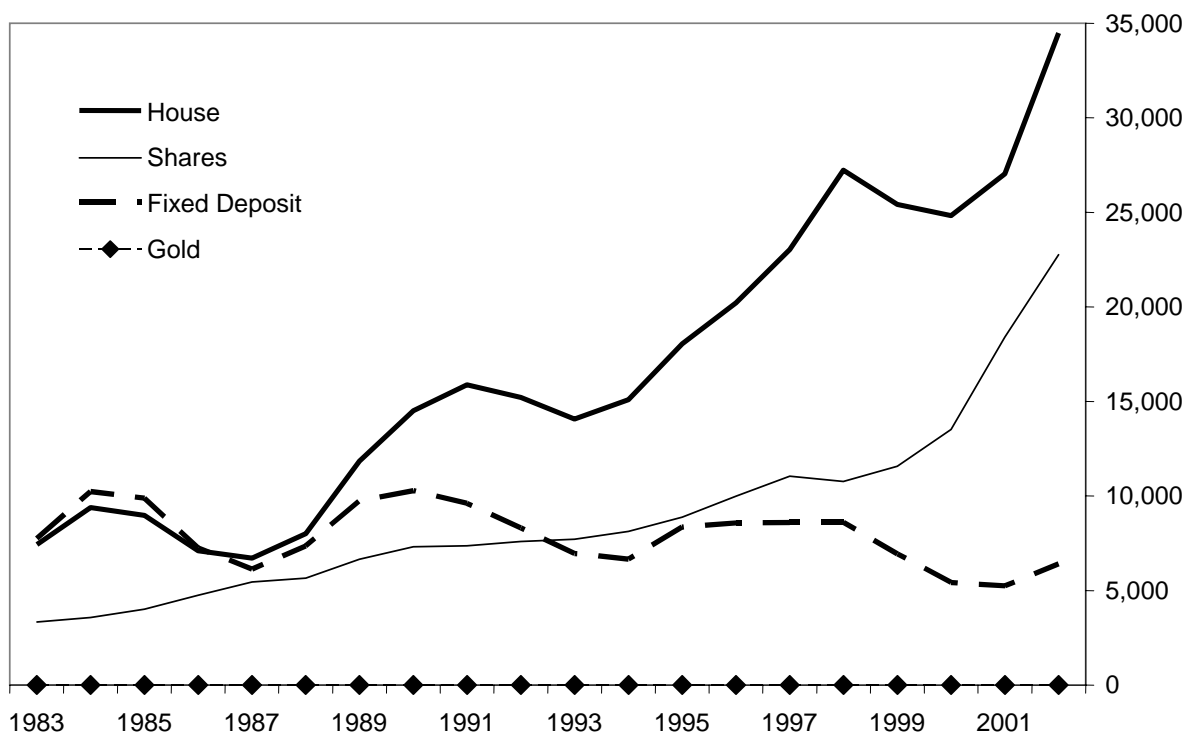
It is clear that the capital growth component of a residential property investment was not as high as the capital growth that could have been achieved on a share portfolio based on the all-share index of the JSE Securities Exchange. However, gross income (with costs and taxes not deducted - see Graph 9) still made residential property a fairly solid contender among the asset classes considered here.

Combining the data from Graphs 8 and 9 into gross internal rate of return figures (ie, no adjustments were made to allow for deductions such as maintenance costs and commissions or for taxation), shows that residential property could be regarded as the best performing asset class over 20, 15, 10 and five year periods (see Graph 10).

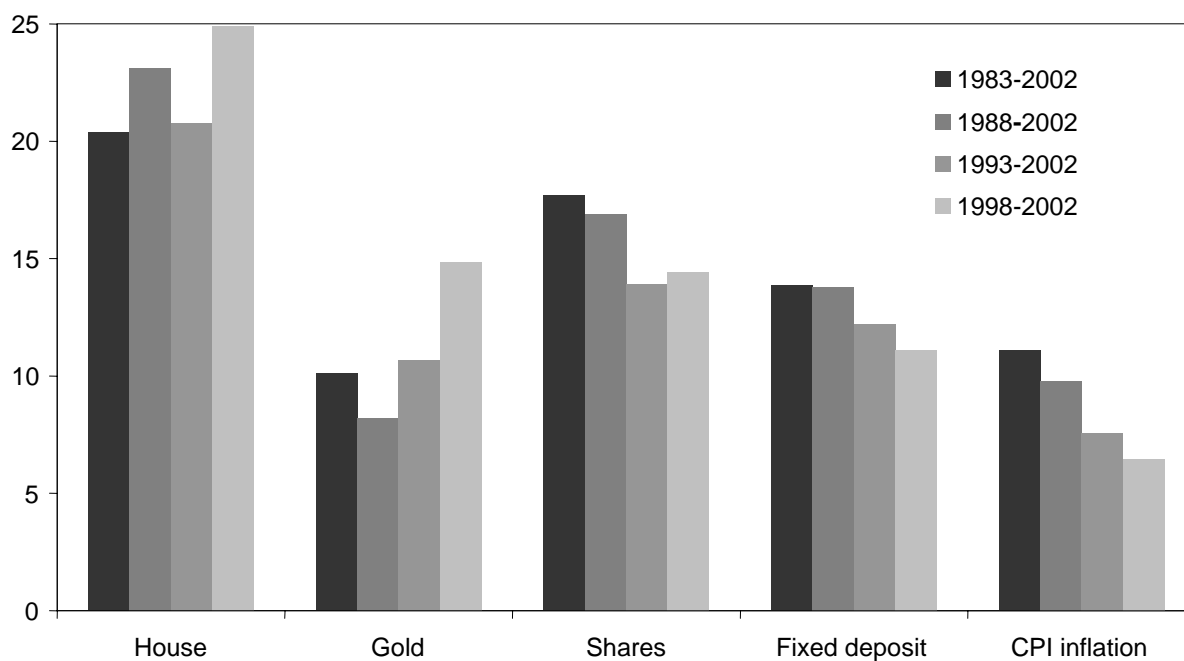
Graph 8  
Real capital values



Graph 9  
Nominal income per annum



Graph 10  
Gross internal rates of return and inflation



### 6.3 Determining if there is a property price bubble: South African vs some international evidence

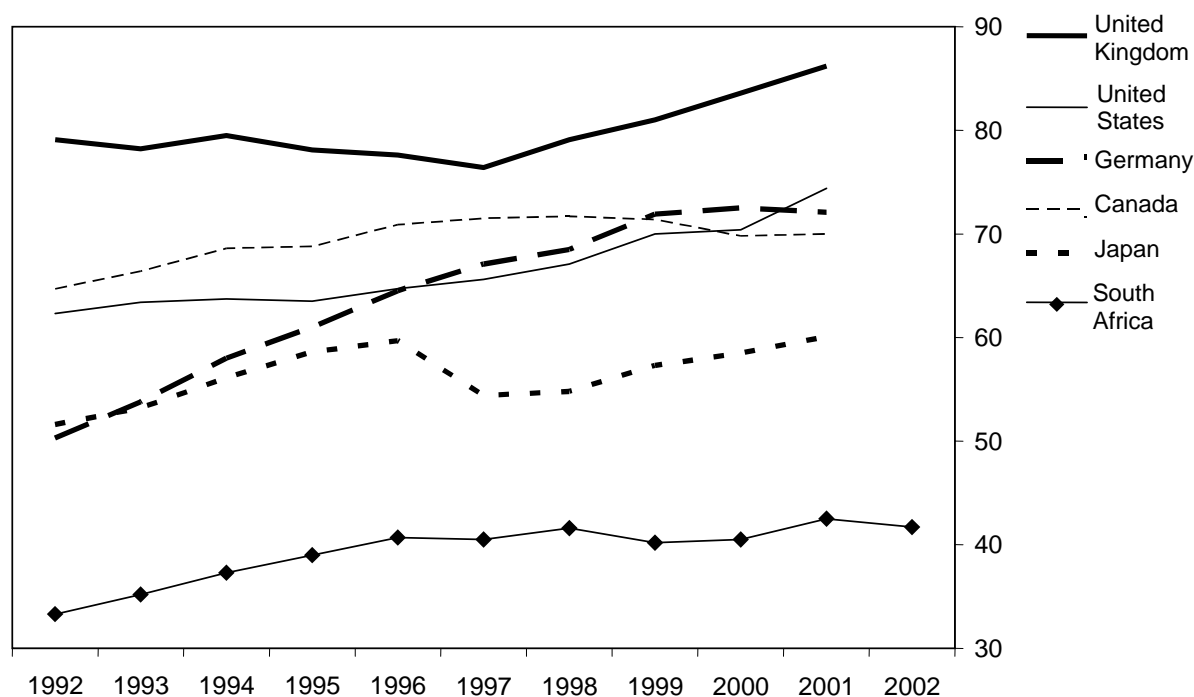
Market bubbles are usually unwelcome developments because of the macro-economic distortions that they may cause once they burst. Monetary policy is usually slow to react or may even not react at all to an impending bubble and the fall-out of a market crash may prove difficult to contain with monetary policy measures alone.

Part of the problem is that bubbles are often not detected until it is too late. The wealth effects associated with the bursting of an asset bubble - more specifically a property market bubble - may be more severe the higher the level of indebtedness in an economy.

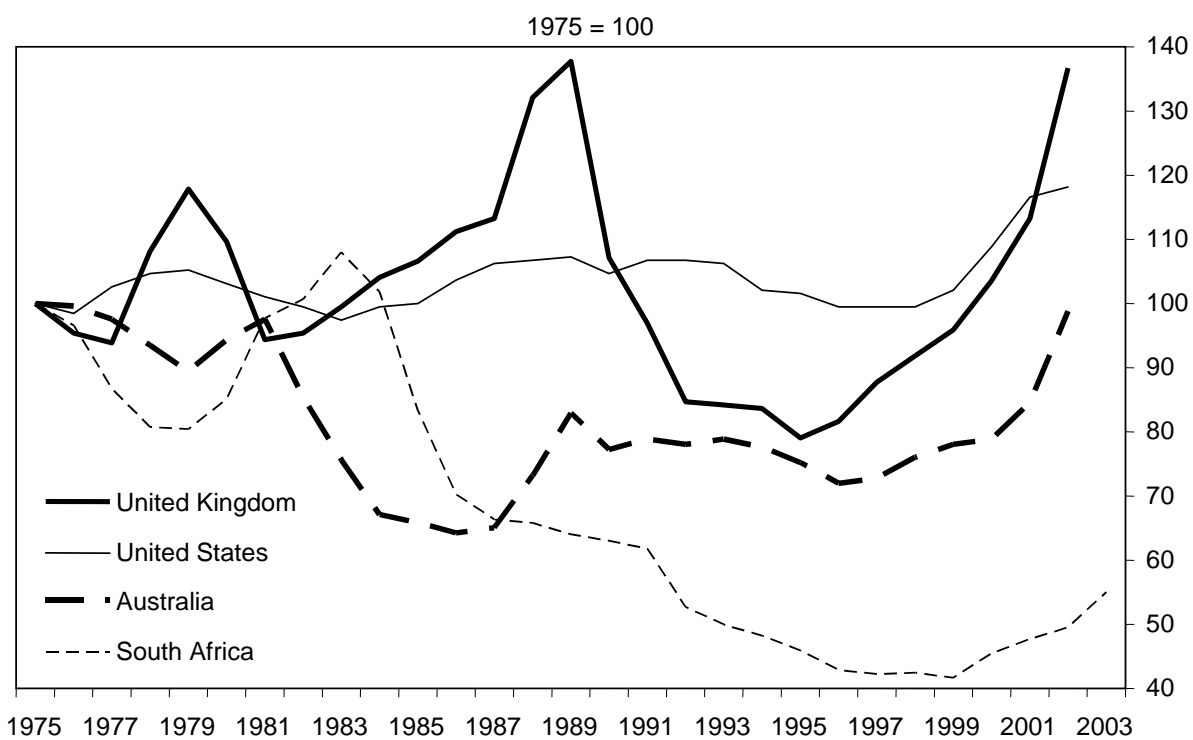
As pointed out in Section 6.1, the level of household debt to disposable income in South Africa was around 53% by mid-2003, having reached a peak of 61% in early 1998. Compared with some developed economies such as Japan, the United Kingdom and the United States, this level cannot be considered particularly high. Mortgage debt levels in many developed countries are likewise significantly higher than in South Africa. However, allowing for nominal interest rates that are some two to three times higher in South Africa than in most of these countries would bring the country's mortgage debt level roughly on a par with that of the United States (see Graph 11).

Graph 12 shows the movement of house prices in selected countries, relative to average income levels, since 1975. It is clear that, according to this measure in 2002, house prices in Australia and the United Kingdom roughly equalled their previous peaks, whereas relative house prices in the United States exceeded their previous peaks since 1975 by a considerable degree. In contrast, South African house prices relative to income levels remained far below their previous peak reached in 1983. Graph 13 indicates that, in real terms, house prices are still some 25% below their 1983 peak.

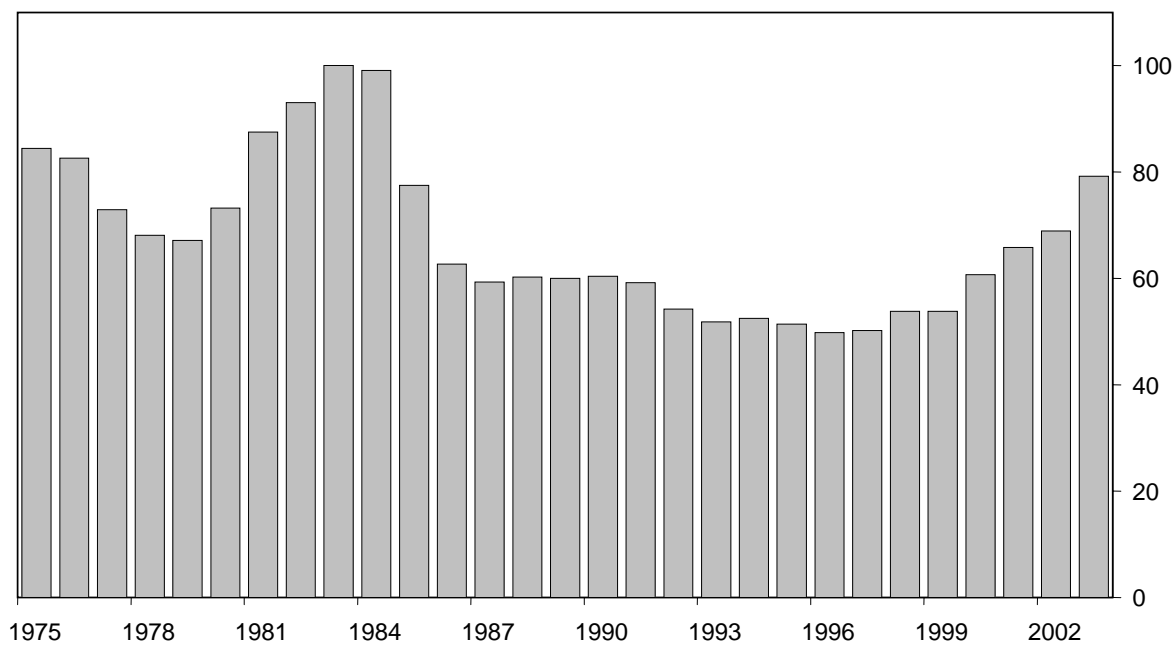
Graph 11  
Mortgage debt



Graph 12  
House prices to average income



Graph 13  
Real house prices



## 7. Driving forces impacting on the residential property market in South Africa

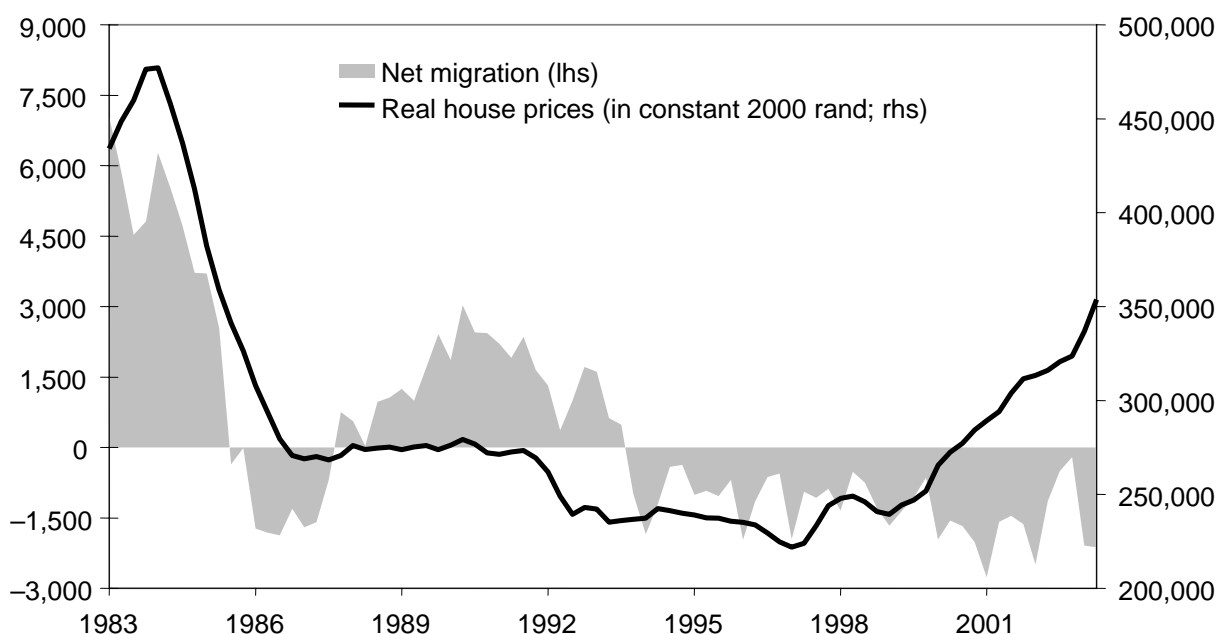
What follows is a non-exhaustive list of factors that have recently been influencing, or that are in future expected to influence, residential property market trends in South Africa.

### 7.1 Migration trends

According to official statistics, some 87,800 people have emigrated from South Africa during the period January 1994 to June 2003, whereas only 42,800 people immigrated to South Africa during the same period. However, unofficial estimates (obtained by, for instance, comparing the data of foreign-destination countries) put the emigration figures at two to three times this number.

This so-called brain drain was, prior to 2001, caused by the pull-effects of skills shortages in many developed economies as well as the push effects of an underperforming economy, crime and affirmative action policies in South Africa. Consequently, a relative oversupply of residential properties for most of the 1990s, resulted in declining real property prices (Graph 14).

Graph 14  
Net migration and real house prices



Source: Stats South Africa.

With weaker global economic conditions and increased geo-political risks after 11 September 2001, the net migration loss from South Africa seems to have abated somewhat.

### 7.2 Black economic empowerment

One of the major tenets of the government's current socio-economic policy is to enable so-called "historically disadvantaged" people to participate in the mainstream economy. Thus far, significant strides have been made in changing the racial composition of the workforce at all levels and of all organs of government, including the state-owned enterprises. The creation of a "black middle class" has supported the demand for properties in previously whites-only residential areas.

In addition, negotiated private sector “industry charters” will specify targets for certain percentages to be achieved for historically disadvantaged people to be included in employee numbers, procurement contracts and ownership. Social responsibility efforts (also in terms of “community reinvestment”) and training will also receive special attention.

Since there is still an enormous shortage of black people possessing the required qualifications and skills, these objectives may be difficult to achieve in the short to medium term. However, in the longer term they are likely to further assist with the expansion of a black middle class, provided that economic growth is sufficient. If productivity and economic growth do not increase meaningfully, these socio-economic measures may prove to be only redistributive in nature.

### **7.3 Security issues**

Crime<sup>6</sup> has shown a rapidly increasing trend over the past number of years, which has seen a rapid expansion in the development of so-called “security villages” - fenced-in units containing anything from four or five to hundreds of properties with 24-hour security control. Consequently, the prices of such units - usually a small plot with a sizeable house - have also increased rapidly in some urban areas. The development of golf estates for upper-income households has also been benefiting from similar trends.

### **7.4 Growth, income and employment**

Conceptually, disposable income and employment changes should feature high on the list of factors that could potentially impact on a county’s residential property market. In South Africa, neither of these variables have shown significant growth since the mid-1980s, mostly because of low economic growth, especially during the period from 1985 to 1993. However, household disposable income per capita has, with the exception of 1998 and 1999, increased every year since 1995, whereas formal sector employment recorded a slight increase in 2002 - the first such rise since 1990.

Regrettably, very rigid labour market conditions, brought about by the restrictive labour laws introduced over the past number of years, as well as a highly unionised and militant work force render the probability of substantial increases in employment unlikely. Therefore the process of capital intensification in the economy is expected to continue, which might not aid efforts to reduce unemployment figures.

### **7.5 Foreign buying of South African properties**

An undervalued currency (especially during 2002), heightened global political risks, and the well-known natural beauty and desirable climate of South Africa have caused foreigners - especially from the United Kingdom and the rest of Europe - to display a growing interest in South Africa as a holiday destination.

Some, lured by the relatively low property values, have bought properties particularly in coastal regions, such as the Western Cape and KwaZulu-Natal. This had a noticeable impact on the prices of properties in some of these areas in recent years.

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<sup>6</sup> Rampant crime can mainly be ascribed to the following:

- A largely underqualified, understaffed, and underpaid police force;
- An inefficient criminal justice system;
- Lax border controls, which are leading to an enormous influx of poor, unemployed people from neighbouring African states, and even those further afield;
- The perceived lenient treatment of criminals and sometimes insufficient sentences for serious crimes; and
- Increased drug-trafficking and the establishment of foreign crime syndicates in South Africa.



## **7.6 Monetary and fiscal policies**

Significant progress has been made in lowering inflation and restoring fiscal discipline over the past decade or so. The budget deficit as a percentage of GDP has averaged only 1.9% since 1998/99, whereas the debt-to-GDP ratio declined to just 41.3% in June 2003. Consequently, the cost of debt servicing has been reduced, making it possible to increase the extent of social service delivery. Also, during the past three budgets, the government announced relief for homebuyers by reducing transfer duties on properties.

However, the introduction of capital gains tax in October 2001 may still impact negatively on the residential property market. This tax also applies to all residential properties, except on the primary dwelling of a taxpayer. When a primary dwelling is sold, the first R1 million in capital gain will not be subject to capital gains tax.

Inflation rates that have been persistently higher than those of South Africa's trading partner nations necessitated a fairly restrictive monetary policy over the past number of years. Over the past decade, nominal mortgage rates, which are linked to short-term rates, have fluctuated between 13% and 24% and have at times caused substantial problems, with households finding it difficult to afford higher interest payments.

However, conditions appear to be becoming more favourable for a structurally lower inflation rate of between 3 and 6% over the next few years, after the introduction of an inflation-targeting regime for monetary policy. This could also imply an era of somewhat lower interest rates, which might lend further support to the property market.

## **7.7 Investment returns**

South Africa did not escape the fallout from the weakness that has characterised the US and other stock markets since early 2000, even though the local stock market has not really been overvalued since the emerging market crisis of 1998. The South African bond market performed excellently, with bond yields falling from 18.3% (September 1998 average) to around 9% currently, but this bull run also seems to be losing steam. With the South African equity market's price-earnings ratio seemingly unable to improve above the recent level of 12 (compared with 18.2 reached in May 1998), investors appear to have given up hope, for now, of a strong recovery in South African shares - at least while the US market remains overvalued and the rand relatively strong.

Solid property returns - especially in view of declining interest rates - have again highlighted the value of property in portfolios, and investments in residential properties have benefited from the search for low risk-high return assets. Of course, property is unlikely to outperform other investments indefinitely, but it may do so over the next year or two.

## **8. Conclusion**

The Absa Group's fairly comprehensive residential property database, based on around a third of properties being mortgaged in South Africa, facilitates an improved analysis of trends and cycles in the economy. In particular, it may be used to compare current prices with previous peaks, as well as with income levels.

Although residential property prices in South Africa seem to have followed the rising trend prevailing over the past number of years in most other developed markets, prices in South Africa are still below the peak reached in the early to mid-1980s.

Various factors are influencing property prices in South Africa. Some of these - notably structurally lower interest rates - could support property prices over the next few years.

## Appendix A

### New residential buildings completed

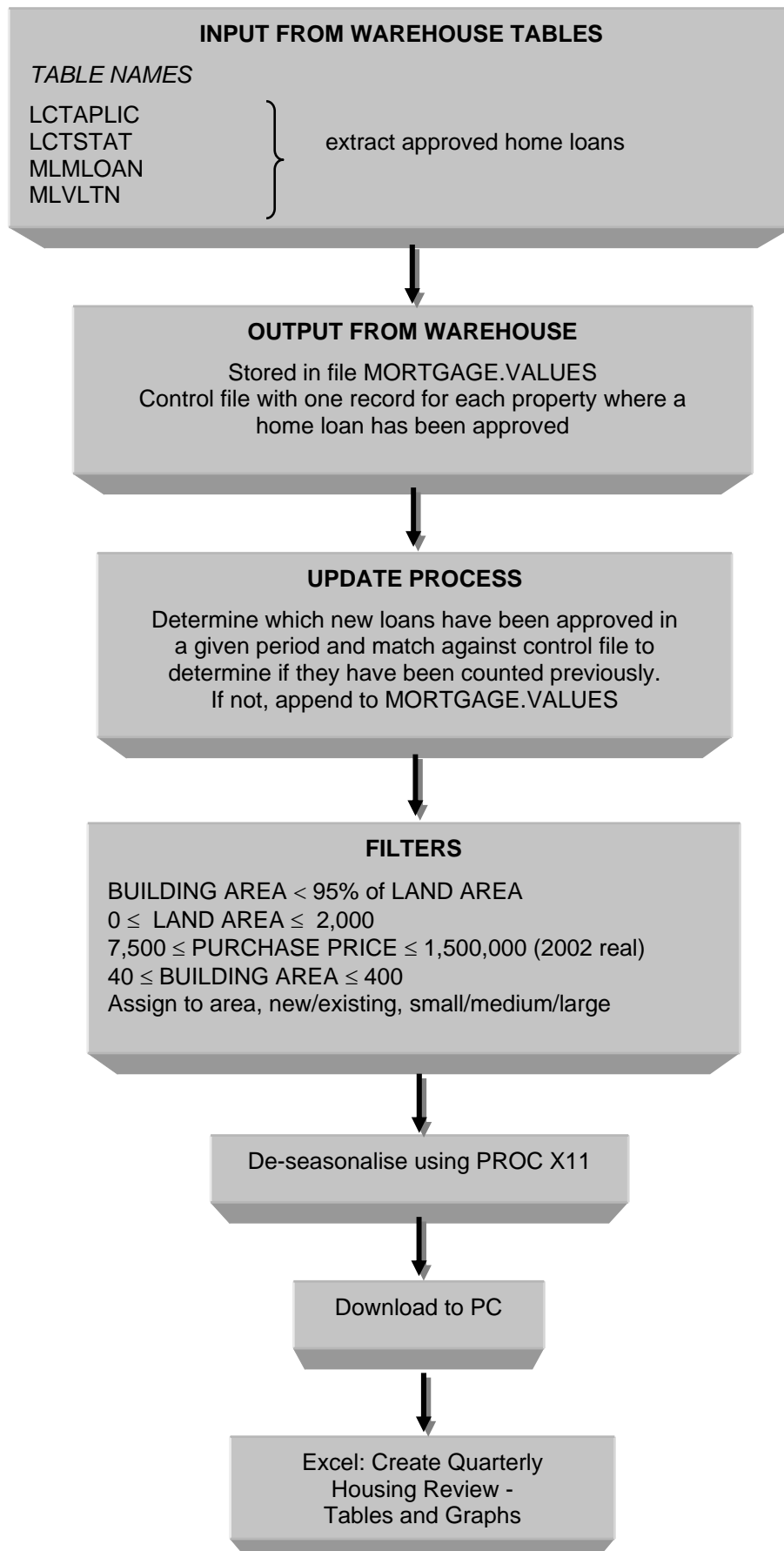
Number of units and total value in rand

	Houses (<80m <sup>2</sup> )							
	2001 Number	2002			2001 R'000	2002		
		Number	% change	% of total		R'000	% change	% of total
Western Cape	5,792	7,457	28.7	20.4	265,614	312,207	17.5	25.4
Eastern Cape	2,820	3,331	18.1	9.1	122,013	189,827	55.6	15.5
Northern Cape	126	116	-7.9	0.3	9,076	5,187	-42.8	0.4
Free State	2,155	2,896	34.4	7.9	49,875	70,689	41.7	5.8
KwaZulu-Natal	2,307	2,430	5.3	6.6	103,023	97,506	-5.4	7.9
North West	2,510	1,826	-27.3	5.0	61,630	35,208	-42.9	2.9
Gauteng	7,986	16,303	104.1	44.5	299,744	455,506	52.0	37.1
Mpumalanga	3,165	2,010	-36.5	5.5	64,123	42,295	-34.0	3.4
Limpopo	426	231	-45.8	0.6	22,480	18,944	-15.7	1.5
<i>South Africa</i>	<i>27,287</i>	<i>36,600</i>	<i>34.1</i>	<i>100.0</i>	<i>999,579</i>	<i>1,227,369</i>	<i>22.8</i>	<i>100.0</i>
	Houses (≥80m <sup>2</sup> )							
	2001 Number	2002			2001 R'000	2002		
		Number	% change	% of total		R'000	% change	% of total
Western Cape	4,099	5,659	38.1	39.1	1,169,702	1,769,314	51.3	38.0
Eastern Cape	943	648	-31.3	4.5	172,903	159,558	-7.7	3.4
Northern Cape	165	60	-63.6	0.4	36,079	15,146	-58.0	0.3
Free State	317	373	17.7	2.6	65,145	74,308	14.1	1.6
KwaZulu-Natal	1,618	1,388	-14.2	9.6	479,379	423,434	-11.7	9.1
North West	577	803	39.2	5.6	144,952	206,809	42.7	4.4
Gauteng	3,421	4,939	44.4	34.2	1,182,440	1,873,542	58.4	40.2
Mpumalanga	354	407	15.0	2.8	65,074	94,836	45.7	2.0
Limpopo	159	178	11.9	1.2	34,743	43,845	26.2	0.9
<i>South Africa</i>	<i>11,653</i>	<i>14,455</i>	<i>24.0</i>	<i>100.0</i>	<i>3,350,417</i>	<i>4,660,792</i>	<i>39.1</i>	<i>100.0</i>
	Flats and townhouses							
	2001 Number	2002			2001 R'000	2002		
		Number	% change	% of total		R'000	% change	% of total
Western Cape	1,860	2,436	31.0	23.3	299,930	411,201	37.1	21.9
Eastern Cape	244	364	49.2	3.5	31,743	35,511	11.9	1.9
Northern Cape	80	46	-42.5	0.4	8,950	12,543	40.1	0.7
Free State	195	356	82.6	3.4	25,551	60,447	136.6	3.2
KwaZulu-Natal	780	741	-5.0	7.1	149,134	185,063	24.1	9.8
North West	169	612	262.1	5.9	16,600	89,314	438.0	4.8
Gauteng	3,544	5,670	60.0	54.2	611,453	1,055,292	72.6	56.1
Mpumalanga	149	207	38.9	2.0	16,021	26,440	65.0	1.4
Limpopo	72	26	-63.9	0.2	11,435	4,123	-63.9	0.2
<i>South Africa</i>	<i>7,093</i>	<i>10,458</i>	<i>47.4</i>	<i>100.0</i>	<i>1,170,817</i>	<i>1,879,934</i>	<i>60.6</i>	<i>100.0</i>

Source: Stats South Africa.

## Appendix B

### ARPM Database Process Diagram



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# New quality adjusted price indexes for non-residential structures

Bruce Grimm<sup>1</sup>

## Introduction

Accurate, quality adjusted prices for non-residential structures are necessary for a good understanding of the functioning of the economy. For example, there have been poorly measured quality improvements in many types of non-residential structures, for such items as improved energy efficiency and pre-wiring for computer networks. In addition, better price estimates may shed light on the long-standing puzzle of low or declining productivity in the construction industry. For example, both real gross output and real value added per person engaged in the construction industry have declined in each of the three most recent years for which estimates are available. If price increases are overstated, measures of real output and productivity trends will be lowered.

In order to improve its estimates of non-residential structures' prices, the Bureau of Economic Analysis (BEA) has developed new quality adjusted price indexes for several types of non-residential structures. The new indexes will be incorporated into the comprehensive revision of the national income and product accounts (NIPA's) later this year. They are designed to replace the existing price index estimates, which are constructed using an indirect methodology. The new indexes are expected to be used only until the Bureau of Labour Statistics introduces Producer Price Indexes (PPIs) for non-residential structures later in the decade. The price indexes are based on hedonic regressions, and yield rates of inflation that are slightly higher than those yielded by corresponding matched-model price index estimates based on the same source data. Also, relative to the existing price indexes, the new price indexes will slightly increase estimated rates of inflation for non-residential structures, beginning with 1998. BEA will use the new price indexes to deflate related structure types within private non-residential structures and Federal and state and local government gross investment in structures.

BEA's existing methodology is indirect; for the overwhelming portion of non-residential structures, the detailed price indexes are based on a summary price index that is an unweighted average of the Census Bureau's price index for single-family houses under construction and a three quarter moving average of the Turner Construction Company's building cost index. The use of this methodology means that movements in estimated prices of non-residential structures are often similar to those for residential structures. Further, a previous BEA internal study of the quality of the Turner index found that it was a judgmentally-constructed index and that its documentation did not make available sufficient data to evaluate its statistical consistency and reliability. Thus, the existing methodology lacks credibility and offers no assurance that it is able to accurately portray movements in prices of non-residential structures.

## The estimation of non-residential structures prices

### 1. Earlier work on quality adjusted prices

Two approaches are generally used to estimate non-residential structures' prices. The first approach holds quality constant by pricing and repricing sample structures that are designed to be typical of structures of a given type. The second approach uses hedonic estimates that value quality

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characteristics, so that the effects of changing quality can be separated from price changes. The first use of hedonic indexes for construction prices was by the Census Bureau in 1968, and was for single-family housing. A revision of the methodology for price indexes for construction was done by a joint BEA-Census Bureau group in 1974 (Bureau of Economic Analysis (1974)). Since then, with the exception of the introduction of the single-family housing price index into the calculation of price indexes for non-residential buildings, little has changed in BEA's methodology for non-residential structures prices.

As part of a search for an improved methodology, Edwin Coleman of BEA produced an unpublished study of the quality of 32 private sector construction cost indexes (Coleman (1988)). He found that most of the indexes contained "...one or more... conceptual or statistical problems...". He also found that the various indexes tracked reasonably closely to the corresponding NIPA price indexes for non-residential structures. He laid out criteria for evaluating the quality of the indexes and, using these criteria, he produced standardised descriptions of each of the indexes as well as additional descriptions specific to the various indexes. He found several indexes to be somewhat more successful than the others. Among these was the Turner Construction Company's cost index, but he found that there was insufficient information to fully evaluate it. This was also the case for the Engineering News Record building and construction cost indexes that were used for Census' monthly real construction estimates. The R S Means Company's construction cost index made enough data available, but had some significant limitations, including changes in methodology over time.

A former BEA chief statistician, Frank de Leeuw, completed a study of construction prices in 1991 and produced two related discussion papers. The first paper used hedonic regressions with Census data and log-log specifications to estimate price indexes for multifamily housing for 1978-89, and found increases in prices that were at about the same rate as those for Census' single-family house prices (de Leeuw (1991a)). The paper also analysed the "components" approach used by Statistics Canada for non-residential and multifamily housing buildings. This approach specified the components of several prototype buildings and surveyed contractors to determine what they would charge for the prototypes at the time of the survey. The paper also described cyclical fluctuations in output prices relative to input prices in the Canadian construction sector.

The second paper reported on a set of hedonics-based price indexes for 1986-90 that were estimated using F W Dodge Company data for six types of non-residential buildings (de Leeuw (1991b)). It noted that only a very limited set of quality characteristics were available for use as explanatory variables in hedonic regressions. Nevertheless, it found substantial differences in the trend rates of inflation for the six types of structures, and that their central tendency was similar to the published NIPA price index for non-residential structures. It concluded that the hedonic approach did not yield significantly improved results, and that a data set with additional quality characteristics would be needed if improved hedonics-based indexes were to be constructed.

Several other preliminary studies, at both BEA and at the Census Bureau, evaluated the feasibility of developing price methodologies, both using the hedonic and the model building approaches. The studies were not continued because of a lack of resources; in particular, the necessary private information sources were too costly for either agency to afford.

The Bureau of Labour Statistics is working with a private contractor to develop PPIs for four types of non-residential structures; warehouses, light industrial/factory buildings, office buildings, and schools. The methodology will be broadly similar in approach to the model price work that has been done in Canada. Specifications for typical versions of the structures are being developed, with some geographical disaggregation to account for differing characteristics that arise due to different climates in different parts of the country. A private source will provide estimates of the costs of materials used in construction, and sampled contractors will provide monthly updates on margins. Additional PPIs for component assemblies for non-residential structures are being developed. The PPIs are scheduled for initial publication later in this decade. Because BEA's new indexes are designed to link up with the corresponding PPIs, the linked indexes should allow BEA to prepare an unbroken set of estimates beginning with 1998.

## 2. Source data

The data used to support the new price estimates are taken from annual publications by the R S Means Company, *Square Foot Costs*, and cover the period 1 January 1997-1 January 2003. Although these data are proprietary, they have withstood the market test of being commercially profitable over a long period of time. R S Means has sold its data for many years to firms in the construction business - architects, builders, and others - who use it to put together bids on construction projects. Because the Means annual cost estimates are revised in the fall of each year, the estimates are based on costs observed late in the previous year and projected forward to 1 January of the succeeding year. These costs are gathered by Means from a large number of contractors, building supply firms, and the like.

Means publishes the costs at several levels of detail. At the most detailed level, the costs for specific sub-assemblies or components are calculated as the sum of the costs of labour, materials, any equipment needed, and overhead and profit. At a more aggregate level, Means publishes estimates of the square foot costs for sample structures, both residential and non-residential. The sample non-residential structures are priced for six combinations of wall and support frame type, and for nine sizes (in square feet). Additional information is supplied for one specimen structure of each type that describes about 34 quality characteristics, such as electrical service, types of roof, and wall finish. These quality characteristics change gradually to reflect changes in typical buildings in the Means surveys. For example, between the mid-1990s and 2003, the type of roof changed for their sample two to three storey college dormitory, and the electrical service was upgraded. The percent shares of each of 11 construction characteristic categories, under which the characteristics are grouped also change from year to year. For example, the share of the exterior closure category for the specimen dormitory went from 12.9% of the total in the mid-1990s to 14.8% in 2003. Site work, such as earthwork, roads, and landscaping are not included in the estimates, but architects' fees, interest costs, and taxes incurred as part of the building process are included.

At a still more aggregate level, Means estimates "city cost indexes" for 30 major US cities. Nine sample structures are costed out; one storey factory, two to four storey office building, retail store, two to three storey town hall, two to three storey high school, four to eight storey hospital, parking garage, one to three storey apartment, and two to three storey motel. In order to simplify the computational process, the inputs to the nine buildings are simplified and aggregated by Means, using 66 commonly used construction materials, labour hours for 21 building construction trades, the latest negotiated labour wage rates for the same construction trades, and related equipment rental costs for six types of construction equipment.

The 30 city cost indexes are aggregated into a national average cost index. As such, this Means index is probably not capable of picking up cyclical fluctuations other than those associated with materials inputs and labour costs. Also, the index amounts to a chained Paasche index; this is likely to understate inflation. Because the index is based on actual costs of construction, it is in principle able to pick up changes in productivity. However, as may be seen in Chart 1, the Means 30-city national average price index has had broad movements in 1960-2002 similar to those of the existing NIPA price index. Year-to-year fluctuations in the two indexes also exhibit generally similar patterns, but although the Means index is about equally volatile until 1970, it is somewhat less volatile thereafter (Chart 2).

Because of the limitations of the Means 30-city national average index, the Means square foot cost estimates for the sample buildings of various specifications and types offer superior information for estimating non-residential structures prices. The blowup factors used in the calculation of the sample buildings' total costs appear to be fixed from year to year, and thus do not allow for changing profit margins.<sup>2</sup> A limitation of the quality adjustment process occurs because the quality characteristics of the individual sample buildings tend to changeover time at a finer level of detail than that of the reported characteristics; these will not be observed at all. For example, a substitution of a more energy efficient, more costly insulation material would not be noted and would show up as a price increase. Despite these limitations, detailed price estimates based on the Means square-foot-cost data allow much more direct estimation of the prices of individual non-residential structures types than does the

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<sup>2</sup> Some sort of cyclical corrections - perhaps along the lines of those suggested by Frank de Leeuw - might be tried, but such work is beyond the scope of this study.

present methodology. The direct estimates allow greater differentiation of prices among various types of non-residential structures than can be obtained from the existing, indirect summary price methodology.

### 3. Methodology

The hedonic price indexes underlying BEA's new non-residential structures price indexes are "regression" price indexes. That is, ordinary least squares regressions are used to explain costs per square foot for various types of structures as functions of the number of square feet, a number of quality characteristic dummy variables, and time dummy variables that indicate the year each observation is from. The price index estimates are derived directly from the constant term and the estimated parameters of the time dummy variables.

As a check on the hedonic estimates, matched model price indexes were also calculated, using selected observations from the same data set for which more detailed characteristics information is available. Because the matched model indexes for each type of structure are based on just two observations per year rather than the 108 observations per year used for estimating the hedonic indexes, the hedonic estimates are more robust. Generally, the matched model indexes yield similar patterns of increase, with slightly lower average rates of inflation.<sup>3</sup> The matched model indexes are briefly described in the appendix.

Some hedonic studies of structures' prices have used structures' total costs as the dependent variables. However, examination of the Means data found that there is a non-linear relationship between structure cost per square foot and size in square feet. Experimentation using the Means data also indicated that, for given structure type and year, the logs of these two variables have a nearly linear relationship, and limited Box-Cox testing confirmed the superiority of the log-log functional relationship. Hence, the dependent variables in the regressions are the logs of the cost per square foot and the first explanatory variables are the logs of the buildings' sizes in square feet. The quality characteristic dummy variables have values of one when the characteristic is present and zero otherwise, and are entered into the equation linearly. The time dummy variables have values of one in the indicated years and zero otherwise and are also entered into the equations linearly. Thus, the functional form of the estimated hedonic equations is:

$$\log(\$/\text{sq ft}) = c + a_0 \times \log(\text{sq ft}) + \sum_i (a_i \times \text{characteristic}_i) + \sum_t (b_t \times \text{time dummy}_t),$$

where  $i$  is the set of quality characteristics,  $t$  is the set of time periods,  $c$  is the estimated constant term and the constant term and the  $a_0$ ,  $a_i$ , and  $b_t$  parameters are estimated coefficients.

One additional quality characteristic used in some equations is the presence or absence of basements. The cost per square foot for basements is a linear function of the number of square feet. Because the log of the cost per square foot is the functional form used for the dependent variable in the regression equations, there is a non-linear relationship between the dependent variable and the costs of basements. Also, the costs per square foot for basements have generally increased somewhat more slowly than other costs per square foot over the sample period. In order to evaluate whether this linear relationship results in distorted estimates in what is otherwise a log-log equation specification, three equations were estimated for each type of structure; an equation that combined observations on structures with and without basements and included a dummy variable for the presence or absence of basements, and two equations that each contained only the observations for structures with or without basements.

With regression-type hedonic price indexes, there is a danger that parameter instability might affect the estimated coefficients of the time dummy variables. Concerns about the sensitivity of the estimates to parameter instability led to the estimation of regressions for adjacent pairs of years for each type of structure, separately for structures with and without basements; this was done to evaluate the effects of any parameter instability. The full data set contains 648 observations for each structure type - both with and without basements - and the individual pairwise regressions are each based on

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<sup>3</sup> The similarity of hedonic and matched model price estimates, made using the same or similar data, has been found elsewhere. See, eg, Aizcorbe et al (2000) and Landefeld and Grimm (2000).



216 observations. (Half of the observations are available for the regressions for structures with, and without, basements.) The results of pairwise regressions yielded price index estimates nearly identical to those yielded by equations estimated over the full, 1997-2003 sample period, and they are not described here in detail.

The types of structures for which hedonic regressions were estimated included one storey warehouses, one and three storey factories, and three height ranges for office buildings - two to four storeys, five to 10 storeys, and 11-20 storeys. Exploratory work indicated that estimated parameters of equations for structures with different numbers of storeys were sometimes statistically significantly different for differing heights. As a result, separate sets of regressions were estimated for the two heights for factories, and for the three height ranges for office buildings. In addition, hedonic regressions were estimated for four types of schools; elementary, junior high, senior high, and vocational.

Reflecting the lower rates of increase for basement costs than for other structures' prices, the estimates of average rates of price increase for structures without basements were somewhat greater than those for structures with basements. Alternative estimates of rates of inflation, based on the regressions for structures both with and without basements, found average rates of price increase that were between the rates for structures with, or without basements.

The estimates for the regressions combining structures with and without basements tend to weight the two variants roughly equally. In contrast, general observation suggests that some types of structures were more or less likely to have basements (eg, unlikely for one storey warehouses, highly likely for 11-20 storey office buildings). Similarly, the relative importance of construction of different heights of buildings varies (eg, more square feet of one storey factories than three storey factories).

As a result, the price indexes presented here are weighted averages of the separate indexes for structures of each type with, and without, basements, and where applicable, of different heights or type of school. Eight intermediate summary price indexes were constructed by weighting together the separate indexes for structures of each type with and without basements. Next, summary indexes were constructed for factories and for office buildings by weighting together the intermediate indexes for the various heights. In both stages, the weights were based on subjective judgment about the prevalence of the value of construction in each height category. Similarly, the indexes for the various types of schools were weighted together using Census Bureau estimates of numbers of students of appropriate ages, and assuming that vocational school students are one fifth of the number of students of high school age. The two sets of weights are listed in the appendix.

There were some departures from this general methodology. The estimated rates of inflation for all four types of structures were implausibly low for 1997-98 and surprisingly high for 1999. As a result, the Means 30-city national average price index was used as an interpolator between 1 January 1997 and 1 January 1999 estimates for each type and height of structure. In addition, specification changes of sample structures, combined with apparent quality changes at an unpublished finer level of detail, led to a drop in the prices of two to four storey office buildings, between 2000 and 2001. As a result, a price index for two storey medical office buildings was constructed and used for the estimate of price increase from 2000 to 2001 for two to four storey office buildings. Specification changes, and apparent unpublished quality changes, for 11-20 storey office buildings from 2000 to 2001, led to the substitution of the estimates for price increases for five to 10 storey office buildings for the price increase for the taller buildings from 2000 to 2001.

## **The estimates**

### **1. Equations**

As discussed above, all of the regression equations make the log of the price per square foot a function of the log of the number of square feet. Because the dummy variables for quality characteristics - which were for exterior wall type and interior support type, two or three of the dummy variables are not used in order to avoid singular moment matrices. Likewise, it is necessary to omit one year dummy, for 1997. Thus, the equations presented here contain three to five quality characteristic dummy variables and five year dummy variables.

Table 1 summarises the estimated equations used to construct the price indexes. In all the equations, the constant term and the coefficient of the log of number of square feet are highly significant, with p-values less than 0.01. Likewise, the coefficients of the year dummy variables are all significant, with p-values less than 0.01. The time period for all of the regressions is 1997-2003.

The summary statistics for equations for warehouses, factories, and office buildings both with and without basements are very similar to those for the corresponding equations shown in Table 1. The principal differences are that the combined equations had F-test statistics roughly double those for the equations in Table 1. The pairwise regressions also yielded estimates for price increases that were quite similar to those derived from the Table 1 equations. Alternative price index estimates, made using the pairwise regressions, found that for nearly all years, for all six structures types, the estimated rates of price change are within 0.1 percentage point of indexes estimated using the Table 1 equations, and for most estimates, the rates are within 0.01 percentage point. Based on this, it appears unlikely that the effects of year-to-year parameter instability on price estimates are

Table 1  
Summary measures for the hedonic  
regressions used to construct price indexes

Structure type	Number of characteristics	Number with p-values < 0.01	R <sup>2</sup>	F-test statistic
<b>Warehouses:</b>				
with basement	4	4	.979	1451
without basement	4	4	.979	1468
<b>Factories:</b>				
1-storey:				
with basement	5	4	.991	3364
without basement	5	4	.992	3336
3-storey:				
with basement	3	3	.990	3309
without basement	3	3	.981	3296
<b>Office buildings:</b>				
2-4 storey:				
with basement	5	4	.982	1633
without basement	5	4	.983	1727
5-10 storey:				
with basement	3	3	.972	1232
without basement	3	3	.972	1239
11-20 storey:				
with basement	3	3	.953	725
without basement	3	3	.953	729
<b>Schools:</b>				
Elementary:				
with basement	3	3	.997	13070
without basement	3	3	.997	11824
Junior high:				
with basement	4	4	.996	8132
without basement	4	4	.996	7644
Senior high:				
with basement	3	3	.992	4686
without basement	3	3	.993	8835
Vocational:				
with basement	4	4	.991	3519
without basement	4	4	.989	2919

## 2. Price indexes

The four price indexes derived from the hedonic regressions - in percent change form for the years 1998-2003 - are shown in Table 2. In addition, the table shows percent changes in the existing NIPA price index. (Because the new price indexes are for changes from 1 January of a given year to 1 January of the following year, the changes in the existing NIPA price index are calculated by averaging fourth and first quarter level values and then calculating percent changes.)

Table 2  
Percent changes in the price indexes

Year	Existing NIPA index	Hedonic indexes			
		Warehouses	Factories	Office buildings	Schools
1998	3.71	4.19	3.74	4.54	3.74
1999	3.96	5.08	4.55	5.49	4.47
2000	4.22	4.00	3.60	4.31	3.71
2001	4.45	3.64	3.89	4.11	4.50
2002	3.07	3.97	4.05	1.97	2.92
2003	1.33	2.52	4.53	3.17	3.79
<b>Average</b>	<b>3.45</b>	<b>3.90</b>	<b>4.03</b>	<b>3.92</b>	<b>3.85</b>

As may be seen in Chart 3, the differences in average changes between the existing NIPA price index and the hedonic indexes are partially due to a slowing of inflation in the existing NIPA index in 2002 and 2003 that is not matched fully by the hedonic indexes. As may be seen in Chart 4, the year-to-year rates of inflation for the various indexes show considerable variation. The rough similarities in pattern for the four hedonic indexes in 1998-2000 is due to the use of the Means 30-city national average price index as the interpolator between those years.

## Conclusions

The new estimates of prices for non-residential structures introduce directly applicable quality adjustments by using hedonic estimates. Even though the new price indexes do not result in substantial changes in estimates of inflation in structures prices, they will make a significant improvement in the quality of the estimates of non-residential structures prices. The last major overhaul of the methodology for construction prices occurred in 1974 (BEA (1974)), and generally lowered estimates of inflation for the period ending in 1973. Because the lower inflation estimates led to higher trend rates of increase in real non-residential structures investment, they helped to reduce the puzzle of low or declining productivity in the US construction industry. In contrast, the new estimates of non-residential structures prices presented here slightly raise the estimated rate of inflation, and this exacerbates the puzzle of low or declining productivity in the construction industry.

Chart 1  
**Non-residential construction price indexes**  
 (1996 = 100)

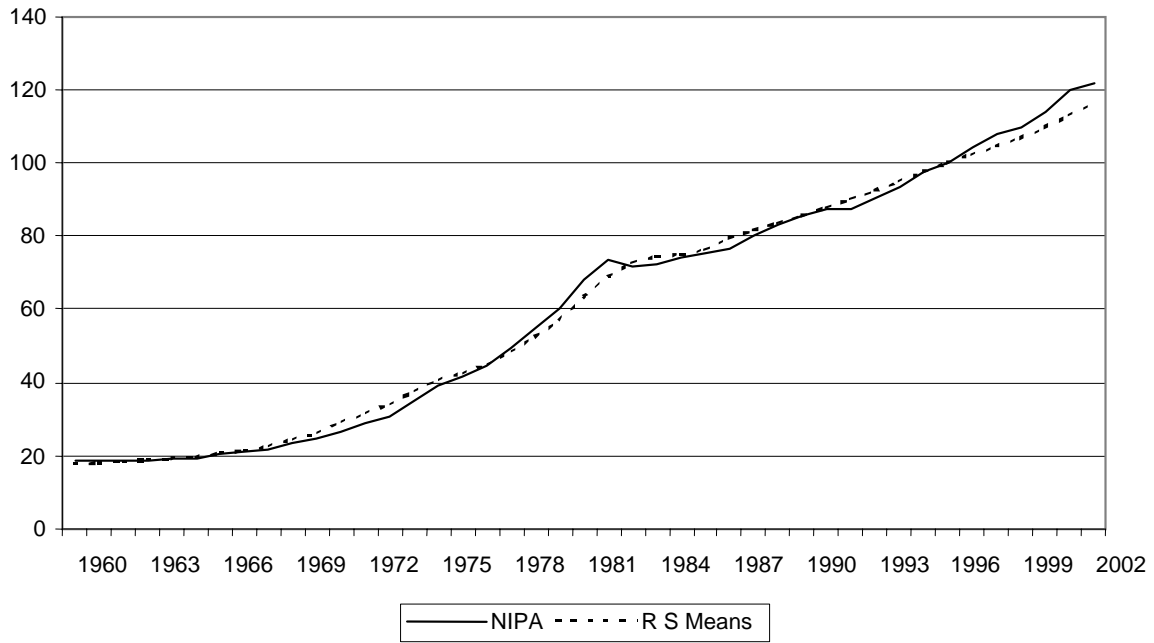


Chart 2  
**Non-residential construction price indexes**  
 (Percent change)

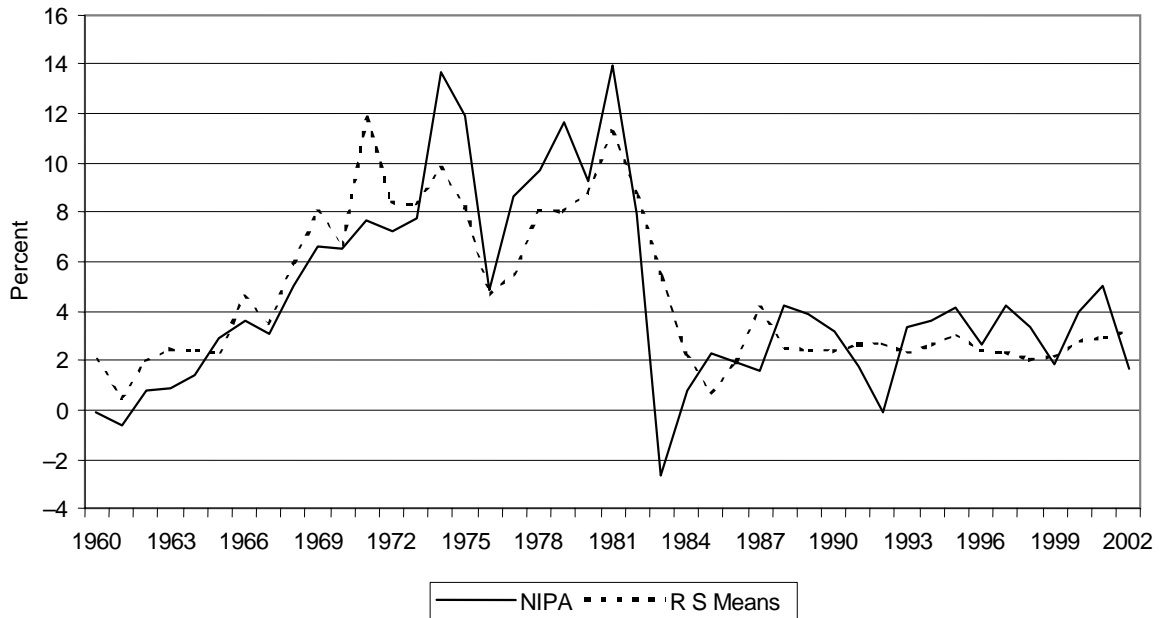


Chart 3  
**Price indexes for some non-residential structures**  
 (1 January 1997 = 100)

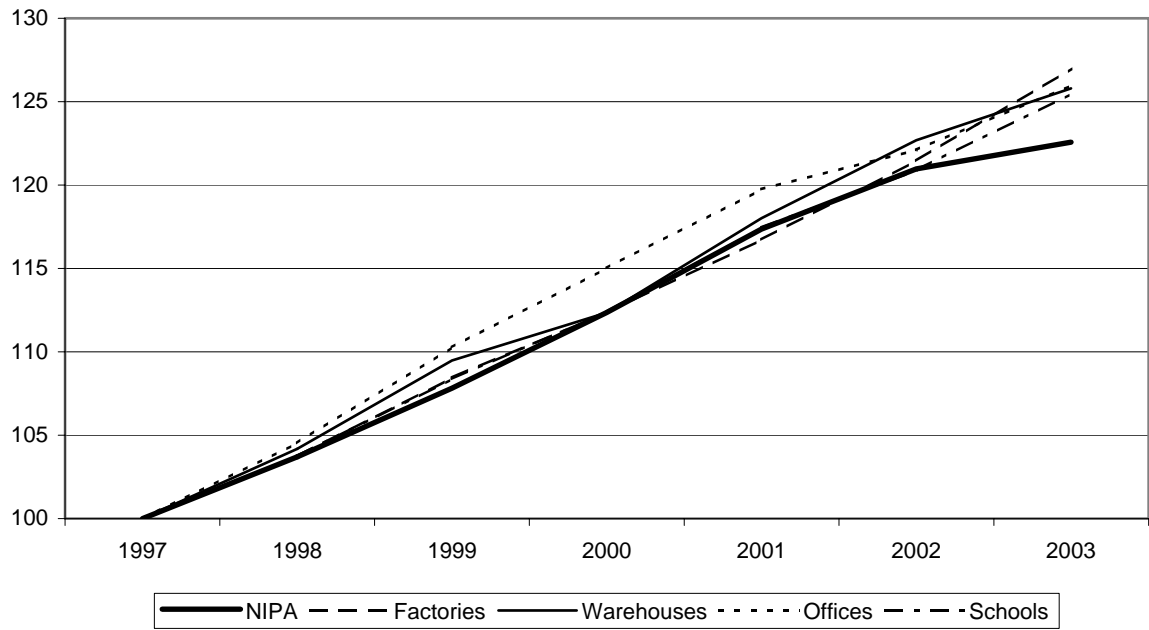
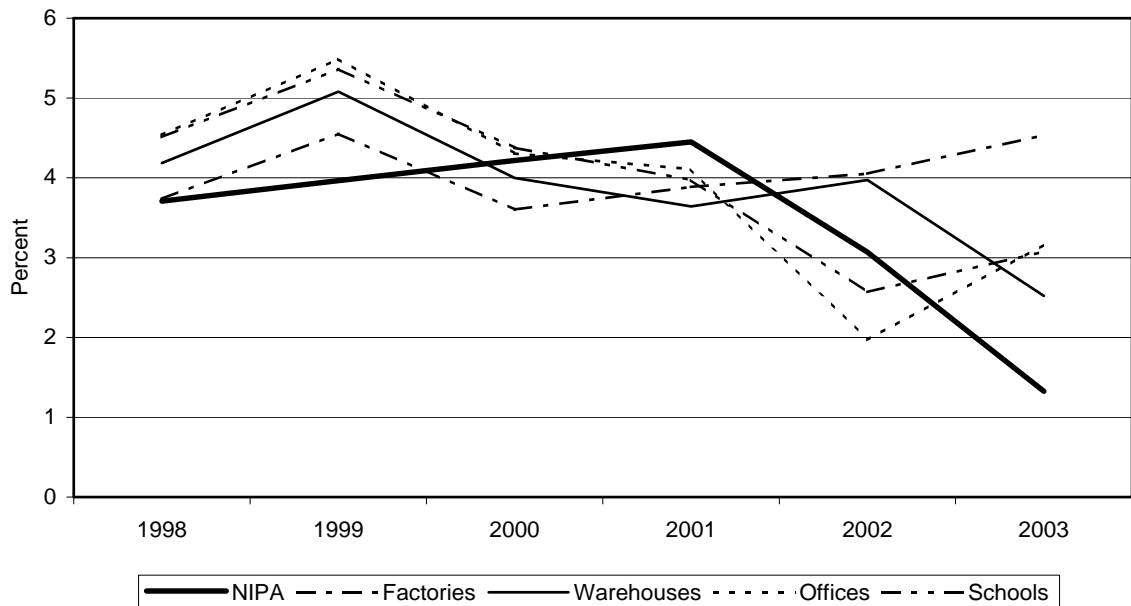


Chart 4  
**Price indexes for some non-residential structures**  
 (Percent change)



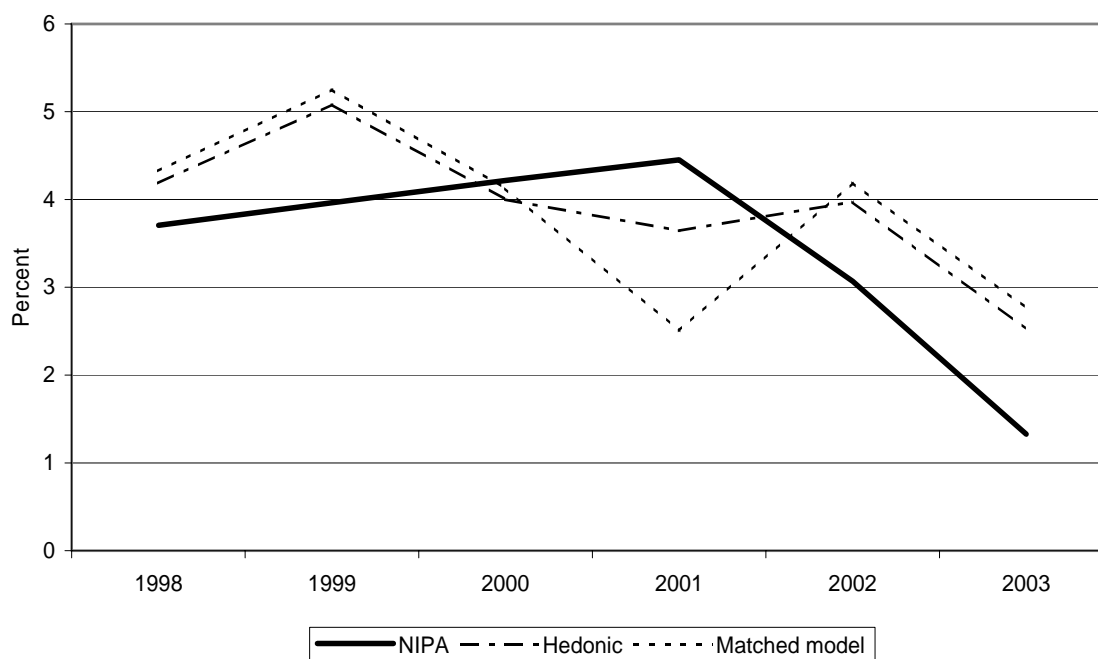
## Appendix

### 1. Alternative estimates

Average rates of increase - from 1 January 1997 to 1 January 2003 - of the various quality adjusted price indexes are shown in Table A1. These include the separate hedonic indexes for each type and height of structure with and without basements (these are the detailed price index estimates underlying the estimates presented in Table 2), the hedonic indexes calculated using the regressions that include structures both with and without basements, and matched model indexes corresponding to the hedonic estimates.

The hedonic price indexes increase more rapidly than the matched model price indexes for all four types of non-residential structures, and within types, for each height class except for one-storey factories. Price indexes for structures with basements increase more slowly than those without, and indexes for structures, including those both with and without basements, increase at intermediate rates. Both hedonic and matched model price indexes exhibit similar year-to-year increases, but they are not in lock step; Chart A1 illustrates this for warehouse prices.

Chart A1  
Price indexes for warehouses  
(Percent change)



### 2. Weights

The judgmental weights used to aggregate components indexes for structures with and without basements - within heights, where applicable - are shown in the first column of Table A2. The judgmental weights used to aggregate different heights (or types of schools) within structure types are shown in the second column.

Table A1  
**Average rates of increase for  
non-residential structures prices**  
1 January 1997-1 January 2003

Structure type	Hedonic estimates	Matched model estimates <sup>1</sup>
<b>Warehouses</b>	3.90	3.86
with basement	3.63	3.57
without basement	3.99	3.95
with and without basement	3.81	3.86
<b>Factories</b>	4.03	4.00
1-storey:		
with basement	3.48	3.60
without basement	4.03	4.12
with and without basement	3.79	3.90
3-storey:		
with basement	4.21	3.97
without basement	4.40	4.14
with and without basement	4.31	4.10
<b>Office buildings</b>	3.92	3.50
2-4 storey:		
with basement	3.95	3.43
without basement	4.09	3.52
with and without basement	4.02	3.44
5-10 storey:		
with basement	3.97	3.71
without basement	4.03	3.75
with and without basement	4.00	3.72
11-20 storey:		
with basement	3.70	3.42
without basement	3.74	3.49
with and without basement	3.68	3.42
<b>Schools</b>	3.97	3.77
Elementary:		
with basement	3.57	3.43
without basement	3.88	3.71
with and without basement	3.72	3.65
Junior high:		
with basement	4.05	3.83
without basement	4.19	4.10
with and without basement	4.12	4.05
Senior high:		
with basement	3.67	3.42
without basement	3.78	3.73
with and without basement	3.75	3.67
Vocational:		
with basement	3.32	3.23
without basement	3.52	3.46
with and without basement	3.45	3.41

<sup>1</sup> Matched model indexes for structures with and without basements are weighted sums of the separate matched model indexes for structures with and without basements; weights are from Table A2.

Table A2

**Weights within type for basements and height**

<b>Structure type</b>	<b>Weight within type for basements</b>	<b>Weight within type for height, or school type</b>
<b>Warehouses:</b>	---	1.00
with basement	.25	---
without basement	.75	---
<b>Factories:</b>		
1-storey:	---	.67
with basement	.25	---
without basement	.75	---
3-storey:	---	.33
with basement	.25	---
without basement	.75	---
<b>Office buildings:</b>		
2-4 storey:	---	.60
with basement	.80	---
without basement	.20	---
5-10 storey:	---	.20
with basement	.90	---
without basement	.10	---
11-20 storey:	---	.20
with basement	.95	---
without basement	.05	---
<b>Schools:</b>		
Elementary:	---	.54
with basement	.20	---
without basement	.80	---
Junior high:	---	.19
with basement	.20	---
without basement	.80	---
Senior high:	---	.215
with basement	.20	---
without basement	.80	---
Vocational:	---	.055
with basement	.20	---
without basement	.80	---



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# Real estate prices and CNB monetary policy

Ivan Matalík, Michaela Skolkova and Jan Syrovatka

## I. Introduction

Real estate prices are among the fundamental indicators for the development of asset prices. The growing importance of asset prices for central banks' monetary policy is the consequence of the ongoing liberalisation of the economic environment and the ensuing globalisation of the world economy. The central banks of advanced countries continue to focus primarily on their main objective, price stability. Nevertheless, the changing global economic environment has been responsible for a certain shift in the perception of a central bank's fundamental role towards that of securing financial stability.

The changing global economic environment has also affected the impact on the central banks' monetary policy in the developing European countries, including the Czech Republic. The high degree of liberalisation of the financial markets not only means that the effects of global economic changes are swiftly passed on to the national economy, but is also responsible for a wide variety of financial innovations. These innovations result in an ever-expanding range of assets, the gradual erosion of differences between the financial and non-financial sector and the rising importance of asset prices in monetary policy in the transforming countries.

In the case of the Czech Republic, the question of asset prices in the Czech National Bank's monetary policy has been examined chiefly in the last two years. This is based on the desire to preserve macroeconomic and financial stability, particularly following experiences with the instability of the banking system in the second half of the 1990s. With regard to the Czech Republic's entry into the European Union in 2004, attention is currently paid to the sharp rise in real estate prices. This is the background to this study on the subject of real estate prices and CNB monetary policy. The next two sections focus on the general definition of assets and the significance of asset prices for the central bank's monetary policy. The three subsequent sections look at the situation in the Czech Republic, primarily with regard to the definition of assets, monitoring real estate prices and the importance of real estate prices in the CNB's monetary policy. The resulting analysis chiefly reflects the authors' practical experience of monetary policy and monetary analyses during the economic transformation of the Czech Republic.

## II. General definition of assets

Using a theoretical definition, an asset may be defined as an item with a market, ie, exchangeable value, which forms part of the wealth or property of its owner. A distinction is made between financial and non-financial, or real, assets.

*Financial assets* are assets in the form of cash, bank deposits and securities which bring their owners a return in the form of interest on the deposits and bonds or dividends from shares. Financial assets also include a foreign exchange rate as the price of a specific asset - currency. *Non-financial assets* include production factors (land, buildings, machines, vehicles, mineral deposits) and immaterial assets (eg patents or trademarks). When examining asset prices, central banks typically focus primarily on financial assets and non-financial assets in the form of real estate and land.

Financial and non-financial assets are present in all areas of a society's economic activity. They constitute a common ingredient of the portfolios of practically all economic sectors. A fundamental factor that determines the prices of specific assets is supply and demand. The classic market axiom applies: when demand is greater than supply an asset's price rises and vice versa. This is closely linked to the degree of a given market's development, ie, whether the market is advanced and effective and has sufficient liquidity.

The economic cycle also influences asset price developments. Different assets develop differently within the economic cycle. The largest difference can be seen in the development of share and bond

prices. During a recession, share prices fall as a result of falling profits. Bond prices, however, rise in response to the fall in interest rates. During a depression, shares continue to have a low, and bonds a high, market value. During the recovery phase, share prices rise together with rising profits, while bond prices begin to fall. In times of boom, share prices are high due to high profits and bond prices continue to fall. From the long-term standpoint, share prices essentially copy the development of economic activity; in fact, from a shorter perspective they generally anticipate the development of the real economy by several months.

Expectations also influence prices. According to the theory of expectation, long-term rates represent the mean of future anticipated short-term rates, including risk premium. This means that share prices can be interpreted as prices reflecting the current value of anticipated future company revenues and real estate prices on the basis of expected future rents. Changes in short-term interest rates thus affect long-term rates and asset prices in relation to how monetary policy will affect expected future short-term rates, returns and rents. Expectations also form part of the effective market hypothesis<sup>1</sup> (the school of rational expectations as part of new classical theory), according to which all accessible data on asset prices that are relevant for the formation of expectations are immediately reflected in market prices. In addition to existing experience, this data also includes various prognoses of economic development and the opinions of central bankers regarding the development of basic macroeconomic indicators.

No less important a factor in price forming is speculation, the result of which is the creation of so-called price bubbles. Bubbles can indicate the future fall in asset prices and thereby reduce real economic activity. According to monetary theory,<sup>2</sup> a bubble may arise, but will only grow into a real financial crisis if the public loses confidence in the banking sector. This theory does not acknowledge the relation between bubbles and the economic cycle. Adherents of the financial instability approach<sup>3</sup> (a post-Keynesian concept), on the other hand, regard asset price bubbles as the result of irrational behaviour on the part of investors and acknowledge the relation between price bubbles and the economic cycle. The view prevails that in the event of price bubbles the central bank should play a positive role in moderating the unfavourable impacts on the real economy. This view is shared by both monetarists and proponents of the financial instability theory<sup>4</sup> (ie post-Keynesians) as well as the adherents of asymmetrical information<sup>5</sup> (ie, institutionalists).

Asset prices are also influenced by other factors, which are chiefly present in the new market economies. These contribute to the uncertainty over the true level of asset prices and thus to uncertainty concerning the future response of asset prices to monetary policy. Among them are restricted access to information, weak and uncompetitive markets and volatile macroeconomic indicators.

As is clear from the above survey, asset prices are determined by a variety of diverse factors whose weight changes over time. This means that in order to assess the price development of assets it is necessary to know both the specific type of asset and the structure of factors that applies to the relevant asset at any given time.

Some work has been done in constructing an aggregate asset price index.<sup>6</sup> Its **reliability factor** depends on the one hand on the concept of its construction and on the other on the quality of the data used. In essence, there exist two fundamental criteria for the selection of assets in the index. The first is the sufficient ratio of the relevant asset to the wealth of the private sector, which guarantees the proper representative character of the affluence of the whole of society. The second criterion is sufficiently high liquidity on the publicly organised markets.

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<sup>1</sup> Some of the more important authors in this field are Fama, Miller, Modigliani and Sharpe.

<sup>2</sup> See Friedman and Schwartz (1963).

<sup>3</sup> See Minsky (1975).

<sup>4</sup> See Minsky (1986).

<sup>5</sup> See Mishkin (1991).

<sup>6</sup> Borio et al (1994).

In the technical sense of the word, the construction of the relevant asset price index is quite problematic. The assets market contains a wide variety of heterogeneous products. And it is precisely the differences between assets that have a powerful impact on the overall value of the aggregate index and its **reliability factor**. Nevertheless, in general we can say that despite these limitations, asset prices represent a major source of information for the central bank's monetary policy decision-making.

### III. Asset prices and monetary policy

#### A. The importance of asset prices for the central bank's monetary policy

The importance of asset prices for monetary policy rises in correlation with the development of the financial markets. Information from the financial markets can be used in timing specific monetary policy measures. This means that asset prices can suggest whether the measures will be effective. Opinions differ on whether the central bank should respond to asset price changes. One line of thinking is that the central bank should include asset prices in the overall target price index. Others believe that asset prices are only relevant for monetary policy if they affect the forecast for future inflation, or if they threaten the stability of the financial system. The optimal monetary policy reaction to changes in asset prices thus depends on their importance in the transmission mechanism and on those factors that influence them.<sup>7</sup>

If fundamental factors are responsible for a change in asset prices then this is justified. An increase in productivity leads to increased company profits and higher share prices. On the other hand, experience tells us that improvements in fundamental factors almost always result in a higher dynamic for asset prices than would correspond to those factors. Nevertheless, price movements on the assets market generally influence inflation expectations and expectations of future economic growth. This is due to the fact that asset prices are strongly influenced by expectations of future returns, which themselves are dependent on expectations of future economic activity, inflation and monetary policy. The use of asset prices as a sufficiently reliable indicator thus depends to a large extent on whether the relevant expectations are determined by fundamental economic factors.

Taking account of asset prices for monetary policy in general has its adherents and opponents. The argument for the inclusion of asset prices in the monetary policy planning concept is based chiefly on their forward-looking character, which corresponds to current monetary policy approaches based on medium to long-term outlooks. It's frequently emphasised that financial assets very easily monitored, only revised in exceptional cases, and stand out for their statistical reliability. Those who argue against their inclusion in monetary policy claim that there is no reason to expect the repetition of previously-monitored links between asset price developments and monetary policy objectives. The reason is the strong dependence on expectations. If the price volatility of one type of asset can successfully be reduced, this volatility may switch to other assets.<sup>8</sup> The inclusion of speculative price fluctuations on the assets market between the mediating objectives of monetary policy may make it less transparent for the public. Monetary policy responses to price fluctuations on the assets market thus do not necessarily lead to their stability. On the contrary, future prices may have a tendency to greater volatility. This applies particularly in cases where a monetary policy measure does not fall within previous monetary policy experience and is considered surprising.

The degree to which asset prices can act as sound leading indicators depends to a significant extent on whether the expectations on which they are based reflect fundamental economic factors.<sup>9</sup> The

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<sup>7</sup> Several studies exist on the impact of monetary policy on asset prices; most of them however focus on the ability to influence financial market interest rates. The Swedish Central Bank, which examined the impact of all instruments used by the central bank on the stock market, including inflation reports and the governor's speeches, concluded that it actually does influence share price levels and market volatility (the question is whether this is desirable). In Japan, a relation was proved between share and land prices on the one hand and real economic indicators on the other. Share and land prices are therefore important indicators.

<sup>8</sup> See Dornbusch's "Overshooting model".

<sup>9</sup> Information effectiveness has been addressed by, for example, Le Roy, Kupiec, Borio, Kennedy and Andersen.

assessment of the significance of asset prices in the context of monetary policy represents a relatively new subject, one which in certain respects objectively meets with inappropriate methodological approaches and opinions. Nevertheless, it is a matter of importance for the majority of central banks. The reason is the fact that the development of asset prices and monetary policy register definite mutual links, which it is useful to take into account when considering the various approaches in monetary policy.

## **B. The impact of monetary policy on asset prices**

Monetary policy may influence asset prices in a variety of ways. One of these is the so-called rational approach,<sup>10</sup> which consists of the setting of short-term rates by the central bank. This then influences asset prices in the economy through the rates. A second method is the monetary approach,<sup>11</sup> which is essentially based on the volume of disposable financial resources for the purchase of assets. It proceeds from the fact that there are only two basic ways in which people can dispose of their money. Either they can spend it on buying goods and services, which ultimately increases economic activity, or they can save it through purchasing financial assets.

The development of asset prices is also connected to a number of macroeconomic variables that stand at the hub of monetary policy. For example the relation between *financial assets and the money supply*. If the money supply exceeds demand for money a certain surplus will probably be spent on the acquisition of assets, asset prices will rise, and vice-versa. The reasons why asset prices are relevant for the demand for money are clear. Higher aggregate asset prices are logically linked to the higher value of financial transactions and real assets. A rise in asset prices also increases the overall wealth of a society, which can positively affect demand for money.<sup>12</sup>

Other such links include the relation between *asset prices and credits and the offer of and demand for savings*. The relation between credit and asset prices is many-sided; economic subjects may use credit directly for the purchase of real and financial assets. A direct result of a rise in prices is therefore an increase in the credits issued by financial institutions. The expansion in the assets side of the balance sheet (credits) appears on the liabilities side (money supply). Of particular significance in the relation between asset price development and demand for savings is the link between the development of the offer of savings in the economy and the overall demand of economic sectors for financial resources. If the offer of savings in the economy as a whole exceeds demand for financial resources, a certain surfeit will be spent on existing assets, whose prices will thus tend to rise. Alternatively, if the offer of savings is lower than demand for financing in the economy as a whole, existing assets will be sold and their price will instead tend to fall.

One of the key links between the development of asset prices and the central bank's monetary policy is the relation between *asset prices and inflation*.<sup>13</sup> Analysis of this relation is important in deciding whether monetary policy should respond to asset price developments or not. A theoretically positive or negative relation between the expected inflation rate and nominal asset prices depends on the correlation between inflation and returns on assets. The level of consumer prices may also be directly affected by an increase in asset prices, or indirectly through changes in household expenditure.

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<sup>10</sup> See BIS (1998).

<sup>11</sup> See Borio et al (1994).

<sup>12</sup> Grice and Bennett were the first to attempt to include affluence in the conventional function of demand for money. Other authors include Hall, Corker and King. M Friedman analysed the impact of share prices using a narrow definition of money and concluded that asset prices should be treated in the same way as an alternative income rate.

<sup>13</sup> This has been examined, among others, by Modigliani and Cohn (1979), Gultekin (1983), Solnik (1983) and DeFina (1991).

## IV. Asset prices in the Czech Republic

### A. Asset prices during the Czech Republic's economic development to the present

Asset prices during the decade-long history of the Czech economy have developed in different ways at different times. Abroad, price fluctuations on the asset market can partially be explained by upturns in the economic cycle. In the case of the Czech Republic, asset price movements have been associated primarily with the economy's transition from a planned to a market-oriented economy.

In the first case, this meant the impact of the *change in ownership structure*. In the space of a few years, an enormous volume of property changed owners. This change took several forms which, from the point of view of prices (or rather the valuation of the property), had no comparison with, and in terms of their rapidity no analogy outside, the transforming economies. *Price, business and financial liberalisation were also important*. A significant proportion of prices in the economy were liberalised and barriers limiting the imports of foreign goods and preventing the free movement of capital were relaxed. The Czech Republic thus joined those economies for which a high level of openness is customary.

Another factor determining the structure and price fluctuations of the asset market was the *creation of a financial market* which at the beginning of the economic transformation was practically non-existent. Initial price relations did not reflect the real value of individual financial assets. The first significant change towards more realistic prices in this area took place in 1990 with the devaluation of the Czech currency and again during the currency turbulence of May 1997. The Czech financial market was shown to be easily vulnerable and influenced by external factors in a context of inter-connected world markets. Similarly, share prices from voucher privatisation fell sharply after their introduction on the stock market (1993-94) and even in the following years failed properly to reflect the real value of company assets. Only with the economy's subsequent restructuring at the end of the 1990s did their prices begin to reflect companies' performance in the conditions of a market economy.

### B. Definition of assets in the Czech Republic

The period of economic transformation saw the creation of the following categories of financial and non-financial assets, which form the subject of analysis of the asset prices channel as part of the monetary transmission mechanism of the CNB's monetary policy. The chief financial assets<sup>14</sup> include securities, household assets in the form of building savings and capital pension insurance. Non-financial assets include real estate, land ownership, production equipment and other immaterial assets. The detailed assets structure in the Czech Republic is evident from the following diagram.<sup>15</sup>

The development of financial and non-financial asset prices in the Czech Republic differed markedly for individual assets from the beginning of the economic transformation period. It's important to note that at the beginning of the 1990s almost none of the aforementioned financial assets existed, with the exception of some forms of life insurance. Financial assets were overwhelmingly in the form of cash or deposits and only with the development and strengthening of the liquidity of basic segments of the financial market did alternative forms of financial investment begin to emerge. This development was understandably reflected in the development of their prices. This applied primarily to the over-valuing of asset prices in the form of company shares and investment funds in the mid-1990s, which was linked to the economy's general imbalance. We may describe this situation as a transformation bubble in this asset segment.

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<sup>14</sup> In accordance with the definition of the monetary transmission mechanism in Section 5 we do not include among asset prices financial assets in the form of currency and deposits since these are examined by other transmission channels.

<sup>15</sup> We leave to one side the fact that Czech subjects may also own assets abroad in the same or similar structure.

Figure 1

**Assets in the Czech Republic****A. Financial assets**

1. *Monetary assets*
  - currency
  - demand deposits at banks
  - term deposits at banks (including building societies)
  - deposits at credit unions
2. *Securities*
  - a. with a given maturity
    - short-term:
      - T-bills
      - CNB bills
    - medium-term:
      - government bonds
      - municipal bonds
      - corporate bonds
      - mortgage bonds
    - (and long-term)
  - b. without a given maturity
    - shares of enterprises
    - shares of investment funds
    - open-end mutual funds
3. *Private capital insurance*
  - pension insurance
  - life insurance

**B. Nonfinancial assets**

- real estates
- land
- production equipment
- other: immaterial assets (patents), art and historic objects, valuables and jewels

Certain non-financial assets, in particular real estate prices, developed similarly. At the beginning of the 1990s, real estate prices rose markedly due to the limited supply and high demand. Only with the gradual deepening of liquidity on the real estate market, chiefly as a result of the construction of new houses, flats commercial and production premises, did this asset market start to see more realistic price relations at the end of the 1990s. The deformation of the asset prices with respect to real estate also impacted on the credit market. On the one hand, they acted as unrealistic and low-liquidity collateral, on the other hand institutional conditions (the Act on Bankruptcy and Settlement) also hindered the recovery of collateral. As a result, deformations on the capital market and the real estate market were reflected in banks' worsening portfolios and the subsequent credit restrictions by banks.

An international comparison reveals that the ratio of financial assets to GDP in the Czech Republic still falls short of the figure recorded in advanced countries. The structure of financial assets also differs and reflects both the structure of the financial market and certain historical correspondences with regard to the preferences of household investments. In the Czech Republic, households continue to prefer to hold currency and invest in deposits. The following table provides a comparison of the asset price structures of different countries.<sup>16</sup>

Table 1

**Structure of financial assets held by  
households in selected countries in per cent (2000)**

	Germany	France	United States	United Kingdom	Czech Republic
Currency and deposits	36.2	30.4	11.1	22.2	59.6
Equities	15.6	24.8	33.1	17.4	17.7
Other securities	10.1	2.7	6.4	1.3	14.5
Mutual funds	10.5	9.0	12.9	5.5	4.7
Life insurance	13.6	23.3	7.1	27.5	2.3
Pension funds	5.2	1.5	23.8	22.1	1.2
Financial assets as a percentage of GDP	180	234	341	299	121

<sup>16</sup> See OECD (2000).

At present, the CNB pays closest attention to real estate prices within the larger development of asset prices. Recently, this assets segment has recorded quite a sharp price increase, chiefly as a result of expectations associated with the rise in price of apartments and houses following entry into the EU in 2004. Interest in acquiring property has also been stimulated by the lowest ever interest rates in the Czech Republic and the consequent accessibility of mortgages to finance real estate purchases. For this reason, the following two sections address the monitoring of real estate prices in the Czech Republic and the relation between real estate prices and the CNB's monetary policy.

## **V. Monitoring real estate prices in the Czech Republic**

### **A. Current situation**

Since 1997, the Czech Statistical Office, together with the Ministry of Justice, has been developing a system to monitor real estate prices in the Czech Republic. This is the first attempt to gather data from the real estate sphere in the period since 1989. An important milestone was the introduction of Act no 151/1997 Coll., on Asset Evaluation, which stipulates the obligation of the tax authorities to pass on to the Ministry of Finance and the Czech Statistical Office data from tax declarations concerning prices established by real estate evaluations and prices agreed for real estate in the case of sale. The Act came into effect as of 1 January 1998.

Certain requirements are placed on the development of the real estate price monitoring system. First, it should be reliable and up-to-date and should provide information on the price level spread according to the types of real estate, their location and other determining factors, including the development of this spread in time. The system should provide global information at a macroeconomic level and should thus not duplicate the so-called price maps which are compiled by local administrative bodies for their own purposes.

The system's data comes from real estate tax declarations, which owners or sellers of real estate are obliged to provide to the tax authority within 30 days of receiving a registered purchase agreement from the Land Registry. A database for tax was established by the tax authorities for tax declarations provided in 1998, ie, the data has been collected since February 1999 (with an average gap of seven months from the sale date, or delivery of the real estate tax declaration). The tax authorities have identified the following types of real estate from the declarations in the database: buildings and halls, family houses, recreational cottages and homes, recreational and gardeners' huts, garages, wells, apartments and non-residential premises, building plots, agricultural land and forest land. These data, which are owned by the Ministry of Finance, are electronically sent to the Czech Statistical Office on a monthly basis in coded form.

The chief advantage of this resource is that it comes from real, paid (declared) prices and is therefore a comprehensive, regular and optimised data flow on price transactions on the real estate market. The only problem may be distortions caused by the possibility that the declared price is not always the same as the price actually paid. Nevertheless, in a relative comparison of prices over time and generally also in the real estate's location this objection has no weight since it can be posited that any such distortion remains, on average, constant.

The Czech Statistical Office used this database to compile the publication in 2002 of "Prices of Monitored Types of Real Estate between 1998 and 2000" (ČSÚ (2002)). The publication, which is mostly analytical in character, provides information on real estate's price dependence on a variety of determining factors. The explanatory priority variable in the publication's tables is a unitary purchase price, and from that a price index, which is a proportion of average prices from two different time periods. The explanatory variable expresses mainly location and time, followed by wear and tear and the size of the community. Only single-apartment brick family homes, apartments, multi-dwelling buildings, brick garages and building plots were selected from those on the database as they fulfilled the criteria of sufficient volume and homogeneity.

The selection of explanatory factors and of real estate types for this publication (for the years 1998-2000) is the result of extensive numerical analyses, of which the most important is probably the analysis of the seasonal character of sales. Also of interest is the analysis of the stipulation of the relative degree of average unitary price in each of the explanatory factors and the analysis of the connection between the unitary price and the size of the building plot.



The study also showed the relatively precise dependency of the unitary price on wear and tear, which makes it possible to conduct a hypothetical calculation of the price of a new family home for each price given (the Czech Republic can be divided into two localities - more expensive and cheaper). The price diffusion is greater in localities with a higher price level.

The statistical analyses were used to stipulate the maximum extent of a set of tables as one of the publication's objectives had been to find the maximum reliability factor of the current state of data, or to define the border for the reliability factor of the examined from a perspective selected in advance. This classification pointed to uneven data coverage from various regards and thus to the urgent necessity to improve the statistical system for the monitoring of real estate.

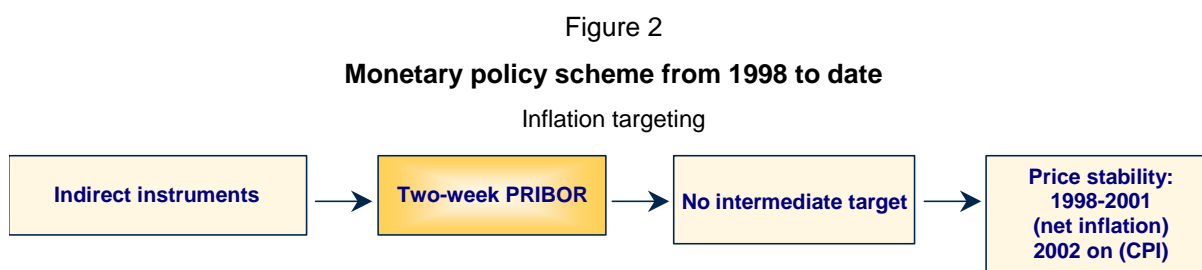
## B. Proposals to improve data collection

Due to the character of the data resource (data from tax declarations owned by the Ministry of Finance) the information provided on real estate prices cannot be absolutely up-to-date. For the future, the Czech Statistical Office is considering the annual publication of "Monitored Real Estate Prices". The next publication, which comes out at the end of 2003, will cover the period 1998-2002. The Office's objective is to shift the publication's **reliability factor** to the real estate price indices; however, because the available data do not provide adequate information for the calculation of clean price indices, it will be necessary to apply more demanding statistical methods which place higher demands on sources. Nevertheless, the publication under preparation will also contain an aggregated real estate index for selected types of real estate, or for those types of real estate for which an index can reliably be constructed. For the future, the Czech Statistical Office is considering the creation of standard, long-term schedules for real estate price indices. The aforementioned character of the data resource is a further reason why real estate price indices cannot be entirely up-to-date.

## VI. Real estate prices and CNB monetary policy

### A. CNB monetary policy and the monetary transmission mechanism

Since 1998, the CNB's monetary policy has been based on the so-called inflation targeting regime. The changeover from so-called currency targeting, which was practised from 1990 to 1997, to inflation targeting was caused by the loss of the nominal currency policy anchor in the form of the exchange rate during the exchange rate turbulence of May 1997, subsequent rise in inflation and the associated rising inflation expectations and the necessity to increase overall transparency and consistency of the CNB's monetary policy. The monetary policy scheme from 1998 to the present is given in the following graph.



Since 1998, when the Czech Republic became the first transforming economy to introduce an inflation targeting regime, this form of monetary policy has been significantly developed. This applies above all to the target itself, which, since 2002, has been the overall consumer price index instead of "net inflation"<sup>17</sup>. Other important changes include, for example, the switch from defining targets for specific

<sup>17</sup> Net inflation = the total consumer price index less changes in so-called regulated prices and indirect taxes (approx 20% of the price index).

years to a target in the form of a **continuous band**, the change from a conditional to an unconditional prognosis, greater transparency in the CNB's monetary policy through the publication of future inflation factors, the voting ratios of the Bank Board members etc.

An important feature of the CNB's monetary policy is the inflation prognosis, which is the result of the CNB's short- and medium-term macroeconomic prognosis. When compiling the prognosis, the CNB proceeds from a number of theoretical postulates, but also from empirical information which are the result of a permanent analysis of the monetary transmission mechanism (MTM) in the Czech Republic.

The study of the MTM in the Czech Republic is one of the basic areas of research in the CNB. For example, as part of the research from 1998,<sup>18</sup> the following six channels were defined:

- CNB action on interest rates on the interbank deposits market (PRIBOR)
- the impact of interbank deposits market interest rates on other financial market interest rates
- the impact of financial market interest rates on the exchange rate
- the impact of the exchange rate and interest rates on aggregate demand
- the impact of interest rates on demand for money
- the relation of the money supply to inflation and GDP.

With the gradually changing character of the Czech economy, primarily through the economy's restructuring and culmination of economic transformation, changes have taken place in the way economic impulses function in the economy. The asset price channel, which since 1998 has been included in the MTM roughly under the channel describing the impact of interbank deposit interest rates on other financial market interest rates, is currently allocated a separate channel of its own. The effectiveness of the asset channel is closely linked to the level of the financial market's development. The connection between central bank measures and their impact on asset prices is, however, generally not straightforward. The transmission is highly influenced by expectations.<sup>19</sup> At present, the MTM is most often broken down into the following five channels:

- **direct monetary transmission** - classic transmission channel via in which demand for money is influenced;
- **interest channel** - operates through official interest rates determining financial market rates; its effects are manifest in investment, substitution and income;
- **asset price channel** - affects real economic activities through asset prices such as shares, bonds, real estate, land, exchange rate etc. In this respect of chief relevance are Tobin's  $q$  effects and affluence effects. The exchange rate channel is also incorporated in the assets channel;
- **credit channel** - acts on the economy through the offers of credits and their price,<sup>20</sup> can be sub-divided into two channels: banking credit channel and **balance sheet channel**;
- **expectations and uncertainty channel** - relates primarily to the credibility of the central bank's monetary policy. A further aspect of the channel concerns the uncertainty of loan contract repayments, eg increased uncertainty at times of recession obfuscates the distinction between good and bad credit risks. The rise in uncertainty thus reduces the **reliability factor** of information on the financial markets, while negative selection and moral hazard restrict credit and thus contribute to the fall in economic activity.

The increasing significance of the asset prices channel in the MTM, which has also become a feature of CNB monetary policy over the past two years, chiefly stems from the change in the microeconomic

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<sup>18</sup> Eg Arlt et al (1998).

<sup>19</sup> Among the major authors to have written on the role of asset prices in the MTM as part of their studies are Von Mises, Keynes, Kindleberger, Minsky, Friedman and Kuttner.

<sup>20</sup> See Bernanke and Blinder (1988), Gilchrist and Zakrajšek (1995) and Peek and Rosengren (1995).

environment. This is the process of globalisation, deregulation and financial liberalisation,<sup>21</sup> which has led to changes in the perception of monetary policy in many countries, or a switch to inflation targeting, in which expectation plays a major role. Another important factor that has influenced the earmarking of a separate asset price channel in MTM is the experience of many countries which, as a result of rising asset prices and their subsequent fall, suffered major financial instability and high losses in the banking sector. The final factor contributing to the greater attention paid to asset prices as a separate channel are the fundamental characteristic features of asset prices, but in particular their information content. The aforementioned factors are the reason why the CNB's monetary policy also focuses on asset prices and within them real estate prices. This focus is the result of similar factors to those abroad, ie, the impact of globalisation, deregulation and financial liberalisation on monetary and economic development in the Czech Republic.

## **B. Real estate prices as a factor in CNB monetary policy**

CNB monetary policy pays close attention to developments in real estate prices. Yet this asset's role in the process of monetary policy remains limited and only indicative. This is mainly due to insufficient current information on asset price developments in this segment. As has already been mentioned, data are obtained more than a year in arrears and even with an improvement in data collection the delay in publishing statistics on real estate prices will be almost one year. Monetary policy thus uses partial information from a variety of statistical surveys provided by the large real estate agencies. Currently, the CNB, in conjunction with the Czech Statistical Office, is attempting to speed up the data collection procedure and possibly to introduce current studies on the development of real estate prices in the Czech Republic.

The second reason for the purely indicative role of real estate prices in monetary policy is the specificity of real estate market developments in the Czech Republic, mainly due to the culmination of economic transformation and the Czech Republic's entry into the European Union. Real estate prices continue to narrow the gap with prices that are normal in the European Union, depending on the level of economic development of the various regions of the Czech Republic. Any increase in real estate prices over the last year (eg +20% in Prague) is recorded as significant; real estate prices in the capital are also only coming nearer to those common in the European Union. If we take into account that, at an economic level, Prague is around 130% of the EU average, this development can be considered as justified. Further price movements should however be linked chiefly with economic developments in the Czech Republic.

Real estate prices also only play an indicative role in CNB monetary policy because of the absence of any empirical evidence that real estate prices influence household consumption habits and company investment. It thus proceeds chiefly from theoretical assumptions on the impact of real estate prices on economic development.

When examining the *impact of real estate prices on household consumption*, we assume the existence of three channels. The first is the classic *affluence effect* associated with F Modigliani. In his concept of the consumption function, based on the model of the life cycle, consumer expenditure is determined by lifetime resources which form financial wealth, real and human capital. Since real estate comprises the decisive part of assets in the household portfolio, it can be assumed that with its increase in price the consumers' lifetime resources increase and with it their routine expenditure. From a macroeconomic point of view, there is an increase in aggregate demand. In the Czech Republic, the affluence effect has yet to manifest itself to any meaningful extent. Apartments and family houses are very rarely used for investment purposes. The second channel acts through the *possibility of using*

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<sup>21</sup> Liberalisation on the financial markets and related procedures leads to:

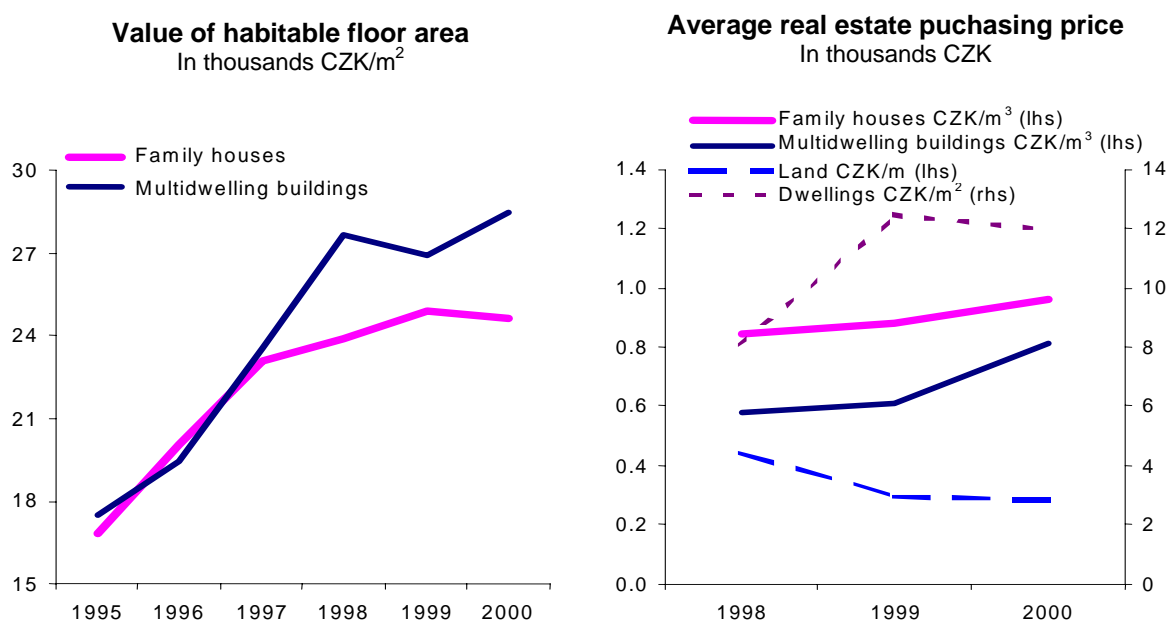
- a reduction in interest margins, to which banks react by entering into higher risk transactions (eg credit for the purchase of shares and real estate)
- a significant shift in banking credit from the public sector to the private sector
- easing access of the private non-financial sector to credit
- diversification of the assets and liabilities sides of the balance sheet of the private, non-financial sector
- a reduction in the proportion of fixed interest rates in favour of variable interest rates
- securing credit by means of collateral in the form of financial assets
- a general expansion of securities holdings at the expense of traditional forms of savings.

*real estate as collateral for credit.* For owners, real estate represents highly valuable collateral since credit secured on its basis is, in comparison with other types of credit (personal loans, credit cards), generally cheaper. The increase in real estate prices thus directly influences the accessibility, or potential credit capacity of a household with a direct impact on consumption. In the Czech Republic it is unlikely that a relation through collateral will become more pronounced. The third channel acts through *additional expenditure arising from the acquisition of real estate.* This applies to purchases of items long-term consumption which, while they are considered investments from the point of view of economic theory, from the standpoint of statistical monitoring they are categorised under normal consumption in the system of national accounts. Over the past few years in the Czech Republic, the rise in consumer demand has been closely connected with the process of equipping items of long-term consumption in relation to the rise in the proportion of new real estate in household ownership.

*The impact of real estate price development on company investment* is assessed using Tobin's  $q$  theory of investment and the credit channel theory. Under the former theory, real estate is assessed in the same way as other assets (eg shares), ie, an increase in the price of real estate - for example in the event of a relaxation of monetary policy - increases Tobin's  $q$  (the market price of real estate divided by costs for the reproduction of real estate) and thereby stimulates its new construction, or investment generally. On the other hand, the volume of investment in real estate reduces in the event of a fall in the price of real estate, ie, if there is a tightening of monetary policy. Real estate is often used as collateral when providing credit. Therefore, *changes in real estate prices, or requirements for collateral quality (on the part of commercial banks and banking supervision) may influence the volume of overall credit in the economy, particularly investment credits.* A tightening up of monetary policy (increased interest rates) can result in the fall in the values of collateral and thus to restriction on the credit supply (and vice-versa). In addition, a change in real estate prices may alter the value of a bank's and company's portfolio, or balance sheet, which in turn means a change in the position for the provision and obtaining of credit, or debt repayment.

From the Statistical Year-Book of the Czech Republic and the publication "Monitored Real Estate Prices 1998 to 2000" it is evident that real estate prices continue to rise (between 1995 and 2000 the value of unitary habitable floor area in family houses and multi-dwelling buildings rose by approximately 50%), as the following graph and table indicate.

Graph 1



Source: Czech Statistical Office.

We can expect that in the future the asset price channel in the real estate segment will function very differently due to increased competition and the introduction on the market of financial innovations.

This should particularly cover mortgage financing which is more accessible to a wider circle of clients, not only through falls in mortgage rates but also the provision of new mortgages to refinance existing mortgages and the introduction of flexible mortgage products. The development of real estate prices as part of the analysis of asset prices should thus play an increasing role in the CNB's monetary policy.

Table 2  
**Value of habitable floor area**  
In thousands CZK/m<sup>2</sup>

Year	Family houses	Multidwelling buildings
1995	16,826	17,528
1996	20,063	19,457
1997	23,109	23,542
1998	23,913	27,688
1999	24,899	26,902
2000	24,654	28,470

Source: Czech Statistical Office.

**Average real estate purchasing price**

	1998	1999	2000
<b>Family houses CZK/m<sup>3</sup></b>			
Prague	2,914	3,102	3,069
CR	843	880	959
<b>Dwellings CZK/m<sup>3</sup></b>			
Prague	19,228	22,954	26,296
CR	8,077	12,453	11,936
<b>Multidwelling buildings CZK/m<sup>3</sup></b>			
Prague	701	849	1,206
CR	580	612	812
<b>Land CZK/m<sup>2</sup></b>			
Prague	3,158	3,152	3,183
CR	444	296	285

Source: Czech Statistical Office.

## VII. Conclusion

Real estate prices are one of the prime indicators for the development of asset prices in the Czech Republic. The development of real estate prices is reflected in the specifics of the period of transition that the Czech economy went through in the 1990s. This period is characteristic for the emergence of a transitional price bubble on the real estate market at the beginning of the 1990s, when the enormous demand for this asset without corresponding response on the part of supply led to an unfounded increase in prices. With the restructuring of the Czech economy in the second half of the 1990s and the gradual convergence of the Czech economy with the EU, the Czech real estate market gradually came to function more efficiently. The market is currently experiencing a rise in prices as a result of expectations concerning the development of real estate prices following the Czech Republic's entry into the EU and the accessibility of funds to invest in this asset.

Real estate prices have begun to take a central position in the CNB's monetary policy in the last two years, during which time monetary policy has been based on an inflation-targeting regime and has

focused more on the comprehensive study of the monetary transmission mechanism and attention to a variety of financial and non-financial indicators of monetary and economic development. Real estate prices are one of these indicators.

An analysis of the development of real estate prices as part of an analysis of the monetary transmission channel comes up against data problems. In 1997, the Czech Statistical Office, in conjunction with the Ministry of Finance, setup a system to gather information on the development of real estate prices. At present, data are available on real estate prices from 1998 to 2000. The current system represents a very solid basis from which to proceed and make it more efficient. The major challenge for the Czech Statistical Office is the acquisition of more up-to-date information and the construction of an aggregate price index for the development of real estate prices.

We expect that, once an effective data gathering system has been put in place for real estate prices in the Czech Republic, the CNB's monetary policy will be able to focus more on analysing this indicator of monetary and economic development. In line with the theoretical preconditions and results of empirical research we may expect that the development of real estate prices in the Czech Republic will likewise have a standard effect on household consumption patterns and companies' investment decisions.

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# Residential real estate price indices as financial soundness indicators: methodological issues

Bradford Case and Susan Wachter<sup>1</sup>

## I. Introduction

The purpose of this conference on real estate indicators and financial stability is “to promote the development of reliable, timely and consistent statistics on real estate prices” in order to support policy initiatives to promote macroeconomic stability. The recent volatility of asset prices and the Asian financial crisis of 1997 have focused attention on the role of asset markets and, in particular, real estate markets in the generation of financial crises and economic instability across nations.<sup>2</sup> With contagion effects driven by fast and large flows of capital, such national crises threaten global financial stability. Hence the need for monitoring devices and policy instruments to respond to the heightened potential for asset market induced global financial instability.

This paper focuses on the potential uses of residential real estate price indices as a tool to monitor asset market instability, and the methodological issues involved in their development. In Section II we examine how real estate price indices can serve as a monitoring device to help minimise financial instability. Section III reviews the methodological issues in the development of residential price indices, and Section IV provides a discussion of the availability of data in the United States to support the development of such indices. Section V discusses what we learn from the price trends revealed in the indices. Section VI concludes.

## II. The use of price indices to monitor asset markets and promote financial stability

Although there are many possible empirical methods and data sources for estimating real estate price indices, not all of them can be expected to play an effective role in promoting financial stability. Before discussing the methodological and data considerations involved in developing a price index, we must consider the function of a properly constructed real estate price index in monitoring asset markets and promoting financial stability.

Fundamentally, the price of any property is equal to the present discounted value of all future services (ie housing) that will be provided by that property while it is owned by its current owner, plus the present discounted value of the price at which the owner will be able to sell the property in the future. In general, we would expect the value of housing services to change only gradually, but the future market price could change more rapidly. To take this a step further, the “market price” of any property at a given time can be defined as the highest price at which the owner would be able to find exactly one willing buyer for that property at that time. This market-clearing price, however, may fluctuate sharply over time: because of changes in the availability of particular types of housing services, because of changes in the cost of financing housing purchases, or because of changes in expectations about future increases in the market-clearing prices among other market participants.

Indeed, a market “bubble” can be thought of as an increase in the market-clearing prices that is justified only by expectations that those price increases will continue into the indefinite future, and not by current or expected changes in the value of housing services or the cost of financing. Although all types of financial instability can be disruptive, it is important to distinguish these market bubbles from

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<sup>1</sup> The views expressed are those of the authors and do not represent official views of the Board of Governors of the Federal Reserve System or its staff.

<sup>2</sup> See Mera and Renaud (2000).

what may be termed “fundamentally supported” fluctuations in asset values. Both sources of boom-bust cycles are cause for concern, but they may call for sharply different policy responses.

Property markets and real estate prices are inherently subject to booms and busts. One reason for this is construction lags: if a surge in demand pushes the price of existing property above its replacement cost, then developers have an incentive to build more properties. But new properties may take years to complete, and until the new supply is forthcoming, market-clearing prices will remain high. In the presence of construction lags, then, price increases efficiently reflect the current scarcity of housing services. Nonetheless, this increase in market-clearing prices will tend to be followed by a drop once the new supply is forthcoming. This cyclical nature in asset values means that lending at any given loan-to-value (LTV) ratio during the price boom - when the demand for construction financing is strongest - may well produce a portfolio of loans with higher than anticipated LTVs when asset values drop after supply responds.

A second reason for cyclical nature in asset values is the absence of short selling in real estate markets. Myopic buyers tend to extrapolate price increases into the future, even when sustained price increases are not justified by market fundamentals. In an efficient market, such price rises would be countered by non-myopic investors selling short (that is, selling something for future delivery that they do not currently own, in the hope that they will be able to buy it more cheaply later). But, due to the underlying heterogeneity of properties, there are no organised futures or options markets for individual property sales. In markets with no short sellers, prices will be driven by myopic buyers so long as the upward trend continues. Moreover, as Herring and Wachter (1999, 2002) show, in an economy in which real estate prices have risen over a long period of time with no declines, buyers typically underestimate the likelihood of an eventual downturn. That is, investors are prone to “disaster myopia”, the tendency over time to underestimate the probability of low-frequency shocks.<sup>3</sup>

Real estate markets are made more vulnerable to fluctuations because of the role played by the banking system. As Herring and Wachter (1999) show, increases in the price of real estate raise the economic value of bank capital to the extent that banks own real estate; thus banks increase their exposure to real estate when prices are rising. Higher prices also lift the value of banks’ own property holdings and hence their capital, which encourages them to relax their lending standards. If prices fall, this process goes viciously into reverse, and a credit crunch can amplify the impact of falling prices.

Moral hazard may also contribute to a bank’s supply of capital to real estate, exacerbating booms and busts. To the extent that bank managers’ salaries and bonuses are based on reported short-term profits without adjustment for reserves against shocks, the line officers who are in the best position to assess such dangers will be rewarded for disregarding them (Pavlov and Wachter (2004)). Moreover, Pavlov and Wachter (2003) show that, due to competitive pressures in the banking industry, all managers will be pushed to underprice the risk of real estate loans, and, additionally, bank shareholders themselves will incentivise such behaviour.

In addition to problems of moral hazard, poor information and inadequate analysis of real estate risk contribute to the vulnerability of the banking system. Banks and individual managers, besides being poorly incentivised, have little data on which to base careful analysis of future real estate prices. The property value appraisal process is based on observing the prices of comparable properties to estimate the market value of properties (and therefore LTV ratios). While lending decisions would ideally be made on the basis of long-term expectations about the market value of the property throughout the life of the loan, the observed transaction prices of comparable properties are market-clearing prices, subject to bubbles and other sources of short-term fluctuation. Moreover, prices of comparables cannot be used for appraisal purposes until after the transaction is closed, which means that price indices based on appraisals generally lag actual movements in real estate prices.

Real estate price indices can serve in two ways to reduce boom-bust cyclical nature in asset value markets, and the attendant cyclical nature in the banking system. First, to counter the tendency for banks and appraisers to underestimate LTV ratios by basing them on short-term real estate price booms (whether induced by bubbles or not), indices of current market-clearing prices can be compared to measurements of what might be called long-term property values. “Long-term value”, for example, might be thought of as the (relatively stable) value of housing services, plus an average over the range

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<sup>3</sup> See Tversky and Kahneman (1982) and Guttentag and Herring (1986).



of future non-bubble market values (all discounted to present value). One advantage of estimating such long-term value is that it could potentially prevent banks from financing property transactions or construction based on unrealistic expectations about future market prices. A major concern, however, is that it is far more difficult to construct indices of long-term value than of current market value. This has consequences for the availability of credit. Transactions occur only at the current market-clearing price: for example, if governments mandate that sales cannot occur at any price above (or below) the long-term value, then sellers (or buyers) will generally refuse to sell (buy) if the current market-clearing price differs from the long-term value.<sup>4</sup> In any case, the tendency for banks to increase exposure to real estate by liberalising LTV ratios during real estate booms can be countered.

Second, extreme volatility in the price index, or extreme differences between the index of current market-clearing prices and “long-term value”, can function as a warning that a market bubble has occurred, perhaps requiring a different public policy response. While a discussion of the feasibility of developing such methodologies is a subject for another paper, it may be useful to offer some suggestions on how these analyses could be implemented. For this to work, for example, methodologies could be developed to estimate expected volatility, or the extent of deviations from long-term equilibrium values. Estimation methodologies could be based on housing cycles or on ratios that are derived from such models. Additionally, under simplifying assumptions, ratios of prices to rents could be used to uncover prevailing price change expectations (given real interest rates), which can be compared to model-generated expected price changes. Generally, actual price realisations could be compared to model-specified price outcomes through simulation based on assumptions on supply and demand functional forms. While there are many possible housing market models and the specifications would vary with the underlying characteristics of the economy, all empirical models that are designed to track current asset price realisations as compared to longer-run outcomes must first identify and measure the current market asset price of housing. As the following details, this is not a small task, conceptually or practically.

Finally, it is worth noting that moral hazard and scale economies suggest that the development of real estate price indices is an appropriate exercise of the government’s regulatory function. Banks cannot be relied on to construct market-wide price indices, both because they do not individually have adequate data and because their incentive structures may oppose the collection of reliable market data. Furthermore, technology and data requirements mean that there are likely to be strong economies of scale in the development and maintenance of price indices, which suggests the value of centralised price index estimation. While there is certainly a place for private sector estimation of real estate price indices, the goal of financial stability may well best be served by the development of appropriate price indices at the central government level.

### III. Methods used to construct residential real estate price indices

As noted above, there are many possible empirical methods and data sources for estimating real estate price indices, and selecting the most appropriate method and data must depend in large part on the function to be served: monitoring asset market instability and promoting financial stability. Each methodology is usually best suited to a certain type of application. In this section we discuss the different empirical methods available, evaluating the extent to which each method can be expected to further the goal of financial stability.

Four methods are commonly used to compile residential real estate price indices. The most straightforward is simply the *average* or *median price*<sup>5</sup> during each time period. For example, in the United States, the National Association of Realtors publishes an index giving the median price of existing single-family residential properties that transacted in each quarter for each metropolitan

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<sup>4</sup> Some governments currently attempt to embody long-term market value in price indices constructed using judgment of local appraisers and assessors. While intuitively interesting from a policy perspective, it is difficult to judge how well such procedures have worked. Moreover, appraisers in the United States and Royal Chartered Surveyors are required to estimate the current market-clearing price, rather than long-term value.

<sup>5</sup> Our discussion focuses on price (at transaction), but indices may also be compiled on the basis of value (at or between transactions). Below we discuss the choice between using transaction prices and values.

statistical area (MSA) in the United States. The median price is generally preferred to the average because the distribution of prices is sharply skewed, so that fluctuations in sales volume among expensive properties would have a strong effect on average selling price but a muted effect on median selling price; for some applications, however, average price might be preferable. The data requirements for this method are minimal: simply the prices at which all (or a representative sample of) properties transacted during the time period.

The major problem with this method, however, is quite substantial: it fails to control at all for changes in the quality of the properties whose prices were observed in each period. Quality, of course, tends to improve over time as new properties are constructed, older properties are demolished, and existing properties are renovated; because of this, an average- or median-price index tends to substantially overstate the increase in price for a constant-quality property, or for any existing (and depreciating) property. Moreover, the sample of properties that transacts in a given time period is not constant over time; because of this, an average- or median-price index tends to overstate price increases when all that is happening is that relatively expensive properties are overrepresented among transactions, and understate price increases when relatively inexpensive properties are overrepresented.

A second reasonably straightforward technique to track property prices, the *representative-property* method, is implemented by defining a representative property and then recording in each period the price (or value) of a property conforming to the specified characteristics. The shelter component of the US consumer price index (CPI) essentially proceeds in this way, as do some proprietary indices such as the National Real Estate Index published by Global Real Analytics. The only data item that is actually collected is the price of the representative property in each time period. In order to implement this method, the data collector must observe all of the characteristics used in defining the representative property in order to select one conforming to the definition. The major problem with this method is that data points may not be fully comparable across markets or over time, because of differences among data collectors in subjectively interpreting the definition of the representative property and applying that definition to choose a representative property. A second problem is unmeasured quality change: specifically, quality improvements that are not captured by the definition of the representative property. For example, if a property is defined with respect to location, lot size, living space, and number of rooms but not with respect to major amenities such as central air conditioning, then any increase in the prevalence of those amenities will show up improperly as an increase in the price index rather than properly as an improvement in quality. Finally, because the method focuses on the price of only one property (the representative), it does not take advantage of information contained in the prices of all other properties; in fact, in extreme cases it may not reveal the movements in the general price level if, for whatever reason, the representative property's price does not respond in the same way.

In order to avoid the problems inherent in the average-/median-price and representative-property methods, economists estimate price indices using *hedonic-price* models. These models postulate that the transaction price of any given property is a function of the time period in which it transacted as well as its hedonic characteristics - that is, the physical features of the house or lot, and the features of its location and neighbourhood, that affect the price at which it transacts. If we know the hedonic function, then regression analysis can be used to estimate the parameters of this function. For example, a common hedonic-price function is

$$P_{it} = \alpha X_i^{\beta_1} e^{\beta_2 Y_i + \gamma_1 T_{i1} + \gamma_2 T_{i2} + \dots + \gamma_n T_{in}} \text{ or, in logs,}$$

$$\ln P_{it} = \alpha + \beta_1 \ln X_i + \beta_2 Y_i + \gamma_1 T_{i1} + \gamma_2 T_{i2} + \dots + \gamma_n T_{in}$$

where  $P_{it}$  is the transaction price of property  $i$  during time period  $t$ ;  $X_i$  and  $Y_i$  are hedonic attributes of the property (with  $X$  measured continuously - say, square feet of living space - and  $Y$  measured discretely - say, presence of central air conditioning);  $T_{i\tau}$  are dummy variables indicating whether the transaction took place during time period  $\tau$ ; and  $\alpha$ ,  $\beta_j$  and  $\gamma_\tau$  are the parameters to be estimated. In particular, the series of parameters  $\gamma_\tau$  is the price index.

The hedonic-price method offers several advantages over the average-/median-price and representative-property methods. First, and most importantly, the hedonic-price method controls for quality change: specifically, if there has been any change in the attributes measured  $X_i$  and  $Y_i$  - either because the quality of individual properties has changed or because different-quality properties are more likely to transact - then this quality change will be reflected in the hedonic measures rather than in the parameters (including the price index). This is a great advantage over the use of the median and average price. Compared to the representative-property method, the hedonic-price method does not

require subjectively interpreting the definition of the representative property or applying that definition to choose a representative property, nor does it fail to make use of data from other properties.

On the other hand, the method does have some disadvantages as well. The data requirements are much more onerous than for the average-/median-price method,<sup>6</sup> as the analyst should have data on all of the hedonic attributes of the property, as well as its price, at the time of the sale. This method potentially shares the problem of unmeasured quality change; if the hedonic measures do not capture amenities that improved over time, then any increase in the prevalence of those amenities will show up improperly as an increase in the price index rather than properly as an improvement in quality.

Another disadvantage is the problem of determining the correct model specification. The hedonic-price function must be specified correctly - that is, the analyst must use the correct "functional form" and include all relevant hedonic characteristics (ie must not have any omitted variables) in order to generate unbiased estimates of the price index.<sup>7</sup> Moreover, the parameters on the hedonic-price attributes ( $\beta_j$ , called the "implicit market prices" of the attributes) must not have changed over time, or if they have, then that must be incorporated into the functional form. Any violation of these conditions - incorrect functional form, omitted variables or changing parameters - *theoretically* will result in biased estimates of the price index. In practice, however, it appears that the hedonic-price method is quite robust to reasonably minor violations of these conditions: for example, it appears that the estimated price index will be fairly close to the true price index as long as several of the most important hedonic attributes (eg number of bathrooms) are included. Thus it seems, in practice, that the major disadvantage associated with the hedonic-price method is the cost of data collection.<sup>8</sup>

The onerous data requirements of the hedonic-price method (as well as of the representative-property method) have encouraged analysts to use a simpler method derived from hedonic-price models, called the *repeat-sales method*. This method takes advantage of the fact that when a given property transacts twice, many or most of the hedonic attributes of that property will not have changed at all between transactions. To the extent that this is true, the analyst need not collect data on the level of each hedonic attribute at the time of either sale; it is enough to know that the attribute has not changed. In these cases, the change in price of the property between transactions can be expressed as a simple function of the time periods elapsed between transactions. The cost and ease of implementation advantages of the repeat-sales method have made it the price index methodology of choice for large-scale applications: for example, price indices for single-family residential properties in several hundred US metropolitan areas (as well as at the national, regional and state levels) are published quarterly by both Freddie Mac and the Office of Federal Housing Enterprise Oversight (OFHEO). Nonetheless, as discussed further below, there are important measurement disadvantages in the use of such indices. Chief among these disadvantages is the need for frequent transactions. The repeat-sales methodology can only be used in markets where properties are transacted frequently and plenty of sales data are available. In western Europe, for example, the repeat-sales methodology is not useful given the small number of housing transactions. Moreover, it should be noted that repeat-sales price indices need to be combined with initial priced hedonic indices to compute comparable price levels across markets.

The repeat-sales model is derived from the hedonic-price model by expressing the ratio of the prices for two transactions of the same property as the ratio of the right-hand-side hedonic functions for those two transactions:

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<sup>6</sup> But no more onerous than the representative-property method: although only the price of the representative property is actually recorded, information on the full set of hedonic characteristics should be used to define and identify a representative property.

<sup>7</sup> Halvorsen and Pollakowski (1981) addressed the difficulty of selecting the correct functional form for a hedonic price model. Meese and Wallace (1991) proposed a non-parametric method for estimating the implicit market prices of hedonic attributes in order to avoid this problem.

<sup>8</sup> Constant-quality methodologies are ideal for many uses and applications such as attempting to identify a "bubble" in housing markets. In this type of analysis, the pure price signal is what should be identified and analysed in an attempt to see if pricing has become irrationally high. Nonetheless, a financial institution attempting to "mark to market" LTV ratios on a portfolio of mortgages would not want to use a "constant-quality" methodology since improvements in quality on a collateral property are real improvements in value that should be considered.

$$\frac{P_{it}}{P_{it'}} = \frac{\alpha X_i^{\beta_1} e^{\beta_2 Y_i + \gamma_1 T_{i1} + \gamma_2 T_{i2} + \dots + \gamma_n T_{in}}}{\alpha X_i'^{\beta_1} e^{\beta_2 Y_i' + \gamma_1 T_{i1}' + \gamma_2 T_{i2}' + \dots + \gamma_n T_{in}'}} \text{ or, in logs,}$$

$$\ln \frac{P_{it}}{P_{it'}} = \beta_1 \ln \frac{X_i}{X_i'} + \beta_2 (Y_i - Y_i') + \gamma_1 (T_{i1} - T_{i1}') + \gamma_2 (T_{i2} - T_{i2}') + \dots + \gamma_n (T_{in} - T_{in}')$$

Because  $X_i' = X_i$  and  $Y_i' = Y_i$ , this can be simplified to

$$\ln \frac{P_{it}}{P_{it'}} = \gamma_1 (T_{i1} - T_{i1}') + \gamma_2 (T_{i2} - T_{i2}') + \dots + \gamma_n (T_{in} - T_{in}')$$

where  $P_{it}'$  is the transaction price at the time of the previous sale;  $X_i'$  and  $Y_i'$  are the hedonic attributes of the property at the time of the previous sale;  $T_{i\tau}'$  are dummy variables indicating whether the previous transaction took place during time period  $\tau$ ; and the series of parameters  $\gamma_\tau$  is the price index. Two points are worth noting about the right-hand side of this equation. First, the expressions  $T_{in} - T_{in}'$  take the values  $-1$  during the time period of the first transaction,  $+1$  during the time period of the second transaction and  $0$  otherwise. Second, any property that sold at least twice<sup>9</sup> in different time periods can be included in the analysis, but if all transactions of that property occurred during the same time period, then the property must be dropped from the analysis because all terms on the right-hand side will have the value  $0$ .

As noted, the major advantage of the repeat-sales model is that it requires little data collection. This applies so as long as it is known that none of the relevant hedonic characteristics of the property have changed between transactions. However, it is easy to overestimate this advantage in practice, because an analyst must have some reliable way to determine whether, indeed, the property's characteristics have remained constant. This generally means that the practical data requirements of the repeat-sales model are quite similar to those of the hedonic-price model or, alternatively, the potential that an index increase is simply due to quality increases cannot be determined.

In practice, analysts generally assume that hedonic attributes have *not* changed between transactions, and this assumption of course greatly reduces the data collection burden. This assumption, however, is not generally true, and for this reason the unmeasured quality change introduces an unknown positive bias into the estimated price index, thus undermining its use in monitoring unsustainable price increases.

An advantage of the repeat-sales model is that it automatically controls for *all* hedonic characteristics that remained unchanged between transactions, whereas the hedonic-price model controls only for those that are measured. Because of this, the repeat-sales method makes more efficient use of the information contained in repeat transactions of a given unchanged property. There is a major cost associated with this, however: because it uses information only on transactions of those properties that sold at least twice during the study period (and remained unchanged between transactions), the repeat-sales method ignores a very large amount of potential information from transactions of properties that sold just once during the study period (or that changed between transactions). The number of property transactions ignored in this way varies with the length of the study period and the level of market activity, but generally is the great majority of available transactions.<sup>10</sup>

Another disadvantage of the repeat-sales model is the changing-parameters problem discussed above in connection with hedonic-price models: the parameters on the hedonic-price attributes ( $\beta_j$ , the implicit market prices) must not have changed over time, or if they have, then that must be incorporated into the functional form of the hedonic-price equation. In the standard repeat-sales formulation, however, there is no way to modify the functional form of the equation to incorporate

<sup>9</sup> If a property has transacted more than twice during the study period, then each observation (transaction pair) on that property must be weighted to correct for collinearity in the disturbance terms. See Bailey et al (1963) and Palmquist (1982).

<sup>10</sup> Moreover, properties may be more or less likely to transact depending on whether prices are increasing rapidly or slowly (or declining), in which case a repeat-sales price index could potentially be biased. Note that this problem of sample selection bias would also exist for hedonic-price methods, but would be much less serious even than for repeat-sales methods.

changes in implicit market prices; instead, the effect of the changed implicit market prices will be improperly reflected in the price index.<sup>11</sup>

This disadvantage, together with the other shortcomings of the repeat-sales method - failure to use information from properties that transacted just once, (measurable) changes in hedonic attributes, and changes in implicit market price parameters - motivated the development of a hybrid model that combines attributes of both the repeat-sales and the hedonic-price method.<sup>12</sup> The essence of hybrid models is that they “stack” repeat-sales and hedonic models, and then estimate the two models imposing a constraint that estimated price changes over time are equal in both models. In effect, such methods are weighted averages of the hedonic and repeat-sales methods. The evidence suggests that repeatedly sold properties may differ in unobserved ways from other properties, in which case the stacking method induces measurement error. While such indices, unlike hedonic or repeat-sales indices, do use all available information, Case et al (1991) do not find clear efficiency gains from using the hybrid model instead of the hedonic approach.

#### IV. Types of price data with which to create residential price indices

In addition to the wide variety of empirical methods available, there are also many different types and sources of data that could be used to construct real estate price indices. As we discuss in this section, however, few of these data sources would support the development of reliable price indices that can be expected to promote the goal of financial stability.

In the United States, there are several sources of data on real estate prices or values, some collected by government agencies and provided to the public free of charge, others collected privately and kept private or offered for sale. The Census Bureau of the US Department of Commerce, for example, provides data on sales price, and median and average prices, on an annual and quarterly basis, for *New Houses Sold* and another set of price indices for *Median Prices of Existing Family Dwellings*.<sup>13</sup> The major limitation of these data series is the overstatement of house price appreciation, because they do not account for the changes in quality that occur over time. The Census also constructs, based on new construction, a *Constant-Quality Pricing Index*, since 1978, although its value is lessened due to its geographical limitations. A set of statistical models relating sales price to selected standard physical characteristics of house units is used to derive the average price for a constant-quality unit. Generally, the geographic distribution of these indices is limited to an aggregate index of the United States and the four major census regions.<sup>14</sup> An issue to be considered when prices are based off new construction is where the new construction occurs. Because new construction is likely to occur on the fringe of urban areas where supply is elastic, such indices may underestimate property price appreciation. For example, price appreciation of newly constructed homes in suburban Rhode Island or Massachusetts would not be comparable to the appreciation rates of condominiums in downtown Boston. New construction methodologies therefore may not pick up the effects of land scarcity in a market, and may tend to underestimate overall market price appreciation for this reason.

A second US government source for house price data, the CPI published by the Bureau of Labor Statistics of the US Department of Labor, is constructed using the representative-property method.<sup>15</sup> The largest part of the CPI's housing series is in the shelter category,<sup>16</sup> which covers rent of primary

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<sup>11</sup> Shiller (1993) showed that a generalisation of the standard repeat-sales formulation, however, permits the estimation of a separate price index for each hedonic attribute.

<sup>12</sup> See Case and Quigley (1991).

<sup>13</sup> These data are constructed by the National Association of Realtors (NAR), who also release a quarterly, quality-unadjusted series for a panel of large MSAs based on median prices from the local Board of Realtor Multiple Listing Service.

<sup>14</sup> In addition, the decennial census data record house prices and rents, and publish median values for MSAs and even smaller jurisdictions.

<sup>15</sup> See <http://www.bls.gov/cpi/cpifact6.htm> for more information.

<sup>16</sup> Other parts include the price of household furnishings, appliances, utility services, etc.

residence<sup>17</sup> and owner's equivalent rent (far and away the most heavily weighted item in the overall series). Owner-equivalent rent is constructed from data provided by homeowners themselves. Homeowners are asked what their unit would rent for.<sup>18</sup> This methodology appropriately calculates changes in owner user costs and, by design, it does not measure changes in house prices or values. As discussed above, change in the owner-equivalent rental component of the CPI can be compared to value change as an indicator of asset price inflation relative to changes in the price of the underlying stream of housing services, but it cannot be used to measure house price inflation.

A third source of price data is mortgage transactions, which are used for repeat-sales price indices provided by OFHEO. As federal regulator of the two government-sponsored enterprises (Freddie Mac and Fannie Mae), OFHEO has access to the nation's largest database of mortgage transactions, over 23 million repeat transactions on conforming, conventional single-family loans insured by the GSEs. Both OFHEO and Freddie Mac make quarterly series, organised by census division, state, MSA, or national, available on their website, free to the public. The indices are easily downloadable in Excel or text format, generally two months after quarter-end. The national, census division, and state series are available back to 1975, but the MSA series have different starting points because an MSA series is only published if at least 1,000 observable transaction pairs exist in the area. One advantage of these data is the high frequency, but this also leads to frequent revisions. Each quarter, recent mortgage transaction data from the GSEs are combined with past data and calculations are then performed on this updated dataset. The index is created by looking at all properties which have been sold at least twice and comparing the two sale prices using a modified Case-Shiller method.<sup>19</sup>

A disadvantage of the OFHEO and Freddie Mac series, besides those discussed above that are generic to repeat-sales price indices, is their limited geographical coverage. Private analysts, such as Case and Shiller (1989, 1990), present basic results for an additional but still limited number of locations. The private firm Fiserv CSW (formerly Case-Shiller-Weiss) and a collaboration of the research departments of Fannie Mae and Freddie Mac have produced such indices for a wide range of MSAs and smaller areas; however, the small area indices are proprietary and not readily available for research purposes.

Most of the discussion in this paper has been phrased in terms of a price index based on property transactions, but that is not the only type of data that can be used (or that is commonly used) to compile residential real estate price indices. The advantages of using actual sales prices from property transactions are, first, that sales prices (from arm's length, non-coerced transactions) represent the most reliable indicator of the actual market value of any given property; and, second, that data on sales prices may already be readily available if they are collected for the administration of real property taxes, transfer taxes, deed recording fees, or other public purposes. The disadvantages of using sales prices from property transactions are, first, that during a given study period only a fraction (generally a small fraction) of all properties will have transacted even once; and, second, that if some properties are more or less likely to transact depending on whether prices are increasing rapidly or slowly (or declining), then the use of transaction prices may introduce sample selection bias into the estimation of the price index. These disadvantages appear to be minor compared to the quality advantage of data from actual market transactions.<sup>20</sup>

It is also possible, however, to compile residential real estate *value* indices from observations on what is believed to be the underlying market value of a given property, as opposed to the price observed (only) when that property transacts. Perhaps the most straightforward source is estimates of the market value of each property that are recorded for the purposes of assessing real property taxes,

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<sup>17</sup> Shelter also includes lodging away from home, housing at school, excluding board, other lodging away from home including hotels and motels, and tenant's and household insurance.

<sup>18</sup> From 1987 to 1998, CPI data collectors gathered information from the owners to calculate an appropriate initial, implicit rent. Changes for similar (based on structure and attributes) renter-occupied units were then applied to the initial value to calculate changes in owner-occupied implicit rents. Since 1998, the rent index of the survey has simply been reweighted to rents on the CPI Housing Survey.

<sup>19</sup> [http://www.ofheo.gov/Media/Archive/house/hpi\\_tech.pdf](http://www.ofheo.gov/Media/Archive/house/hpi_tech.pdf).

<sup>20</sup> For owner-occupied multifamily rental properties, price indices that are based on transactions may reflect variation in liquidity over the business cycle, which affects the ease with which owners are able to sell properties. Fisher et al (2003) propose a constant-liquidity price index method, and find that movements in the constant-liquidity index tend to lead movements in a transaction-based index.

which are imposed almost universally in the United States. Real property tax assessment records are readily available in any jurisdiction that imposes the real property tax, and they are established regularly, generally every year. Unfortunately, real property tax assessment records are generally considered to be of very poor quality. Even if they are updated annually, the updating process may bear little relation to changes in the market price level, for several reasons. First, for simplicity most jurisdictions adjust the assessed values of all properties within the jurisdiction by the same factor, regardless of whether prices in parts of that jurisdiction have increased more or less rapidly than the average. Second, the adjustment factor is set through a political process that need not reflect actual market fluctuations. Third, assessed values for individual properties may be set closer to market prices only when those properties transact; indeed, in some jurisdictions (such as California) assessed values may be explicitly prevented from adjusting to the same extent as market prices. Finally, homeowners are much more likely to challenge the estimated values on which their property tax assessments are based when those values have increased sharply, so property tax assessment records generally tend to understate the actual pace of property value increases. For these reasons property tax assessments are rarely, if ever, used as residential real estate value indices in themselves.

A much more commonly used source of market values is records from private appraisals, which are generally conducted in connection with mortgage transactions - whether purchase-money mortgages upon a property transaction, or mortgage refinancings. Indeed, in the United States the indices published by Freddie Mac and OFHEO both include appraised values from records of refinanced mortgages purchased by Freddie Mac (and, for the OFHEO index, Fannie Mae). The quality of private appraisals is probably much higher than the quality of property tax assessment records, but appraisals may still differ sharply from underlying market values because of the subjectivity of the appraisal process, particularly if the subject property did not transact at the same time and there were few transactions of closely comparable properties during the same time period. Moreover, appraisal-based price indices may suffer from sample selection bias, especially since homeowners may be more or less likely to refinance their mortgages if property values are increasing rapidly.<sup>21</sup> For these reasons, economists have found that price indices based on appraisal records tend to be smoother than price indices based on transaction records and tend to misrepresent the times at which market prices reach their peaks or troughs. Also for these reasons, in the United States both Freddie Mac and OFHEO are considering deleting appraisals that were conducted in connection with mortgage refinancings from the computation of their price indices.

Another source of information on property values is records on listing prices of properties offered for sale: for example, various local multiple listing service (MLS) databases in the United States have been used to construct value indices. The advantages of these data are that (1) listing prices are established with the assistance of real estate agents, who may have especially good judgment regarding the value that would be assigned to each property in a well functioning market, and (2) the number of properties listed for sale during any time period is even greater than the number of property transactions. The disadvantages of these data, however, are closely related to the advantages. First, listing prices may differ sharply from underlying market values, partly because neither real estate agents nor homeowners may be good judges of market value and partly because they may in fact have incentives not to equate the listing price with the market value. Second, properties with particularly low listing prices relative to market value can be expected to transact quickly, while properties with particularly high listing prices relative to market value can be expected to remain on the market for a long time and perhaps never transact. For these reasons listing prices are generally not considered a reliable source of market value data.

Nonetheless, the underlying data collected on assessments and listing prices have themselves been used in estimation of hedonic indices (Clapp and Giacotto (1992)). Moreover, the underlying data on sales transactions, including prices, date of sale, and housing attributes, collected by the MLS and by municipalities, are potentially valuable for the construction of price indices. Appraisal and assessor

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<sup>21</sup> In addition, some property appraisals may be motivated not by mortgage transactions but simply by the observation that the pace of market price increases seems to have changed significantly. This is much less common among (single-family) residential properties than among commercial properties (including multifamily residential properties), but should be recognised because price indices based on appraisals that are motivated in part by sharp increases, or declines, in the general property price level can be expected to suffer from sample selection bias.

agencies are moving towards using these data for statistical-model based price estimation. Assessors are incorporating hedonic methodologies in computer-assisted mass appraisal (CAMA) and appraisers are using automated valuation methods (AVMs) for desk review appraisals and for mortgage underwriting. Thus lenders and municipal authorities are increasingly making use of statistical methods to estimate the market value of homes; these technologies also have the potential to generate standardised<sup>22</sup> hedonic local area residential price indices.

A final source of market values is simply a survey of homeowners requesting that they assess the value of their own properties. The American Housing Survey, for example, records owner-assessed property values, and these values have been used to construct value indices.<sup>23</sup> In principle, owner-assessments can provide a useful source of market value information, as homeowners (1) are particularly knowledgeable about the condition and amenities (structural and locational) of their properties, and (2) often observe market prices of comparable neighbouring properties. However, property owners are not necessarily good judges of the value that would be assigned to their properties by a well functioning market. Indeed, economists have found that homeowners tend to overestimate the market values of their properties, and tend furthermore to underestimate the rate of increase in the market values of their properties (Kiel and Zabel (1999)). For this reason owner assessments are generally not considered a reliable source of market value data with which to construct property value indices. Nonetheless, these data have been used by researchers to construct hedonic indices for the United States. For example, Malpezzi et al (1980) used AHS data from the 1970s to construct constant-quality indices for a sample of MSAs. This work was subsequently updated and expanded by Thibodeau (1992, 1995).

## V. What stories do the US residential real estate price indices tell?

The most important story told by residential price indices about the US residential real estate market is that, in the long run, housing price increases in the United States have tracked increases in the overall price level quite closely. Graph 1 below shows the overall CPI, CPI Rent, CPI Owner-Equivalent Rent and Census Constant-Quality price indices from 1979 to 2002. The growth rates of these indices over this roughly 20-year period were similar; however, the close relationship between housing prices and overall prices often does not hold over short time periods. For example, in Graph 2, year-over-year growth rates in the CPI, CPI Housing and Census Constant-Quality indices are shown from 1997 to 2003. In six of the seven years since 1997, the appreciation in the CPI Housing index has exceeded the growth in the overall CPI index. However, using the growth of the Census Constant-Quality index as a measure, the housing price growth rate was significantly higher than the growth of the overall CPI and CPI Housing indices only in 2002.

In order to determine if there is currently a “bubble” in US residential real estate, it is important to look not only at housing price increases, but also at rent increases. If house prices are appreciating rapidly, this does not necessarily imply that a “bubble” exists if rent prices are increasing just as rapidly, since consumers are rationally pricing increasing rents into owner-occupied housing units.

The data in Graphs 1 and 2 do not demonstrate the existence of a bubble in US residential real estate markets. Over the past seven years shown in Graph 2, rents and constant-quality appreciation have been very similar, and in most years appreciation in rents (CPI indices) has actually been higher than growth in constant-quality home prices. While the ratio of CPI Rent index to the housing price, using the Constant-Quality index, does not show any decline, some private data collected on rents do imply declining rents over 2001 and 2002 that, when coupled with increasing constant-quality house prices, could lend some strength to arguments that a “bubble” does exist. Private data compiled by REIS, RERI and others show rents declining over 2001 and 2002. These indices include only effective rents on newly leased properties, and do not consider rental increases on properties which are already

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<sup>22</sup> Some municipalities collect information on numerous housing attributes, others on few. However, the use of geographical information, which is available for all municipalities, can substitute for an inclusive list of attributable variables.

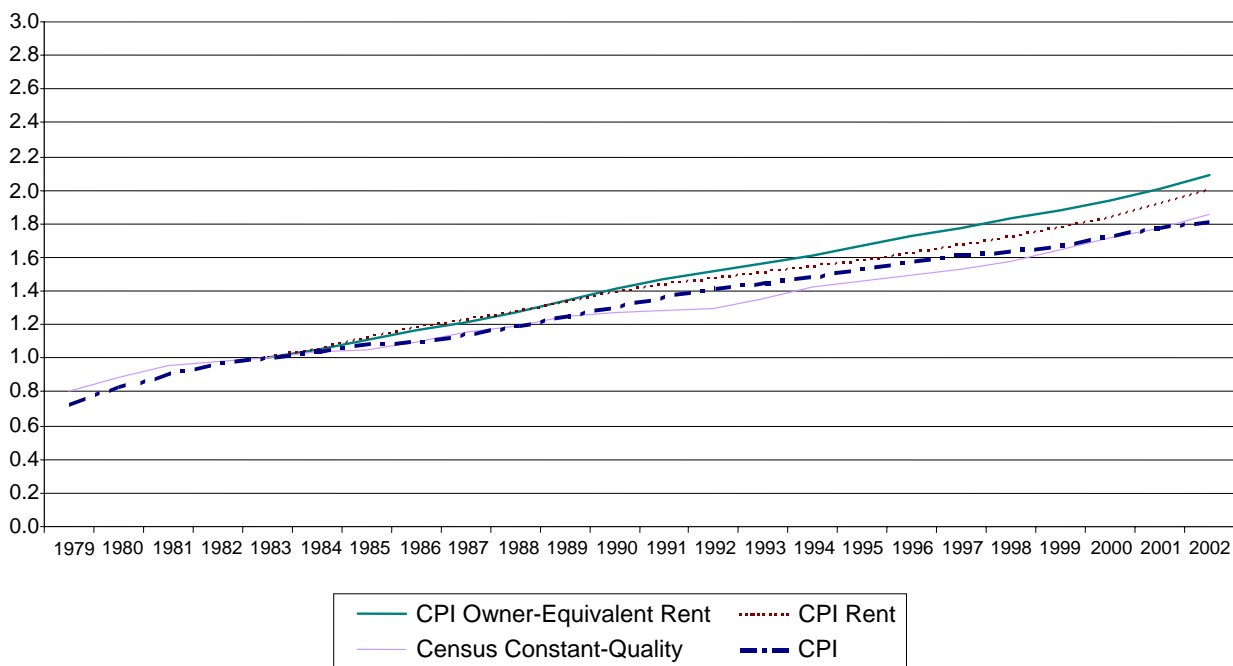
<sup>23</sup> To supplement the decennial census, the Commerce Department releases the American Housing Survey, started as an annual survey in 1973 and changed to a biannual one in the early 1980s. Currently, the AHS covers about 50,000 housing units throughout the United States.



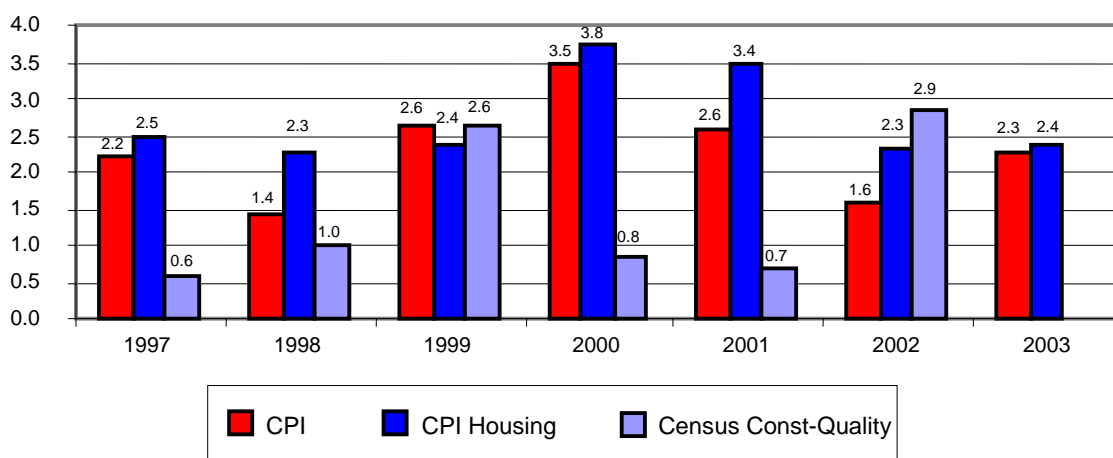
leased. These data therefore may more accurately reflect the current state of rental markets, rather than the “smoothed” CPI indices that include rents and escalations on existing leases.

Graph 1

**CPI vs Census Constant-Quality, CPI Rent and  
CPI Owner-Equivalent Rent - 1979-2003 (1983 = 1.0)**



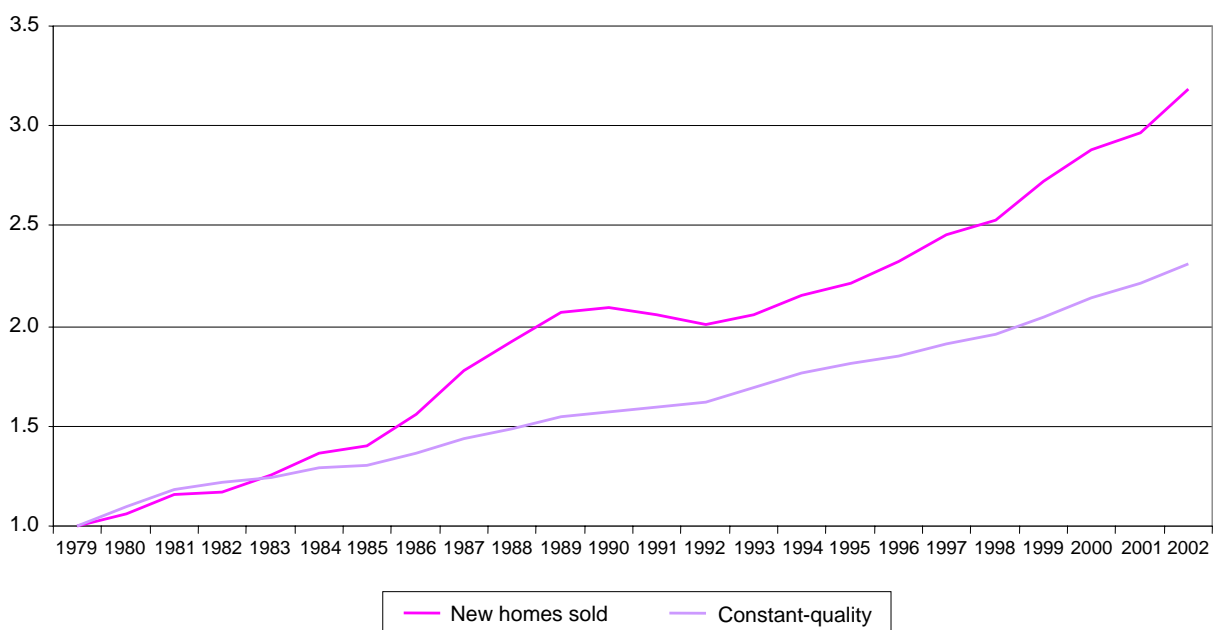
Graph 2  
**Annual growth in overall CPI, CPI Housing and Census  
Constant-Quality Indices, 1997-2003**  
September-September (in per cent)



It should also be remembered that the recent accelerating growth in constant-quality prices shown in Graph 2 above is within a range of increases that would be predicted given the tremendous declines in mortgage rates experienced over the past 10 years. While some observers consider the effects of declining interest rates on housing prices a “bubble”, it is important not to confuse a “bubble” with a commonly experienced cycle. Bubbles usually refer to irrational asset pricing, but consumers have been completely rational to bid up home prices as interest rates have declined. However, this is not to say that housing prices will not experience some weakness as the cycle turns, and consumers bid lower amounts due to increasing interest rates.

While “headline” price indices, such as means and medians, have shown rapid growth in recent years, it is important to remember that these numbers are influenced by increasing quality of housing, and are not representative of pure price inflation. In Graph 3, a price index for new homes sold is compared to a constant-quality price index. The much greater increase in new home prices when compared to the increase in constant-quality prices shows that Americans are increasingly demanding much better quality in their housing, and that this demand is driving overall housing transaction prices higher. However, one must remember that this quality-related appreciation is not a “bubble”, since consumers are paying more for a better product, a completely rational economic behaviour.

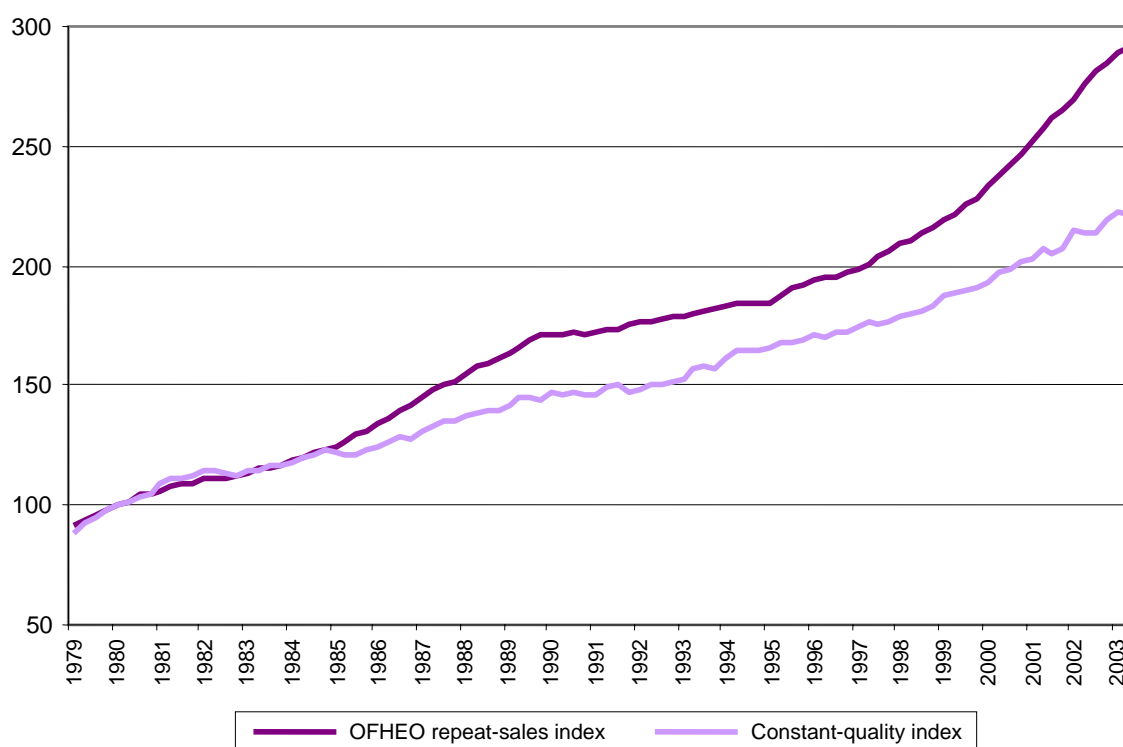
Graph 3  
**Price indices for new homes sold vs constant-quality price index  
 1979-2003**



Many people feel that repeat-sales indices control for changes in housing quality, but, in reality, this is not the case. The quality of a single house is not static between transactions, since owners may renovate, expand, or make other quality improvements to the property. The data shown in Graph 4 bear out this hypothesis. In the graph, the OFHEO repeat-sales index is compared to a constant-quality index. Since 1985, the OFHEO index has increased much more rapidly than the constant-quality index, showing that repeat-sales indices do not fully control for changes in housing quality since owners may improve quality between transactions. While this does show real positive investment in the nation’s housing stock, this is not to say that this investment in quality will continue indefinitely. If interest rates increase, demand for real estate may decline, and the current investment in real estate quality may prove excessive.

Graph 4

**OFHEO repeat-sales index vs constant quality index, 1979-2003**



One important caveat to the above analysis is that all the indices used were national, and while they do not seem to imply the existence of a national residential real estate bubble, it does not follow from this that bubbles do not exist in any individual regional markets. Real estate markets are regional in nature, and anyone who wishes to analyse the state of the market should rely more heavily on regional price indices of interest rather than aggregated national indices. Individual markets or regions can have vastly different current situations and historical experiences with real estate pricing and appreciation than does the nation as a whole.

## VI. Conclusion

The organisers of this conference have recognised the fundamental connection between real estate markets and financial stability, and therefore the need for prudential supervision and monitoring of real estate markets. Because banks are exposed to cyclical in real estate markets, and because banks' incentive structures may lead them to exacerbate boom-bust cycles in real estate markets, fluctuations in real estate prices have the potential to strain financial stability and even to jeopardise entire financial systems. In countries in which banks play a dominant role - such as Japan, where banks hold some four fifths of total assets - the consequences for the real economy can be severe.

In particular, for several reasons, banks are liable to increase their origination of real estate loans at the same time that short-term, market-clearing asset prices are at their peaks. As asset prices revert to their longer-term values, however, the result is that banks hold portfolios of loans with higher LTV ratios than anticipated. To counter this tendency - whether it is associated with market bubbles or simply "fundamentally supported" price fluctuations - it is necessary to continually monitor real estate markets, in particular to challenge weakening of underwriting standards when short-term asset prices are rising. This task requires the development of reliable real estate price indices.

There is a wide variety of empirical methods and data sources that could be used to construct real estate price indices; as we point out in this paper, however, not all can be expected to support the goal of financial stability. One straightforward method, for example, simply reports the average or median price of houses transacting during each time period. This method, however, fails to control at all for quality changes or for changes in the mix of transacting properties; thus it presents a picture of asset price movements that is both biased upwards (because quality increases over time) and unreliable (because the mix of transacting properties may change during different parts of the market cycle). A second straightforward method, reporting the price of a representative property, is not well suited for measuring residential property asset value, since such properties transact infrequently.

The hedonic-price method offers a way of avoiding the quality change, comparability and narrowness problems associated with the first two methods; unfortunately, the data required to estimate a hedonic-price model make this method relatively expensive to implement. Because of this, perhaps the most reliable price index method in wide use in the United States, for the nation as a whole as well as for the states, is the repeat-sales method, which requires only two pieces of data (transaction price and date) along with the troublesome assumption that no relevant characteristics of the property changed between transactions. Hybrid models offer the potential to improve on repeat-sales methods where additional data are available, but have not yet been shown to be appreciably superior to repeat-sales methods.

Several data sources could be used to estimate real estate price indices, but many of these are unsuitable for the purposes of monitoring asset markets and promoting financial stability. Owner assessments of property value, property listing prices, and property tax appraisals all suffer from severe problems of bias and unreliability. The best source of data is records of property transaction prices and dates. In the United States, these records are commonly collected and made public in local real property tax assessment systems, many of which also contain records of hedonic property characteristics, thus offering the potential of hedonic-based residential price indices for local areas.

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# A comparison of UK residential house price indices

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## Summary

The measurement of house prices poses significant conceptual and practical problems, mainly because dwellings are heterogeneous assets whose prices can only be observed when they are sold. There are now seven main house price indices for the United Kingdom. In broad terms, each measures one of three different concepts: the *value* of a representative set of house transactions; the *price* of a house with “typical” characteristics; the *value* of the housing stock. The indices are constructed from different data using different methods. Consequently, the available measures of house prices can give conflicting or misleading signals about house price inflation.

The data and methods used to construct the indices can vary in three key respects: the point in the house purchase process at which the price is measured; the techniques used to adjust for differences in the characteristics of houses; and the weighting scheme used. Indices that measure the price earlier in the purchase process are able to detect price changes first, but will measure final prices with error because prices can be renegotiated extensively before the deal is finalised. This is not necessarily a disadvantage, because it is useful to have a measure of prices at each stage of the purchasing process and those indices measuring prices earlier in the purchase process may lead other indices. Quality adjustment aids interpretation of price changes, and can have significant effects on measured house price inflation. A variety of methods and specifications are used, each with advantages and disadvantages. The choice of weighting scheme allows the index to measure different concepts of house prices and movements in price for different sets of dwellings. Again, a variety of methods are used.

All the available indices have advantages and disadvantages so it is important to look at a wide range of indicators and examine the reasons for the differences between them. Observers and policymakers must always be careful to match the measure of house prices they use with the concept they are interested in, and to ensure that the information in short-run changes in house price inflation is not over-interpreted, because sampling and estimation error in monthly and quarterly house price inflation rates appears to be substantial.

## 1. Introduction

As with many economic statistics, the measurement of house prices poses significant conceptual and practical problems. This is mainly because dwellings are heterogeneous assets whose prices can only be observed when they are sold. The United Kingdom does not have a definitive dataset of all the characteristics and prices of all transacted houses so there has been, and is, significant scope for various organisations and government departments with access to different proprietary or public datasets to each produce a house price index.

There are now seven main house price indices in the United Kingdom, three of which are “official” indices, in the sense that they are constructed by different government departments; two are

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<sup>1</sup> The views expressed in this paper are those of the author, and not necessarily those of the Bank of England. I am grateful for helpful comments and suggestions from Gregory Thwaites, Simon Whitaker and Ian Bond, any remaining errors are my own. Robert Wood, Structural Economic Analysis Division, Monetary Analysis, Bank of England, Threadneedle Street, London, EC2R 8AH; e-mail: Rob.Wood@bankofengland.co.uk.

constructed by the Office of the Deputy Prime Minister (ODPM) and one by the Land Registry.<sup>2</sup> A further two are constructed by two of the main mortgage lenders in the United Kingdom; HBOS (formerly the Halifax Building society) and the Nationwide Building Society. Finally, two companies with an interest in the housing market, Hometrack and Rightmove, have introduced indices in the last few years. In addition to these indices there are two main survey based measures of house price inflation, produced by the Royal Institution of Chartered Surveyors and the House Builders Federation, and a number of less well known indices and surveys some of which are regional or concentrate on specific market segments (such as Buy to Let purchases).

The data and methods used to construct the indices vary. This is because there are several valid concepts of house prices - such as the average transaction price, the price of a typical house and the housing stock deflator - and the methods to calculate each are different. However, the methods used vary even within the set of indices measuring each particular type of house price. The data used are often proprietary to the institution constructing the index.

These issues introduce significant complexity and confusion into determining house price movements in the United Kingdom. The range of available measures of house prices almost always give different estimates of the rate of house price inflation and since the indices use different methods and samples it is difficult to analyse why there are differences. This paper compares the available indices in the United Kingdom; both their construction methods and their outturns. Since there are seven main house price indices that is a difficult task. The focus of the paper, therefore, is to try to identify the advantages and disadvantages of each method relative to the other methods. The paper then compares the outturns of the indices with a view to highlighting the importance of the different methods.

The next section considers how house prices could be measured, and sets up a framework for categorising the various methods and data sets that can be used to measure prices. The third section then categorises the available residential house price indices and compares the methods used to construct the various indices. Section 4 compares the outturns of the indices with a view to considering the impact of the different methods used to construct them.

## **2. Methods and data sets used to construct residential house price indices**

### **2.1 Why are house prices difficult to measure?**

The price of housing is harder to measure than that of most other goods and assets because of three key distinguishing characteristics. First, and most importantly, dwellings are heterogeneous. No two dwellings are identical, if only because they cannot occupy quite the same location. This means that sampled house prices may be a poor indicator of all house prices because we cannot always reliably predict the sales price of a given dwelling from the price of another.

Second, the market price of a given dwelling cannot easily be observed without it being sold. Dwellings are typically transacted at a price reached through negotiation or at auction, so the advertised price can be a poor guide to the eventual selling price. The set of observations that can be used to estimate house prices is therefore usually restricted to transactions prices, so the mixture of prices that can be observed will be determined by the types of houses transacted in any given period. There is, however, no definitive dataset of all the characteristics and prices of all transacted houses in the United Kingdom. Consequently, many similar house price indices can coexist because they use different, mostly proprietary, datasets.

Third, houses are generally sold infrequently: over the 1990s the number of private dwellings sold per year was around 7% of the stock. At that rate, each house would be sold, on average,

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<sup>2</sup> The Financial Times (FT) has recently begun publishing an index that is a forecast of a monthly and seasonally adjusted version of the Land Registry index.

approximately once every 14 years. So the most recent price observation for a given house will be, on average, seven years old, and will therefore be an unreliable guide to the price it would fetch today.

As well as prices being hard to measure, there is no single definitive concept of the UK house price. A simple average of transaction prices in a given period has a clear interpretation: the mean price of houses sold in that period. This is a useful measure if one wants to estimate the value of turnover in the housing market (which will be related, for example, to stamp duty receipts and estate agents' turnover). But, we may equally well be interested in the value of the total housing stock - sometimes referred to as housing wealth - or the price of a representative house. To calculate indices consistent with those other concepts the data must be quality adjusted - because changes in the mean price over time may reflect changes in the mix of houses being sold rather than in the value of the stock of dwellings or the price of a typical house - and weighted correctly - because the mix of houses sold each period is unlikely to be a consistently reliable indicator of the mix of houses whose price the index is trying to measure eg the mix of houses typically transacted or the mix of houses in the housing stock.

## 2.2 Methods for quality adjusting data and their advantages and disadvantages

Constant-quality measures of house prices try to standardise, and make comparable over time, the information available in the data, to overcome the limitations of simple averages. Three main methods can be used: hedonic regression; mix-adjustment; and the repeat-sales method:

- *Hedonic regression.* The price of a house depends on its location and its physical characteristics. Hedonic regression is a way of estimating the value the marketplaces on each of those attributes. The estimates are then used to construct the price of a synthetic house with a representative amount of each characteristic.
- *Mix adjustment.* House price observations are grouped into sets or "cells" of observations on houses with similar location and physical attributes. For instance, the old ODPM index contained around 300 cells (the new ODPM index contains around 150,000 cells). The mean prices in each cell are weighted together to give a "mix-adjusted" price. A change in the composition of the sample will alter the number of observations in each cell. But if the cells are defined sufficiently precisely, so that all elements of the cell have similar prices and price trends, then such compositional changes will not systematically affect the mix-adjusted house price.

The mix-adjustment and hedonic regression techniques can give very similar results if they control for the same house characteristics.

- *Repeat sales.* Both of the previous methods require a large number of dwelling characteristics to be recorded if they are to be reliable. In some cases this information is not readily available. Instead, there may be information on the history of transactions for a large sample of dwellings, which allows us to examine the price changes of individual houses. Observing the sale prices of a given house at two points in time will give an estimate of general house price inflation between those two transactions. With a sufficient number of estimates from partially overlapping periods, house price inflation could be estimated. No repeat sales indices yet exist for the United Kingdom.

All these methods have disadvantages. Both hedonic and mix-adjusted indices will suffer from the same problems as simple averages if they do not control for all relevant characteristics. If some characteristics were omitted from the hedonic regression or cell structure a change in the distribution of these characteristics over time would create inaccuracies in the estimated change in the price of a constant-quality house. For example, if fitted kitchens became more common, but were not recorded as a characteristic of the houses in the sample, the price index may rise too quickly: higher prices from the inclusion of fitted kitchens may be mistaken for an increase in the price of a constant-attributes house.<sup>3</sup> To the extent that the existing house price indices do not measure such quality improvements

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<sup>3</sup> It should be noted that the impact of an excluded variable is particularly complicated if the existence of that characteristic, for instance fitted kitchens, is correlated with some other characteristic that is included in the hedonic regression or mix-adjustment.



as they become more prevalent, they may overstate the rate of constant-quality house price inflation. Furthermore, if these unobserved attributes were more common in properties sold at certain phases of the cycle (for example, if the top end of the market were relatively active during booms) then the amplitude of fluctuations in house price inflation may be understated or overstated accordingly.

Changes in the sample mix between houses with different inflation rates would affect the estimates from simple repeat-sales indices. For example, if detached and terrace houses appreciate at 0% and 5% per year respectively, a shift in the sample towards terrace houses will increase the estimated average inflation rate, because no account is taken of the characteristics of the sample. Furthermore, the estimated appreciation rate will also be biased if the property is altered or its condition changes between the two price observations. Hybrid hedonic repeat-sales indices can remove this problem by controlling for the characteristics of the sample, but such indices will be subject to similar disadvantages to those for hedonic indices and will have similar data requirements.

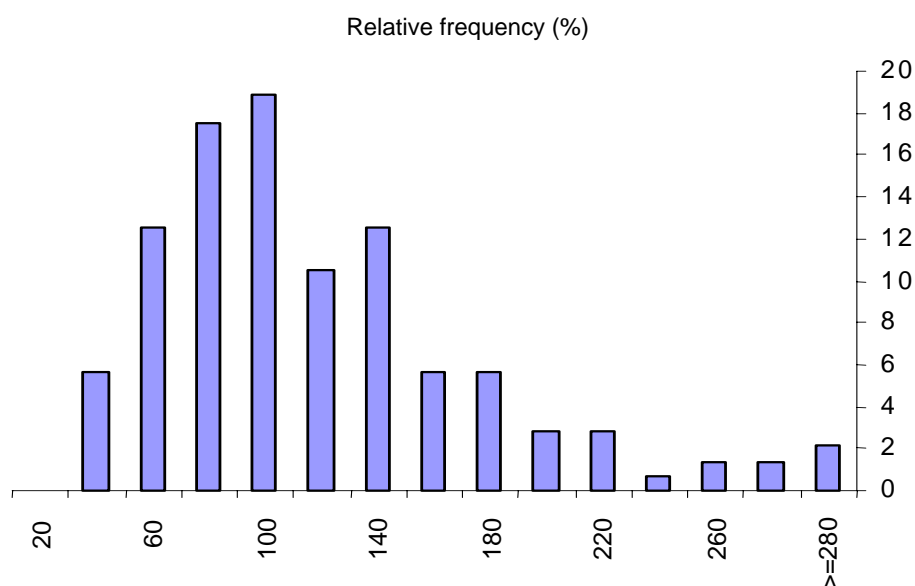
### 2.3 Weighting

The levels and inflation rates of house prices in the United Kingdom are widely dispersed - the prices of similar dwellings in different locations can vary by a factor of more than seven (see Chart 1) - so the choice of weights for an index could have significant effects on measured house prices and inflation. The weighting scheme will depend on two factors:

- Which constant notional house or set of houses the index is representing. For instance, is the index measuring the price of typically transacted houses or the stock of dwellings?
- Whether the index is measuring the change in *value* of a set of houses or the change in *price* of a typical member of a set of houses (which need not be an actual house, it could be the average or median house in a group). In other words, the weighting scheme will depend on whether expensive houses in the set should receive more weight, commensurate with their share of expenditure on the set? We can choose to represent the price of a house with typical characteristics, where all houses in a set have equal weight in determining what is typical. This would involve “volume weighting”. Alternatively, we can represent the price of a representative collection of houses, where more expensive houses have an accordingly higher weight. This would involve “expenditure weighting”.

Chart 1

**Distribution of average transacted flat and maisonette prices in localities in England and Wales in 2002 Q3**



Source: Land Registry.

If all houses were appreciating at a common rate, both price indices reflecting expenditure and volume weights would appreciate at that rate. But if low- and high-value houses were to exhibit different price trends, the inflation rates of volume and expenditure-weighted indices would diverge.

## **2.4 Available datasets**

The Land Registry dataset<sup>4</sup> contains the prices of all transacted houses in England and Wales, including those purchased without a mortgage (so called cash transactions). However, it has two disadvantages. First, only a very limited number of characteristics are recorded for each house so it is unsuitable for use in an hedonic regression; it does not include house size which is one of the more important characteristics. Second, it is only available quarterly and with a six week lag. Missing observations are then added to the dataset a further three months later; so the final dataset is not available until four and a half months after the quarter to which it refers. The Council of Mortgage Lenders (CML), an organisation representing the industry, compiles a sample of its members' mortgage approvals called the Survey of Mortgage Lenders (SML). However, until recently the sample proportion has been small (it has only increased from a 5% sample in the last couple of years) to date and it is not available until four weeks after the end of the month.

The problems with the Land Registry and SML datasets mean there is significant scope for other organisations with access to house price data, such as mortgage lenders, estate agents and advertisers, to produce house price indices based on that data. This, of course, makes comparison of the indices difficult because differences could be due to two factors: differences in the data or differences in the construction methods.

## **3. Comparison of the methods used to construct the seven main UK house price indices**

### **3.1 UK house price indices**

Table 1 describes the seven main UK house price indices.<sup>5</sup> The first three could be considered "official" indices because they are produced by government departments. The old and new ODPM indices both use the SML dataset but use different methods. The new index replaces the old one; it is based on a much larger sample of mortgage approvals than the old ODPM index and uses a more sophisticated mix-adjustment method.<sup>6</sup> It is intended that the new index will, in due course, become a National Statistic, but currently only a short back-run of data is available (extending back to February 2002) and it was published for the first time in September 2003, so both the old and new indices have been included in this analysis.

The Land Registry index has been discussed previously. The Halifax and Nationwide indices are produced by two UK mortgage lenders. Rightmove is a website on which estate agents post adverts for properties for sale or to rent. They use the posted asking prices on their internet site to construct a house price index. Hometrack use a survey of estate agents to construct an index.

### **3.2 Housing market timeline**

The main indices measure the price of dwellings at different points in the house purchase process, shown in Chart 2. Indices nearer the beginning may detect changes in house prices first: the house

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<sup>4</sup> The "Land Registry" is a government department that maintains a register - the Land Register - of the ownership of all property and land in the United Kingdom. The Land Registry must be informed of changes in ownership for them to be legally recognised, so it is able to maintain a database of all housing market transactions.

<sup>5</sup> The Land Registry, Hometrack and Rightmove indices cover only dwellings in England and Wales but are included because transactions in England and Wales account for a large proportion of those in the whole of the United Kingdom.

<sup>6</sup> See Wall (1998) and Fenwick and Duff (2002). Further information about the new index is also available from the ODPM website: [http://www.odpm.gov.uk/stellent/groups/odpm\\_control/documents/contentservertemplate/odpm\\_index.hcst?n=1618&l=3](http://www.odpm.gov.uk/stellent/groups/odpm_control/documents/contentservertemplate/odpm_index.hcst?n=1618&l=3).

prices appearing in the September Halifax and Nationwide indices will not appear in the ODPM sample until October or November. However, because house prices are usually reached through negotiation the sale price may change through the process. A buyer may agree a price with a seller somewhat below the seller's initial asking price (recorded by the Rightmove index). A survey of the property carried out for the mortgage lender at the mortgage approval stage may lead to further revisions of the price. This may occur if, for instance, the surveyor suggested to the mortgage lender that the house was not worth the price agreed between buyer and seller. Finally, the price may be renegotiated following the approval of a mortgage (the stage at which the price is measured by the Halifax, Nationwide and Hometrack indices).

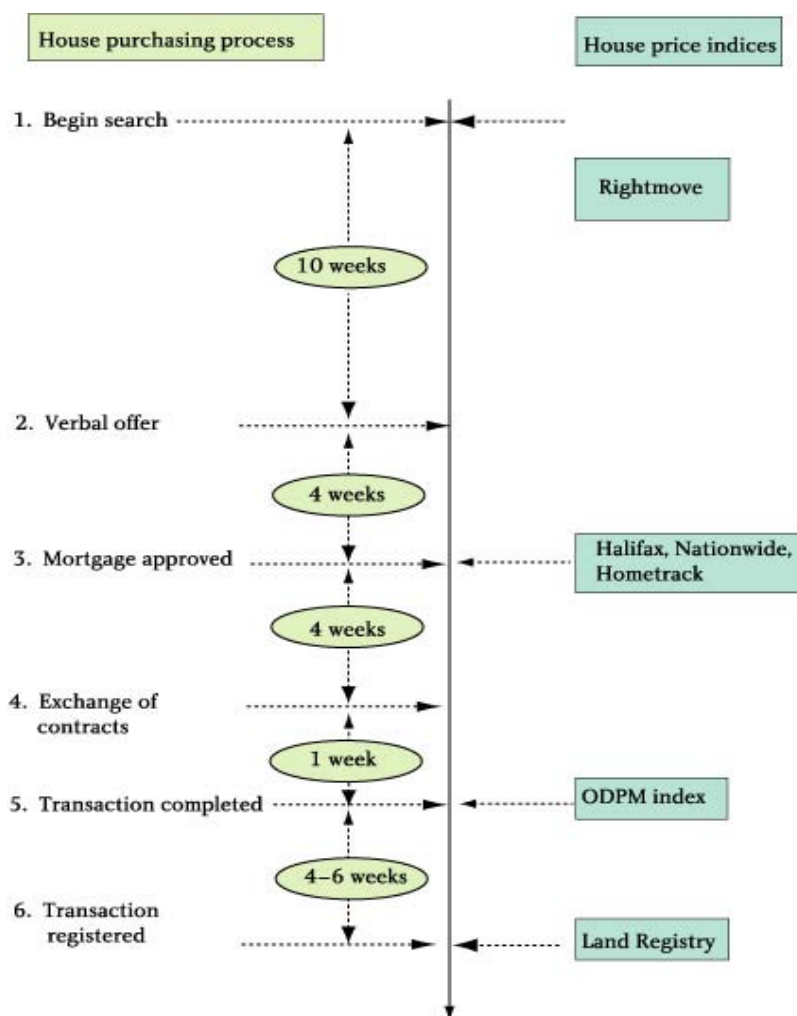
Table 1  
Main UK house price indices

	Data	Quality adjustment method	Seasonally adjusted?	Weights used	Weighting method	Measures
"Old" ODPM	SML 5% sample of CML eligible completions	Mix adjustment	No	Rolling average of SML transactions	Expenditure	Value of average set of transacted dwellings
"New" ODPM	SML 30-50% sample of CML eligible completions	Mix adjustment	No	Rolling average of Land Registry transactions	Expenditure	Value of average set of transacted dwellings
Land Registry	100% of sales registered in England and Wales	Simple average	No	None	Expenditure	Value of set of transacted dwellings
Halifax	Loans approved for house purchase by Halifax	Hedonic regression	Yes	1983 Halifax loan approvals	Volume	Price of "Halifax" representative dwelling
Nationwide	Loans approved for house purchase by Nationwide	Hedonic regression	Yes	Rolling average of SML, Land Registry and Nationwide transactions	Volume	Price of "Nationwide" representative dwelling
Hometrack	Survey of approx 4,000 estate agents' estimated local average prices	Mix adjustment	No	England and Wales housing stock	Expenditure	Value of housing stock
Rightmove	Sellers' asking prices posted on internet site	Mix adjustment	No	England and Wales housing stock	Expenditure	Value of housing stock

The prices at each stage of the house purchase process have uses. For instance, estate agents may be interested in the extent to which sellers are changing asking prices. But in general the indices exist, or are used by many observers, to provide an estimate of changes in the final or actual "price of housing". Indices based on mortgage approval data will exclude some transactions, cash transactions, from their datasets. This may be important if the sample also does not include houses similar to those purchased with cash. But to the extent that the price of houses purchased with cash do not behave differently to those purchased with a mortgage and that the size and incidence of price revisions do

not vary over time, an index positioned at any point in the house purchase process should measure changes in the final agreed prices correctly. Both these conditions are, however, unlikely to hold.

Chart 2  
House purchase timeline and house price indices



Sources: Bank of England; ODPM.

Comparing the indices, the Rightmove index will detect price changes earliest in the timeline, but the prices used by Rightmove will be the most likely to be revised. At the other extreme, the prices in the Land Registry index will never be revised (because they record how much buyers *have* paid for a dwelling), but price changes will be captured by Rightmove six months earlier than by the Land Registry (nearly eight months if the lag in compiling the Land Registry dataset is taken into account).

The Halifax and Nationwide indices are in many ways a good compromise between accuracy and timeliness. Their data is likely to measure final prices more accurately than the Rightmove data, but less accurately than the Land Registry data. Their datasets will be subject to sample selection bias to some extent, since each index relies only on the lender's own mortgage approvals, which may depend on the competitiveness of the mortgage rates offered by each lender. However, the Halifax and Nationwide indices will measure price changes nearly three months earlier than the Land Registry index (nearly five months if the lag in compiling the Land Registry dataset is taken into account).

Price revisions between mortgage approval and transaction completion stage may, however, be systematic and wide-spread. In times of house price rises, price revisions are likely to be systematically positive, whilst when prices are falling revisions are likely to be negative. In England

and Wales, an agreed sale can be cancelled by either side of the transaction at any point until ownership changes (transaction completed). This leaves each side an alternative option should the value of a house change after a sale is agreed. Sellers can accept a higher offer from another buyer (called “gazumping”), and buyers can agree a price for another property. Consequently, when prices are rising sellers may be able to take advantage of the outside option of accepting another offer to revise the price upwards. When prices are falling buyers may be able to take advantage of the outside option of purchasing another, cheaper property. Transactions and search costs complicate this simplistic picture, but the broad point is likely to stand.

Finally, the Hometrack index is a measure of house prices at the mortgage approval stage. But it makes use of estate agents’ estimates of average prices by postcode and house type (detached, semi-detached, terraced, bungalow). Estate agents are exposed directly and frequently to the market so they might be considered the correct group to survey about house prices. Such a survey requires estate agents to accurately estimate local average prices. But as long as any errors made are not systematically biased then they should have little effect on measured of house price inflation.

### 3.3 Quality adjustment

All indices other than the Land Registry use hedonic regression or mix-adjustment methods to quality adjust their data to take account of the effect of changes from one period to the next in the mix of houses transacted. The mix adjustment and hedonic regression methods for quality adjusting the data can be similar under certain circumstances. If mix-adjustment is undertaken with the same house characteristics as in an hedonic regression, both indices use the same weights, and the mix-adjusted index is a geometric mean of the cell prices, then the two indices should give similar results.

In practice, the hedonic regression methods used by the Halifax and Nationwide have been more encompassing than the mix-adjustment method used to construct the “old” ODPM index. The old ODPM index was mix-adjusted using a small number of characteristics: region; number of bedrooms; house type (ie detached/bungalow/flat, semi-detached, terraced); old or new; type of buyer (first time buyer or former owner occupier). Consequently, the old index had only 300 “cells”. Table 2 below shows that the Halifax and Nationwide indices control for the effects of many more characteristics, and so are less likely to be affected by changes in the mix of houses sold than the old ODPM index; the ODPM index may change if the number of houses in the sample with, for instance, bathrooms, or garages, or a garden, changes. The Halifax and Nationwide indices are unlikely to be affected to the same extent.

The new ODPM index controls for more characteristics than the old version and each characteristic is included in more detail. For instance, local authority district is used instead of region; the exact number of rooms is used instead of allocating dwellings to a group eg five or less rooms, five to seven rooms etc. The seven characteristics used are: location (local authority district); cluster (an ONS classification of local authorities); type of neighbourhood (ACORN classification); dwelling type (detached, semi-detached, bungalow, flat, terraced); number of rooms; old or new; type of buyer (first time buyer or former owner occupier). The new index has over 150,000 cells instead of 300 in the old index.

Turning to comparing the Halifax and Nationwide indices, Table 2 shows that the hedonic regressions employed by the two indices differ to some extent in the judgements they embody: each is based on a somewhat different set of characteristics, and some characteristics contribute to the house price in different ways. For instance, both lenders assume that the number of bathrooms affects the price of a house. But the Halifax index treats each successive bathroom as contributing the same additional amount to the house price, whereas the Nationwide index makes no distinction between a house with two bathrooms and one with three or more.<sup>7</sup> Such discrepancies may give rise to differences in the two indices’ estimates of the rate of house price inflation; the inclusion of a variable in one equation but not another is likely to affect the coefficients on other variables in the equations. So even if the Halifax and Nationwide used the same data and definition of a typical house, their estimates of the price of a typical house would be likely to differ.

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<sup>7</sup> The method used to construct the Halifax index is discussed in some detail in Fleming and Nellis (1984), available on request from the Halifax.

The Hometrack and Rightmove indices mix-adjust data by postcode and property type. The location used is defined at a lower level of aggregation than that in any other index, but both indices exclude a large number of other relevant characteristics (such as number of bedrooms). The mix-adjustment used in these two indices can be considered to be broader than that in the Land Registry index but narrower than used in other indices.

Table 2  
**Characteristics in the Nationwide  
and Halifax hedonic regressions**

Characteristic	In the Nationwide regression?	In the Halifax regression?
Detached house	✓	✓
Terraced house	✓	✓
Detached bungalow	✓	✓
Semi-detached bungalow	✓	But uses one bungalow dummy variable rather than two
Purpose built flat/maisonette or new converted	✓	✓
Converted flat/maisonette	✓	But uses one flat dummy variable rather than two
Tenure	✓	✓
Number of bedrooms	✓	x
Number of habitable rooms	x	✓
Double garage	✓	x
Number of garages	x	✓
Number of garage spaces	x	✓
Parking space or no garage	✓	x
Central heating type	✓	✓
Floor size (sqft)	✓	x
Number of acres	x	✓
More than one bathroom	✓	x
Number of bathrooms	x	✓
Number of toilets	x	✓
Garden	x	✓
Subject to a road charge	x	✓
Property age	x	✓
New	✓	x
Region	✓	✓
ACORN (A Classification of Residential Neighbourhoods) classification	✓	x
Parliamentary constituency	✓	x

### 3.4 Weighting

There are two issues to consider when comparing the weighting schemes of the indices. First, which constant notional house or set of houses is the index representing? Second, is the index volume or expenditure weighted?

In terms of the first issue, the indices can be put into one of two groups with respect to the type of price they are trying to measure.

- *Transactions weights* (Old ODPM, New ODPM, Land Registry, Halifax and Nationwide). Indices in this group measure either the price of a typically transacted house, or the value of a set of typically transacted dwellings. The Land Registry index is a special case in this group because, in a strict sense, the average price uses transactions weights from the most recent month or quarter.
- *Housing stock weights* (Hometrack and Rightmove). Indices in this group measure either the price of a typical member of the housing stock, or the value of the housing stock.

The indices also differ in their use of current or base weights:

- *Base weights* (Halifax and Rightmove). The weights are defined by the transactions or housing stock from a particular year and are never changed. For instance, the Halifax index measures the price of a dwelling that has characteristics typical of dwellings transacted in 1983.
- *Rolling weights* (Old ODPM, New ODPM, Nationwide, Hometrack and Land Registry). The weights are updated periodically, usually annually, with new data on transactions or the housing stock.

The differences are summarised in Table 3. If the type of houses transacted or the characteristics of the housing stock change over time the indices using base weights are most likely to measure the change in price of a currently representative house or group of houses with error.

Table 3  
Weights used in UK house price indices

	Transactions weights	Stock weights
Base weights	Halifax	Rightmove
Rolling weights	Old ODPM New ODPM Nationwide Land Registry	Hometrack

The Halifax “standard house” is defined by the characteristics of the average house on which the Halifax approved a mortgage in 1983. All other indices base their weights on information from a wide range of mortgage lenders (SML transactions) or on all transactions (from the Land Registry) or the housing stock. These other weights may be more representative of the UK housing market than those based on dwellings on which mortgages were approved by the Halifax alone. For instance, the North of England may be over-represented, compared to the true regional distribution of housing market transactions, in the Halifax weights because the Halifax used to have a larger presence in the North of England than in the South.

Comparing the weights used in the other indices, those using transactions weights based on Land Registry information are likely to be the most representative of the typically transacted house or typically transacted set of houses, because the Land Registry records all housing market transactions. Those indices using weights based on SML transactions will not be quite as representative because, whilst the survey includes data from almost all mortgage lenders, it excludes cash transactions which account for approximately 25% of all housing market transactions in the United Kingdom. Of course, indices using SML transactions weights will be representative of the change in price of a typical house or set of houses purchased with a mortgage, which might be a useful price for mortgage lenders’ to monitor.

Comparing stock and transactions weights is difficult. The different weights just allow the index to measure a different concept of the price. The preferred weights will depend on which measure the user is interested in.

The second issue was whether the indices were volume or expenditure weighted. Of the seven main UK house price indices, two are volume weighted and five are expenditure weighted. Neither weighting method is better than the other for all applications; they measure different concepts of the price of housing which are useful for different applications. Observers and policymakers must be careful to match the measure they use with the concept they are interested in.

### **3.5 Where does the comparison of the methods used to construct the indices leave us?**

One point apparent from the discussion in this section is that it is complicated to compare the indices because of the wide variety of samples, methods, and weighting schemes used. However, we can draw some conclusions from the analysis of this section:

- The main indices measure the price of dwellings at different points in the house purchase process. The Rightmove index measures asking prices, the Hometrack, Halifax and Nationwide indices measure prices at the loan approval stage, the ODPM index measures prices at the loan completion stage and the Land Registry index measures final transaction prices. It is therefore important for observers to match the measure of house prices used with the concept they are interested in eg it may be unwise to use the ODPM instead of the Rightmove index to analyse asking prices.

But there are further conclusions we can draw, some of which depend on the extent to which the indices are used to measure final transaction prices:

- The Land Registry index uses the largest dataset; it covers all transactions in England and Wales. But the dataset is not timely and does not record many dwelling characteristics, so quality adjustment is difficult.
- For the purposes of measuring final transaction prices the Halifax and Nationwide datasets can be considered a good compromise between accuracy and timeliness.
- The Rightmove dataset appears to have the least accurate measure of final transaction prices. Asking prices are the earliest in the housing market timeline and so most likely to be revised during the transaction process.
- The Hometrack index places a significant computational burden on estate agents, and so may be subject to greater measurement error.
- The Halifax and Nationwide datasets are the most likely to be affected by sample selection bias. This is particularly the case for the Nationwide index, whose dataset is somewhat smaller than the Halifax's.
- The Land Registry index uses the simplest possible price measure - the average price of transacted houses. So it is likely to be most affected by changes in the mix of houses sold each quarter.
- The Halifax and Nationwide have until recently used the most comprehensive quality-adjustment methods, and were therefore least likely to be affected by changes in the mix of houses sold. It is difficult to judge whether their methods are more or less comprehensive than those used to construct the new ODPM index, since both have advantages and disadvantages.
- Current weights based on Land Registry data will be most representative of all current housing market transactions in England and Wales.

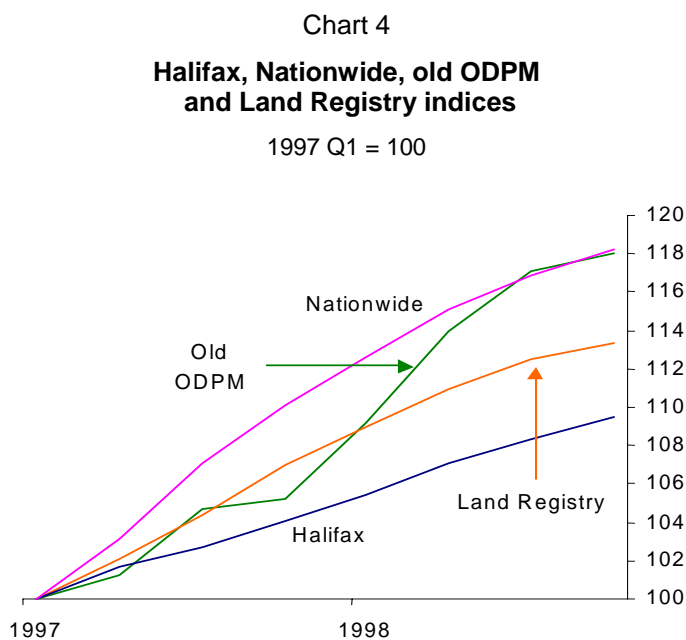
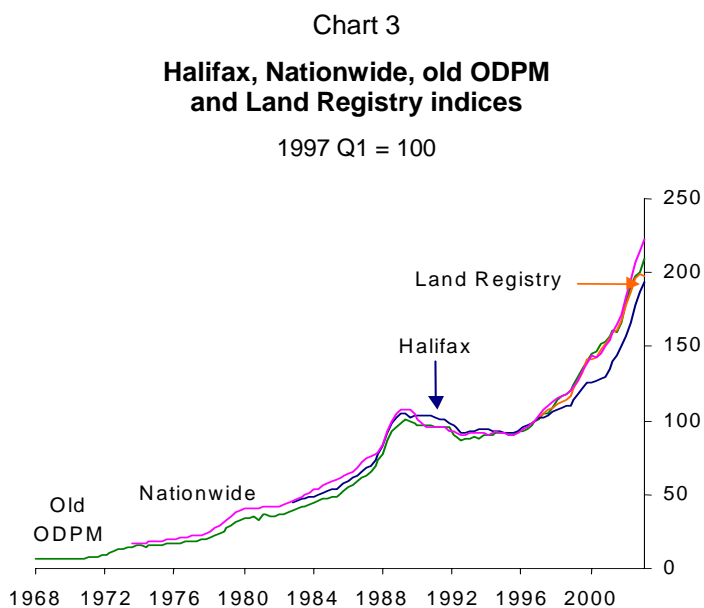


## 4. Empirical comparison of the available UK house price indices

In this section we consider the implications of the different methods used to construct the main UK house price indices; to what extent can the different methods of construction explain the differences between the outturns of the indices.

### 4.1 Long-run vs short-run

Chart 3 shows that the main house price indices have very similar long run trends. In other words, the estimated rate of house price inflation over long time horizons is similar across all the main indices. Chart 4 shows, however, that in the short run the indices - even those purporting to measure the same price - can give quite different estimates of house prices.<sup>8</sup>

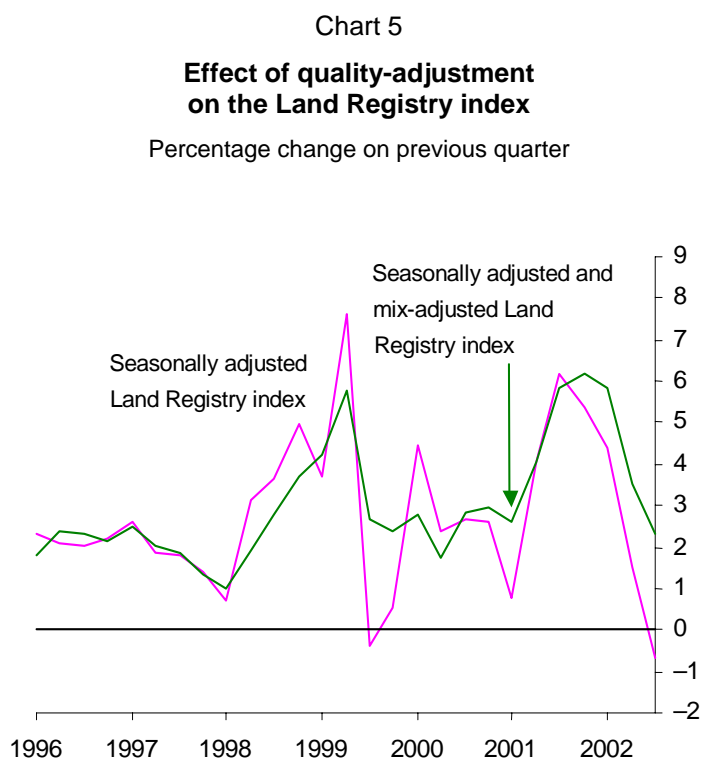


<sup>8</sup> Some indices were not included because only a short back run of data is available for them.

In times of uniform market-wide inflation, all measures of house prices will move by similar amounts. Consequently, these charts suggest that differences in methodology have an effect in the short run because different house types appreciate at different rates, but over a long-period of time all houses appreciate by a similar amount. So the choice of house price measure matters much more for analysis of short-run movements in prices than long-run movements.

#### 4.2 Effect of quality-adjustment

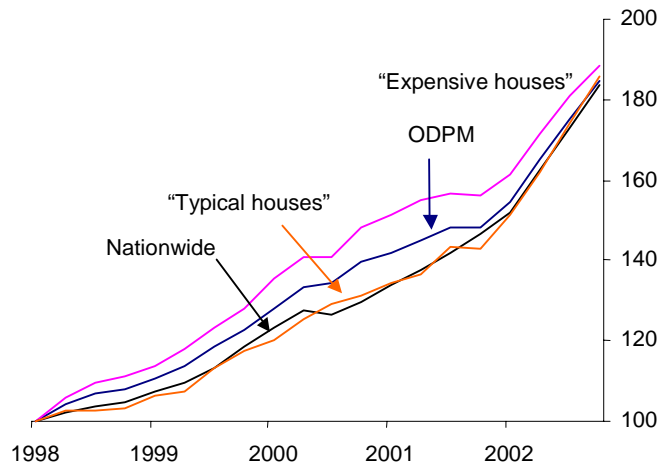
Chart 5 shows the quarterly house price inflation rate measured by a seasonally adjusted version of the Land Registry index and a mix-adjusted and seasonally adjusted version. The mix-adjustment is simple since it controls for the effect of only two house price characteristics: location (defined by county and London Borough); and house type (detached, semi-detached, terraced, flat/maisonette). Nevertheless, the mix-adjustment has a marked effect on the estimated quarterly inflation rate. Using the mix-adjusted index would have led to a very different interpretation of developments during late 1999, than if the not mix-adjusted index had been used. More recently, both indices have shown a slowdown in house price inflation, but the rate of inflation of the not mix-adjusted index has fallen about twice as much from its peak than the mix-adjusted index. So even the most basic mix-adjustment has empirically significant effects and can aid interpretation of house price movements.



#### 4.3 Volume vs expenditure weights

To demonstrate the practical effect of the difference between volume and expenditure weights Chart 6 shows two sub-indices based on the most expensive quartile and the middle-priced 50% of the cells in the old ODPM index, which can be interpreted as indices of “expensive” and “typical” houses. The ODPM and Nationwide indices are also shown. As expected, the ODPM index, which is expenditure weighted, is more in line with the expensive index than the Nationwide index is.

Chart 6  
**Effect of volume weighting**  
 Index (1998 Q1 = 100)



**4.4 Can the differences between the Halifax and Nationwide indices be explained?**

The Halifax and Nationwide indices both use similar methodology, but Charts 7 and 8 show that the short-term (ie month on month) and long-term (ie annual) growth rates of the two indices can diverge significantly and sometimes for relatively long periods of time. This might be expected because the definition of the typically transacted dwelling differs slightly between the indices, the characteristics they control for in their regressions are somewhat different (see Table 2), and they use different samples. But how important are these methodological differences?

Chart 7  
**Monthly Halifax and Nationwide house price inflation**  
 Percentage change on previous month

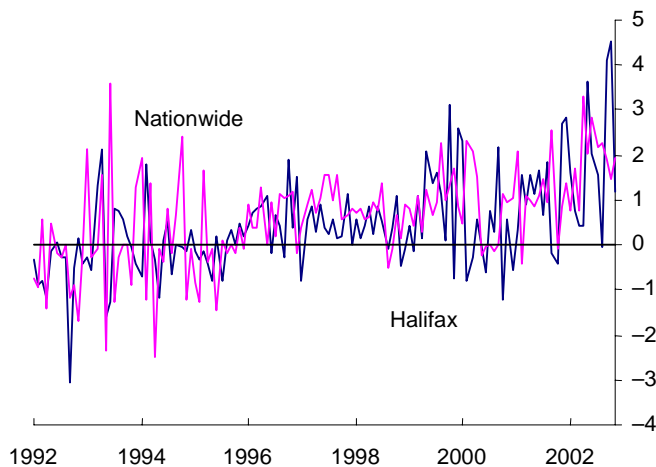
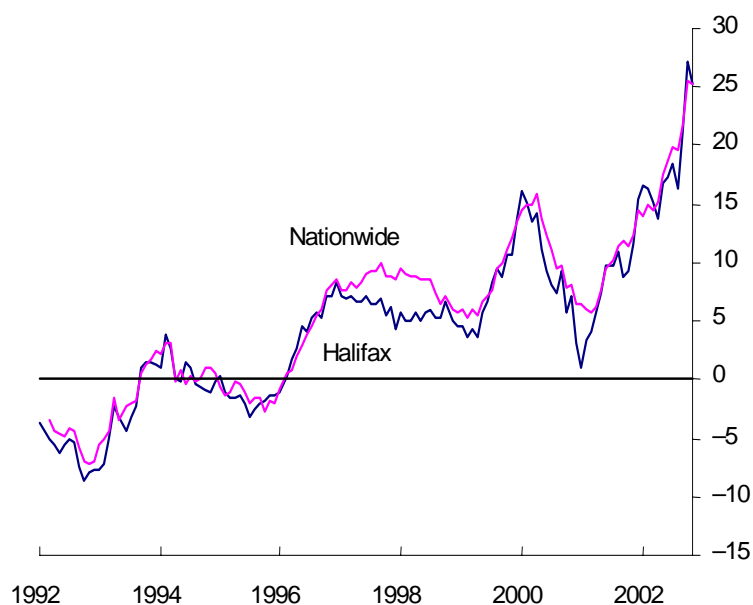


Chart 8

### Annual Halifax and Nationwide house price inflation

Percentage change on previous year



The common framework used by the two indices for estimating prices means there are four possible explanations for the divergence between their growth rates: different typical house; different specification of the hedonic regression equations; different data; estimation error. However, these explanations cannot be assessed without access to the underlying data. Some work has found that the differences between the weights used in the two indices do not explain much of the differences between the monthly growth rates of the two indices. The most likely candidate for the differences between the monthly growth rates of the two indices appears to be estimation error. It may be reasonable to expect that estimation error in an individual month would dominate the effect of there being different typical houses, but over a longer time period the effect of the different typical house becomes more marked.

#### 4.5 Summary of empirical comparison of the main UK house price indices

We have seen that all the indices give similar estimates of house price inflation over long periods (10-20 years) but they can differ in the short run. Considering the reasons for the differences we found that quality adjustment and the choice of expenditure or volume weights can have significant impacts on measured house price inflation. But, estimation error is likely to dominate other explanations for differences in measured monthly or quarterly house price inflation rates from different mix-adjusted indices.

## 5. Conclusions

There are several valid concepts of house prices and many possible ways of constructing an index to measure each type of price. Combinations of methods and datasets have given rise to seven main UK house price indices, and a large number of other indices and surveys.

Comparing the available indices is complicated, although some conclusions can be drawn from an analysis of the methods and data sets used. The most important point to note is that no one method of constructing an index or concept of the price of a house is "right". The main indices in the

United Kingdom use a variety of methods and measure the price of dwellings at different points in the house purchase process, so they have distinct uses. But, we can still learn from the advantages and disadvantages of the methods used by the main UK indices.

The Land Registry index uses the most complete dataset, in the sense that it covers all residential housing market transactions. But that dataset does not record details of many dwelling characteristics so only very simple quality adjustment can be applied to the data. However, we have seen that even simple quality adjustment can have a large impact on measured rates of house price inflation. The Hometrack and Rightmove indices are likely to measure final transacted prices with error, and use, relative to other indices, narrow quality adjustment methods. The Halifax and Nationwide indices use the broadest quality-adjustment techniques and a dataset that, for measuring final transacted prices, represents a good trade-off between accuracy and timeliness. But their samples exclude cash purchases and are smaller than that used by the new ODPM index.

The indices available in the United Kingdom are useful because they allow observers to examine a range of information when assessing past or prospective changes in house prices. But the existence of a large number of indices, whose differences are hard to analyse and interpret because they rely on proprietary data, can create confusion and complexity in what is anyway a difficult area to monitor - because house prices are inherently difficult to measure. Observers and policymakers must, therefore, always be careful to match the measure of house prices they use with the concept they are interested in, and to ensure that the information in short-run changes in house price inflation is not overstated, because sampling and estimation error in monthly and quarterly house price inflation rates appears to be substantial.

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## Methodological issues regarding residential real estate prices

Paul Hilbers

Before commenting on the excellent papers by Case and Wachter (2003) and Wood (2003), I would like to emphasise that I will be reviewing the issue of developing residential real estate price indices from a user point of view rather than as a compiler or statistical expert. In that light, I would like to spend a few words on the particular interest of my Department - the Monetary and Financial Systems Department (MFD) in the IMF - in the important work on improving residential real estate indicators that is currently taking place worldwide, as reflected in the many papers discussed during this conference.

As already noted by the Managing Director in his opening remarks, the IMF, together with the World Bank, set up a programme in 1999 to assess the financial systems of our member countries. This so-called Financial Sector Assessment Program (FSAP) is voluntary in nature. So far about 60 countries have participated in the programme, including many systemically important ones (such as Canada, Germany, Japan, Korea, Switzerland, the United Kingdom, etc), and about 30 more have indicated their willingness to do so in the near future.

The programme has two key components: assessments of compliance with international standards and codes and a macroprudential analysis of the soundness of the financial system. The former is guided by the financial sector standards and accompanying methodology documents developed in recent years by international standard-setting bodies, such as the Basel Committee for Banking Supervision. For the latter component, however, there was a need to develop a set of Financial Soundness Indicators (FSIs). Therefore, MFD and the Statistics Department (STA) organised a consultative meeting in September 1999 on Macroprudential Indicators (MPIs), since renamed FSIs.<sup>1</sup> The purpose was to develop a list of relevant indicators for analyses of financial sector soundness, including to support our FSAPs. An important conclusion of that consultative meeting was that one should pay close attention to developments on asset markets, and in particular real estate markets.<sup>2</sup>

As a follow-up, in 2001 a study was issued on the link between real estate price developments and financial crises.<sup>3</sup> An important conclusion was that in many cases there seemed to be a clear relation. In particular, the paper concluded that imbalanced real estate price developments often contribute to financial sector distress and trends in real estate markets should be monitored closely in the context of financial sector assessments. It also noted that the lack of good quality and timely data with respect to developments in the real estate markets was a major complicating factor.<sup>4</sup>

The papers by Case and Wachter and Wood illustrate the complexities of developing useful and reliable indicators for developments in residential real estate prices. They show that (1) there are many different ways of compiling price indicators for residential real estate, (2) there are many different sources of data, both official and private, and (3) these indicators and sources may give different pictures of developments in residential real estate prices (although Wood concludes that differences are larger in the short term than in the long term). The question then is: what makes real estate markets so special? Both papers deal with this issue, and let me make a few general points about this taken from our 2001 study, focusing first on the markets, then on the causes of cycles/bubbles, and finally on the important role of the banks.

Real estate markets are characterised by heterogeneity. No two properties are identical and information on market transactions is often limited and not generally available. Also, real estate

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<sup>1</sup> See IMF (2003).

<sup>2</sup> For details, see Evans et al (2000).

<sup>3</sup> Hilbers et al (2001). For a study focused on Asia, see Collins and Senhadji (2002).

<sup>4</sup> See also Sundararajan et al (2002), pp 32-4.

markets are typically characterised by infrequent trades, a negotiated pricing process, large transaction costs and rigid supply. In contrast to stock markets and other financial markets there is, therefore, no clear market price. Differences in financing structure, regulatory framework, tax treatment, and the use of real estate as collateral further complicate international comparisons.

The price of a property should in principle equal the discounted present value of the expected stream of future income (rents - this is also what Case and Wachter say on page 3). In a well-functioning market, this price should equilibrate demand and supply. The fundamental equilibrium price can be thought of as the price at which the stock of existing real estate equals the replacement cost. However, the real estate market is characterised by several market imperfections that distort the adjustment toward equilibrium. First, the market suffers from imperfect information about future demand. Second, supply is rigid in the sense that new construction may take several years to be completed, and in many markets the supply of land is a binding constraint. Also, in markets where collateralised lending is widespread, real estate prices affect the availability of resources to finance real estate, which may again affect the price of real estate. Some of these market imperfections can lead to cycles that differ from the economic cycle or to bubbles.

Certain mechanisms can trigger or amplify the appearance of these cycles and bubbles in real estate markets. Some of them are related to non-financial characteristics of real estate markets, but in many cases banks and their lending policies play a large role. Key mechanisms include:

- *The combination of fixed supply and the optimistic investor.* In markets where supply (land and in the short run also buildings) is fixed, a few investors willing to pay a price above the fundamental price can determine the market price, if their demand is sufficient to clear the market. In efficient financial markets, such a process of price increases would be moderated by investors selling short and supply would increase until the price has returned to its fundamental level, but in markets with fixed supply this mechanism does not function well, at least not in the short run. These optimistic investors are likely to stay in the market as long as prices are rising and financial resources are available.
- *Construction lags and imperfect information.* When the price of existing real estate rises above the replacement cost, developers will initiate new construction and increase the supply.<sup>5</sup> However, as new construction may take several years to be completed, the adjustment to equilibrium will be slow. Prices will continue to rise until the new construction is ready for occupancy. By that time, demand for real estate may have fallen or several competing construction projects may have resulted in over-supply, without a fundamental equilibrium being reached.
- *Collateral.* Increasing real estate prices raise the market value of collateral on outstanding real estate loans. This lowers the risks for lenders and may increase their willingness to lend more to finance real estate projects. Hence, the use of real estate as collateral tends to exacerbate real estate cycles.
- *Financial liberalisation.* Following liberalisation and deregulation, new financial markets and institutions tend to emerge. Prime borrowers find that their funding needs can be met at lower costs on domestic and international capital markets. Faced with shrinking margins, banks will search for better yields and may move to new categories of borrowers while underestimating the risk of these loans, eg, in Eastern Europe.
- *Bank holdings of real estate.* As noted also in Case and Wachter, rising real estate prices may finally encourage increased lending to the real estate sector as a bank's own holdings of real estate rise in value.

Evidence from several financial sector crises points to a high exposure of banks to the real estate sector. As also indicated by Case and Wachter, this exposure can take different forms:

- holdings of real estate assets in the banks' portfolios;
- lending to customers for real estate purchases (often collateralised);

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<sup>5</sup> Herring and Wachter (1999).

- financing of real estate developers and construction companies;
- lending to non-bank intermediaries, such as finance companies, that engage in real estate lending; and
- relying on real estate to collateralise other kinds of lending.

The higher the exposure of banks to real estate, the more amplified the cycles in real estate markets can become. Still, banks tend to underestimate the risks associated with high exposure to this sector. As also indicated by Case and Wachter, there are two important explanations.

- *Disaster myopia or low frequency shocks.* Real estate cycles are often long and an entire generation may have passed since the last serious decline in prices occurred. If real estate prices have risen steadily for many years, the repayment record of real estate loans will likely be good. Hence, during a real estate boom, lenders can be lulled into a false sense of security, as real estate prices are rising and loan-to-value ratios on outstanding loans decline, leading to a higher portfolio quality. Profitability in terms of expected returns is high, but the risks are underestimated.
- *Inadequate data and weak analysis.* Banks may underestimate the risk of heavy exposure to the real estate sector because of inadequate information and weak analysis.

This brings us to the key subject of the papers in this session, namely how can we compile better indicators for residential real estate prices. This is not only important for the buyer/seller of residential real estate but also for financial institutions involved in financing, which provide an important link to financial stability. Both the paper by Case and Wachter and the one by Wood discuss in detail the methodology for developing residential real estate indicators, describing the pros and cons of the key types of indicators, and comparing the actual behaviour of these indicators over the past period (see Box 1). An important conclusion seems to be that the better the indicator from a theoretical point of view - and hedonic indicators are clear favourites - the more difficult it is to compile. Both papers seem to agree here, but at the same time it is interesting to note that there is a discrepancy in the empirical results. Whereas Case and Wachter note important differences in the outcomes over a longer period in the United States, Wood concludes that in the long run the results for the different indicators in the United Kingdom seem to converge. It would be interesting to know the reason behind this difference.

Box 1		
<b>Price indices for residential real estate: a comparison</b>		
	<b>Advantage</b>	<b>Drawback</b>
(a) Average or median prices	– Easy to collect	– No correction for quality changes
(b) Representative property method	– Avoid (most) quality change problems	– Focuses only on one sort of properties and ignores developments elsewhere
(c) Hedonic price models	– Control for quality changes – Not just one representative property (as b)	– Data requirements – Potential bias from incorrect model specification
(d) Repeat-sales method - derived from hedonic price model	– Less data requirements – Less dependent on model	– Requires at least two sales – Quality of same property may change between sales

To start where I began, from a user point of view I would prefer to have available a range of indicators rather than just one. This will provide the user with the broadest set of information, provided the caveats that come with the different indicators are clearly identified. From that perspective, the papers discussed here are very useful, and more work in further developing a methodology and comparing the empirical results, not just for the United States and the United Kingdom but also for other countries, would be welcome.



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# US commercial real estate indices: transaction-based and constant-liquidity indices

Donald R Haurin

## Abstract

This paper discusses commercial price indices, focusing on transaction-based indices. It discusses the problems created by using transactions as the basis for a price index and solutions to the problems. It also introduces a recently derived index that provides measures of the value of commercial property in an environment where “liquidity” is held constant. Various transaction-based indices and the constant-liquidity index are compared with an appraisal-based index.

## Introduction

Indices of the price performance of commercial real estate are important to multiple groups ranging from private market investors to pension funds. As described in a paper by Jeffrey Fisher at this conference (“US commercial real estate indices: The NCREIF property index”), the traditional method of valuing commercial properties has been to use appraisals. However, as Fisher notes, there are multiple problems with appraisal-based indices. These problems include the use of “stale” appraisals (ie dated appraisals) and inaccurate appraisals due to lack of current market information about the value of commercial properties. The latter problem causes appraisal-based indices to lag behind market changes in the value of commercial property. Further, Fisher notes that appraisal-based indices are smoothed compared with actual changes in market values. Thus, measures of the volatility of the value of commercial property are underestimated using appraisal-based indices. This mismeasurement could be important when attempting to optimally balance a portfolio of assets that contains commercial property. Fisher notes that “unsmoothing” techniques have been developed to attempt to counter this problem.

## Standard transaction-based indices

An alternative to constructing an index of commercial property values based on appraisals is to use the prices recorded in transactions. Indices based on residential transactions are well known and have been created and used for over three decades. The methods for constructing these indices are well developed and thus a natural application is to commercial property.

There are various methods of using transactions to construct a price index. The most frequently used are the “hedonic-price” method, the “repeat-sales” method and the “hybrid” method. Each method uses econometric regression methods to explain price levels or price changes and then uses the results to create an index of changes in price for a “typical” property. Thus, this method “holds constant” the quality of the property, a requirement for creating a price index for a heterogeneous good.

The hedonic method has been in existence for over 70 years (Rosen (1974)) and was first used to evaluate price changes in automobiles. The fundamental relationship that is estimated is the link between the price of an asset and its characteristics. Examples include estimating the link between the transaction price of a property (commercial or residential) and characteristics such as its land area, structural area, quality of the structure, and locational attributes. Lists of characteristics included in estimations can often be extensive, depending on the amount of data describing the property.

If a dataset includes observations of transaction prices from multiple periods (months, quarters or years), then the hedonic-price method can be applied separately to each period. The result is a set of valuations of each of the characteristics of properties in each time period. These time-varying

valuations can then be applied to a particular set of property characteristics (often the sample's average values), yielding an estimate of property value for each time period. Next, these values for the selected constant-quality property can be transformed into a price index, which reveals the changes in the price of property over time. An often used alternative method is to pool all of the data and estimate a single set of valuations of the property characteristics, but include a set of variables that indicate the period in which the property sold (so called "dummy variables"). If the price is transformed into a natural logarithmic scale, the coefficients of these time period variables trace out a price index for properties.

The above technique is frequently applied to residential property because the needed data are available from both public and private sources and there are many transactions; however, it is more difficult to apply to commercial property. There are a relatively small number of large commercial properties and, of course, not all transact in a particular year. Further, one must collect an extensive set of descriptors of the property. Thus, while there are hundreds of hedonic-price studies of residential properties, there are only a handful of hedonic-price studies of commercial properties.

An alternative to the hedonic-price estimation method is the repeat-sales method. This technique, available for about 40 years, has been used to create house price indices, particularly in the last 10 years. A price index compiled using Freddie Mac and Fannie Mae data (the Conventional Mortgage Home Price Index) is available quarterly for the United States, its regions, states and major metropolitan areas. It is currently based on 17 million property valuations obtained when residential mortgages are purchased. The advantage of this method is that the dataset does not have to describe property characteristics when creating the index; rather, one need only observe the transaction prices for the same property from two periods. Based on the assumption that the property does not change quality, a price index can be created using the econometric technique developed by Bailey et al (1963). The repeat-sales technique is, in practice, impossible to apply to existing commercial property datasets. There are an insufficient number of repeat sales to create a reliable index due to the relatively small number of recorded property transactions.

The repeat-sales technique has been criticised because of its assumptions that properties do not change over time. All properties age and depreciate, and some are renovated. To account for these changes, Case and Quigley (1991) developed a hybrid technique that modifies the repeat-sales method to include selected property characteristics (similar to the hedonic technique) in the estimation model. Again, due to the lack of data, this technique can be applied to commercial property only with great difficulty.

The conclusion drawn from the above is that the most feasible method to create transaction-based commercial price indices is the hedonic-price method. The required data include transaction prices, characteristics of the property, and the date of sale.

### **Problems with the hedonic-price method of creating a transactions-based commercial property price index: the issue of sample selectivity**

An important problem encountered when using the hedonic-price method to create an index of variations in prices over time is bias created by not using a random sample of properties for the estimation. This problem is known as sample selection bias. The basic problem is that not all properties transact during a particular period. If the properties that transact are not representative of the entire stock of properties, then the standard econometric techniques may yield biased estimates of the coefficients in the hedonic model and this may lead to a biased price index. Research by Gatzlaff and Haurin (1997, 1998) showed, using a sample of residential properties, that sample selection could induce biases in residential price indices. The analogy to commercial property is direct. If the commercial properties that transact systematically differ over time in ways not controlled for by the set of explanatory variables (ie property characteristics), then a commercial price index created from transacted properties may be biased. This problem is likely to be particularly acute for commercial property because only a small percentage of the stock of properties transact during any particular time period. The nature of the bias depends on the specifics of how transacted properties change over the real estate or business cycle.

Both formal search theories and intuition suggest that transacted properties may not be representative of the stock of properties. For example, in a normal market, the real values (ie deflated values) of

some properties will rise while others may decline. If the owners of properties with falling values tend to choose not to sell their properties, while owners of properties with rising values tend to choose to sell (or vice versa), then the sample of transacted properties is clearly not random and is biased towards a particular price outcome. It is also plausible that the choices of whether to sell properties with rising and falling values change over the real estate cycle and thus the nature of the sample selection bias will change over time. This changing bias results in an estimated transaction-based price index that differs from a price index that tracks the market value of the *stock* of properties.

Only through empirical testing can it be determined whether bias exists in a particular sample. There is a well known multi-step statistical technique that corrects for possible sample selection bias (Heckman (1979)). The first step develops a model of which properties sell in a particular time period, followed by the creation of a variable that corrects for the bias. The final step is to estimate the hedonic-price equation with this correction variable included (this variable is known as the inverse Mills ratio). This technique was followed by Gatzlaff and Haurin (1997, 1998), who used a sample of residential properties, and Judd and Winkler (1999) and Munneke and Slade (2000, 2001), who used samples of commercial properties. The data requirements are, in addition to the data needed for a hedonic estimate, knowing the factors that influence the likelihood of a property selling.<sup>1</sup>

### **Problems with the hedonic-price method of creating a transactions-based commercial property price index: the issue of time-varying liquidity**

A price index should measure changes in the value of a representative property, where this property's characteristics remain constant over time. This requirement is similar to standard consumer price indices, where the requirement is that the market basket of goods remains constant over time. When creating the index based on the hedonic method, the method enforces the requirement that the observed property characteristics are unchanged. However, there is another important aspect of the transaction that should be held constant, but is difficult to do so in practice. This aspect is the "liquidity" of the market.

Market liquidity refers to the ease, or speed, with which properties transact, or are expected to transact. One measure of the liquidity of a market is the reciprocal of the transaction frequency. More commonly, market liquidity is measured as the expected time required for a particular property to transact. Thus, market liquidity depends on the relative number of buyers and sellers in the market at a particular time - reflecting the conditions of the market and other factors affecting purchase/sale decisions. It is important to note that the relative change in the number of sellers and buyers is fundamental to changes in market liquidity.

Market liquidity and transaction prices are related. Property owners can sell any given asset quicker and easier (holding price constant) when there are more buyers in the market (ie the market is more "liquid"). Alternatively, a property owner can sell a given asset in the same amount of time at a higher price when there are more buyers in the market. This relationship also holds when one aggregates the transactions in a market. Thus, transaction frequency (and liquidity) is positively correlated with the asset market "cycle". Controlling for market size, transaction frequency is typically greater when the property prices are relatively high and/or rising, and lower when prices are relatively low and/or falling. Relative to the general economic conditions, changes in the frequency of transactions are typically found to be procyclical and persistent. During "up" markets, capital flows into the real estate sector, there is a greater volume of trading, and it is easier to sell assets. Just the opposite typically occurs in "down" markets.

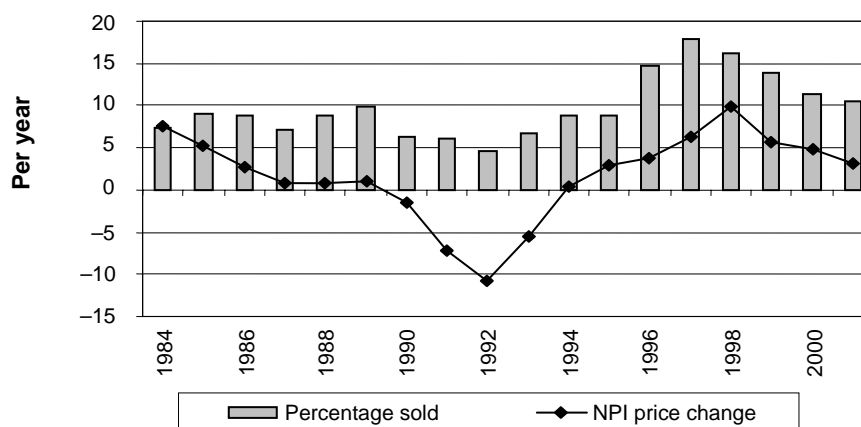
The relationship between transaction frequency and property appreciation is shown in Graph 1 below (reproduced from Fisher et al (2003)). The annual appreciation rate of the capital component of the National Council of Real Estate Investment Fiduciaries index (NPI) is denoted by the solid line for the period 1984 to 2001. The grey bars chart the percentage of properties in the NCREIF portfolio that transacted each year. A strong positive correlation between periodic movements in the annual

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<sup>1</sup> One of the first fairly complete empirical models of a commercial property's probability of sale is in Fisher et al (2004).

transaction frequency and the rate of appreciation is noted. During the economic downturn of the early 1990s, both the percentage of transactions and the annual rates of appreciation experienced persistent declines from 1990 to 1992. Transaction frequency and appreciation rates then rose consistently until peaking in 1997 and 1998, respectively.

Graph 1  
**Transaction volume and capital appreciation  
in the NCREIF index**  
1984-2001, in per cent



The conclusion drawn is that transaction prices reflect not only property characteristics, but also market liquidity. While the issue of heterogeneous property characteristics can be addressed with the hedonic-price technique, it has to be modified to address the issue of intertemporal variations in market liquidity. Otherwise, variations in the price index reflect not only true changes in commercial property values, but also changes in market liquidity.

The solution to purging transacted prices of time-varying liquidity is fairly complex. Fisher et al (2003) developed a search model where a property owner has a reservation price below which he or she will not sell the property and potential buyers have an offer price that they will not exceed. Some matches of sellers and buyers are successful and transaction prices are negotiated. The frequency of these successful matches in the market during a particular period of time yields information about the liquidity of the market, and this information can be used to adjust the hedonic estimates of prices to hold liquidity constant. The method involves a three-step procedure where the first two steps are similar to the correction for sample selection bias. The final step fully identifies all of the parameters of the model, thus allowing for a correction to be made for time-varying liquidity.

The intuition of the above discussion is that the liquidity of the market affects transaction prices and prices in the market affect transaction frequency. Thus, there is simultaneous determination of prices and the probability of a property selling. Empirically, we observe both transaction prices and which properties sell, providing enough information for the analyst to separate these effects. This separation allows the possibility of creating a new price index, one in which liquidity effects are held constant.

### **An application to the NCREIF Commercial Real Estate Database**

The results of a study by Fisher, Gatzlaff, Geltner and Haurin (FGGH (2003)) of the NCREIF Commercial Real Estate Database are discussed below. They created multiple indices of commercial property prices including an appraisal-based index, an index based on transaction prices, an index based on transacted prices but which includes a correction for selection bias, an index that holds liquidity constant, and a stock exchange based index (NAREIT).

Their database includes property-specific information on over 8,500 investment grade properties. These data have been used to construct an appraisal-based price index (NPI) since the fourth quarter of 1977. For 2001, quarter four, the NCREIF portfolio of properties includes 3,311 properties, with an aggregate appraised value of just over \$100 billion. Properties included in this database are generally well distributed across the four major regions of the nation (East, Midwest, West and South represent 22%, 16%, 33% and 29% of the number of properties in the database, respectively). The database includes four property types: office (29%), industrial (29%), apartment (24%) and retail (18%). During the period 1982:2 to 2001:4, 3,138 properties sold and there are 27,254 observations of properties that did not sell during a particular year.

## Results of the NCREIF application

FGGH's (2003) results are reproduced in Table 1 and Graph 2 below. The table presents a statistical summary comparing five capital return indices and the graph depicts the cumulative log value levels of these indices. All five commercial real estate value indices reviewed here present a similar general pattern, characterised by a very notable cycle, peaking in the mid- to late 1980s and again in the late 1990s (or possibly 2001). All five indices present a very similar long-run trend or average growth rate over the entire cycle. At a more detailed level, the five indices display interesting differences.

The appraisal-based NPI presents a smoothed and lagged appearance compared to the other indices. This is not surprising, given the nature of the appraisal process, and the way the NPI is constructed (including some "stale appraisals" each quarter).

Table 1

### Annual return for five alternative commercial price indices

Annual return statistics (continuously compounded returns), 1984-2001

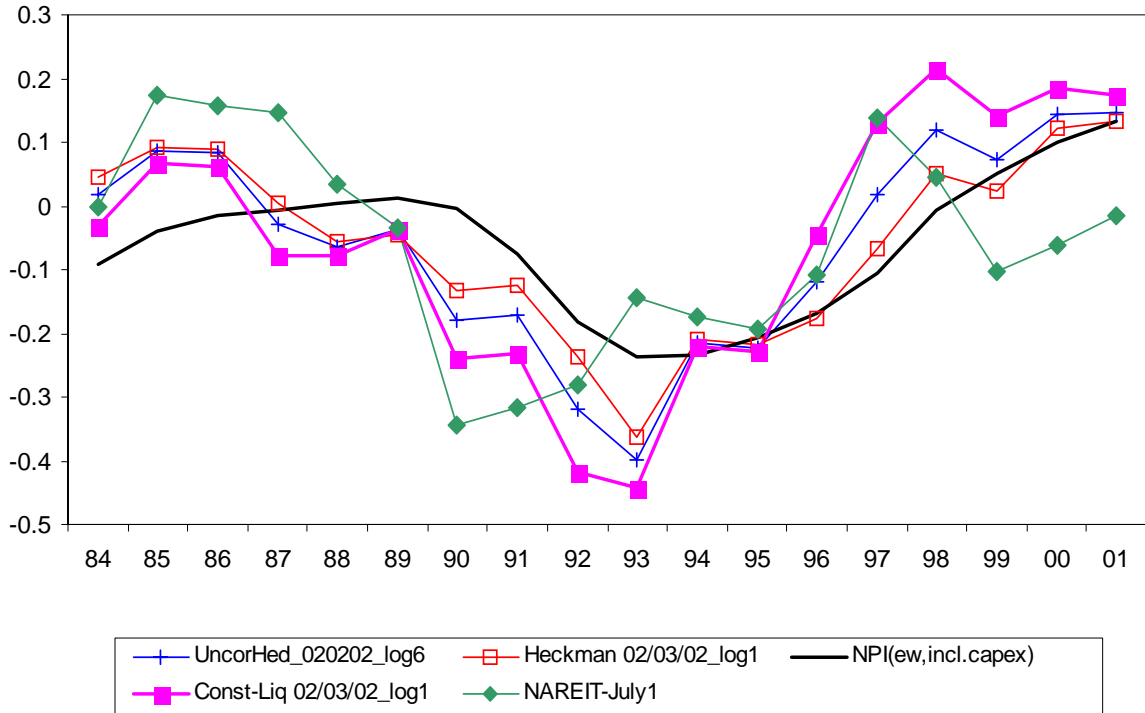
Index	NPI	Transaction-based	Selection-corrected	Constant-liquidity	NAREIT
Mean	1.32%	0.76%	0.52%	1.22%	-0.08%
Std dev (volatility)	5.22%	9.61%	8.33%	12.07%	12.99%
Autocorrelation (1st order)	0.801	0.081	0.066	0.088	0.102
<b>Correlation coefficients</b>					
NPI	1	0.584	0.631	0.495	0.024
Transaction-based		1	0.951	0.966	0.403
Selection-corrected			1	0.838	0.260
Constant-liquidity				1	0.502
NAREIT					1

Graph 2

**Various indices of commercial price movements, 1984-2001**

**Transaction-based value indices of NCREIF vs appraisal-based NPI and securities-based NAREIT indices**

Estimated log value levels (Set AvgLevel = Same 84-01)

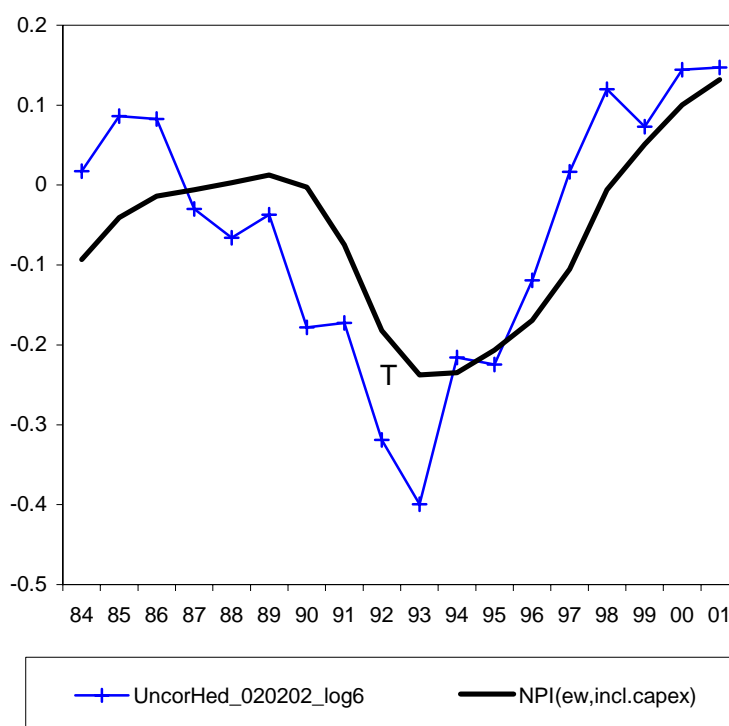


Notes:  
 The "uncorHed" index is the standard transaction-based index.  
 The "NPI" index is the NCREIF appraisal-based index.  
 The "Heckman" index is the sample selection corrected price index.  
 The "Const-Liq" index is the constant-liquidity index.  
 NAREIT is a stock market based index of REITs.

The three transaction-based indices (uncorrected transaction-based, selection bias corrected, and constant-liquidity) behave in a generally similar way, tracing out a pattern roughly in between those of the REIT-based index (stock) and the appraisal-based index. The uncorrected transaction-based index displays greater volatility and greater cycle amplitude than the appraisal-based index (see Graph 3), and it appears to temporally lead the NPI. Specifically, the peak in the mid-1980s is earlier (and similar to the NAREIT peak) and the rise out of the early 1990s trough steeper. Unlike the appraisal-based NPI, but like the NAREIT index, all transaction indices depict a down market during 1999, a period when commercial real estate securities suffered setbacks due to the 1998 financial crisis and recession scare, choking off a major source of capital flow into commercial real estate markets.

Graph 3

**Transaction-based (uncorrected) vs  
the NCREIF (appraisal-based) price index**

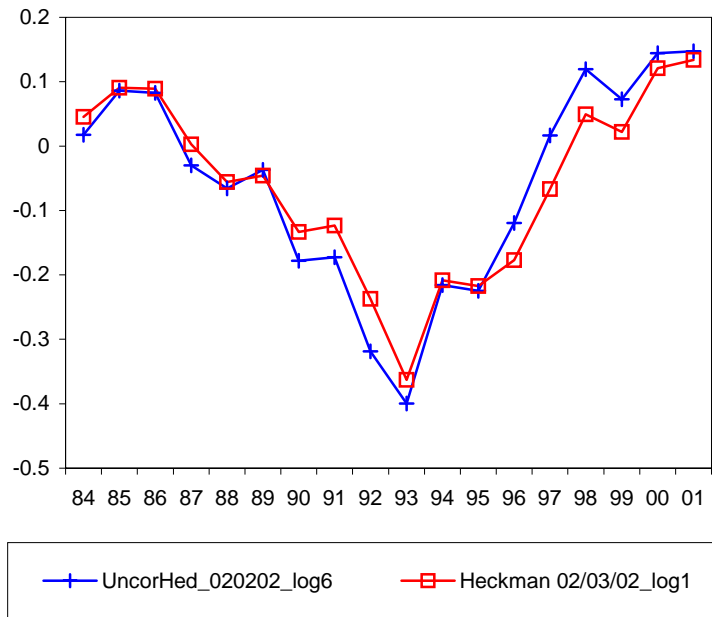


The selection-corrected transaction-based index lags slightly behind the uncorrected index (see Graph 4). Recall that the transaction-based index is the observed index, while the selection-corrected index is representative of the change in prices of the stock of commercial properties. This finding suggests that NCREIF members tended to sell their “losers” during the downturn of the early 1990s and sell their “winners” during the upswing of the late 1990s. Lower-quality properties would tend to suffer the worst performance during a severe real estate slump. Conservative institutional investors such as the pension funds whose capital is managed by NCREIF members may prefer to sell underperforming real estate during such a period, even though such a disposition policy makes their investment performance look worse during the down market. They may then try to recoup the performance hit by selling star properties in the upswing.



Graph 4

**Sample selection corrected transaction-based vs the uncorrected transaction-based value index**

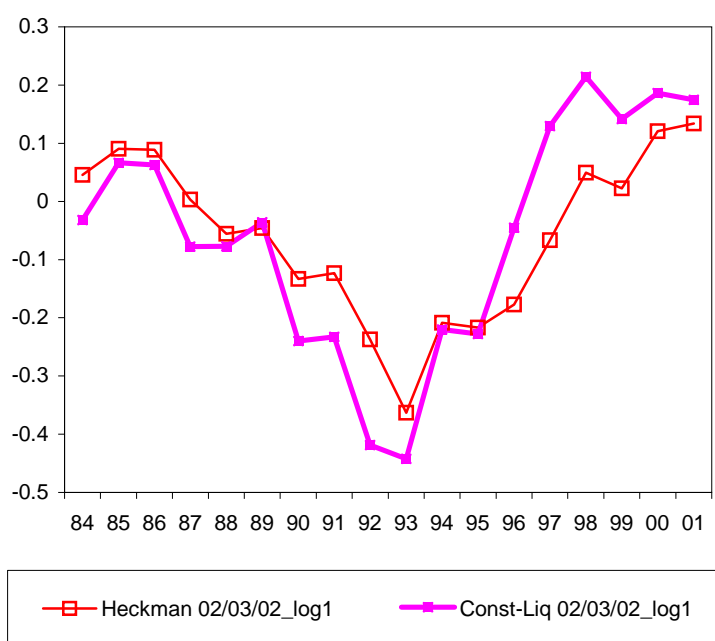


The constant-liquidity value index displays greater cycle amplitude and greater volatility compared to the variable-liquidity transaction price indices (see Graph 5). Indeed the constant-liquidity value index has annual volatility almost equal to that of the NAREIT index (12% for the constant-liquidity index versus 13% for NAREIT, compared to less than 10% for the variable-liquidity price indices), and it has a cycle amplitude even greater than NAREIT in the 1990s upswing (see Graph 6). There is also evidence that the constant-liquidity value index leads the variable-liquidity transaction price indices in time, for example in the earlier peak in 1998 and the slightly faster fall in the late 1980s. The increased amplitude and volatility of the constant-liquidity index are consistent with buyers changing their reservation prices more so than do sellers in response to news.<sup>2</sup> Specifically, the temporal lead in the constant-liquidity index is consistent with “quick buyers” and “sticky prices” for sellers’ reservation prices. A comparison of the constant-liquidity value index with the selection-corrected variable-liquidity price index suggests that both of these behaviours are present to some degree in the institutional commercial real estate market.

<sup>2</sup> Fisher et al (2003) derive a theoretical model that shows the relationship of the buyer and seller behaviour to the constant-liquidity and variable-liquidity indices.

Graph 5

**Constant-liquidity index vs selection-corrected variable-liquidity index**



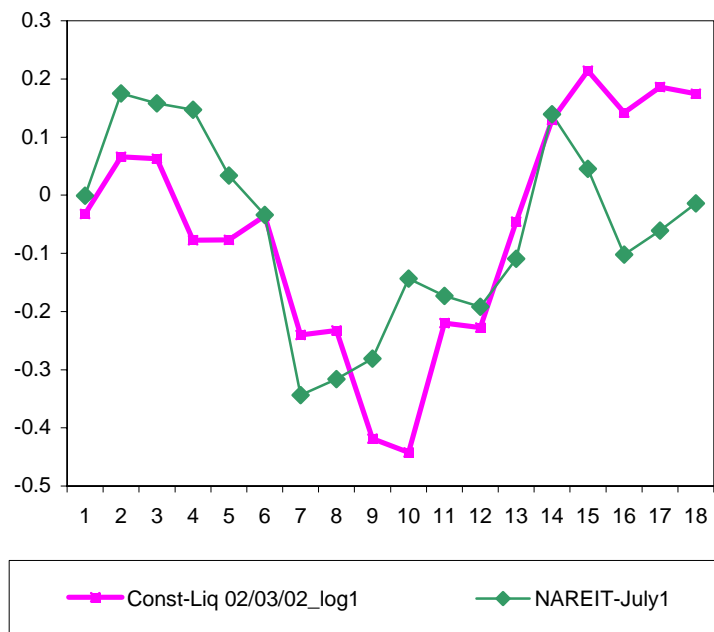
The stock exchange based NAREIT index presents a bit of an “odd man out” appearance, with some movements that are not echoed in any of the other indices. In part, this may reflect fundamental differences between REITs and direct property investments.<sup>3</sup> It may also reflect the effect of the different type of asset market in which REIT shares are traded. Obviously, the market microstructure and functioning of the public stock exchange are very different from those of the private real estate market, in which whole properties are traded. In addition, the investor clienteles are different between these two types of asset markets. There is some evidence of a lack of complete integration between the stock market and the private real estate market.<sup>4</sup> It is interesting to note that, in Graph 2, the NAREIT index shows some evidence of leading the private market indices in time, particularly in its turning points at the bottom of the cycle in 1990 and subsequent peak in 1997. This may reflect the greater informational efficiency of the public stock exchange mechanism, compared to private asset markets.

<sup>3</sup> The types of properties held by REITs are not exactly identical to the types of properties represented in the NCREIF database. In addition, REIT management policies and considerations (including property trading, development projects, and financial strategy) add a layer of investment performance results on top of that of the underlying “bricks and mortar” represented by operating property assets in place.

<sup>4</sup> See Ling and Ryngaert (1997) and Ling and Naranjo (1999).

Graph 6

**NAREIT (stock) index vs constant-liquidity value private market index**



**Summary**

This paper describes alternative indices of price changes for commercial property. The “traditional” measure of commercial property price change is based on appraisals. An advantage of this method is that all properties can be appraised relatively frequently (although this is costly). However, there are significant disadvantages, including the use of old (stale) appraisals. More importantly, appraisal-based indices tend to lag price shifts over the real estate cycle, this lag being substantial at times. Further, appraisal-based indices tend to be smoothed compared to other, more accurate measures of price change. A recent study by Fisher, Gatzlaff, Geltner, and Haurin (2003) of the NCREIF database confirms the existence of these problems. The appraisal-based NCREIF price index is both smoothed and less volatile than actual changes in commercial property prices.

An alternative method of constructing a commercial price index is to use data on observed transactions. Problems of smoothing and lagged measures of price changes are addressed with this method. The creation of a transaction-based index requires the use of a technique to adjust for quality differences among transacting properties. The most feasible method of controlling for property differences is to use the hedonic-price method. This method requires that the characteristics of transacted properties be recorded, a requirement that is typically met. Using NCREIF data, the feasibility of creating a transaction-based index was demonstrated.

A transaction-based index created with the hedonic-price method is also subject to particular problems. One is that the sample of properties that transact may not be a random sample of the stock of commercial properties. In this case it is possible that the index created from transacted properties is biased. FGGH (2003) found evidence of the presence of this bias, but the impact on the estimated commercial price index was relatively slight. A second problem is that the liquidity of the market varies over the real estate cycle. Thus, some transactions occur when it is relatively easy to sell a property (a liquid market) and others sell when it is relatively difficult to sell (an illiquid market). Holding the liquidity of the market constant is relatively difficult; however, FGGH present a two-equation model that allows for liquidity to be held constant.

The constant-liquidity market shows greater volatility than the simple transaction-based index. Changes in values in the constant-liquidity index tend to lead changes in the transaction-based index. It is sensible to argue that the desired measure of the value of commercial property is one where the

ease of selling a property is held constant over time. Our findings suggest that a constant-liquidity index is much more volatile than the commonly used appraisal-based indices. Also, the appraisal-based index lagged the constant-liquidity index by a substantial amount.

FGGH (2003) also compared the transaction-based indices to the NAREIT index of publicly traded REITs. The NAREIT index appears to be slightly more volatile and to temporally lead the constant-liquidity value index. The general pattern of price discovery seems to involve the NAREIT index typically moving first, followed by the constant-liquidity value index, then by the variable-liquidity transaction-based indices, and last by the appraisal-based NCREIF index. The total time lag between NAREIT and NCREIF can be several years, as measured by the timing of the major cycle turning points.

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# Going where the data is

## TWR's experience with real estate values

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### Going where the data is: Torto Wheaton Research's experience with commercial real estate values

Torto Wheaton Research (TWR) has developed products to analyse the rent and vacancy forecast for commercial markets, but it has usually been left up to the client to translate this information into specific property incomes and values to inform pricing.<sup>2</sup> For several years, TWR has increasingly been doing this translation for clients, in consulting assignments and through software such as TWR Outlook Interactive. This paper provides a detailed explanation as to how rents and vacancies are connected to the investment variables that are of concern to investors, and how this information can be customised to specific assets. In this way Torto Wheaton Research develops its own valuation database.

NCREIF information on income, appreciation, and returns since 1978 provides a good benchmark of institutional-based real estate performance; however, this information is limited from a research/econometric perspective in several ways. The data cover institutional real estate only, provide a limited sample size for most metropolitan areas by property type, and are not usually "market representative".

Additionally, NCREIF investment data are divorced from space market fundamentals. By this we mean that it is rarely clear how the income and appreciation variables in NCREIF connect to market rents and vacancies. For instance, a sample of office properties within a specific market might show great performance, but one does not know if this performance is due to rents, occupancy, or cost leverage. What is known is only how the properties in the NCREIF database in that specific market performed - not why.

While there are data available on space markets, and from NCREIF a second body of data on investment returns, both data sets exist in separate, unconnected worlds. As a subsidiary of C B Richard Ellis, Torto Wheaton Research has access to their information on rents and vacancy, which are already closely tracked by the brokerage community. Torto Wheaton Research's models "tie" together the investment measures (NOI growth, values, cap rates and returns) to the current and future fundamentals market (rents and occupancy). The *Torto Wheaton Research Investment Database* essentially integrates market fundamentals of economic demand, rents, and occupancy with a property by property dataset, including expenses, lease rollovers, and the like, to estimate gross and net income, future capitalisation rates, and values.

### Discounted cash flow and the translation to investment variables

Once an understanding has been developed of our methodology for forecasting rents and vacancies in the different property types, some explanation is still in order to better understand how those rents and vacancy rates are transformed into investment fundamentals, such as net operating income, value, and total return.

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<sup>2</sup> There is a paucity of pricing data for commercial real estate partly due to market inefficiencies and partly due to the nature of the asset. Those unfamiliar with these issues should see, for example, Fisher et al (1999).

Discounted cash flow analysis (DCF) is often used to arrive upon a price of an asset by creating cash flows and discounting them back using a discount rate to create a price. In this case, TWR uses DCF to determine the likely internal rate of return (IRR) given the current price and the future cash flows.

The outline of the methodology will follow the format of popular valuation software such as ARGUS or ProJect.<sup>3</sup> In fact, TWR's valuation methodology can be thought of as a simplified version of these tools. However, the methodology has the advantage of using TWR rent and vacancy forecasts to formalise the analysis of future cash flows using econometrically derived values instead of broad assumptions. The differences between TWR's year-by-year forecasts and the common market assumptions (for example, that rent will grow by 3% each year), create varying IRRs and other investment statistics across markets, property types, and buildings. These statistics allow for comparison of investments and ranking and descriptions of markets to find opportunities in real estate investment.

### Discounted cash flow

Schedule of prospective cash flow<sup>1</sup>

For the years ending	Year 1 Mar 2002	Year 2 Mar 2003	Year 3 Mar 2004	Year 4 Mar 2005	Year 5 Mar 2006	Year 6 Mar 2007
Potential gross revenue						
Base rental revenue	\$2,262,200	\$2,257,400	\$2,246,000	\$2,252,200	\$2,295,200	\$2,373,200
Absorption and turnover vacancy		-426,600	-469,734	-430,100	-462,550	-487,850
Effective gross revenue	2,151,380	2,191,686	2,263,117	2,308,021	2,305,666	2,369,693
Total operating expenses	870,000	870,000	891,750	914,043	936,894	960,317
Net operating income	1,281,380	1,321,686	1,371,367	1,393,978	1,368,772	1,409,376
Leasing and capital costs						
Tenant improvements						
Capital improvement reserves						
Total leasing and capital costs	230,000	230,000	235,750	241,644	247,685	253,877
Cash flow before debt service and taxes	\$1,051,380	\$1,091,686	\$1,135,617	\$1,152,334	\$1,121,087	\$1,155,499
Cap rate	8.9	10.1	10.4	10.0	9.8	9.7
Value	\$14,470,407	\$13,084,510	\$13,243,632	\$13,899,439	\$13,999,372	\$14,514,676
Yield	7.3%	8.3%	8.6%	8.3%	8.0%	8.0%
Appreciation		-9.6%	1.2%	5.0%	0.7%	3.7%
Total return		-1.2%	9.8%	13.2%	8.7%	11.6%
IRR	7.86%					

<sup>1</sup> In inflated dollars for the fiscal year beginning 1 January 2002.

Source: Torto Wheaton Research.

<sup>3</sup> ARGUS and ProJect assist with cash flow analysis by automating many of the calculations necessary once data has been entered.

The methodology is simplified from an ARGUS run by virtue of the detail that is covered. Under ARGUS, there are myriad possibilities in DCFs for details on the leases, expenses, additional income, and so forth; In contrast, the TWR valuation only concentrates on the basics of what drives net operating income and value in general - rent growth, vacancies, and costs.

The following pages outline the different components of the TWR valuation line by line. The methodology for each item is explained so that clients have a better understanding of the assumptions behind the valuations, and with this understanding can determine the relation to properties in their portfolio or under consideration.

For all of the line items, there are two cases to discuss. First, there is what is done in determining the investment statistics for a "prototypical" building in the market, and secondly how the methodology is specified to take into account more collateral specific attributes of the building.

### DCF - revenue

#### Schedule of prospective cash flow<sup>1</sup>

For the years ending	Year 0 Mar 2002	Year 1 Mar 2003	Year 2 Mar 2004	Year 3 Mar 2005	Year 4 Mar 2006	Year 5 Mar 2007
Potential gross revenue						
Base rental revenue	\$2,262,200	\$2,257,400	\$2,246,000	\$2,252,200	\$2,295,200	\$2,373,200
Absorption and turnover vacancy	-400,000	-426,600	-469,734	-430,100	-462,550	-487,850
Effective gross revenue	2,151,380	2,191,686	2,263,117	2,308,021	2,305,666	2,369,693
Total operating expenses	870,000	870,000	891,750	914,043	936,894	960,317
Net operating income	1,281,380	1,321,686	1,371,367	1,393,978	1,368,772	1,409,376
Leasing and capital costs	From TW rent and vacancy forecasts					
Tenant improvements						
Capital improvement reserves						
Total leasing and capital costs	230,000	230,000	235,750	241,644	247,685	253,877
Cash flow before debt service and taxes	\$1,051,380	\$1,091,686	\$1,135,617	\$1,152,334	\$1,121,087	\$1,155,499
Cap rate	8.9	10.1	10.4	10.0	9.8	9.7
Value	\$14,470,407	\$13,084,510	\$13,243,632	\$13,899,439	\$13,999,372	\$14,514,676
Yield	7.3%	8.3%	8.6%	8.3%	8.0%	8.0%
Appreciation		-9.6%	1.2%	5.0%	0.7%	3.7%
Total return		-1.2%	9.8%	13.2%	8.7%	11.6%
IRR	7.86%					

<sup>1</sup> In inflated dollars for the fiscal year beginning 1 January 2002.

Source: Torto Wheaton Research.

By determining the NOI, cash flow, yield, total returns, and IRR of a prototypical building, we are taking attributes that are averages across all buildings in the property type, for example that office leases have five-year terms, and applying it to a fictional building in the market. The result is that the prototypical building should be a good representation of the investment figures for buildings in that market. The better the understanding of the assumptions that go into the prototypical building, the

better investors will be able to apply the general results shown in the investment variables to buildings that differ from the prototypical. The relationship to the average result in the market is a more complex one, and will be discussed later in this paper in comparing the methodology for deriving NOIs to NOI histories in the NCREIF database.

Buildings where more collateral-specific information is available have the advantage of additional attributes being applied to TWR's DCF formulation. Examples might be current data on rents and costs, the pattern of future turnover, or an existing cap rate. Any of these variables would narrow the distance between the prototypical valuation and a more detailed DCF run, thus requiring the user to make far fewer assumptions about the relation between the two.

The first and most important piece in the TWR valuation is determining building revenue given market rents and vacancies. For rents in the prototypical office building, we use the fact that leases in our exclusive database from C B Richard Ellis average five years in length quite consistently across office markets. If we further assume that these leases were signed evenly over the past five years at market rate, then the average of market rents over the period times the square feet of rentable space in the building gives us our potential rent. In absence of additional information, we take a standard 100,000 square foot building for each market to represent the prototypical building.

As leases turn over, their rents that were signed five years ago are replaced with current market rents. This continues in future years and even the leases signed at today's rents re-sign at a new rate five years from today.

In the case where more information about the building is known, the average of historical market rents across time can be replaced with an average existing rent throughout the building to form a starting point for gross potential revenue. The building's average existing rent can be affected by both the quality of the building and the timing of past lease signings. It may be the case that rents are consistently above the market average, like in a Class A tower, or it may be that the building has leases that were all signed in 2000 when rents were generally near their peak. Any change in the average existing rent number will normally need to be accompanied by a change in the current market rent number. Here, current market rent refers to the building's peer market rather than the metropolitan area as a whole. The current market rent for a building can be estimated by looking at a current lease signing or by examining average current rents in a peer group of buildings. Together, the two numbers sort out whether rents might be higher in a building because of a permanent premium due to quality or a more temporary premium because management has timed leases well.

The second component in determining gross revenue is building vacancy. The TWR valuation methodology has building vacancy affected by market vacancy through a calculation of downtime as leases turn over. As a lease expires, the current tenant either renews at the new rent, or the space is put on the market. The amount of time the space spends on the market without being leased, or downtime, is determined by the market vacancy. When market vacancy is high downtime can last for years. When the market is tight, downtime is short and building vacancy remains low.

For the prototypical building, it should not be surprising that average building turnover each year and average renewals lead prototypical building vacancy to equal market vacancy. Building vacancy where collateral specific information is available can differ from the market in that higher turnover in a year will lead to higher building vacancy than the market and vice versa. Renewals in a building can also be set to differ from the market average to create a more permanent advantage or disadvantage in comparison to the market vacancy rate.

Rent and vacancy together provide a basis for gross revenue, but what really determines the health of real estate is Net Operating Income, or NOI. The starting point for NOI is determined by subtracting out the sum of operating costs from gross revenue. For the prototypical properties, this starting point is determined using industry data to determine a relationship between rents and operating costs. For example, prototypical office buildings use data publicly available from the Building Owners and Managers Association (BOMA) to create an equation that relates rent to operating costs. The TW Rent Index is then applied to this equation to determine the starting level for operating costs in the prototypical building.



## DCF - costs

Schedule of prospective cash flow<sup>1</sup>

For the years ending	Year 1 Mar 2002	Year 2 Mar 2003	Year 3 Mar 2004	Year 4 Mar 2005	Year 5 Mar 2006	Year 6 Mar 2007
Potential gross revenue						
Base rental revenue	\$2,262,200	\$2,257,400	\$2,246,000	\$2,252,200	\$2,295,200	\$2,373,200
Absorption and turnover vacancy		-426,600	-469,734	-430,100	-462,550	-487,850
Effective gross revenue	2,151,380	2,191,686	2,263,117	2,308,021	2,305,666	2,369,693
Total operating expenses	870,000	870,000	891,750	914,043	936,894	960,317
Net operating income	1,281,380	1,321,686	1,371,367	1,393,978	1,368,772	1,409,376
Leasing and capital costs						
Tenant improvements						
Capital improvement reserves						
Total leasing and capital costs	230,000	230,000	235,750	241,644	247,685	253,877
Cash flow before debt service and taxes	\$1,051,380	\$1,091,686	\$1,135,617	\$1,152,334	\$1,121,087	\$1,155,499
Cap rate	8.9	10.1	10.4	10.0	9.8	9.7
Value	\$14,470,407	\$13,084,510	\$13,243,632	\$13,899,439	\$13,999,372	\$14,514,676
Yield	7.3%	8.3%	8.6%	8.3%	8.0%	8.0%
Appreciation		-9.6%	1.2%	5.0%	0.7%	3.7%
Total return		-1.2%	9.8%	13.2%	8.7%	11.6%
IRR	7.86%					

BOMA data adjusted to match revenue in TWR's prototypical building

Grown with inflation

<sup>1</sup> In inflated dollars for the fiscal year beginning 1 January 2002.

Source: Torto Wheaton Research.

This starting level is incremented over time by our forecasted inflation rate. Examining our sources of operating data, long-run trends clearly show a close correlation between growth in operating expenses and general CPI inflation. The exception to this is in the hotel sector where operating expenses are managed on a day-to-day basis depending on advance reservations. So, in periods where occupancy is low, costs are generally lower because maids are not brought in, etc. This is captured by a multi-equation system for the hotel sector that has been derived from hotel-level operating statements collected by our product partner Hospitality Research Group.

The implication for all property types is that a higher ratio of operating costs to rents produces greater risk for the property. TWR often refers to this ratio as the operating leverage of the property. Like leverage from taking on debt, operating leverage increases risk because for an equal increase or decrease in gross revenues, NOI will experience a bigger shift. For an extreme example, in the case where expenses are 95% of revenues a 5% decrease in rents will lead to a 100% loss of NOI. Similarly, a 5% increase in rent will double NOI. This often leads to more risk in smaller markets where rents tend to be lower and there is less wiggle room to allow for drops in rents.

There are also additional costs beyond operating expenses which appraisals treat as "below the line" expenses. Subtracting these expenses, capital expenses and tenant improvements, from NOI give us an income number we label as Cash Flow.

The TWR methodology treats capital expenses not so much as occasional expenses that are recorded in one period, but in terms of a capital reserve account that needs to be paid into each year. To determine this number, TWR uses the NCREIF data to analyse the long term ratios of capital expenses to NOI in each property type. These ratios are used to determine a capital expense value.

Tenant Improvement information is gathered from data sources similar to the operating expense information. These TI costs are applied only to leases that are not renewing. As a result, these costs are incurred only on the non-renewing leases that are turning over. As this is a small percentage of the total leases in the building, TI costs are often a smaller factor than is the capital reserve payment in subtracting from NOI. As for all costs, both starting values and growth over time can be altered from the prototype where more information on the collateral is available.

### DCF - cap rates

Schedule of prospective cash flow<sup>1</sup>

For the years ending	Year 1 Mar 2002	Year 2 Mar 2003	Year 3 Mar 2004	Year 4 Mar 2005	Year 5 Mar 2006	Year 6 Mar 2007
Potential gross revenue						
Base rental revenue	\$2,262,200	\$2,257,400	\$2,246,000	\$2,252,200	\$2,295,200	\$2,373,200
Absorption and turnover vacancy		-426,600	-469,734	-430,100	-462,550	-487,850
Effective gross revenue	2,151,380	2,191,686	2,263,117	2,308,021	2,305,666	2,369,693
Total operating expenses	870,000	870,000	891,750	914,043	936,894	960,317
Net operating income	1,281,380	1,321,686	1,371,367	1,393,978	1,368,772	1,409,376
Leasing and capital costs						
Tenant improvements						
Capital improvement reserves						
Total leasing and capital costs	230,000	230,000	235,750	241,644	247,685	253,877
Cash flow before debt service and taxes	\$1,051,380	\$1,091,686	\$1,135,617	\$1,152,334	\$1,121,087	\$1,155,499
Cap rate	8.9	10.1	10.4	10.0	9.8	9.7
Value	\$14,470,407	\$13,084,510	\$13,243,632	\$13,899,439	\$13,999,372	\$14,514,676
Yield	7.3%	8.3%	8.6%	8.3%	8.0%	8.0%
Appreciation		-9.6%	1.2%	5.0%	0.7%	3.7%
Total return		-1.2%	9.8%	13.2%	8.7%	11.6%
IRR	7.86%					

Starting cap rates use NCREIF income and ending market values for best available estimate.

Forecast uses the econometric model to generate changes to future cap rates.

<sup>1</sup> In inflated dollars for the fiscal year beginning 1 January 2002.

Source: Torto Wheaton Research.

So far, the methodology has given us a stream of NOIs and a stream of Cash Flows as measurements for the income streams of a building, either prototypical to describe the market or more asset specific where more information is available. At this point, these income streams can be used to determine value. There are two ways this can be accomplished. Determine a starting value from a discount rate or determine a return from a starting value. Both methods are discussed to contrast the goal of the usual appraisal with the goals of the TWR methodology.

In the usual appraisal, the goal is often to arrive upon a normative value for the asset in question. In this case, the DCF valuation is trying to determine the price that should be paid in accordance with the return expectations (or discount rate) and views of income growth of the buyer. Given a discount rate and income stream (and usually a selling price that is assumed at the end of the holding period), the appraiser determines the appropriate value to pay for the asset.

However, as there are usually multiple bidders for an asset, there are also multiple appraisals. As a result, if there are five bidders, four of the appraisals are wrong about the price! Given that the TWR methodology is shorthand for more robust programs such as ARGUS, it is unlikely that the TWR system would be the one that could come out with the right value. This is not to say that the TWR rent and vacancy forecasts cannot be brought into the ARGUS system to improve the valuations there, but this done better by porting TWR information to ARGUS than the other way around. The positive, as apposed to normative, price is determined by the bidder that has the most aggressive combination of assumptions on rents, vacancies, and discount rate, given their additional information on revenues and costs.

The TWR approach is to compare investments by forecasting the results of these positive values. For our prototypical building, the starting positive value is determined by using the capitalisation rate for each market and property type. Where available, the NCREIF data is used as it usually has the most observations and by virtue that the database is filled with stabilised properties that correspond most closely to our prototypical example. These cap rates represent the culmination of assumptions and information that the individual appraisers have used to develop a value. They represent a market average of the assumptions that have gone into the appraisers' DCF analyses. By using the market cap rates, we are using our best estimates of what the market believes to be future income and the appropriate discount rate for assets in the area and property type. This will always differ from what TWR believes to be appropriate.

The market cap rate is used on the prototypical property to determine a starting value. Going forward, the differences between the market beliefs about future income, which are not observed but summarised in the cap rate, and the TWR forecast of future income and cash flow will lead to differences in IRR.

But first, the TWR methodology must determine a selling price for the asset. Again, this assumption is likely to differ from the winning appraisal in a market bidding contest. The TWR methodology does this through an econometric forecast of cap rates. The econometrics behind this forecast are summarised in "The Determinants of Appraisal Based Capitalisation Rates", which is listed in the Bibliography. The end result is that one of the biggest influences on market cap rates over time is the performance of the fundamentals, particularly rent. This can be translated as a capital flow argument. Capital flows into the real estate sector or market when it has recently done well, driving down cap rates. When rents are weak, however, cap rates tend to increase. All else not being equal, of course, other factors can play a role, as has happened recently when interest rate changes were large enough to have a countering impact on cap rates despite weak fundamentals. By and large though, the cycle for cap rates is the inverse of the cycle for rents.

This is important because it draws another contrast with what is common in appraisals. Namely, that exit capitalisation rates are not necessarily 50 basis points higher than entry rates. A common conservative assumption in appraisals is that the building will depreciate from the standpoint of the ratio of its value to income. The econometric analysis suggests, however, that the cap rate is more likely to be determined by whether the asset is sold into a hot market or cool market for real estate.

The cap rate forecast combined with the other information could filter into a normative value that differs from other appraisals. The information provided by this difference would suggest that the buyer overpaid or underpaid and by how much. Given that this difference may be driven by small details of the lease that are not analysed in TWR's shortcut methodology, it is our feeling that this is not the most appropriate way to present the information. Instead, taking the starting cap rate as a given and calculating an IRR over the forecast provides a number that will more universally apply to buildings. That is, given a starting value, income stream, and closing value, what is the discount rate that matches the latter to the former? The discount rate is equivalent to TWR's expected IRR.

**DCF - internal rate of return**

Schedule of prospective cash flow<sup>1</sup>

For the years ending	Year 1 Mar 2002	Year 2 Mar 2003	Year 3 Mar 2004	Year 4 Mar 2005	Year 5 Mar 2006	Year 6 Mar 2007
Potential gross revenue						
Base rental revenue	\$2,262,200	\$2,257,400	\$2,246,000	\$2,252,200	\$2,295,200	\$2,373,200
Absorption and turnover vacancy		-426,600	-469,734	-430,100	-462,550	-487,850
Effective gross revenue	2,151,380	2,191,686	2,263,117	2,308,021	2,305,666	2,369,693
Total operating expenses	870,000	870,000	891,750	914,043	936,894	960,317
Net operating income	1,281,380	1,321,686	1,371,367	1,393,978	1,368,772	1,409,376
Leasing and capital costs						
Tenant improvements						
Capital improvement reserves						
Total leasing and capital costs	230,000	230,000	235,750	241,644	247,685	253,877
Cash flow before debt service and taxes	\$1,051,380	\$1,091,686	\$1,135,617	\$1,152,334	\$1,121,087	\$1,155,499
Cap rate	8.9	10.1	10.4	10.0	9.8	9.7
Value	\$14,470,407	\$13,084,510	\$13,243,632	\$13,899,439	\$13,999,372	\$14,514,676
Yield	7.3%	8.3%	8.6%	8.3%	8.0%	8.0%
Appreciation		-9.6%	1.2%	5.0%	0.7%	3.7%
Total return		-1.2%	9.8%	13.2%	8.7%	11.6%
IRR	7.86%					

IRR discounts future years' cash flow including profits from sale in the fifth year.  
Note that the result is similar but not equivalent to average total return.

<sup>1</sup> In inflated dollars for the fiscal year beginning 1 January 2002.

Source: Torto Wheaton Research.

The IRR itself is equivalent to an expected return for a stated holding period. As such it is the first component to comparing the results of assets across markets and property types. This number alone can provide a means of comparison between markets and property type or even between assets. The real payoff occurs in the speed of the analysis compared to the more in depth appraisal tools. The paper "Real Estate Risk: Equity Applications" (cited in the Bibliography) describes using this approach in a Monte Carlo format to come up with a range of IRRs, thus giving a forward-looking estimate of risk as well as return.

Also, the effect of changing any of the inputs and comparing the results to the prototypical property in the market can be quickly done through our consultants or through the Outlook Interactive software. This allows a greater understanding of the impact of different property operating characteristics or management strategies on the expected return over the holding period.

While the IRR is an important measure of expected return, an important feature of the TWR methodology is the ability to break down that return, even to the point of being able to trace the process all the way back to the rent growth and vacancy change that eventually lead to the IRR. In a simpler exercise, the IRR can be examined by year as an annual total return number, which itself can be disaggregated into income and appreciation return.

## DCF - valuation and return

Schedule of prospective cash flow<sup>1</sup>

For the years ending	Year 1 Mar 2002	Year 2 Mar 2003	Year 3 Mar 2004	Year 4 Mar 2005	Year 5 Mar 2006	Year 6 Mar 2007
Potential gross revenue						
Base rental revenue	\$2,262,200	\$2,257,400	\$2,246,000	\$2,252,200	\$2,295,200	\$2,373,200
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Total operating expenses	870,000	870,000	891,750	914,043	936,894	960,317
Net operating income	1,281,380	1,321,686	1,371,367	1,393,978	1,368,772	1,409,376
Leasing and capital costs	Value = NOI/cap rate					
Tenant improvements	Yield = cash flow/value					
Capital improvement reserves	Appreciation = change in value from last year					
Total leasing and capital costs	230,000	230,000	235,750	241,644	247,685	253,877
Cash flow before debt service and taxes	\$1,051,380	\$1,091,686	\$1,135,617	\$1,152,334	\$1,121,087	\$1,155,499
Cap rate	8.9	10.1	10.4	10.0	9.8	9.7
Value	\$14,470,407	\$13,084,510	\$13,243,632	\$13,899,439	\$13,999,372	\$14,514,676
Yield	7.3%	8.3%	8.6%	8.3%	8.0%	8.0%
Appreciation		-9.6%	1.2%	5.0%	0.7%	3.7%
Total return		-1.2%	9.8%	13.2%	8.7%	11.6%
IRR	7.86%					

<sup>1</sup> In inflated dollars for the fiscal year beginning 1 January 2002.

Source: Torto Wheaton Research.

Year-by-year, the total return is the combination of yield (the cash-on-cash return from holding the property) and appreciation (the change in the value of the asset from the previous period). This being real estate, even how this breakdown is done is a matter of some controversy. In the standard TWR methodology, we define yield as cash flow, as opposed to NOI, divided by value. Most importantly, this means that the capital reserve payments are subtracted out when calculating the income return. Appreciation is then simply the change in value without any complex adjustments.

While this is consistent with common definitions of yield and appreciation for the stock market, the same calculations are controversial in real estate because of the widespread use of the NCREIF index. Because the NCREIF index is based on operating data and valuations from the holdings of pension funds, capital improvements are recorded as they are made rather than spread out over time as payments. To avoid dips in yield whenever a large capital improvement is undertaken, the NCREIF approach is to subtract the capital improvements from the appreciation return, rather than the income return (yield). This keeps the income and appreciation returns from jumping around in quarters where there are capital improvements, but also has implications for users of the index who are trying to determine long term trends.

Specifically, if capital improvements average 2% per year, when looking over a number of years, income returns will be equivalent to the cap rate, but the appreciation returns will be lower by the 2% per year. So, if a view of sales prices would show an increase of 5% per year, NCREIF appreciation

would only count 3% per year as “appreciation not due to improvements”. In the long run, and given that we are dealing with future estimates rather than the messiness of a changing dataset, we think it is better to treat capital improvements as a cost that decreases income returns rather than the more complicated idea that appreciation returns that result from those costs should not count. In either case, total returns for the period will be the same, which suggests that TWR returns and IRRs are comparable to NCREIF forecasts, albeit on a different set of buildings.

## Comparisons to NCREIF data

The question remains, even if each of the inputs into the TWR methodology is accurate, will putting all these accurate pieces together give an accurate picture of investment variables as a whole? To address this question, we have used the TWR methodology not only to forecast prototypical properties going forward, but also used the methodology going backward in time. With this data, we can compare the results of the methodology to the NCREIF database, which averages the results of buildings owned by pension fund advisors.

The NCREIF numbers have been adjusted in these comparisons for the differences in accounting for capital improvements costs. In the end we get a comparison of an indexed NOI number where 2001 is equal to the same value in both series. Looking at individual markets and property types is instructive.

Starting at the national level for the office market, if any pattern emerges from the comparison, it is that the TW series tends to be slightly more volatile over the cycle from the NCREIF series. While it is gratifying that the two histories match up well, there are differences between the series. Our explanation boils down to two differences between the methodologies of the series. First, the rents, vacancies, and operating costs that form the basis of the TWR series represent an average of the entire market. If we were to formulate data that goes into the methodology that more closely matched the generally Class A buildings in the NCREIF database, we can get a closer match between the series. Operating leverage is particularly important in this comparison as our data suggests that lower class properties tend to operate “closer to the bone” and present more volatility from that perspective.

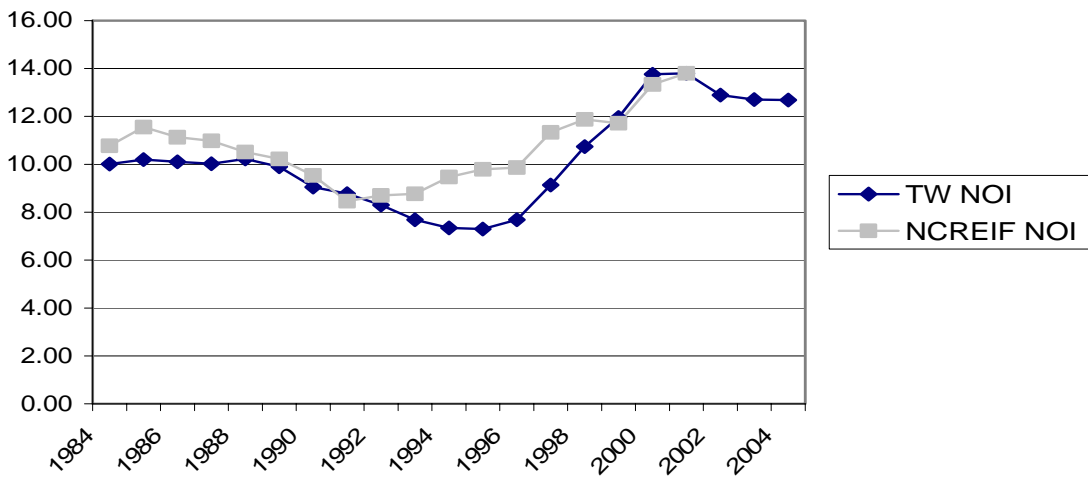
The second difference is that the TWR methodology sets rules such that the prototypical buildings have turnover spread perfectly evenly each year. NCREIF data, being managed properties, not only have uneven turnover, but also show some evidence that such management can be used to smooth out the cycle. For example, the national model might suggest that once the downturn became evident in 1992, NCREIF properties locked in their leases so that NOI would not fall further than it already had for the buildings. Meanwhile, in the “unmanaged” TWR index, leases continued to roll into a weaker and weaker market.

If this is the case, it suggests a limitation of the TWR index as a benchmark in the way that it is used. It should be made clear that the purpose of the TWR index is not to replace the NCREIF index, but to supplement it. This is particularly the case when looking at smaller markets and/or property types where there are few or no properties in the NCREIF database, but rent and vacancy data is plentiful. NCREIF data also lacks the ability to “get under the hood” as to why the index is moving the way it does, in comparison to the ability to trace back the TWR index as outlined in this paper.

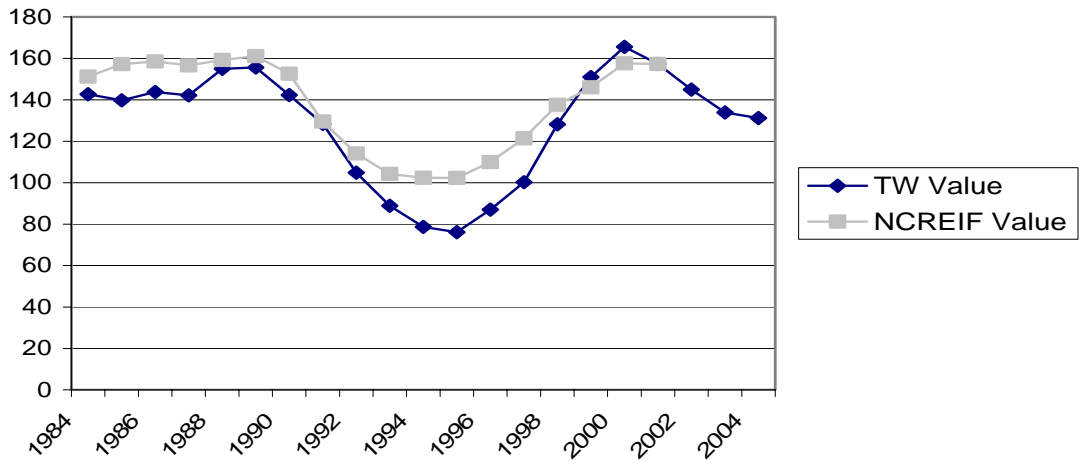
Looking at the data in some of these smaller markets, we can see the advantage of using the more plentiful rent and vacancy data. The Tampa industrial market, for example, has 10 warehouses tracked by the most recent NCREIF data, with even less in some historical periods. This is not a huge sample and an analyst may have some questions about using the NCREIF data as representative of the full Tampa industrial market. Compare this to the TWR data on vacancies done from a sample of the full market. In this case, the NCREIF data appears to be more volatile than the market, but likely because of the small sample size captured. That said, this is how the average property in their database has performed and it would be wrong for NCREIF to report anything different.

The most important aspect of this comparison is that it provides some understanding of the strengths and weaknesses of using the TWR investment data. First, it is incredibly important to keep in mind that the TWR market data represents what would happen to an unmanaged prototypical property based on the market rents and vacancies. While this information may or may not be a perfect predictor for an individual property in the market, it certainly gives some quick insights into what is likely to drive the investment performance of the properties in the market being examined. Furthermore, one can be assured that the index will be available in any market where rent and vacancy information is available from TWR. This proves very helpful in using the data for market selection purposes, for example.

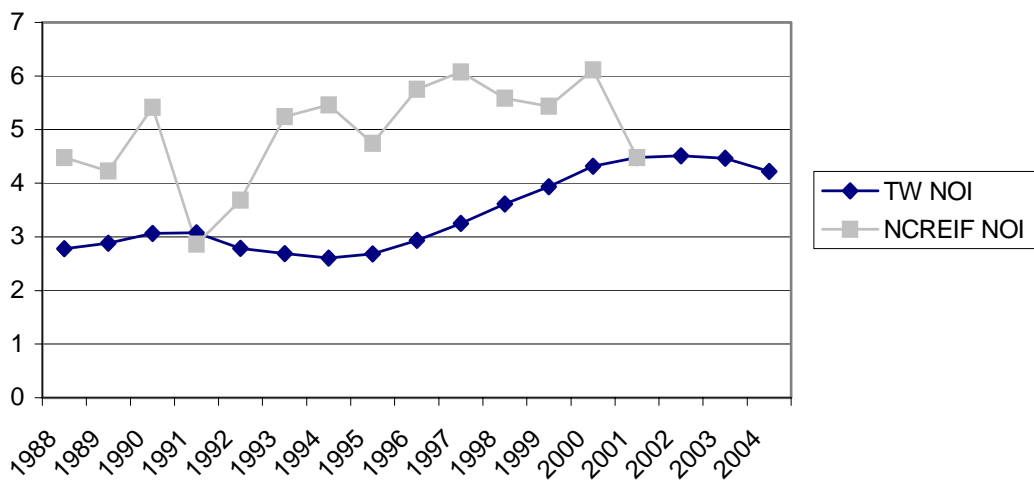
**National office NOI**



**National office value**



**Tampa industrial market**



## Conclusion: uses of the database

Given that investment data exists in the marketplace, most prominently from the NCREIF database, why did Torto Wheaton Research choose to create the Investment Database? The answer lies in the broader availability of data and the ability to detail the reasons why value has moved the way that it has. Because the Investment Database includes every market where TWR has rent and vacancy data, its ability to provide market representative NOI and value streams (including forecasts) provides a powerful tool for targeting market and property type combinations. The addition of an estimate of risk on these valuations provides a methodology for comparing markets with even more depth.

In addition, in the same way the database has been created using typical building properties, we have created databases that use non-typical assumptions to compare the impact of leasing and management decisions. Both comparing the effect of non-standard leasing decision to the baseline and comparing across markets using non-standard leasing decision have been useful for clients in thinking through strategies.

For example, if leases are not spread evenly but instead grouped in the latter years of a five-year holding period, the timing creates NOI movements that increase the importance of rent levels in the later years while taking out the effect of rents in the early years. If rents are falling in the first year but quickly cycle upwards, the strategy that avoids rollovers in this down year will outperform the market. However, if rents continue to fall through the fourth year, rents will be locked in at a lower rate, harming NOI. Running such a strategy through the TWR methodology allows investors to compare across markets the effects of strategies that differ from the baseline.

Investigating the effects of the combination of leasing strategy and market forecast has its ultimate culmination in the use of the Investment Database in the monitoring of existing portfolios. Knowing that an existing portfolio already has a leasing strategy in place that can be gleaned from timing of expirations of current leases, TWR's Investment methodology can combine this information with the rent and vacancy forecast to create asset-specific investment data. The asset-specific forecasts can then be used to compare to a benchmark, or to categorise assets in the portfolio for future management and disposition decisions. The information on the existing expectations for portfolio returns can also be used to shape additional acquisition decisions.

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## Introduction to Session VI

Marc Prud'Homme

Although hedonics is not always a perfect or desired methodology for producing a quality-adjusted price series, it is nevertheless the only practical solution under certain conditions. Products for which quality-adjustments should be applied to price series are numerous and are growing in number as the outputs of the economy becomes more complex. One only has to look at computers and automobiles, where rapid technological change has meant that the conventional way of measuring “pure” price change (matched-model or -sample) is not the best option and when applied results in biased numbers.

Housing and real estate are another good example of a product for which, although the dynamics may be different from, for example, computers, the underlying problem is the same: from one period to the next, an identical version is impossible to find and therefore matched sampling cannot be applied. Given the relative importance of housing in household budgets and its importance in most people's wealth portfolios, the use of hedonics, which is more resource intensive than some other approaches, can easily be justified. Compared to its alternatives, my own research shows that long-term price trends and short-term cyclical behaviour of prices are best measured using hedonics. Another benefit of using hedonics for measuring real estate prices is that you could actually attack two birds with one stone, meaning that you could use the same hedonic function and data with only the slightest of tweaking in order to do spatial (or geographical) price comparisons, which have an analytical value with regard to real estate.

I would like to mention a few words about what is going on at Statistics Canada with regard to real estate prices. We at Statistics Canada are very interested in this conference and encouraged by the papers being presented, and thank the organisers for inviting us. At present, if I have to describe our current situation with regard to real estate prices, I would have to say that we are simply house-poor. For residential houses, we have the New House Price Index (NHPI) produced by Statistics Canada, which is a monthly series that measures changes over time of the contractor's selling prices of new residential houses, where detailed specifications pertaining to each house remain the same between two consecutive periods.

The survey also collects contractors' estimates of the current value of the land from which a land price index is obtained. The resulting series is used for calculating some of the components of the consumer price index for shelter, depreciation to be exact, and for deflating the value of the national housing stock in the national accounts.

My own hedonic studies, or I should say my own exploratory hedonic studies, using resale house prices drawn from Multiple Listing Services (MLS) data, which is available in Canada, seem to confirm that trends in the NHPI appear to track pretty well what is going on in the resale housing market.

Our general situation with regard to real estate prices is likely to change in the near future, however, and we might be expanding our series on house price indexes or our real estate price indexes for a number of reasons. The first reason being our reaction to the comments by the Governor of the Bank of Canada delivered at the Conference of European Statisticians about the need for better real estate price indexes. The second reason is the federal government's need for better house price indicators, which are used in our provincial equalisation payment program. And the third reason is because right now at Statistics Canada there seems to be a growing need for a more comprehensive inter-area or inter-city price comparison program, for which we do not have accurate measures of house prices that could be used for this purpose at the moment. In fact, it is Bohdan Schultz, our now retired index number guru, who said that a spatial price index without good shelter prices is like a meal without its main course.

I have said enough about our situation at Statistics Canada. Turning the discussion on hedonics, I thought I would probably provide some background information on hedonics by presenting some of the milestones in the development of hedonics. This can be helpful given that a lot was said yesterday about hedonics but I suspect not many people in the room are necessarily familiar with the subject.

A person named Haas conducted one of the first studies using hedonics in 1922, and the interesting fact – or tidbit – about this price index was that it was actually a real estate price index for an area around Minnesota.

Andrew Court in 1939, in one of the most cited works using hedonics, produced a hedonic price index for automobiles. It is in this study that the term “hedonics” applied in the context of a quality-adjusted price index using regression analysis was first coined.

Bailey, Muth, and Norris, in 1963, produced a regression method for real estate. In 1968, the US Bureau of Census started to produce a price index for single-family homes under construction, and it was certainly the first hedonic index produced within the context of a regular statistical program. It is still produced today. In 1991, the American Real Estate and Urban Economics Association devoted a whole number of their journal to real estate price indexes.

Hedonics has become quite popular. Yesterday on Google, if you typed in the search word “hedonic”, you would get 71,000 results. In 2000, according to Grimm and Landefeld, just about 17 percent of GDP final expenditures are deflated using hedonic price indexes. And today, we have two more papers to add to the growing collection of papers on hedonics.

# Housing stock in Brazil: estimation based on a hedonic price model

Luís Otávio Reiff<sup>1</sup> and Ana Luiza Barbosa<sup>2</sup>

## 1. Introduction

As an important aspect for the level of wealth, social welfare and economic growth, the housing stock, and more specifically, home ownership are significant structural mechanisms in the reduction of poverty and social inequalities.<sup>3</sup> Nevertheless, the difficulties in measuring the prices of real capital such as housing are very well known. These difficulties stem, in part, from the heterogeneity of these non-standard assets and the infrequency of observed transactions with individual properties. Therefore, accurate measurement of real estate prices is important for both practical and theoretical purposes. In particular, we believe that our empirical findings regarding this subject will make a valuable contribution to the housing policy debate in Brazil, where the housing sector must perform efficiently to provide affordable homes, especially to lower income people.

Statistics on the Brazilian economy show that in 1999 rent expenditures reached 14% of GDP and 17% of household consumption (National Accounts, IBGE (2000)). Ipea's estimates indicate that in this same year housing investment corresponded to 28% of total investment and 5% of gross domestic product (Morandi (2002)). According to the National Household Survey (*Pesquisa Nacional de Amostragem de Domicílios* - PNAD) conducted by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* - IBGE), 74% of households inhabited their own property in 1999. These figures show how meaningful housing investment is in the capital accumulation process of the Brazilian economy. Moreover, it suggests that housing is the main component of wealth for most Brazilian households.

This study is part of a broader project called "Estimates of the Stock of Capital and Wealth of Brazil (1970-99) and applications in the analysis of public and regional policies". The main objective of the latter is to estimate the value of the capital stock and wealth in Brazil according to: (i) categories (residential, non-residential, machinery and equipment, domestic and imported); (ii) productive sectors (industry, agriculture and infrastructure); (iii) property (government, government-owned enterprises and private companies and families); and (iv) location (states and municipalities).

The purpose of this study is to estimate the housing stock in Brazil from 1970 to 1999. Estimations are based on the value of the rent payments of rented residences and the imputed rents of owned properties. Based on the monthly rent paid and the physical and locational characteristics of the property, a hedonic function is estimated to serve as a base to impute the rent for all residences. The conversion of the rent into the price of the property is done indirectly using an average discount rate of 0.75% per month (9.38% per year), found in empirical works on the subject. The source of data for the census years (1970, 1980, and 1991) was the Demographic Census, and for other years the National Household Survey (PNADs).

This study is organised as follows: in Sections 2 and 3 we present the hedonic price model and the model to evaluate the housing capital stock, respectively. Section 4 describes the data used for the estimation and Section 5 presents the estimation. The results are discussed in Sections 6 and we sum up with concluding remarks in Section 7.

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<sup>3</sup> See Wolff (2000), Spilerman (2000), Neri et al (1999), among others. Other relevant aspects for the analysis are: taxation on capital gains or taxation on imputed rents of owned residences (Poterba (1992), Hendershott and White (2000)); the construction of price indices (Zabel (1999)); and the demographic determinants of housing prices (Green and Hendershott (1993)).

## 2. Hedonic price model

Hedonic price models are used to identify factors or influences on the price of goods based on the idea that price is based on both intrinsic characteristics and external factors. These models are most commonly applied to housing markets in which the price of housing is based on the physical characteristics of the house (size, appearance, features) and the surrounding neighbourhood (accessibility to schools and shopping, quality of other houses, availability of public services). Estimating hedonic prices makes it possible to identify the extent to which specific factors affect the housing price.

In our model, we assume that the value of the monthly rent ( $R$ ) of a property has a stable relation with its price ( $P$ ),  $R = \alpha P$ , where  $\alpha$  is the opportunity cost of renting housing.<sup>4</sup> Therefore, hedonic pricing relates the housing price to its attributes as follows:

$$R = X\beta + Z\delta + \varepsilon, \quad (1)$$

where  $R$  is a vector of the rents of the good (housing, in our case); the explanatory variables correspond to the physical attributes ( $X$ ) of the housing unit and the location attributes ( $Z$ ), which is related to amenities, public and service infrastructure, construction quality, among others; the coefficients  $\beta$  and  $\delta$  correspond to the implicit price of housing attributes, and  $\varepsilon$  is the stochastic residual.

The vector of physical attributes aggregates 19 variables, where 17 are dichotomic variables and the other two are polythomic variables. The vector of location attributes consists of three variables, where one is a continuous variable and the remainders (two) are dichotomic variables.

Regarding location variables, one method of modelling it is to change each location's intercept. In other words, when we include dummy variables, we handle all specifications of each location  $i$  related to a reference community. The other alternative to attain the location effect in the model is to apply a proxy variable. As Zabel (1999), in our model we also use a proxy variable, the median income of the location, along with two other location dummies.

We assume that rents ( $R$ ) have a distribution close to log-normal. The functional form that best fits this hypothesis is the log-linear form. The original equation which relates the rent to the other variables is:

$$R = \exp(X\beta + Z\delta + \varepsilon). \quad (2)$$

## 3. Method of hedonic income

In this section we briefly discuss four classical methods of measuring the capital stock. They are: (i) physical inventory stock; (ii) perpetual inventory; (iii) accounting value; and (iv) present value of hedonic prices. There are two other methods found in Brazilian literature: (v) data from income tax returns; and (vi) to use credit balance of the *Caixa Econômica Federal* (the federal savings and loan bank) as a proxy for the housing capital stock (Rebelo (1998)).

These methods are presented in the table below.

In this work we use an adaptation of Method IV - Present value of prices. The reason is the impossibility of using all the others. In Brazil, there is no information on residential housing prices or the flow of investments in residences. This makes it impossible to use Methods I and II. Method III also is not suitable because we do not have a financial census of households. There is only one for companies, which was conducted in 1985, and was subsequently substituted by sampling surveys. The information required by Method V is confidential and difficult to obtain. Method VI has a selection bias because only properties financed by the *Caixa Econômica Federal* (federal savings and loan) are covered, and these data are subject to great fluctuations that are more a reflection of macroeconomic financial conditions than real ones.

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<sup>4</sup> We discuss more about this relation between rent and price of housing in the next section.

Table 1

Methods	Description
i. Physical inventory stock	It is a direct account of each capital unit through its average value. Example: estimation of the automobile stock in the United States;
ii. Perpetual inventory	The capital value is estimated through the accumulation of the investment flows over time. The net capital stock and depreciation rate are indirectly calculated. This is the method that has been most commonly used in the literature for its simplicity and adequacy to the available data;
iii. Accounting value	It uses the carrying value of asset on firms' balance sheets, collected by economic censuses;
iv. Present value of prices	It consists in discounting the estimated future income flows (wages and rents, respectively) to present values;
v. Data from income tax returns	Property statements are in income tax returns;
vi. Credit from <i>Caixa Econômica Federal</i> (the federal savings and loan bank)	Data from the credit balances of the <i>Caixa Econômica Federal</i> (the federal savings and loan bank) could be used as a proxy for the housing capital stock (Rebelo (1998)).

The method we use in this study is the present value of hedonic prices. We call here the “method of hedonic income”. It differs from the “classical” present value of prices method in two ways. First, the data of rents used are not observed, but imputed rent for both rented and non-rented residences (owned, granted, others) through the hedonic price method. Second, we assume a perpetual capitalisation. Therefore, if we assume that residential property is a perpetual asset, its price  $P$  can be obtained by dividing the rent  $R$  by a parameter ( $\alpha$ ), which is the opportunity cost of renting a property:

$$P = R/\alpha. \quad (3)$$

Another way to shed light on the relationship between housing price and rent is to assume housing as a financial asset. In this case, “the families arbitrate between the gains in the rent market and those in the financial assets markets” (Rebelo (1998, p 25)). Parameter  $\alpha$  is a function of the market interest rate ( $r$ ) and the expected appreciation of the property ( $a$ ),  $\alpha = f(a, r)$ . At equilibrium,  $R = rP - aP$ , which implies that  $\alpha = r - a$ .

The imputation is obtained as follows: the regression coefficients  $\beta$  and  $\delta$  of equation (2) are estimated for 1999 and are applied to the values of  $X$  and  $Z$  obtained in each year of the period under analysis. The estimation is made in terms of September 1999 prices and is based on fixed weights.

An alternative process to the rent imputation is to construct a housing capital index based on annual weights. The advantage of this process is that it is able to capture changes in the relative prices of the attributes and the possible changes in variable definitions. The drawback is that it also captures changes in rent relative to prices and the other prices of the economy, including real estate prices.

In particular, the 1980s and early 1990s were a period of severe macroeconomic instability in Brazil. The economy had to cope with chronic and accelerating inflation. As rents have a large rigidity in relation to the general level of prices, the housing capital index would not reflect the physical behaviour of the housing stock, but only the changes in the relative prices caused by macroeconomic imbalances. The solution in this case could be to impute trend values to the coefficients. However, using a tendency can be as arbitrary as the choice of a particular year (1999, in our case) as a fixed base for the prices of the attributes. For example, during the high inflation period, particularly from 1986 to 1994, when the Real Plan currency reform finally stabilised the economy, rent increases generally lagged behind the inflation rate, since readjustments were legally limited to every six months. Then, in the first year after the Real Plan, there was an over-correction until market forces came more fully into play and rents stabilised.

In terms of national accounts, using a fixed base means, for instance, that the difference of the value added of building an apartment and that of building a house remains constant over the years. Or, it means that the value added of building a house with piped water, sewage, electricity and masonry walls (generally the most desirable construction in Brazil), among other attributes, is the same as the

value added of building a house without these attributes. As we have no information available from the building industry, using a fixed base for the prices of attributes seems to be a reasonable assumption.

The correct calculus of each attribute's price depends on the objective of estimating the housing capital stock. In this study we use the fixed base as reference. In order to compare the housing index GDP in absolute terms, we assume that the parameter  $\alpha$  is constant with the time and equals 0.75%.<sup>5</sup>

## 4. Data

The data sources for this study are the demographic censuses of the IBGE for 1970, 1980 and 1991 and all National Household Surveys (PNADs) conducted from 1981 to 1999. PNAD is a survey that interviews from 65,000 to 115,000 households yearly. The ratio between the sample and universe is close to 1:400. The interviews occur in the last quarter of each year, with September the reference month. The demographic censuses data consist of a sample of 25% of the housing in 1970 and 1980 and 12.5% from the 1991 census. The reference month of the censuses is August. We used 12,000 observations (number of rented residences) to estimate the hedonic model.

In this study we follow the definition of a housing property made by the demographic census, which classifies it as "permanent private houses". A house is considered permanent and private if at the moment of the data collection there are at most five households living in a residence, which provided specifically residential use for the households (FIBGE (1996, p 15)). Therefore, residential properties such as those classified as "collective houses"<sup>6</sup> and those classified as "improvised private houses"<sup>7</sup> are excluded in this study.

The variables used in the rent imputation are presented on Chart 1. The dependent variable is the declared value of the monthly rent payment stated in the PNADs and in the censuses.

The median incomes are obtained in the censuses. We expect that the larger the median income, the better the location quality (infrastructure, amenities, etc). Nevertheless, due to the high inflation faced by the Brazilian economy prior to mid-1994, we had to control the income variable in order to measure the location effect appropriately.<sup>8</sup>

The effect of changes in the inflation rate on real income is excluded from the calculation of property appreciation in the following manner: income for all years is calculated as a deviation from the 1999 average income, as we use the latter as a standard level. The adjusted median income in the year  $t$  (MEDIADJ( $T$ )) is described as:

$$\text{MEDIADJ}(T) = \text{MEDI} + \text{LOG}(\text{AVERAGE INCOME}_{1999} / \text{AVERAGE INCOME}_T).$$

Therefore, the average of each year is modified, but the original income variance is maintained. Any change in the variance is treated as if the quality of the location has actually changed so that the average of the variable MEDIADJ of each year  $t$  does not correspond to the average for 1999. The impact of a residence's redistribution that favours higher income locations increases the average income and vice versa. For instance, imagine that the only change in the stock of residences for a year is the destruction of an apartment building in a poor neighbourhood and the construction of a building with the same characteristics in a rich neighbourhood. This fact increases the quantum of residences because a residence in a rich neighbourhood is worth more than one in poor neighbourhood. Regarding national accounts, the construction value added of a residence in a wealthy neighbourhood is larger than the same in a poor neighbourhood. One explanation for this is

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<sup>5</sup> This value corresponds to the average of the monthly gross returns of 0.5% and 1% found in the literature. See Malpezzi (1991) and Halfeld (2002).

<sup>6</sup> Examples of collective dwellings are hotels, boarding houses, inns, nursing homes, orphanages, convents, penitentiaries, soldier's barracks, military posts, ships, workers' housing, etc.

<sup>7</sup> Improvised dwellings include those located in industrial and commercial establishments, vessels, truck trailers (but not house trailers/campers/motor homes, which are rare in Brazil), rail cars, tents, rudimentary shanties, lean-tos, etc.

<sup>8</sup> Considera et al (1997).

that the fit and finish of a residence in a rich neighbourhood, which is not an observable variable, demands more qualified labour with higher wages, implying larger profits.

<b>Chart 1</b>	
<b>Variables</b>	
RENT APT	Monthly rent payment 1 if apartment; 0 if house.
<b>Wall type</b>	
WALL_1	1 if type1 (masonry); 0 otherwise (reused wood, straw or other lower quality material).
WALL_2	1 if type 2 (standard cut lumber); 0 otherwise (reused wood, straw or other lower quality material).
WALL_3	1 type 3 (bare wattle and daub); 0 if otherwise (reused wood, straw or other lower quality material)
<b>Roof type</b>	
CEILING_1	1 if ceiling type 1 (reinforced concrete slab); 0 otherwise (standard cut timber, reused wood, thatch or other lower quality material).
CEILING_2	1 if ceiling type 2 (clay tiles); 0 otherwise (standard cut lumber, reused wood, thatch or other lower quality material).
CEILING_3	1 ceiling type 3 (zinc sheeting); 0 otherwise (standard cut lumber, reused wood, thatch or other lower quality material).
<b>Water supply</b>	
WATER_1	1 if water system of type 1 (public water system); 0 otherwise (tank truck, rainwater collection or other).
WATER_2	1 if water system of type 2 (well or spring); 0 otherwise (tank truck, rainwater collection or other).
<b>Sewage type</b>	
SEWA_1	1 if sewer system of type 1 (public sewer system); 0 otherwise (ditch, river, lake or sea, others).
SEWA_2	1 sewer system of type 2 (septic tank); 0 otherwise (ditch, river, lake or sea, others).
SEWA_3	1 if sewer system of type 3 (rudimentary septic pit); 0 otherwise (ditch, river, lake or sea, others).
<b>Garbage collection</b>	
GARB_1	1 if garbage collection of type 1 (if there is direct or indirect garbage collection); 0 otherwise (thrown in river, lake or sea).
GARB_2	1 if garbage of type 2 (burned or buried); 0 otherwise (if thrown in river, lake or sea).
GARB_3	1 if garbage of type 3 (if disposed of on vacant lot); 0 otherwise (if thrown at river, lake or sea).
ELET	Electricity 1 if electric lighting; 0 if pressurised bottled gas, oil, kerosene, others.

Chart 1 (cont)

**Variables**

**Garbage collection (cont)**

ROOMM	Number of rooms besides sleeping quarters (varies from 0 to 29).
ROOMSL	Number of rooms serving as sleeping quarters (varies from 1 to 15).
BATHROOM	1 if housing has indoor bathroom; 0 if no indoor bathroom.
MEDI	Median income of census sector.
MEDIADJ	Adjusted LMEDREN to measure deviation from the 1999 average.
H_MA	1 if housing is located in a metropolitan area. 0 otherwise.
H_AUTO	1 if housing is located in a non-metropolitan area. 0 otherwise

Table 2 presents the average of the variables shown in Chart 1.

Table 2

**Descriptive statistics: average**

Year	Sample	Expanded sample (thousand)	APT	WALL_1	WALL_2	WALL_3	CEILING_1	CEILING_2
1970	4,410,847	17.643	...	...	...	...	...	...
1980	6,302,660	25.211	0.12	0.77	0.18	0.04	0.17	0.69
1981	103,075	26.029	0.07	0.73	0.17	0.08	0.14	0.79
1982	111,359	27.401	0.08	0.75	0.16	0.07	0.14	0.79
1983	113,463	28.185	0.08	0.75	0.16	0.07	0.15	0.79
1984	115,748	29.164	0.08	0.77	0.15	0.06	0.16	0.79
1985	119,055	30.585	0.09	0.78	0.15	0.06	0.16	0.79
1986	65,236	31.100	0.09	0.78	0.14	0.06	0.18	0.76
1987	68,449	32.136	0.09	0.79	0.14	0.05	0.17	0.78
1988	68,773	33.167	0.10	0.80	0.13	0.05	0.17	0.78
1989	70,586	34.339	0.10	0.81	0.13	0.04	0.16	0.79
1990	72,941	34.111	0.10	0.82	0.13	0.04	0.17	0.78
1991	4,342,929	34.743	0.14	0.85	0.13	0.02	0.26	0.56
1992	78,058	35.903	0.09	0.82	0.12	0.04	0.16	0.80
1993	79,948	36.819	0.09	0.83	0.12	0.04	0.18	0.78
1995	85,043	38.474	0.09	0.84	0.11	0.04	0.18	0.79
1996	84,749	39.682	0.09	0.85	0.11	0.03	0.20	0.76
1997	89,696	40.645	0.09	0.86	0.10	0.03	0.19	0.78
1998	90,714	41.840	0.09	0.86	0.10	0.03	0.20	0.77
1999	93,793	42.851	0.09	0.87	0.10	0.03	0.19	0.78



Table 2 (cont)

## Descriptive statistics: average

Year	CEILING_3	WATER_1	WATER_2	SEWA_1	SEWA_2	SEWA_3	GARB_1	GARB_2
1970	...	0.26	0.11	0.08	0.12	0.19	...	...
1980	0.01	0.76	0.15	0.38	0.20	0.30	ND	ND
1981	0.02	0.60	0.25	0.30	0.14	0.34	0.49	0.15
1982	0.02	0.61	0.24	0.29	0.17	0.31	0.51	0.15
1983	0.02	0.65	0.22	0.30	0.16	0.31	0.54	0.14
1984	0.02	0.66	0.23	0.31	0.17	0.31	0.56	0.15
1985	0.02	0.68	0.22	0.34	0.16	0.30	0.58	0.15
1986	0.02	0.70	0.21	0.38	0.14	0.29	0.58	0.16
1987	0.02	0.70	0.20	0.34	0.19	0.27	0.60	0.16
1988	0.02	0.71	0.19	0.39	0.16	0.26	0.60	0.15
1989	0.02	0.73	0.19	0.40	0.15	0.28	0.63	0.14
1990	0.02	0.73	0.19	0.41	0.16	0.27	0.64	0.14
1991	0.01	0.88	0.07	0.44	0.10	0.24	0.76	0.07
1992	0.01	0.68	0.09	0.39	0.10	0.24	0.62	0.16
1993	0.01	0.70	0.09	0.39	0.11	0.23	0.65	0.15
1995	0.01	0.71	0.09	0.40	0.12	0.23	0.66	0.14
1996	0.01	0.74	0.09	0.40	0.12	0.21	0.66	0.13
1997	0.01	0.74	0.09	0.41	0.12	0.23	0.69	0.13
1998	0.01	0.75	0.09	0.42	0.11	0.22	0.70	0.12
1999	0.01	0.76	0.09	0.44	0.12	0.23	0.72	0.12
Year	GARB_3	ELET	ROOMM	BATH-ROOM	ROOMSL	MEDI	H_MA	H_AUTO
1970	...	0.36	1.18	...	0.92	6.73	...	...
1980	...	0.88	...	...	2.68	7.03	...	...
1981	0.29	0.75	3.17	0.80	2.05	6.30	0.33	0.18
1982	0.25	0.76	3.21	0.80	2.00	6.29	0.34	0.18
1983	0.24	0.78	3.26	0.82	2.01	6.29	0.34	0.18
1984	0.23	0.79	3.31	0.83	2.01	6.31	0.34	0.19
1985	0.18	0.81	3.34	0.84	2.00	6.29	0.35	0.18
1986	0.18	0.83	3.34	0.84	2.05	6.30	0.35	0.19
1987	0.16	0.84	3.37	0.85	2.03	6.26	0.35	0.19
1988	0.16	0.86	3.50	0.85	2.00	6.22	0.35	0.19
1989	0.18	0.87	3.48	0.86	1.99	6.20	0.35	0.19
1990	0.17	0.87	3.52	0.86	2.00	6.23	0.33	0.20
1991	0.10	0.97	2.15	0.86	1.72	6.30	0.33	ND
1992	0.15	0.89	3.48	0.86	1.98	6.31	0.32	0.21
1993	0.13	0.90	3.52	0.87	1.98	6.30	0.33	0.21
1995	0.12	0.92	3.62	0.89	1.98	6.27	0.33	0.21
1996	0.12	0.93	3.62	0.90	2.01	6.26	0.32	0.21
1997	0.10	0.93	3.65	0.90	1.98	6.26	0.32	0.21
1998	0.08	0.94	3.69	0.91	1.98	6.27	0.32	0.22
1999	0.07	0.95	3.70	0.92	1.97	6.28	0.32	0.22

## 5. Estimation

The residential real estate market is characterised by its desegregation in physical and location attributes. Pavlov (2000) shows that the coefficients of hedonic attributes of a residence vary substantially among Los Angeles neighbourhoods. The author used an econometric technique which allows smooth space variation of parameters.

Our estimation provides the coefficients to evaluate residences. We divide the real estate market for residences into two sectors: the rural market and the urban market. The definition of rural and urban area follows census and PNAD criteria. According to these sources, an urban area is defined as all areas, whether urbanised or not, of cities and towns, besides isolated urban areas. Other areas are considered as rural: rural agglomerations of urban extensions; isolated rural agglomerations, villages, and other rural zones.

Table 3 presents the estimated coefficients. In the urban area regression, 18 of the 23 coefficients are statistically significant different than zero at the 5% level, and of these, 16 are statistically significant at 1%. The five that are not significant are: intercept, wall\_2 (wood walls), wall\_3 (wattle and daub walls), ceiling\_2 (clay tile roofs) and ceiling\_3 (zinc sheeting roofs). This is an expected result in the sense that the attributes do not differ significantly from the attributes used for the comparison. In particular, regarding the wall case, the comparison is made from "walls of reused wood, straw and other lower quality material", which was the case for close to 1% of all residences in 1999. The roof case is very similar. The "standard cut lumber, reused wood, thatch or other lower quality material" classification corresponded to less than 2% of the total residences in 1999.

Table 3  
Estimated coefficients - 1999

Brazil: rural, urban and total

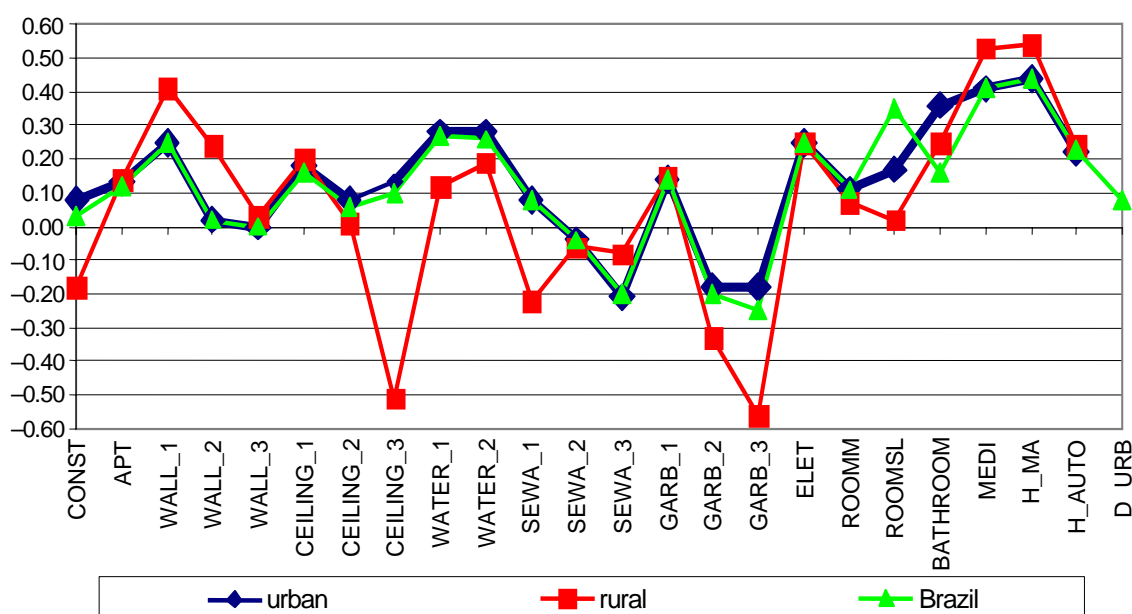
Observations Adjusted R2	Rural		Urban		Total		Difference
	346 0.57		12,390 0.67		12,736 0.68		
Variable	Estimated	P	Estimated	P	Estimated	P	URB - RUR
Intercept	-0.84	0.19	-0.04	0.79	-0.15	0.29	0.80
APT	0.05	0.85	0.12	0.00	0.12	0.00	0.07
WALL_1	0.49	0.09	0.24	0.00	0.24	0.00	-0.25
WALL_2	0.32	0.28	0.01	0.87	0.01	0.88	-0.31
WALL_3	0.05	0.89	-0.02	0.83	-0.02	0.83	-0.07
CEILING_1	0.23	0.44	0.19	0.00	0.17	0.01	-0.05
CEILING_2	0.01	0.97	0.10	0.13	0.07	0.24	0.09
CEILING_3	-0.45	0.50	0.14	0.08	0.10	0.17	0.59
WATER_1	0.11	0.27	0.28	0.00	0.27	0.00	0.17
WATER_2	0.19	0.10	0.28	0.00	0.26	0.00	0.08
SEWA_1	-0.26	0.08	0.08	0.00	0.08	0.00	0.34
SEWA_2	-0.11	0.44	-0.04	0.02	-0.04	0.02	0.07
SEWA_3	-0.14	0.29	-0.21	0.00	-0.20	0.00	-0.08
GARB_1	0.84	0.00	0.18	0.05	0.25	0.00	-0.66
GARB_2	0.35	0.22	-0.12	0.23	-0.08	0.40	-0.47
GARB_3	0.11	0.70	-0.12	0.23	-0.12	0.17	-0.24
ELET	0.28	0.12	0.24	0.00	0.24	0.00	-0.04
ROOMM	0.07	0.00	0.11	0.00	0.11	0.00	0.05
ROOMSL	0.01	0.91	0.17	0.00	0.16	0.00	0.16
BATHROOM	0.25	0.14	0.37	0.00	0.36	0.00	0.12
MEDI	0.52	0.00	0.42	0.00	0.42	0.00	-0.10
H_MA	0.52	0.00	0.43	0.00	0.44	0.00	-0.08
H_AUTO	0.22	0.03	0.22	0.00	0.23	0.00	0.00
Urban dummy					0.08	0.00	

Source: PNAD (1999).

As we expected, two coefficients for the urban area are significantly negative. The *sewa\_2* (sewage through septic tank) and *sewa\_3* (sewage through rudimentary septic pit) variables are comparable to the variables sewage through ditch, river, lake and sea. Therefore, many of the residences are located close to beaches or lakes, which explains the higher values.

On the other hand, the regression for the rural area presents only six coefficients that are significantly different from zero. The lack of precision in the estimates is due to the reduced number of observations. However, this fact does not cause distortions in the value of the residence imputations. Figure 1 displays the differences between the urban and rural estimates. We note that the differences are not very high in absolute terms. For seven coefficients, the difference reaches 0.05 and for eight coefficients it attains no more than 0.20.

Figure 1  
Estimated coefficients, Brazil: 1999



There are two additional problems regarding the parameter estimates. The first regards the lack of explanatory variables in the rent equation. The two main omitted variables are the state of conservation of the property (including the internal finish) and the existence of parking. These omissions may underestimate the residential values of large urban centres. The second problem is the sensitivity between stock and parameter estimates. It was beyond the scope of this work to conduct sensitivity tests of this nature.

## 6. Results

This section presents the residential capital and residential investment series estimated through the method of hedonic income (MHI).

Our methodology follows the estimation of the residential stock by the number of residential units. This stock aggregates its physical and location attributes and varies according to the variation of the units and the attributes. If there is an increase of more valued attributes, such as apartments, number of bedrooms, among others, the residential stock growth rate is higher than the residential units growth rate.

The problems mentioned in Section 4 indicate that the estimates should be taken with caution and could undergo future revisions.

Table 4 presents the results. The stock of residences (SR) is obtained from the rent series and it is transformed into monetary values based on the hypothesis that the median monthly rent/residential price relation is 0.75%. The stock of residences more than tripled in the last three decades, with annual growth of 4.2%. The stock of residences divided by the number of residential units corresponds to the average unitary value of the total of residences in the country (AUV). According to our estimates, the AUV increased from R\$ 17,532 to R\$ 23,755 (in R\$ of 1999), corresponding to a growth of 35.5% or 1.05% a year.

Table 4  
Housing capital value, number of residences, and GDP

Year	SR (R\$ billion)	Residences (million)	AUV R\$	GDP R\$ billion	SR/GDP
1970	309.33	17.643	17,532	275.11	1.12
1980 <sup>1</sup>	504.48	25.211	20,011	629.32	0.80
1981	520.86	26.029	20,011	634.18	0.82
1982	553.24	27.401	20,190	639.45	0.87
1983	584.88	28.185	20,751	620.71	0.94
1984	612.86	29.164	21,015	654.23	0.94
1985	652.29	30.585	21,327	705.59	0.92
1986	676.65	31.100	21,757	758.43	0.89
1987	696.44	32.136	21,672	785.21	0.89
1988	739.74	33.167	22,303	784.74	0.94
1989	761.27	34.339	22,169	809.53	0.94
1990	760.63	34.111	22,299	774.32	0.98
1991 <sup>1</sup>	774.74	34.743	22,319	782.31	0.99
1992	790.21	35.903	22,010	778.06	1.02
1993	819.29	36.819	22,252	816.37	1.00
1994 <sup>1</sup>	856.67	37.647	22,755	864.15	0.99
1995	894.05	38.474	23,238	900.65	0.99
1996	931.19	39.682	23,466	924.60	1.01
1997	951.97	40.645	23,422	954.85	1.00
1998	996.96	41.840	23,828	956.11	1.04
1999	1,017.94	42.851	23,755	963.87	1.06

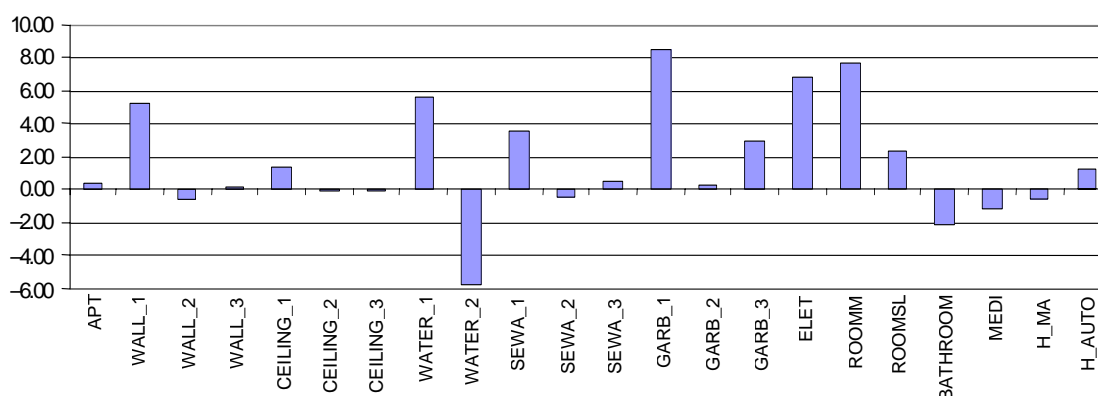
<sup>1</sup> Estimates obtained by interpolation.

Sources: IBGE; IPEA.

This variable measures the evolution of the quality of residences in Brazil. The residential quality growth is related to several factors. The three most important are: (i) the improvement of garbage collection; (ii) the addition of other rooms such as living rooms and kitchens in many Brazilian residences; and (iii) expanded electrification. These three characteristics contributed 22.9% out of the 35.5% total growth in quality, or 64.5% of that total (see Figure 2).

Figure 2

**Growth decomposition of the residence attribute**

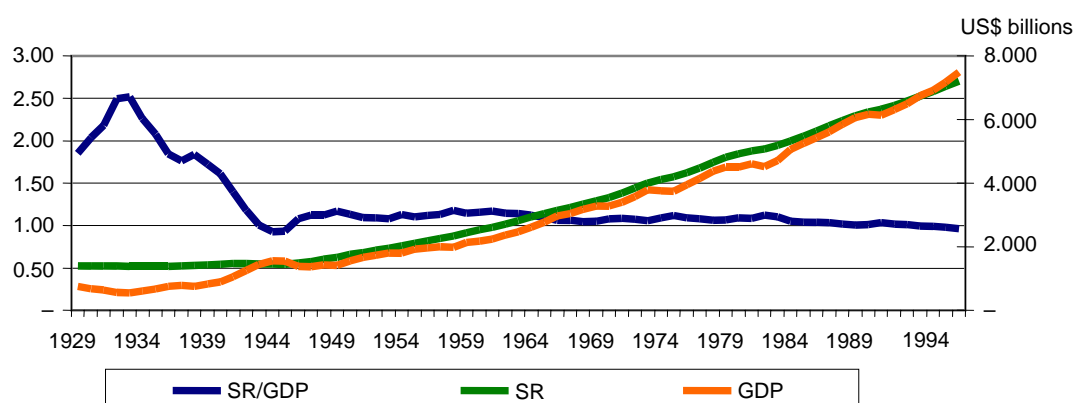


Regarding Brazil's gross domestic product (GDP), SR has shown a cyclical tendency over the last three decades. In the seventies, the SR/GDP ratio decreased from 1.12 to 0.85, which indicates that GDP increased 33% (1.12/0.85) above SR. In the two following decades, this ratio presented a constant growth trend. Therefore, we conclude that SR/GDP is strongly related to the cyclical movement of the product. See Table 4.

This cyclical movement is also observed in the North American economy. Figure 3 shows that the stock of residences behaves more smoothly than GDP, which indicates that the SR/GDP ratio changes according to GDP changes. It is worth noting the sudden fall of this ratio after the economic recovery from the economic crisis of the thirties.

Figure 3

**Net stock of residences/GDP, US: 1929-97 (US\$ 1992)**



The SR/GDP ratio stabilised from 1946, varying only between 0.96 and 1.18. Figure 4 depicts this series and presents the economic growth cycles, such as the economic growth of the 1950s and 1960s, the two oil crises of the 1970s, and the vigorous growth of the 1990s.

Figure 5 presents the SR/GDP ratio for the period of the "Brazilian economic miracle" in the seventies and the stagnant economic growth in the eighties and nineties. The figures are similar to the ones for the North American economy, except for the tendency. While the American SR/GDP ratio presents a decreasing trend, there is an upward tendency for the Brazilian economy. There are two alternative views of these differences. One point of view is that the stock of residences in Brazil will tend to increase over GDP growth in upcoming years, and the SR/GDP ratio will tend to return to the pattern of the seventies (around 1.12). Another view is that this increase can indicate the end of a cycle of low growth of the product, which may point to economic recovery in the next few years.

Figure 4

Net stock of residences/GDP, US: 1946-97 (US\$ 1992)

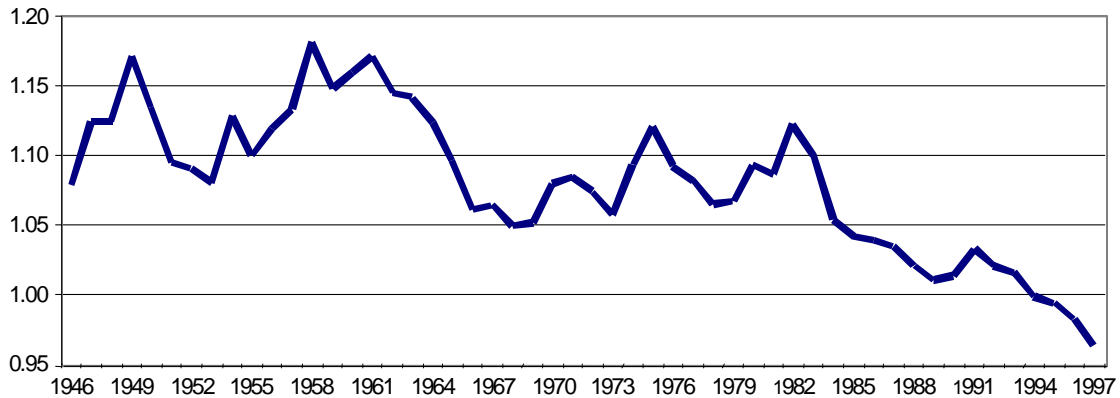
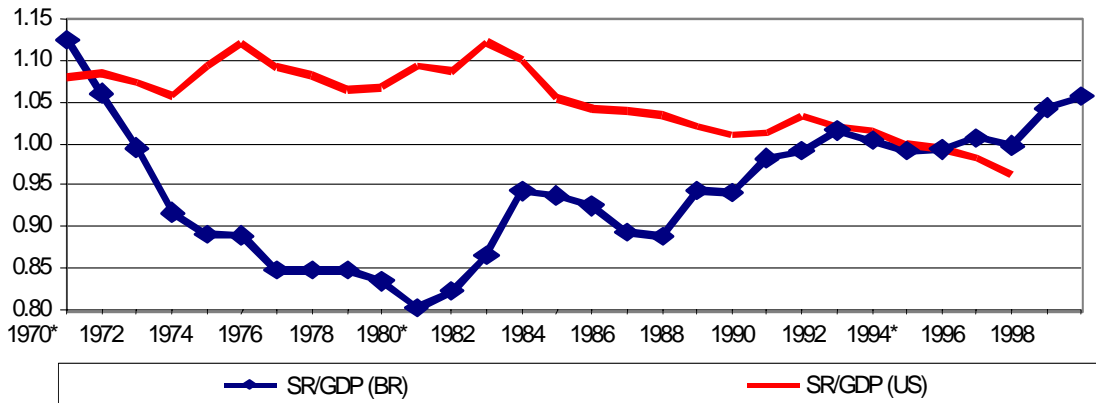


Figure 5

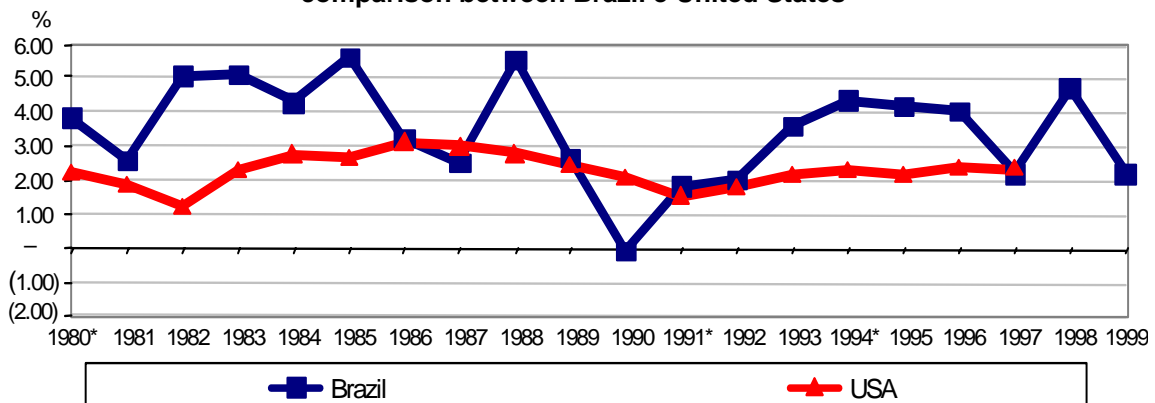
Stock of residential capital/GDP: Brazil and US: 1970-99



Finally, Figure 6 presents a comparison of the investment in residences in Brazil and in the United States from 1971 to 1999. Our estimates indicate that the residential investment in Brazil is more volatile than that in the United States of America. However, the tendency in both countries is the same. Brazilian housing investment attained around 4-5% of GDP in the seventies and decreased to 3% in the eighties and nineties. In the United States of America, the ratio of housing investment to GDP was 3% in the seventies and 2% in the nineties.

Figure 6

Net investment in residences/GDP: 1971-99 comparison between Brazil e United States



## 7. Concluding remarks

The work estimated the residential capital stock in Brazil for the period 1970-99. It is an exploratory work attempting to expand the range of statistics available on the residential property sector in Brazil. There are many applications of the data estimated here, such as use as an indicator of the level of real estate activity, an indicator of the level of welfare, disaggregation of investment in civil construction, imputation of rents in the national accounts, and compilation of consumer price indices.

The data available for Brazil do not allow us to use conventional methods to estimate the level of capital stock, namely the perpetual inventory method and the accounting value method. Hence, we used an innovative method called the "hedonic income method", by which we used the hedonic price model to impute the rent and then transform the rent (income) into a value, dividing by a discount rate, which is known as the "income method".

The results indicate that the magnitude of the residential capital (KR) is near the magnitude of the GDP. They also indicate that the residential capital series has lower variance than the GDP series, so that the fluctuation in the KR/GDP ratio is governed by the economic cycle. These results also are observed for the US economy, which we used as a benchmark in our analysis.

A secondary derivation of the residential capital series is the net residential investment series, which is not made available in the national accounts. Once again, using data from the United States as a benchmark, our estimates cannot be disregarded.

We can suggest three questions and extensions that can lead to future revisions of the residential capital series. The first refers to the starting data of the series data, 1970. The set of variables that describe residences is smaller than that from 1981 onward - there are nine variables available for 1970 against 22 for the remaining years. Besides this, one must consider that the source of data for 1970 is the Demographic Census, while for the period after 1981 the source is the PNAD, with the values for 1980 and 1991 estimated only using the number of residences obtained in the census. At first glance, this problem would lead us to conclude that the series is more consistent from 1981 on. But the fact that the data from 1970 capture the expanding cycle of the Brazilian economy in the 1970s is indicative that the estimate for that year is not totally absurd.

A possible extension of the work would be to transform the fixed-base series into a moving-base series. This would avoid the arbitrariness of choosing 1999 as the base year, besides capturing the price variables relative to the attributes of the properties occurring over the years.

A third question/extension, related with the second, is the estimation of the parameters. One could undertake some analysis of the consistency of the residential capital series by modifying or expanding the areas of the estimations of the parameters. For example, instead of estimating them by rural and urban area, they might be estimated for metropolitan and non-metropolitan region, or other divisions along these lines.

Finally, greater coverage of rural areas is needed.

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# Hedonic housing price indexes: the French experience

Anne Laferrère

## Summary

The whole of France is now covered by quarterly hedonic housing price indexes. They are the fruit of a unique collaboration between the notaries, who collect the data and do the computation, and INSEE, the French statistical agency, that provides the methodology and guarantees its proper use. The method relies on the econometric estimation of the value of fixed baskets of apartments or houses in some 300 geographic zones. The quarterly estimate is based on all sales recorded in a given period. Each zone has its own hedonic model of price. This allows to create indexes at various geographic levels. The regular publication of hedonic housing price indexes at a country level is rare, because it is costly. The French endeavour manages to be relatively cheap to the taxpayer because of a unique methodology and complementary interests between the involved parties.

## Introduction

It is common knowledge that housing is for most households the main part of their wealth, and for all one of the main items of consumption. Many governments still regulate rents, grant rental allowances, allow tax deduction for mortgage payment, or subsidise the construction of public housing. Some enact laws making housing an “entitlement” for the poor. Most tax capital gains on houses, usually exempting a first home, many tax houses sales, regulate land use by zoning. They also decide on the spatial distribution of public goods such as schools, roads or public transportation, which have a direct effect on the price of land, hence of houses. Moreover all countries scrutinise inflation level. In view of this importance the absence of reliable data on the evolution of housing prices and the opacity of the housing market are often regretted.

The making of a price index requires reliable data, a strong methodology and a willingness for long term involvement. In France all housing sales have to take place in front of a notary who draws up the deed and is in charge of collecting stamp duty for the central government. In 1994 the notaries started to centralise those data. This had been done for the city of Paris since the 1980s and a housing price index was published under the name “Notaires-INSEE”, because INSEE (the National Institute of Statistics and Economic Studies), the French statistical agency had helped with the method. In 1997 the notaries naturally turned to INSEE when they wanted to start computing indexes for the rest of France. INSEE agreed to collaborate, providing that a reliable econometric method would be applied. In a context of reduction of public expenses, the collaboration seemed a way of providing a public service at the lowest cost to the taxpayer. The existence of a research centre within INSEE (CREST, Centre de Recherche en Economie et Statistique) proved very important in spurring the methodological reflexion.<sup>1</sup> The new indexes started to be published quarterly in the summer of 2000, and the whole of France was covered at the end of 2002. In 2003 the first revision of the econometric specifications has been successfully done, and more detailed and reactive indexes will be published from 2004.

The methodological problem of a housing price index is no different from that of any price index: how is pure price evolution to be separated from changes in the quality of houses? But it also raises specific questions. First, two houses are never exactly the same, because they have many characteristics, the unique combination of which translates in a particular housing service. These

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<sup>1</sup> Alain David (Perval), François Dubujet (INSEE), Christian Gouriéroux (CREST) and the author of this article, then head of INSEE Housing division, made up the team. Claude Taffin and Jacques Friggit also provided help.

“qualities” include construction type, number of rooms, plumbing, heating and other facilities, but also a specific location (hence access to local public goods) and neighbours, not to mention family ties to a place. Second, a house is a durable good: in France more than a third of first homes are more than 50 years old. As a result 75% of housing purchases are second hand, and, what is more important for a price index, homes rarely change hands. Price observation is rare. Those two features lead to the first problem: how to know the price evolution of a house or of a given group of dwellings, when very few prices are observed at each period, and, if observed, are those of dwellings different from those in the group?

The second problem is two-fold. On the one hand, not only the observed transactions are few, but they are not a random sample of the housing stock. On the other hand the housing stock itself is not fixed: it keeps changing through destruction, deterioration, improvement, new construction, extension, etc. Should the housing stock be perfectly fixed, transactions would have to be a large enough random sample of the housing stock to be validly used to compute price evolution. It never is the case, thus the comparison of average sale prices is a mixture of true price evolution and change in the quality of the sample of transactions drawn from the stock. For all these reasons econometric techniques cannot be avoided.

Section 1 dwells on the methodology of the indexes and their computation. In Section 2 the data collection and database are described, together with the process of index publication. Section 3 concludes.

## 1. Why a hedonic method and which?

As mentioned, dwellings have various idiosyncratic characteristics, including location, size, number of rooms, occupancy, age .... This heterogeneity translates into different sub-markets, various turnover rates, and prices. It leads to difficulties in analysing prices which are rarely observable. Indeed between two sales the value of a house, in the economic sense, cannot be given. It has to be estimated from a model of price.

We make two basic assumptions. The first is common to all hedonic indexes. Each dwelling is defined by the combination of a fixed number of characteristics. That is to say that if a new quality would appear, say air-conditioning or being asbestos free, it would not be considered a quality but an increase in price.<sup>2</sup> The idea is that consumer's utility is not yet changed by those types of quality changes, which are regarded as price changes. The assumption also stems from the fact that only a limited number of attributes are recorded in the data. The second assumption is less common: the relationship between the price of a house and its characteristics is fixed, in a given zone, during the index computation period. It greatly simplifies the quarterly computations as they imply no more econometrics.<sup>3</sup>

In a given zone, the price index is defined as the ratio of the estimated value of a reference stock of dwellings, a “basket of houses”, to its value at the base period of the index. For each quarter, the value of each dwelling in the reference basket is estimated from the prices of all observed sales, thanks to the econometric models that have been estimated on the sales of the “estimation period”.

The process has several steps, as follows:

1. define zones (strata), where price evolution is assumed to be homogeneous;
2. define a hedonic model of price, ie introduce correction coefficients for quality effects, for each zone;
3. estimate the correction coefficients from an estimation stock of dwellings in each zone;

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<sup>2</sup> The “quality” may be a defect. For instance noise is not one of the characteristics usually observed or taken into account in hedonic price models. This means that an increase in neighbourhood noise level is implicitly interpreted as a price decline, if it is capitalised in prices.

<sup>3</sup> The validity of this assumption has been checked. See Appendix A1 for details.

4. compute the value of a reference stock at the base date for each zone;
5. compute the value of this reference stock, from data on all current period sales, by zone;
6. compute the price index as the evolution of the value of the reference stock between base and current date;
7. publish indexes and sub-indexes by aggregation of local zone indexes.

The first four steps are done once and for all (and only revised every five years), the three last ones are repeated every quarter.

## 1.1 The hedonic method

Among all hedonic housing price indexes that we are aware of, the French index has the unique features of combining a large number of geographic zones and the quarterly estimation of so-called “reference stocks” of dwellings in each zone. This section describes those features in some details.

### *Defining zones*

Dwellings (houses and apartments are separated all along) are assumed to be stratified into groups where prices are homogeneous and price trends are roughly parallel. Ideally the elementary geographic zones could be very small sub-markets. Practically they were limited to a few hundreds to ensure a sufficient number of sales in each (over 400 per year). Typically, for large enough cities, above 10,000 inhabitants, a zone is a city centre or a city suburb; it is a group of rural areas or smaller towns in less densely populated regions; it is close to an arrondissement in Paris.<sup>4</sup>

### *Reference stock*

The main idea of the hedonic method is to abstract from the variations of the structure of the market. We achieve this by estimating the value of a reference stock of dwellings at each date. Thus the index follows the price of the same dwellings. A reference stock is defined in each of the 315 elementary zones. It is made of all sales of a reference period of three to five years in that zone, excluding sales in the extreme quantiles of prices per square metre. The reference period is for instance 1994-96 for apartments in the Province;<sup>5</sup> the other reference periods are given in the last column of Table 1.<sup>6</sup> The reference stock in each zone is on average made of some 2,000 dwellings, and the reference stock for France is more than 630,000 dwellings (Table 1, col 4).

### *Hedonic models of price*

To estimate the value of the reference stock econometric models are used, relating prices (the log of the price per square metre) to the characteristics of the dwellings. The characteristics  $Z_i$  include location (a neighbourhood within a zone), and quality of the dwelling itself (see Section 3.1.2 for details). Each model is estimated from a stock of dwellings called estimation stock. It includes all dwelling sales of the reference period, except those for which the number of rooms is not known, or the estimated price was found ex post to differ from the observed price by more than two standard errors. Thus is it close but not equal to the reference stock (see Table 1, col 5).<sup>7</sup> The econometric estimations are made separately for each elementary geographical zone s.

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<sup>4</sup> See Appendix A2 for more details.

<sup>5</sup> By Province we mean all regions except Ile-de-France (Paris and the seven *départements* around it).

<sup>6</sup> The different reference periods stem from the different time implementation of the method, not from any technical reason.

<sup>7</sup> The first version (which is presented here) of the index was rather conservative and the reference stock excluded the bottom and top 10% of dwellings; hence the estimation stock could be larger than the reference stock. After the 2003 revision, only bottom and top 5% of dwellings are eliminated.

The model is the following:

$$\text{Log } p_i = \text{Log } p_0 + \sum_{a=1}^3 \alpha_a Y_{a,i} + \sum_{t=1}^4 \theta_t T_{t,i} + \sum_{k=1}^K \beta_k X_{k,i} + \varepsilon_i \quad (1)$$

where  $p_i$  is the price per  $\text{m}^2$  of dwelling  $i$ ,  $Y_{a,i}$  is a dummy for year of sale of dwelling  $i$ ,  $T_{t,i}$  a dummy for quarter of sale of dwelling  $i$  and  $X_{k,i}$  are the  $k$  characteristics of dwelling  $i$ .

Table 1  
Number of local zones, number of neighbourhoods, size of reference and estimation stocks of the Notaires-INSEE indexes

Index	Zones	Neighbourhoods	Reference stock	Estimation stock	Reference period
<b>Total Ile-de-France</b>	<b>84</b>	<b>333</b>	<b>247,673</b>	<b>284,222</b>	
Apartments					
Paris	18	80	60,152	70,341	1992-96
Petite Couronne	24	92	53,014	62,098	1992-96
Grande Couronne	18	100	55,191	68,874	1998-2001
Houses	24	61	79,316	82,909	1997-2001
<b>Total Province</b>	<b>231</b>	<b>576</b>	<b>390,388</b>	<b>399,124</b>	
Apartments					
UU > 10,000 inhab.	113	302	123,739	123,296	1994-96
centre	84	236	90,571	90,228	1994-96
suburb	29	66	33,168	33,068	1994-96
UU < 10,000, rural	7	35	13,526	24,704	1994-96
Houses	111	239	253,123	251,124	1995-97
<b>Total</b>	<b>308</b>	<b>874</b>	<b>638,061</b>	<b>683,346</b>	

Note: Petite Couronne: the first circle of outskirts of Paris (Haut-de-Seine, Seine-Saint-Denis, Val-de-Marne). Grande Couronne: the rest of Ile-de-France, further from Paris (Essonne, Seine et Marne, Yvelines, Val d'Oise). Province: all other *départements* of metropolitan France, except Corsica.

The variables  $X_{k,i}$  are continuous or dummy variables computed from the modalities of the variables  $Z_i$  and sometimes including interaction effects.<sup>8</sup> The coefficients of the model are prices defined relatively to reference characteristics, which together define a reference dwelling, the price of which is  $p_0$ .<sup>9</sup> The reference apartment has the following characteristics: three rooms, ground floor, rooms of average size, no service room, no parking, no terrace nor balcony, one bathroom, built between 1948 and 1980. The reference house has four rooms, two levels, one garage, one bathroom, a basement, no garden, its construction period is unknown.

<sup>8</sup> For instance the presence of an elevator is interacted with floor level. Note that, as there are as many models as zones, all variables are de facto interacted with the geographical zone.

<sup>9</sup> The reference dwelling is one of a precise quarter and year of sale. The value of a dwelling with the same characteristics, but sold at a different time would be computed from  $p_0$  by adding the corresponding quarter and year parameters  $\theta_t$  and  $\alpha_a$ .

### Current value of the reference dwelling

The same type of model could be used at the current period  $\tau$ , with the same reference dwelling of price  $p_{0,\tau}$ . The price per m<sup>2</sup> of dwelling  $j$  sold in period  $\tau$  is written as<sup>10</sup>

$$\text{Log}(p_{j,\tau}) = \text{Log}(p_{0,\tau}) + \sum_{K=1}^K \beta_K X_{K,j,\tau} + \varepsilon_{j,\tau}.$$

The period  $\tau$  is chosen according to the type of index. More precisely, the index for a quarter  $t$  is computed over all arm-length transactions of a period  $\tau$  ending with quarter  $t$ . Up to the end of 2003, the Parisian index was computed on a six-month basis, hence  $\tau = [t - 1; t]$ ; indexes for the Province were annual,  $\tau = [t - 3; t]$ . From 2004 on they are all pure quarterly indexes,  $\tau = t$ , which makes them more reactive and also allows to study seasonal price variations. However quarterly indexes at a more local level remain semestral or annual to ensure a sufficient number of transactions in the zone.

Let me now explain how the price of the reference dwelling is computed from data on current sales. Assume that the  $\beta_{k,\tau}$  coefficients are known, and call  $\tilde{p}_{j,\tau}$  the price that would fetch dwelling  $j$  if it had the characteristics of the reference dwelling, then:

$$\text{Log}(\tilde{p}_{j,\tau}) = \text{Log}(p_{j,\tau}) - \sum_{K=1}^K \beta_K X_{K,j,\tau}$$

It is the “reference dwelling equivalent price” of dwelling  $j$ ,  $\tau$ . The model can be rewritten:

$$\text{Log}(\tilde{p}_{j,\tau}) = \text{Log}(p_{0,\tau}) + \varepsilon_{j,\tau}$$

Hence, if the  $\beta_k$  coefficients are known, the logarithm of the price of the reference dwelling  $\text{Log}(p_{0,\tau})$  can be estimated as the means of all estimated prices:

$$\text{Log}(\hat{p}_{0,\tau}) = \frac{1}{J_\tau} \sum_{j=1}^{J_\tau} \text{Log}(\tilde{p}_{j,\tau}),$$

where  $J_\tau$  is the number of transactions of period  $\tau$ .

Using our second assumption (the price model is stable over time), allows to replace the  $\beta_k$  coefficients by the  $\hat{\beta}_k$  estimated over the reference period. As mentioned above this greatly simplifies the computation as there is no econometrics to be done:

$$\text{Log}(\tilde{p}_{j,\tau}) \approx \text{Log}(p_{0,\tau}) - \sum_{K=1}^K \hat{\beta}_K X_{K,j,\tau} = \text{Log} \left[ \frac{p_{0,\tau}}{\exp \left( \sum_{K=1}^K \hat{\beta}_K X_{K,j,\tau} \right)} \right]$$

Then the log of  $p_{0,\tau}$ , the price per m<sup>2</sup> of the reference dwelling in period  $\tau$ , is estimated by a geometric mean of the “reference dwelling equivalent prices” of the  $J_\tau$  dwellings sold in period  $\tau$ :

$$\text{Log} \hat{p}_{0,\tau} = \frac{1}{J_\tau} \sum_{j=1}^{J_\tau} \text{Log} \tilde{p}_{j,\tau} = \frac{1}{J_\tau} \text{Log} \left( \prod_{j=1}^{J_\tau} \tilde{p}_{j,\tau} \right)$$

or:

$$\hat{p}_{0,\tau} = \left( \prod_{j=1}^{J_\tau} \tilde{p}_{j,\tau} \right)^{\frac{1}{J_\tau}}.$$

<sup>10</sup> The evolution of the price of the reference dwelling is the core of the index construction. For this reason it must include seasonal and cycle effects. This is why the quarter and year parameters are not in the current period model, while they were introduced in the first model because the estimation was made over more than one quarter. The price for a dwelling of quarter  $(a, t)$  would be:  $\text{Log}(p_{0,a,t}) = \text{Log} p_0 + \alpha_a + \theta_t$ . See examples of hedonic models in Appendix A3.

### Current value of the reference stock

Knowing an estimated value of the reference dwelling, the estimated value of each dwelling of the reference stock can be computed, and, by aggregation, the value of the stock itself. Computations are made zone by zone. For this reason we re-introduce the index  $s$  of the zone. The value of dwelling  $i$  of the reference stock of zone  $s$  in the current period  $\tau$  is estimated from its characteristics  $X_{k,i,s}$ , which are time invariant, by definition of the reference stock. The approached value is:

$$\hat{p}^*_{i,s,\tau} = \exp\left(\text{Log}\hat{p}_{0,s,\tau} + \sum_{k=1}^K \hat{\beta}_{k,s} X_{k,i,s}\right) A_{i,s},$$

where  $A_{i,s}$  is the surface of dwelling  $i$ ,  $s$ .

The estimated current value of the  $N_s$  dwellings of the reference stock of zone  $s$  is obtained by a sum:

$$\hat{W}_{s,\tau} = \sum_{i=1}^{N_s} \hat{p}^*_{i,s,\tau}$$

In the same way, and once and for all, the value of the reference stock is estimated at period  $t = 0$ , the base period of the index. One notes:

$$\hat{W}_{s,0} = \sum_{i=1}^{N_s} \exp\left(\text{Log}\hat{p}_{0,s,0} + \sum_{k=1}^K \hat{\beta}_{k,s} X_{k,i,s}\right) A_{i,s}$$

the value of the transactions in zone  $s$  at date 0, as estimated by the model.

### Quarterly computation of the index

The elementary index of a zone  $s$  is by definition the evolution of the value of the reference stock of that zone  $s$ . It is:

$$I_{t/0}(s) = \frac{\hat{W}_{s,\tau}}{\hat{W}_{s,0}} = \frac{\sum_{i=1}^{N_s} \exp\left(\text{Log}\hat{p}_{0,s,\tau} + \sum_{k=1}^K \hat{\beta}_{k,s} X_{k,i,s}\right) A_{i,s}}{\sum_{i=1}^{N_s} \exp\left(\text{Log}\hat{p}_{0,s,0} + \sum_{k=1}^K \hat{\beta}_{k,s} X_{k,i,s}\right) A_{i,s}}$$

Note that the index of a zone  $s$  can be written:

$$I_{t/0}(s) = \exp\left(\text{Log}\hat{p}_{0,s,\tau} - \text{Log}\hat{p}_{0,s,0}\right)$$

Practically, the computation of the index at date  $t$  does not need the computation of the implicit value of each dwelling of the reference stock, the coefficients  $\text{Log}\hat{p}_{0,s,\tau}$  are obtained by:

$$\text{Log}\hat{p}_{0,s,\tau} = \frac{1}{J_t \sum_{i=1}^{N_s} \text{Log}(\hat{p}_{0,s,\tau}) - \sum_{k=1}^K \hat{\beta}_{k,s} \bar{X}_{k,s,\tau}}$$

where  $\bar{X}_{k,s,\tau}$  is the mean of the  $X_{k,j,\tau}$  variables for the  $J_t$  transactions of the current period in zone  $s$ .

### Aggregated indexes

Most elementary indexes by zone are not published. They are aggregated at higher geographical levels. For instance the index for the "Province" measures the evolution of the value of the whole reference stock of Province.

$$I_{t/0} = \frac{\hat{W}_\tau}{\hat{W}_0} = \frac{\sum_s \hat{W}_{s,\tau}}{\sum_s \hat{W}_{s,0}}$$

It can be interpreted as the mean of the elementary indexes of zones, weighted by the sales value in the zone in the reference stock.

$$I_{t/0} = \sum_s \left( \frac{\hat{W}_{s,0}}{\sum_s \hat{W}_{s,0}} \right) I_{t/0}(s).$$

Practically, the weights of some indexes are redressed by a parameter  $\delta_s$  for zones where the notary database is deemed to be non exhaustive.<sup>11</sup>

## 1.2 A numerical example for year 1999

This section briefly describes, on a concrete example, the steps of computation of the index of the fourth quarter of 1999 for a zone of the Province.

### **Step 1: extract data from the database**

The index of 1999 fourth quarter is computed from all sales of the last quarters, that is from the whole of year 1999.<sup>12</sup> Four hundred and seven sales were registered in the zone for that period. For one of them, neither the number of rooms, nor the surface are known, it is eliminated, and 406 sales remain. The price per m<sup>2</sup> range from 2,825 to 8,065 Francs.

### **Step 2: estimate the price of the reference dwelling**

The first of the 406 sales is a four-room apartment of 71,25 m<sup>2</sup>, with one bathroom and a car-park, without service room, on the third floor, without lift, in a building dating from 1963. The price was 374,000 Francs, or 5,249 F/m<sup>2</sup>. The computations have been done with decimal logarithms and  $\log_{10}(5249) = 3.720$ . Using the previously estimated model allows to know the price it would fetch if it had the characteristics of the reference dwelling.

$$\begin{aligned} \log(\tilde{p}_{j,\tau}) &= 3.720 \\ &\quad -0.0858 \text{ (parking)} \\ &\quad -0.0231 \text{ (third floor)} \\ &\quad +0.0184 \text{ (four rooms)} \\ &\quad -0.0191 \text{ (surface per room less than } 20\text{m}^2\text{)} \\ &= 3.6105. \end{aligned}$$

The “equivalent reference dwelling price”  $\tilde{p}_{j,\tau}$  for this first sale is obtained as  $10^{3.6105}$ , that is 4,078 F/m<sup>2</sup>.

The same operation is done for the 405 other sales. Sales for which the estimated equivalent reference price is deemed extreme (lower than one sixth (3,459 F/m<sup>2</sup>) or higher than five sixths (5,336 F/m<sup>2</sup>) of the price distribution) are excluded. Thus only 270 dwelling prices will be used in the index computation.

The estimated logarithm of the price of the reference dwelling, is the arithmetic mean of the logarithms of the 270 equivalent reference dwelling prices. It is 3.6334, which gives a price of 4,302 F/m<sup>2</sup>.

### **Step 3: compute the value of the reference stock at current prices**

Now the current value of each dwelling of the reference stock of the zone has to be estimated, from the same model. It can be interpreted as the price that the dwellings would fetch in 1999. Taking for example a one-room apartment of 28 m<sup>2</sup>, with one bath, on the ground floor of a 1980 building, without a car-park.

$$\begin{aligned} \text{Log}(\hat{p}_i^*) &= 3.6334 \\ &\quad +0.0571 \text{ (studio)} \\ &\quad +0.0329 \text{ (builtin 1980)} \\ &= 3.7476, \end{aligned}$$

or 5,592 F/m<sup>2</sup> for a total price of 156,588 Francs.

<sup>11</sup> Weights are estimated from stamp duty returns and correspond to the value of the stock in each zones.

<sup>12</sup> Remember that in 1999 the index was quarterly published but on an annual basis. From 2004 on it will be a pure quarterly index.

Adding all the estimated prices gives the current value of the reference stock of the zone, 139.214 million Francs.

#### **Step 4: compute the index in the zone**

The value of the reference stock at the base period was 127.902 million Francs. The index 1999 fourth quarter, base 100 in 1994 fourth quarter, is:

$$I_{1999Q4/0} = \frac{139.214}{127.902} \times 100 = 108.84.$$

This computation, done in April 2000, gives a provisional index for 1999 fourth quarter because all transactions for the last quarter of 1999 are not yet registered at that date. About 85% of the definitive total is present. A special weighting system accounts for the discrepancy. The computation is done again in July 2000 and yields a definitive index.<sup>13</sup>

## **2. Database and publication policy**

All real estate transactions in France have to be registered in front of a notary. There are 4,600 notary practices over the country. The role of a notary is to verify and certify the legal sale contract and deed, send the records to the Conservation des Hypothèques (Mortgage Register), and collect the stamp duty for the government. A notary is at the same time an *officier ministériel*, a public official, and a private entrepreneur.<sup>14</sup> Thanks to this feature of the French legislation, the data collected by the notaries are well suited to computing quarterly housing price indexes.<sup>15</sup> Compared to other well-known indexes such as Freddie Mac in the United States of America or Halifax in Great Britain, the data include purchases made without a mortgage.

### **2.1 Database**

A "Notaires-INSEE" index was created in 1983 for second-hand apartments in Paris.<sup>16</sup> In 1997, the Conseil Supérieur du Notariat (CSN) wanted to create a price index for dwellings outside the Paris region, in the Province. The separation of the Paris region and the Province, each with its own database, is a complication that is due to a history of high centralisation in France with the Paris region concentrating a large part of the wealth.<sup>17</sup> INSEE agreed to provide a methodology, because a public service of reliable housing price indexes was lacking in France. To ensure long-term involvement of both parties, formal agreements were signed between the CSN and INSEE in 1998 for indexes for apartments in the centre large urban units of the province, then in 1999 for houses, and apartments in the outskirts of cities and rural areas, and later between the CINP and INSEE. A renovated Parisian index was published in the spring of 2000, indexes for apartments of Petite Couronne were made available in 2002, and indexes for the Grande Couronne followed in 2003.

Each notary is asked to send for key-boarding an extract or a photocopy of the sale deed, plus some extra notes on the dwelling characteristics. This is done on a voluntary basis. In the near future the sale contracts should be normalised and computerised, thus the process could be automatic and use

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<sup>13</sup> If sales are registered later than July 2000, the index does take them into account.

<sup>14</sup> Part of his fees are regulated by the government, with a fixed part and one roughly proportional to the sale value.

<sup>15</sup> FNAIM (an association of real estate brokers) also collects prices from "commitments to sell", that is earlier in the sale process, and calculates price evolution, but it covers only 13% of transactions.

<sup>16</sup> It was called so because INSEE had helped by defining cells and providing weights from the Census.

<sup>17</sup> The oldest database is the one collected by the CINP (Chambre Interdépartementale des Notaires de Paris, de la Seine-Saint-Denis et du Val-de-Marne) from 1979 for Paris and Petite Couronne, from 1995 for the Grande Couronne. The database of the CSN is more recent: created in 1990, and really in operation in 1993, this base is managed by Perval, a company owned by the CSN, who is in charge of getting the data from the notaries of province. The making of the indexes brought the Parisian, and Province databases closer. For instance a sale of a Parisian dwelling made by a notary of province is now included in the Parisian database and vice-versa.



electronic mail. This is not now the case. The data on a particular sale are integrated in the database within three to four months. The index is restricted to arm-length transactions of second-hand dwellings.<sup>18</sup> To enter the computation a dwelling has to be free for occupation (not rented), only used for habitation (no professional use), and has to be acquired in full property, by a private individual or by a SCI (Société civile immobilière). Exceptional homes such as single rooms, attics, studios, castles, are excluded. The database encompasses all real estate transactions, including for instance parking lots, new buildings, or land. The housing database has some five million references in 2003 (25% are in the Ile-de-France database) and roughly half of them are apartments, half are houses. Some 510,000 housing sales have been registered in 2002.

### **2.1.1 Coverage rate**

The rate of coverage of the notary data compared to the total housing transactions is not perfectly known because there are no official statistics on housing transactions.<sup>19</sup> However test estimates of this coverage have shown it to be around 80-90% for Paris; for the outskirts of Paris it has increased from 60% in 1991 to 80% in 1999. It is around 64% for the rest of France and varies from one district to the other.<sup>20</sup> Overall the coverage has been estimated around 71% of the value of transactions in 2001. As already mentioned, to compensate for the spatial variation in coverage rates, the reference stock for the province and Grande Couronne has been re-weighted (see footnote 11).

Actually a 100% coverage rate is not necessary to compute an index, if the sales are a randomly selected and large enough sample. The way each notary chooses to send the data is not well known. But there is no reason to think that it generates a significant bias on the index at an aggregated level. Moreover the choice of a fixed basket of dwellings over a large enough period to compute the index minimises the adverse effect of potential selection bias.<sup>21</sup>

### **2.1.2 Characteristics of dwellings, treatment of non-responses**

The database is anonymous, to comply with the French law. The precise address of the dwelling is included but is not made public, and is not used in the index computation. Besides the date of the sale, the dwelling characteristics are the following: surface (in m<sup>2</sup>), location (census track), time of construction (eight categories: <1850, 1850-1913, 1914-47, 1948-69, 1970-80, 1981-91, 1992-2000, >2000), number of rooms (from one, to five and more), mean surface per room, number of bathrooms (zero, one, or two and more), number of garages or car parks (zero, one, or two and more) and for apartments, floor level and existence of a lift (ground floor, first, second, third, fourth or more no lift, fourth or more with lift),<sup>22</sup> existence of a service room (zero, one or more). For houses, the number of levels (one, two, three or more), the presence of a basement and the surface of the plot are also known. The rate of non-response varies among variables (Table 2). In case of non-response, either the sale does not enter the computation, or the characteristic is imputed (Table 3).

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<sup>18</sup> New dwellings are submitted to VAT, which is lower than stamp duty. The first sale of a new building if it takes place after five years is no more under the VAT regime, thus enters the scope of the indexes.

<sup>19</sup> Only the amount of stamp duties collected in each of the 95 French *départements* is known and since the tax rate no more distinguishes dwellings from other real estate, a coverage rate can only be estimated. The notaries themselves are in the process of collecting statistics on their activity, but it is for the moment done only in the Paris area, and is partial.

<sup>20</sup> It is lower than 30% in six *départements*, over 50% in 69 *départements* and over 70% in 36 *départements*. There are some 87 *départements* outside Ile-de-France. Corsica is not covered.

<sup>21</sup> The fact that the sales are a non random sample of the stock of dwellings, and that registration in the database is also potentially non random.

<sup>22</sup> Data analysis have been used to group or interact some characteristics.

Table 2  
Non-response rates in %

Zone of the index	Surface	Number of rooms	Age	Garages car park	Bathrooms	Floor or number of levels	Lift
Province							
House	40.2	6.3	27.4	40.6	11.5	8.6	–
Apartment	9.0	1.8	25.1	56.2	7.0	4.6	58.9
Paris apartment	25.9 (7.7)	0	82.0 (8.1)	0.4	0	0.9	48.8
Petite Couronne apartment	46.1	0	23.5	0	0	3.4	59.3
Grande Couronne apartment	14.4	0.7	19.4	0	0	1.9	47.7
Ile-de-France house	47.0	0.2	51.5	0	0	0.3	–

Note: Computed on the reference stocks.

In some cases the missing information can be recovered from sales of other dwellings in the same building at another date. Then the non-response rates above are upper limits of the final rates which appear in parenthesis. In Ile-de-France, for garages and bathrooms the rate is low, but there is a confusion between “no bathroom” (or “no garage”) and non-response.

Table 3  
Treatment of non-responses

Non-response	Action	Method, if imputation
Price	Rejected	
Surface and number of rooms	Rejected	
Surface	Imputed	Reference period mean of dwellings of same number of rooms in the commune or, if unknown, in the region; econometric imputation in Petite and Grande Couronne
Number of rooms	Imputed	From the surface at national level.
Type of dwelling	Rejected	
Lift	Imputed	Non-response = yes
Floor	Imputed	Ground floor
Bathroom	Imputed	No bathroom
Garage, parking	Imputed	No garage, parking
Date of construction		“Non-response” isolated
Nature of buyer	Imputed	Private individual or SCI
Nature of seller		Non-used
Destination of dwelling	Imputed	Habitation, full property
Surface of plot (for houses)	Rejected	

## 2.2 A quarterly INSEE supervision

The notaries collect the data and compute the indexes at their own cost. The question of the cost is not dwelt upon here. I only mention that by-products of the index computation are or could be sold. They go from part of the database, statistics on buyers and sellers, to a complete valuation system of dwellings and expertise on real estate prices.<sup>23</sup> The indexes themselves are publicly available and free.

INSEE is answerable for the index method, but does not compute the indexes. Hence a procedure of quarterly quality verification of the main indexes has been established. It relies on information on the gathering of the data (time of integration in the databases, quality controls) and on the comparison of the evolution of means prices and indexes, to detect structural modification. Volumes of sales, their structure by dwelling type (typically the number of rooms) are followed and compared to the reference stock. Zones with extreme variations of price or volume compared to the preceding quarter or to other zones are also detected and checked for potential errors.

## 2.3 The currently published indexes

Nine indexes are currently published at the national level. Seven are indexes for apartments: Paris, Petite Couronne, urban units of more than 10,000 inhabitants (city centres and suburbs), and small urban units and rural areas. One is a house index for the Province. The indexes for apartments in the Parisian Grande Couronne and houses in Ile-de-France will be added in Spring 2004. In some urban units or districts with enough sales, local indexes are also computed, but not published by INSEE. They might be in the near future.<sup>24</sup> Not waiting for the entire coverage of the national territory, INSEE estimates, a quarterly national index for "France". It will be replaced by one estimated on all sub-indexes "Notaires-INSEE" as soon as all are available and published, in the summer of 2004. All indexes can be found in a paper INSEE publication Bulletin Mensuel de Statistique (BMS), in January, April, July, and October, as well as on INSEE website.

Each published index is identified in the BMS by a code. They can also be found at <http://www.indices.insee.fr> (Indices et séries statistiques, Construction Logement, Indices trimestriels des prix des logements anciens). For each quarter  $t$  two new indexes are produced: a provisional index for  $t-1$  and a revised final index for  $t-2$ .<sup>25</sup> The main indexes are presented in Figure 1.

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<sup>23</sup> Quarterly or annual press conferences held by the notaries of the Paris area are available at <http://www.paris.notaires.fr>. For the rest of France see, <http://www.immoprix.com/>

<sup>24</sup> See Appendix A2 for details.

<sup>25</sup> The base 100 of the indexes was fixed at the second quarter of 1994 for Paris, at the fourth quarter 1994 for the Province.

Figure 1

## Main notaires INSEE housing price indexes

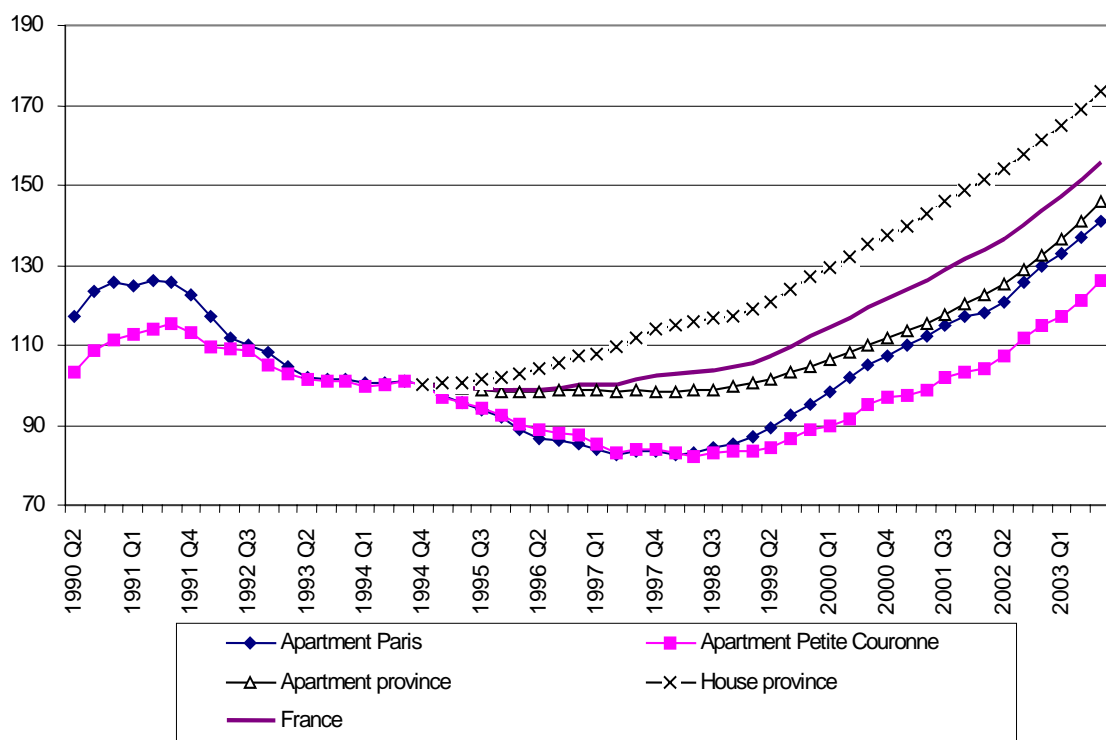


Table 4

## Aggregate indexes

Code			Type of index
Website	Paper	BMS	
081767865	00000	00	France
067517858	11000	10	Ile-de-France
080557385	12000	10	Paris - apartments Petite Couronne - apartments Grande Couronne - apartments (in March 2004) Ile-de-France - houses (in March 2004)
080557486	20000	00	Province
080557587	20000	10	Province - apartments
067517959	20000	20	Province - houses
067517959	21000	10	Urban units above 10,000 inhabitants - apartments
067518060	21100	10	Urban units above 10,000 inhabitants - city centre - apartments
067518262	21200	10	Urban units above 10,000 inhabitants - suburbs - apartments
080557688	22000	10	Urban units less than 10,000 inhabitants and rural - apartments

### **3. Conclusion**

Thanks to the propitious conjunction of sales data, goodwill and accurate methodology, reliable housing price indexes now exist for France. All three elements are necessary and it is important that they persist over the long run. The data should go on being collected, that is the notaries have to settle on a durable way of funding them. The tax authorities are unifying and computerising the real estate sale documents. A side effect is likely to be a reduced cost for data gathering and better quality. But the information necessary for the hedonic models, and not requested by tax authorities, has to be provided for the index and the hundreds of small notary practice have to be motivated. This leads to the second element, goodwill. It is fuelled by information about the use of the indexes. To the notaries, they should become a trademark, and the valuation system that goes with the indexes should prove useful, and a means to make the enterprise profitable. On the INSEE and academic side, and for the general public, the mere existence of reliable indexes and of all the information that goes with them, has begun to fuel new types of studies. As prices can be compared both in space and over time, microeconomic models of agents' decisions can incorporate them, and provide more reliable guidelines to public and individual choices. As housing and more generally real estate prices and consumer prices evolution can differ widely, it is of the utmost importance for economic policy to make use of both. As for methodology, its unique feature is the use of the valuation of reference parks at a detailed geographic level. Besides, the assumption of time stability of the models implies that there is no more econometric in the current period computation of the index, which saves time and cost. The first revision of period base, reference stock and model specification just took place. It proved not too difficult, and to have no major effect on the index profile, comforting the long term resilience of our hedonic methodology.

## Appendix

### A1. The time stability of the models

The models assume that the temporal effect is captured by the term  $\sum_{a=1}^3 \alpha_a Y_{a,i} + \sum_{t=1}^4 \theta_t T_{t,i}$  and that the coefficients  $\hat{\beta}_k$  are time invariant during the years following the estimation period, as the same coefficients are applied at each quarter to compute the index. The time invariance assumption of the  $\hat{\beta}_k$  was checked. It was verified that the difference between the estimated value of dwellings with characteristic  $X_k$  and their actual sale price, the residual  $u_i$ , satisfied the stochastic assumption of the model, and did not include an unobserved deterministic component. The time evolution of the mean of the residuals in some zones was computed for each of the coefficients  $\hat{\beta}_k$ ,  $k = 2$  to  $K$ . They were found stable over time.

After a maximum of five years, they are checked and changed if necessary. This has just been done, and found to have no major effect on the index profile.

### A2. Choice of zones/strata and sub-indexes

It is important to estimate the hedonic models on homogeneous price zones, that is zones where prices are not too different, and move in the same way over time. The strata of the publication of an index are not necessarily homogeneous. This is why they have been cut or grouped. The neighbourhoods have been defined locally by interviewing real estate experts. Then tree analysis allowed to group similar neighbourhoods. Ideally a model could be estimated in each neighbourhood, but as estimations are costly, there is only one model by zone, but dummy variables for particular neighbourhoods were added when necessary.

Indexes at a detailed geographical level are not yet published by INSEE but they are available from the notaries. The zones are the strata, that is the geographical level at which the hedonic models are estimated.

In Paris a zone can be one arrondissement, but also a group of arrondissements or a part of a larger one. In the rest of Ile-de-France, the strata are subdivisions of the five *départements* of the Petite and Grande Couronne (listed in the footnote of Table 1).

In the rest of France, a city centre has no proper apartment index if the annual number of sales is less than 150. Fifty-three zones are made of a single city. They range from Lyon, Marseille and Toulouse to Bayonne, Vichy and Annemasse. For the 33 largest a provisional index can also be published. Outside those large cities, 31 other zones are made of cities grouped by region interacted with four urban unit size (10,000-20,000, 20,000-50,000, 50,000-100,000 and over 100,000 inhabitants). There are 20 administrative regions grouped here into ten larger units. For the “suburbs” of cities, 21 zones are made of the suburb of a single urban unit (from Lyon, Toulon and Grenoble, to Dijon, Toulouse and Tours), and eight zones are groups of suburbs in groups of regions. The zoning for the indexes of apartment prices in rural areas is more heterogeneous. Seven main zones are defined (“Rural Grand Nord”, “Rural Est”, “Rural and Littoral, Grand Ouest”, “Rhône-Alpes, outside ski resorts”, “Rhône-Alpes, ski resorts”, “Languedoc Roussillon”, “Provence-Alpes-Côte d’Azur”), each comprising from two to 10 smaller zones defined by interacting regions and size of the urban unit. Note that for the Alpine regions, the ski resorts are isolated, because their housing market is very different from the surrounding areas.

For houses price indexes, the zones are different because the cities with an index for apartments do not all have enough house sales to compute their own index. Houses are traditionally numerous in cities of the North of France, hence Calais, Douai, Lens and Valenciennes have a house index but not an apartment index, while Chambéry, Annecy or Blois have not. All in all, only 47 cities have a house price index. Outside those cities, zones for houses price indexes are defined by interacting regions and size of urban units (rural villages, suburban zones, urban unit under or over 20,000 inhabitants).

### A3. The hedonic models

There are as many hedonic models as elementary price zones. Two examples are presented here for apartments in zone 13 of Paris, zone two of Hauts-de-Seine in Petite Couronne. The dependent variable is the logarithm (base 10) of the price per square metre in Francs. The estimated coefficients, while being close from one zone to the other, differ to some extent. For instance a garage brings more added value in Paris than on the outskirts of the city. This change in the relative price of characteristics justifies the use of the hedonic method at a decentralised geographical level. It is equivalent to relate all variables with a zone dummy.

The hedonic regressions quality as measured by  $R^2$ , varies between 0.152 and 0.789. For individual cross-section data values of  $R^2$  in the range of 0.25-0.40 for 1,000-3,000 observations and around 20 variables are considered good. This is what is obtained in most zones.

Table A1  
Examples of hedonic regressions:  
apartments, Paris, zone 13

$R^2 = 0.42$ , nb obs: 5520

Variables	Coefficients	Standard error	p-value
Constant	4,120	0,007	0,000
Year 1992	0,119	0,004	0,000
Year 1993	0,076	0,004	0,000
Year 1994	0,078	0,004	0,000
Year 1995	0,045	0,004	0,000
Year 1996	Reference		
Quarter one	0,019	0,004	0,000
Quarter two	0,016	0,004	0,000
Quarter three	0,013	0,003	0,000
Quarter four	Reference		
Neighbourhood one	Reference		
Neighbourhood two	-0,015	0,003	0,000
Neighbourhood three	0,027	0,003	0,000
Before 1850	-0,042	0,016	0,006
1850-1913	Reference		
1914-47	-0,011	0,004	0,002
1948-69	0,009	0,004	0,017
1970-80	0,053	0,005	0,000
After 1981	0,094	0,011	0,000
Unknown	0,015	0,005	0,003
No bathroom	-0,075	0,003	0,000
One bathroom	Reference		
Two bathrooms or +	0,027	0,006	0,000
No garage	Reference		
One garage	0,072	0,004	0,0000
Two garages or more	0,098	0,015	0,000
Service room	0,066	0,006	0,000

Table A1 (cont)

**Examples of hedonic regressions:  
apartments, Paris, zone 13**

$R^2 = 0.42$ , nb obs: 5520

Variables	Coefficients	Standard error	p-value
Ground floor	Reference		
Floor one	0,045	0,006	0,000
Floor Two	0,076	0,006	0,000
Floor three	0,076	0,006	0,000
Four or more with lift	0,091	0,005	0,000
Four or more no lift	0,037	0,008	0,000
One room	0,016	0,004	0,000
Two rooms	Reference		
Three rooms	0,008	0,004	0,018
Four rooms	0,020	0,004	0,000
Five rooms or more	0,020	0,006	0,001
Small surface/room	0,007	0,003	0,030
Average surface/room	reference		
Large surface/room	-0,007	0,003	0,040

Table A2

**Apartments, Haut-de-Seine, zone 2**

$R^2 = 0.48$ , nb obs: 2476

Variables	Coefficients	Standard error	p-value
Constant	4,0349	0,0109	0,0000
Year 1992	0,1118	0,0069	0,0000
Year 1993	0,0736	0,0065	0,0000
Year 1994	0,0748	0,0063	0,0000
Year 1995	0,0307	0,0065	0,0000
Year 1996	Reference		
Quarter one	0,0194	0,0059	0,0010
Quarter two	0,0182	0,0059	0,0020
Quarter three	0,0047	0,0060	0,4282
Quarter four	Reference		
Neighbourhood one	Reference		
Neighbourhood two	-0,1275	0,0045	0,0000
Before 1850	0,1013	0,0233	0,0000
1850-1913	Reference		



Table A2 (cont)  
**Apartments, Haut-de-Seine, zone 2**

$R^2 = 0.48$ , nb obs: 2476

Variables	Coefficients	Standard error	p-value
1914-47	0,0105	0,0059	0,0736
1948-69	0,0100	0,0074	0,1772
1970-80	0,0241	0,0100	0,0158
After 1981	0,0904	0,0123	0,0000
Date unknown	0,0111	0,0061	0,0695
No bathroom	-0,0540	0,0047	0,0000
One bathroom	Reference		
Two bathrooms or more	-0,0245	0,0140	0,0795
No garage	Reference		
One garage	0,0565	0,0083	0,0000
Two garages	0,0559	0,0180	0,0019
Service room	-0,0012	0,0178	0,9463
Ground floor	Reference		
First floor	0,0402	0,0086	0,0000
Floor two	0,0518	0,0084	0,0000
Floor three	0,0475	0,0086	0,0000
Four or more with lift	0,0628	0,0079	0,0000
Four or more no lift	0,0185	0,0107	0,0838
One room	0,0028	0,0069	0,6805
Two rooms	Reference		
Three rooms	0,0265	0,0054	0,0000
Four rooms	0,0397	0,0084	0,0000
Five rooms or more	0,0482	0,0113	0,0000
Small surface/room	0,0066	0,0059	0,2624
Average surface/room	Reference		
Large surface/room	0,0305	0,0084	0,0003

## Reference

David, Alain, François Dubujet, Christian Gouriéroux and Anne Laferrère (2002): "Les indices de prix des logements anciens", *INSEE Méthode*, 98, p 119.

# Euro area residential property prices: the aggregation of non-harmonised national data

Henning Ahnert and Adrian Page

The European Central Bank (ECB) regularly compiles an indicator for euro area residential property prices from non-harmonised national data and has recently established target definitions to improve the information. Main criteria used for selecting national components into the aggregate are geographical and market coverage, quality adjustment, and reliability of source data. In the absence of better quality harmonised indicators, it is difficult to precisely assess the reliability of the current index. Results from aggregating different national price series and using different country weights may, however, at least illustrate the potential error margins of the index. These margins are, compared to other euro area statistics, considerable, though it may be assumed that the price trend is correctly reflected and plausible. The most important and desirable improvements concern the quality of the primary statistics (coverage, quality adjustment) and the publication frequency of the euro area aggregate (from annual to quarterly).

## 1. Introduction

This paper discusses the euro area<sup>1</sup> residential property price indicator which has been published by the ECB since 2001. It begins with a discussion of the residential property price aggregates that are relevant for ECB use and a presentation of the series currently compiled for the euro area and the national sources used. It then tries to address the question of how reliable the euro area indicator is by analysing the methodological differences between the national data and the impact on comparability. The final section looks into the question of which weights should be used for the aggregation of national series from both a conceptual and a practical point of view.

## 2. Why are residential property price developments relevant for ECB use and what are the statistical requirements?

The buying or selling of a dwelling is typically the largest transaction a household enters into. Changes in house prices are therefore likely to influence substantially the budget plans and saving decisions of the prospective house buyers and sellers. House price changes will also have an impact on the wealth of owners of dwellings given that the dwelling is the largest asset in their portfolio. Further, to the extent they affect market rents, house prices also affect consumer price indices; in 2003, rents had a weight of 6.4% in the euro area harmonised index of consumer prices (HICP), which is the measure used by the ECB to define price stability in the euro area. Another reason to monitor these price developments is that owner-occupied housing costs are not yet covered in the HICP. Housing prices may also have an effect on residential construction investment, which accounted for 5.0% of gross domestic product (GDP) in the euro area in 2002. Finally, housing prices are used for financial stability analysis, since sharp increases and declines in prices can have a detrimental impact on financial sector health and soundness by affecting credit quality and the value of collateral.<sup>2</sup>

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<sup>1</sup> The euro area consists of the 12 EU member states currently participating in monetary union: Belgium (BE), Germany (DE), Greece (GR), Spain (ES), France (FR), Ireland (IE), Italy (IT), Luxembourg (LU), the Netherlands (NL), Austria (AT), Portugal (PT) and Finland (FI).

<sup>2</sup> See ECB (2003a, pp 8-14) and IMF (2003, Chapters 9 and 14).

How can these uses of property price statistics be translated into statistical requirements? First, as euro area statistics are compiled from national results, a sufficient degree of *comparability* between the national data is important. Second, in order to be useful in the current monitoring of price developments, *quarterly frequency* of the results is desirable. Third, the degree to which residential property price indices are able to eliminate the effect of *quality differences* between different dwellings compared over time is important. Fourth, property price data for the euro area is needed for the following breakdowns. For the *geographical breakdown*, given the substantial dispersion of developments across countries, results are needed for each individual euro area country in order to understand the trends in the euro area aggregate and form an assessment about its future development. In addition, a certain regional disaggregation of national data is often useful (eg West Germany compared to East Germany), since the regional developments may vary considerably. In addition, a distinction at national or euro area level dividing between price developments in urban areas (and/or capital cities) and non-urban areas may be very informative. For the prices for *different housing types*, the breakdown between new and existing dwellings is the most used distinction.

These and other breakdowns are further explored in Sections 3 and 4 below.

### 3. What aggregates are currently compiled by the ECB?

The ECB compiles a residential property price index for the euro area which is calculated as the average of the annual growth rates of national indicators weighted by 2001 GDP shares. The index is published in the *ECB Monthly Bulletin*.<sup>3</sup> The national components of the overall euro area index are detailed in Annex 1. The series from the four largest euro area countries, which together contribute to 79% of the euro area index, are shown in Graph 1. The selection of national components is based on the degree of market and geographical coverage, the methods used for quality adjustment, the quality of the data source and the sample size. These issues are discussed in detail in Section 4.

The euro area index is calculated when at least 80% of the national data are available. As all euro area countries produce some data on residential property prices the country coverage is close to 100% for most of the length of the euro area series. Where country data are missing at the start or end of the series, the weight is set to zero with the implicit assumption that the missing country follows the same development as the average of the countries for which data is available.

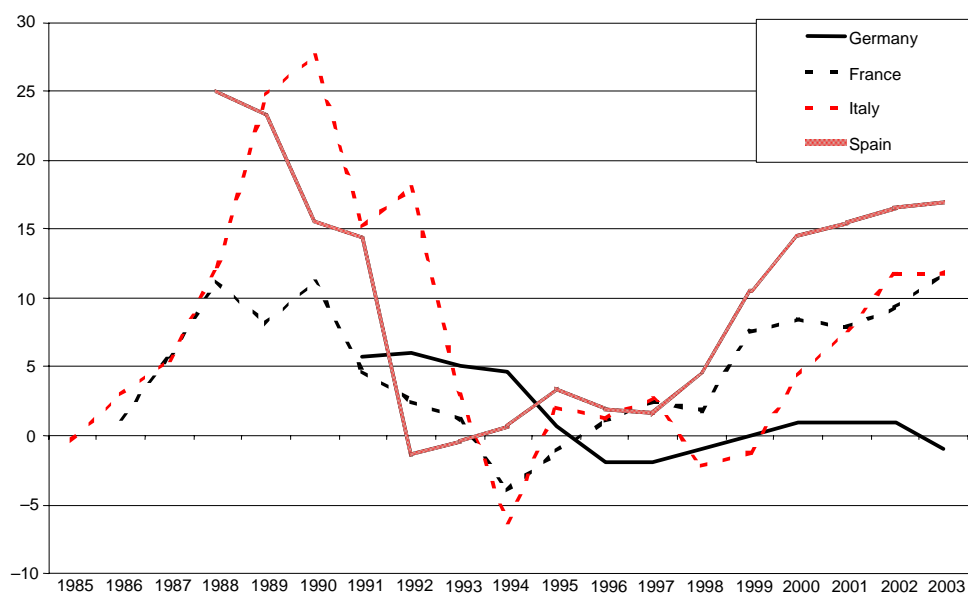
Also important for an indicator used for monetary policy are the frequency and timeliness of the data. The timeliness ranges from one month (Ireland, the Netherlands, Portugal, Finland) to between three to six months in the remaining countries. The euro area aggregate with a coverage of over 80% is available with a delay of around three months, with some countries' latest data being estimated using alternative sources. Since German data are currently available only at annual frequency, a euro area average with a high country coverage can be compiled only at annual frequency. A semiannual indicator can be compiled, but excludes Germany and Luxembourg. Quarterly or even monthly indicators are currently not possible, since, in addition to Germany and Luxembourg, Italy and Austria would not be covered.

Recent efforts by the ECB and the EU national central banks have attempted to improve the homogeneity of the index and provide some additional breakdowns at both euro area and national level via the adoption of some target definitions of the desired market coverage of residential property price indicators. This work is based on *existing* sources, because EU central banks currently do not collect primary statistical information on house prices. However, the central banks have tried to use existing sources to match the target definitions as closely as possible. This has allowed the creation of breakdowns for new dwellings, existing dwellings and residential property price developments in urban areas of the euro area (Graph 2). Despite these improvements, much work remains to improve the quality of the national data and thereby of the euro area aggregate.

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<sup>3</sup> See Box 3 in the *ECB Monthly Bulletin* of October 2002 for the most recent data; at the time of writing, an update was planned for the December 2003 issue.

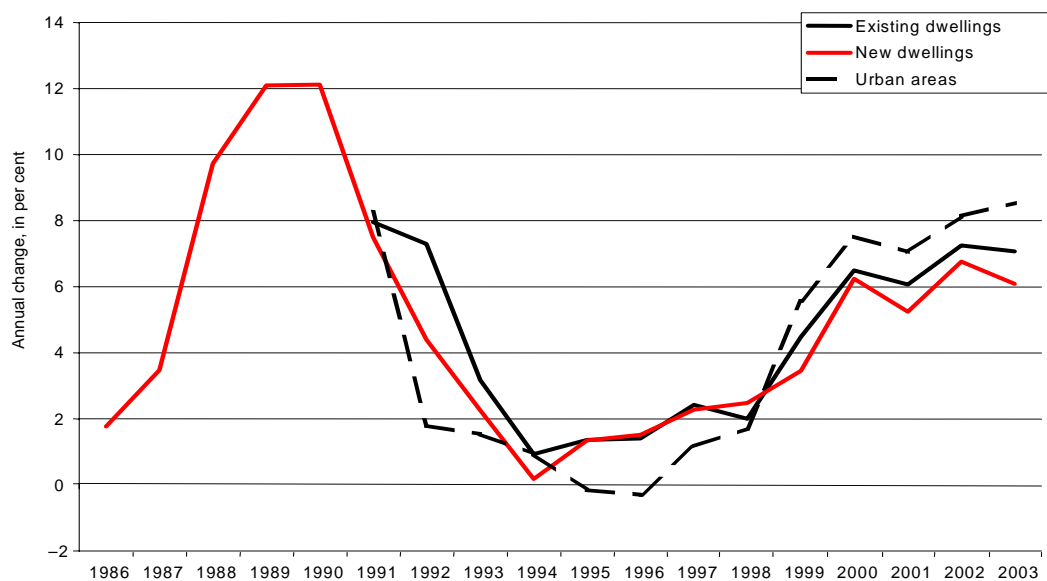
Graph 1  
**Residential property prices in the  
four largest euro area countries**  
Annual changes, in per cent



Note: The indicators are those which are included in the euro area aggregate. Germany: for 1991-95, West Germany only.

Sources: National sources; ECB calculations.

Graph 2  
**Residential property prices in the euro area**



Source: ECB.

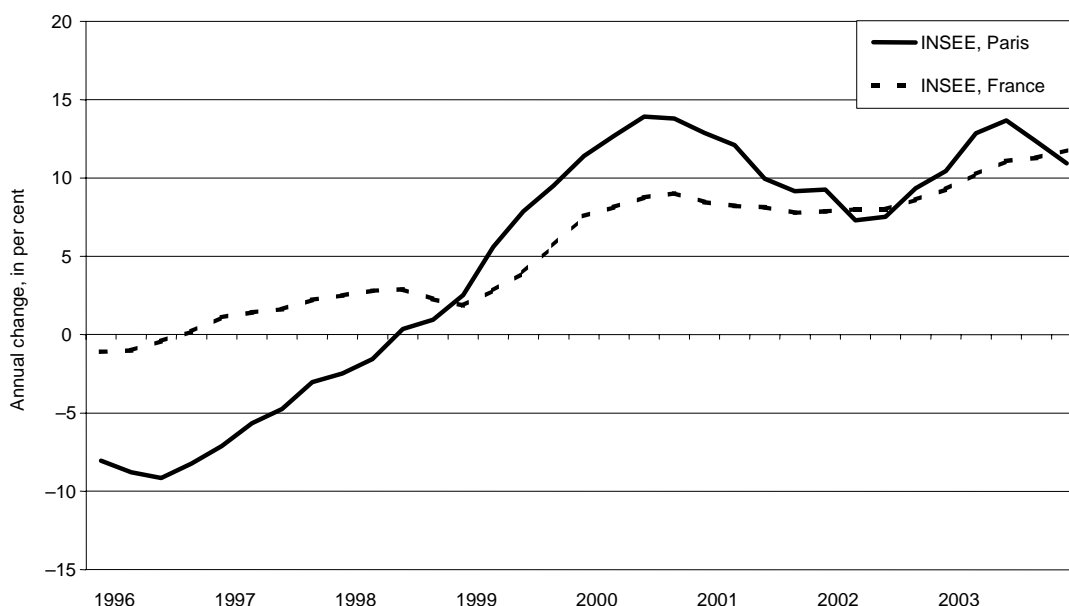
#### 4. How reliable is the aggregation of non-comparable national data?

The methods employed for the compilation of house price indicators vary considerably *between* countries, and even between alternative sources *within* individual countries. A key question with regard to cross-country aggregation is which national series should be used and, given the high degree of heterogeneity between countries, how reliable the resultant index will be. The differences between the available house price indices concern almost every aspect: geographical coverage; market coverage (type of property, mortgage/cash transactions); quality adjustment; data source (tax records, mortgage applications, estate agents, newspapers); index construction; weighting. Each of these differences adds to the likelihood that the non-price factors will affect the aggregate price index and cloud interpretation by users.

Graph 3

##### Prices of existing dwellings in Paris/France as a whole

Annual changes, in per cent



Source: INSEE.

#### 4.1 What are the differences and what might be their effects?

##### 4.1.1 Geographical coverage

###### *National data*

Housing markets tend to be highly segregated between geographical areas. Factors such as population distribution and regional income levels and changes may lead to wide divergence in house price levels, and differing price developments. Many of the local and regional effects on housing markets may cancel each other out in a national aggregate, but this assumes that the national aggregate is a representative average of all regional markets. National sources which provide data on large/capital cities in addition to comprehensive national figures tend to show that city data are more volatile than national averages and sometimes follow different dynamics. Graph 3 shows the annual growth rates of existing dwellings in Paris compared with France as a whole. Whilst there is a high degree of co-movement between the two series (Paris is clearly an important component of the whole of France), the Paris series is more volatile. Even larger differences between local markets were

observed, for example, in Germany. Residential property price changes for flats in the two largest German cities (Berlin and Hamburg) in the period from 1995 to 2002 differed substantially from prices in other large cities (eg Frankfurt and Munich) and from the national average (Deutsche Bundesbank (2003)). Reliance on the results for the two largest cities would signal a significant and continued price decline, and would be a misleading indicator for Germany as a whole. It is therefore important that the geographical coverage of national aggregates be as broad as possible and that over-reliance on large cities as a proxy for national data be avoided.

#### *Euro area data*

For euro area data similar arguments hold. Since the divergence of national price changes is high, coverage of the euro area aggregate must be high in order to produce a reliable aggregate. In 2002, annual growth rates of the five largest euro area countries varied between  $-0.2$  and  $16.6\%$ . This implies that missing national data, or forecast errors for missing national data, may affect the quality of the euro area aggregate. Therefore, a coverage level of  $80\%$  of the euro area is considered as the threshold for compiling the aggregate.

#### **4.1.2 Property type**

Price developments may also differ between types of property, for instance between new and existing dwellings or between houses and flats. Purchasers are able to substitute between new and existing dwellings and therefore one might expect similar price dynamics. However, newly constructed dwellings may offer both advantages and disadvantages compared to existing dwellings and these may be valued differently according to societal preferences in different countries. Differences may also be due to taxation and subsidies, and regional differences due to a lack of land for construction in urban areas. New dwellings may differ considerably from the existing stock in terms of architectural and technical features as well as location. Prices for new dwellings are, at least in the short term, influenced by construction costs. The empirical results for the euro area countries are, however, not fully clear in this respect and suggest that the differences may be more important in some countries (Ireland, Germany) than in others (Italy, Spain).<sup>4</sup>

Many national sources distinguish between houses and flats, which may broadly represent upper and lower ends of the market. Given that these market segments behave differently under different property market conditions and at different points in the business cycle, the breakdown between houses and flats is useful, and it is important that both are represented in the national overall index. In the euro area aggregate our approach has been to use data which include both new and existing dwellings and both houses and flats. Where a combined aggregate is not available, data for existing dwellings are used as they usually account for a larger proportion of the transacted dwellings. Separate series for houses and flats are aggregated using weights of the respective shares in the housing stock, when available.

#### **4.1.3 Quality adjustment**

Price comparisons over time require the availability of comparable housing objects in the two periods under consideration. However, due to heterogeneity of housing markets and infrequent transactions, traditional “matched model” methods for price statistics fail. Quality adjustment is needed to ensure the comparison of “like with like” and to avoid long-term bias in the series. This bias could arise, for example, due to improving living and housing standards, or to new dwellings built further from city centres.

Very basic methods, such as unit value indices of square metre prices, attempt to adjust for the size of the dwellings in each period while still allowing other changes in the composition such as location, amenities, quality of housing, etc, to affect the index. Mix adjustment (or the “classification approach”) defines a classification of dwellings by the characteristics for which it intends to adjust. Individual price indices are then calculated for each cell in the classification, and the overall index is calculated as the weighted average of these subindices. The number of characteristics included in the classification is

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<sup>4</sup> German data for new and existing flats differed by 3.7 percentage points in 2002, whereas the corresponding figure for Italy was 0.9 percentage points.

often limited by the number of observations that can regularly be found for each cell. The most advanced form of quality adjustment used is the hedonic regression approach, which uses a regression model to isolate the value of each of the chosen characteristics and thereby adjust the observed prices according to a standardised housing unit. It is sometimes used together with a mix adjustment. An additional method used in US indices is the so-called repeat sales technique, which matches pairs of transactions of the same dwellings over time. This requires a huge database of transactions and is not used by any of the European data producers. The crucial question for all quality adjustment procedures is whether the chosen characteristics used for adjustment are the main determinants of price differences. While some of these are easy to measure (eg size), other important factors (location) are often difficult to capture.

In practice, national indicators used for the euro area aggregate use a variety of techniques to adjust for quality and compositional changes. In three cases, the available measures are simple unit value indicators, ie which do not control for changes in composition and quality (Ireland, Luxembourg, the Netherlands; see Annex 1). In most other cases, quality adjustment tends to be rather basic, using measures such as square metre prices for individual cities or regions aggregated to a national total. For Germany, the data collection is limited to “good-quality” dwellings, which might imply a built-in measurement problem, since it is unlikely that the market definition of “good quality” is independent of the general increase in housing standards over time. Only two countries (France and Finland) use hedonic regression. These differences and shortcomings in the quality adjustment of national data are considered to be the most important deficiency of the euro area aggregate.

#### **4.1.4 Cash/mortgages**

In many countries, mortgage lenders are the main data source for house price indices. The databases of mortgage lenders can be a rich source of timely information; however, they exclude cash purchases. Research in the United Kingdom has indicated that cash buyers, who account for around 30% of the UK market, tend to purchase at the extremes of the market, ie very cheap and very expensive properties, and that dwellings purchased by cash follow a different development to those financed by a mortgage (Statistik Austria (2001)). It is not clear whether there is any bias in the house price data from other European countries where cash purchases are not included (Belgium, Spain, Ireland) as no alternative source is available.

#### **4.1.5 Timing**

The process of selling a house often takes place over a period of several months or more and the particular stage in this process at which the price is entered into the index varies, often depending on the source of the data, and has consequences for the comparability of the data. National indices used in the euro area aggregate include data at the following stages:

- As soon as the property is on the market. Typical data sources: newspapers, estate agents;<sup>5</sup>
- Mortgage approved. Typical data source: mortgage lenders;
- Signing of binding contract. Typical data source: lawyers;
- Transaction completed. Typical data sources: land registries, tax authorities.

Ideally a house price index would show actual transaction prices at the time when the property is first taken off the market. The signing of the first binding contract fits this requirement best; however, in practice the point at which a contract is binding, and what is considered as binding, differs between countries. The effect of the heterogeneous recording of the available data is likely to be limited in an annual frequency aggregate, but will become more significant as we move towards a quarterly index. For the euro area index it is clear that, whilst aiming for the ideal, compromises must be accepted.

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<sup>5</sup> Although not related to the issue of timing, a disadvantage of advertised prices and mortgage approvals is that not all of the prices included end in transactions, and in the former case, the price will tend to be higher than the final negotiated transaction price.

#### 4.1.6 Choosing amongst the available national sources

Table 1 gives an overview of the correlation coefficients of the main alternative time series which have been considered for inclusion into the euro area aggregate. Graphs of the series compared are shown in Annex 2. The correlation coefficients vary considerably between 0.6 and 0.99. Generally, the series in which the *same* source provides breakdowns of different market segments show relatively high correlation. However, correlation coefficients for series with similar definitions but different sources are in most cases significantly lower. Differences between sources are particularly relevant in the short term, while the long-term trend of the time series is mostly similar.

This suggests that, as measured by the available data, the geographical and market coverage is less important than the choice of the source data and the methodology employed. It underlines the importance of relying on national expertise when selecting property price series for the purpose of compiling euro area aggregates.

Table 1  
Correlation coefficients of alternative national sources

Country	Series	Correlation coefficient	Time period
DE <sup>1</sup>	Five largest cities vs 60 largest cities <sup>2</sup> (both Bulwien AG)	0.902	1991-2002
	New vs existing flats (both Bulwien AG)	0.818	1991-2002
	GEWOS vs Bulwien <sup>2</sup>	0.802	1991-2002
	RDM vs Bulwien <sup>2</sup>	0.790	1991-2001
	GEWOS vs RDM	0.585	1991-2001
GR <sup>3</sup>	BoG including <sup>2</sup> vs excluding Athens (same source)	0.910	1998 Q1-2002 Q4
ES <sup>4</sup>	MdF new vs existing dwellings (same source)	0.948	1988 Q1-2002 Q4
FR <sup>5</sup>	INSEE France, existing dwellings <sup>2</sup> vs INSEE Paris, existing dwellings	0.950	1995-2002
	ECLN France, new flats vs ECLN France, new houses	0.725	1995-2002
	INSEE France, existing dwellings <sup>2</sup> vs ECLN France, new houses	0.718	1995-2002
	INSEE France, existing dwellings <sup>2</sup> vs ECLN France, new flats	0.710	1995-2002
IE <sup>6</sup>	DoE new vs existing <sup>2</sup> dwellings (same source)	0.898	1997 Q1-2002 Q4
	TSB new vs existing dwellings (same source)	0.873	1997 Q1-2002 Q4
	DoE existing dwellings <sup>2</sup> vs TSB existing dwellings	0.714	1997 Q1-2002 Q4
	DoE new dwellings vs TSB new dwellings	0.584	1997 Q1-2002 Q4
IT <sup>7</sup>	Nomisma new dwellings vs existing dwellings (same source)	0.987	1989 H1-2002 H2
	Bol new dwellings <sup>2</sup> vs existing dwellings (same source)	0.952	1989 H1-2002 H2
	Bol new dwellings <sup>2</sup> vs Nomisma new dwellings	0.873	1989 H1-2002 H2
	Bol existing dwellings vs Nomisma existing dwellings	0.847	1989 H1-2002 H2

Note: Coefficients calculated from annual growth rates.

<sup>1</sup> Bulwien AG and GEWOS are private research institutes; RDM is a federation of estate agents. <sup>2</sup> Indicates series used in overall euro area aggregate. See also Annex 2. <sup>3</sup> Both series are compiled by the Bank of Greece (BoG) on the basis of data from a private research institute. <sup>4</sup> Both series are from the Ministerio de Formento (MdF, Ministry for Infrastructure and Urban Planning). <sup>5</sup> INSEE is the National statistical institute of France; ECLN (Enquete sur la commercialisation des logements neufs) is a survey run by the Ministry of Equipment, Transport and Housing. <sup>6</sup> DoE = Department of the Environment and Local Government; TSB = Permanent TSB mortgage bank. <sup>7</sup> Nomisma is a private research institute; Bol = Bank of Italy.

Source: ECB.

#### 4.2 The effect of these differences on the euro area aggregate

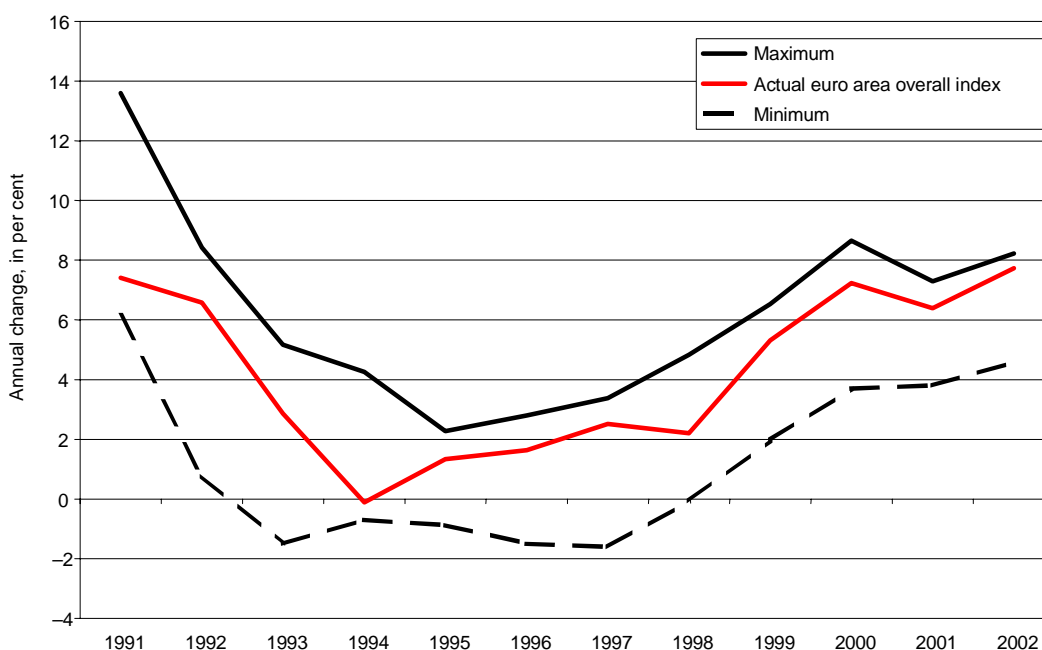
From the available evidence it appears that the differences between the available national data may have a significant effect on comparability, although there may be some cancelling-out at the euro area



level. Without true harmonised data for comparison it is impossible to be certain of the real effect. We may, however, look to the possible margins of error in aggregation of the existing data. In order to investigate this, we have taken for each of the countries where we have at least one alternative source (Germany, Greece, Spain, France, Ireland, Italy) the highest and lowest reported annual growth rate for each observation period from all the alternative series and then created a “minimum” and a “maximum” euro area aggregate. For countries where only one reasonable national source exists, we have used the same series in both aggregates. The results are presented in Graph 4 together with the actual ECB euro area overall index. The results show that there is a significant gap between the maximum and minimum series which corresponds to between 3 and 7.5 percentage points. This confirms that the choice of national components for the aggregate is important and that there is potentially a rather large margin of error. However, the distance between the actual euro area aggregate and the simulated two extremes is relatively stable and the trend over the past 12 years is broadly consistent in all three series. This confirms the ECB’s view that while the euro area residential property price index may be used to analyse trend developments, both smaller short-term changes in the index and the level of annual growth rates have to be treated with a considerable degree of caution.

Graph 4  
**Maximum and minimum boundaries  
of euro area aggregate**

Annual changes, in per cent



Source: ECB.

## 5. The effect of alternative country weightings on euro area totals

Having selected the most representative and homogeneous available national indicators, the question of which country weighting scheme should be used for aggregation is still open. In principle the problem is no different from the decision on weights in a representative national index, which is often calculated as the weighted average of regional indices. The decision is limited to a much greater extent at the international level by the availability of coherent and harmonised structural indicators which may be used for weighting purposes. The construction of good-quality weights requires level data which have uniform coverage of markets in any country. For example, data on the stock of properties that include commercial properties will obviously overstate the weight of a country when

compared with data for residential properties in other countries. The sources for such data within the European Union are scarce.

Conceptually there are two main decisions that must be taken in choosing a weighting scheme for cross-country aggregation; first, whether the indices should be weighted by the flow of transactions or the stock of all dwellings; and second, whether the weights should refer to the value of housing (ie in euros) or the volume (ie the number of houses).

### 5.1 Transaction vs stock weights

Whereas it is clear that the only observable prices that normally enter house price indices are for those transacted, it is less clear whether house price indices should *represent* only these transactions or whether the observed transactions should be used to produce an estimate for the change in the existing stock of dwellings. This choice has a significant impact on the relative country weights for several reasons. First, structural differences mean that some EU housing markets are much more active than others. In Germany, for instance, over the past decade only about 1.7% of the stock was transacted annually, whereas in Ireland and the United Kingdom the figure was closer to 5.5%.<sup>6</sup> Second, transactions are more volatile than the stock and so the share given to a particular country will depend on the state of the housing market in that country in the base period. There were, for instance, more than twice as many transactions in Greece in 1997 as there were in 1991. Third, some types of dwelling are likely to be transacted more frequently and at different stages in the property price cycle than others. Therefore, at any one time, it is unlikely that the make-up of transacted properties is a representative sample of the stock. Finally, the weight given to the subindex for new dwellings would be dramatically different under the two concepts. In Finland, for example, approximately 15% of transacted dwellings are newly constructed, whereas gross fixed capital formation in residential construction in 2002 was only 4.3% of the stock of residential buildings (as recorded in the national accounts balance sheets).<sup>7</sup>

If the house price index is to accurately represent the actual market conditions, ie the price changes faced by a potential house buyer, then a weighting according to the characteristics of transacted dwellings would be expected. As noted above, the price developments for new dwellings are often, at least in the short term, different from those for existing dwellings. However, the weight of new dwellings in a stock-based index would be negligible. Therefore, a transaction-based approach may be preferred on the grounds that it is more representative of the actual market situation.

Different considerations arise from the point of view of a property price index used as an asset price index. Most asset price indices, such as equity prices, are constructed according to market capitalisation. The reason for this approach is that a particular stock should not receive a higher weight in an equity price index because it is heavily traded in a particular period, as investors are interested in the value of their portfolio.

It would seem that the choice of the weights depends on the use of the index. A transaction-weighted index may be useful for analysis of the current market situation, analysis of the demand for credit, analysis of the realised gains by households of the appreciation of house prices, or for use as the owner-occupied housing component in a consumer price index considering housing as a durable good. In contrast, a stock-weighted index may be more appropriate for analysis of housing as an asset. This may include analysis of the influence of house prices on consumer behaviour via wealth effects, use of house price data as a financial soundness indicator (as the index should be representative of the houses used as collateral for securing loans), or comparison of property price data with other asset price indices.

### 5.2 Nominal vs volume weights

Independent of the decision on whether to use transaction or stock weights is the decision on whether the weights should be nominal (eg expressed in euros) and thus influenced by relative price levels in

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<sup>6</sup> Number of transactions as a share of stock of dwellings (source: European Mortgage Federation).

<sup>7</sup> Source: Statistics Finland.

each of the euro area countries, or non-monetary, volume weights (eg expressed as the number of houses or transactions). In between these two options are nominal weights corrected for differences in purchasing power. As with the decision on transaction versus stock weights, the current choices made by the producers of the available data differ between and within countries.

Nominal weighted indices consider that property price levels may vary greatly between regions and countries. For inflation analysis in the single currency area, nominal weights appear appropriate. The same applies for the analysis of wealth effects, because it would be counterproductive to eliminate the effect of different price levels of dwellings from a measure which is used to monitor the development of nominal wealth. There appears to be only one reason to use simple volume indicators for weighting purposes, and this is to use them as proxies in the absence of adequate nominal weights.

Volume weights are used in many of the national indices - eg Italy uses the size of dwelling space in square metres in various regions, Finland uses the number of houses in each cell and Germany and Spain use population weights for aggregating regional indices, although population is clearly a proxy weight in the absence of more appropriate measures.

### 5.3 Potential sources for the euro area country weights

The currently used weighting scheme for compiling the ECB euro area index is based on GDP results, mainly due to the availability of complete and comparable results for all EU countries. Moreover, GDP is the broadest monetary measure of economic activity and a frequently used indicator to aggregate national economic statistics. There are, however, alternative and potentially more appropriate weighting schemes, which are discussed in this section. Table 2 shows the framework of the four possibilities discussed in Sections 5.1 and 5.2 and gives the potential candidates for which data exist.

Table 2

#### Available sources of euro area country weights

Weights	Transactions	Stocks
Nominal	<ul style="list-style-type: none"> <li>– <b>Proxy - National accounts gross fixed capital formation, housing</b> (source: NSIs; available countries: all; harmonised data)</li> </ul>	<ul style="list-style-type: none"> <li>– <b>National accounts balance sheets - dwellings (AN.111)</b> (source: NSIs; available countries: BE, NL, FI; harmonised data)</li> <li>– <b>Proxy - National accounts, actual + imputed rents</b> (source: NSIs; available countries: all except LU; harmonised data)</li> </ul>
Volume	<ul style="list-style-type: none"> <li>– <b>Number of transactions</b> (source: NSIs; available countries: all except ES, AT; non-harmonised data)</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Number of dwellings (total stock)</b> (source: NSIs; available countries: all; non-harmonised data)</li> <li>– <b>Proxy - Population</b> (source: NSIs; available countries: all; harmonised data)</li> </ul>

Note: NSIs = national statistical institutes.

Source: ECB.

As a transaction weight, gross fixed capital formation in housing would be a choice for an index for new dwellings; however, as discussed in Section 4, the share of new dwellings in total transactions is relatively small and varies between countries and so is not necessarily a good weight for the overall index. Moreover, gross fixed capital formation excludes the value of land, which is a non-produced asset. An alternative proxy is to use the number of transactions, with the caveats mentioned before. For all transaction weights, distortion of the weights by one-off influences must be avoided and multi-period averages are preferable to weights for one single period.

The harmonised weighting scheme most relevant for a stock-weighted index, the national accounts balance sheets (according to European System of Accounts (ESA95) definitions), is only available for three euro area countries. The national accounts balance sheets give the current replacement costs of the stock of dwellings, excluding land and including a breakdown by institutional sector. Although the exclusion of land is a disadvantage, as differences in relative land prices between countries would not

be reflected in the weights, the national accounts balance sheets are a promising source for country weights but can only be used once they are compiled by more euro area countries.

As regards stocks, a possible proxy is the actual rents paid and imputed rents of owner-occupiers, which is available for all euro area countries except Luxembourg. The use of such data would require the assumption that the ratio of (actual + imputed) rents to residential property price levels is the same in all countries, which may not be the case due to different tax/subsidy regimes and societal preferences regarding home ownership. As regards "volume" or non-monetary weights, the data on number of transactions are available for euro area countries (except Spain and Austria) from the European Mortgage Federation (EMF) and the data on number of houses in the total stock area are available for all countries from the decennial Census of Population and Housing. The EMF transaction data are non-harmonised and so are not strictly comparable: some countries include, for instance, commercial properties, others exclude new dwellings or own constructions. Data on the number of houses in the stock of dwellings from the censuses come from national statistical institutes, are of good quality and are generally comparable. Unfortunately data from the 2001 census had not yet been published for all countries at the time of writing and so the 1991 round provided the latest available information. Finally, population data may be considered a proxy to a volume-based measure of the stock of dwellings. In practice it is often used to weight detailed regional data, presumably mainly due to the lack of more appropriate regional weighting indicators.

An important point is that, of all the potential data sets mentioned in this section, only gross fixed capital formation in housing, possibly used together with data on national accounts balance sheets, could provide a coherent breakdown between new and existing dwellings at the euro area level. All other data discussed would only provide weights for an overall index.

#### 5.4 What is the effect of different weighting schemes on the euro area aggregate?

Having given an overview of the available data, this section looks at the effect of some of the potential weighting schemes on the euro area aggregate.

Table 3  
Possible country weighting schemes  
for the euro area aggregate

Euro area = 100

	No of transactions <sup>1</sup> (1995-97)	Housing stock (census data 1991)	Actual + imputed rents (2001)	Gross fixed capital formation in housing (1999-2001)	GDP (2001)	Population (2001)
BE	3.5	3.1	3.8	3.0	3.7	3.4
DE	18.2	26.6	34.7	38.8	30.3	26.9
GR	2.5	3.6	2.2	1.7	1.9	3.6
ES	13.4	13.4	6.9	9.5	9.5	13.1
FR	24.4	20.4	22.9	16.6	21.6	19.9
IE	2.2	0.8	1.5	2.4	1.7	1.3
IT	18.1	19.5	17.0	14.3	17.8	18.9
LU	0.1	0.1	0.0	0.2	0.3	0.1
NL	8.9	4.8	5.0	6.8	6.3	5.2
AT	2.6	2.6	2.5	3.1	3.1	2.7
PT	3.3	3.3	1.0	1.8	1.8	3.4
FI	2.8	1.7	2.5	1.9	2.0	1.7

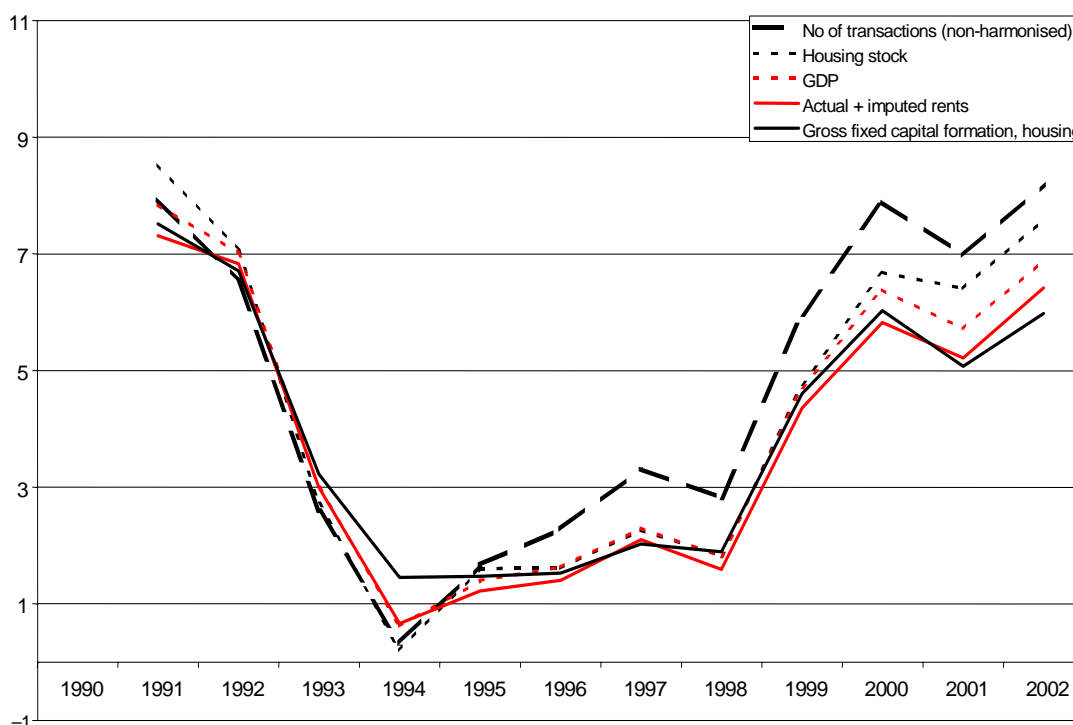
<sup>1</sup> Data from the European Mortgage Federation. Figures for Spain, Austria and Portugal estimated using data on housing stock.

Sources: ECB; EMF; Eurostat; national sources.

Table 3 shows the country shares in the euro area. For the more volatile data (transactions and gross fixed capital formation in housing), a three-year average was taken for the most recent available data; otherwise 2001 data are used with the exception of the housing stock, for which 2001 data are not yet available. The data show both marked differences and similarities in different parts of the table. Regarding their weight in the euro area aggregate, the most significant difference is between different weights for Germany, ranging from 18 to 39% in the euro area aggregate.

Graph 5 shows the results of applying these different weighting schemes to the same set of national data in order to calculate euro area totals. National contributions to the euro area figures for 1992 and 2002 are shown in Annex 3. The results are generally very similar, especially using GDP, actual and imputed rents and the housing stock weights. The aggregate weighted by the number of transactions is relatively similar until 1994 and then deviates and remains consistently higher than the other aggregates. This is mainly explained by the behaviour of the German data, which is similar to the euro area average until 1995 and then drops significantly below (the difference between the annual growth rates was 7 percentage points in 2002). As Germany has a particularly low share in the transaction weights, the transaction-weighted euro area aggregate is higher than all other aggregates. Also important is the effect of different weighting sets for Spain, because after 1998 the annual increases are significantly higher than the euro area average.

Graph 5  
**Euro area residential property price indices using different weighting schemes**  
 Annual changes, in per cent



Source: ECB.

The tables in Annex 3 demonstrate that there are, in some cases, considerable differences in the national contributions under different weighting schemes, but that the cancelling effect means the overall aggregate is often unaffected (eg in 1992). However, where the effects of divergent national growth rates and differences in the weights work in the same direction, as in 2002, the effects are more significant, leading to a difference of up to 2.2 percentage points.

It seems that the choice between the available weighting schemes is more important for the magnitude of the rate of change than the trend. However, as the differences in the magnitude of the rate of change can be significant, the question remains: which weighting scheme should be used in the euro area aggregate? Given the low quality of the data on the number of transactions, and given that this is a basic volume measure rather than the desired nominal measure, we conclude not to use these weights. Gross fixed capital formation in housing provides good-quality harmonised data; however, the fact that it applies only to new dwellings and excludes land prices means it is rather too far from the required measure. Moreover, it tends to be volatile. The remaining three measures produce the closest results, as shown in Graph 5. Both the housing stock and actual + imputed rents differ from the desired measure and, given that GDP falls between the two, we may pragmatically conclude that the existing GDP-weighted index is an acceptable solution given the available data.

## 6. Conclusions

The euro area residential property price index compiled by the ECB is a useful indicator for economic analysis. However, as an aggregate of non-harmonised national indicators it can only be regarded as an estimate of the general trend in price developments. There are substantial differences between the current national sources used and these differences can be assumed to have a greater impact on the resulting aggregate than those found in other non-harmonised euro area statistics. Moreover, the national data are often only broad proxies for the national price developments. In the absence of better quality harmonised indicators, it is difficult to precisely assess the reliability of the current index. Evidence from comparing available national sources suggests that the criteria used for selecting national components into the aggregate, namely breadth of geographical and market coverage, sophistication of quality adjustment, and reliability of source data, are correct. However, in many cases the choice is limited to series which fall considerably short of the targeted definition and quality requirements. For this reason the index may best be used to analyse trend developments, but both *smaller* short-term (annual) *changes* in the index and the *level* of the annual *growth rates* have to be treated with a considerable degree of caution. Work is also needed to increase the periodicity of the euro area index to quarterly, which requires higher-frequency data for Germany and Italy.

For the aggregation of the data into a euro area indicator, there is more than one variant which may provide a valid result. In practice, the choice of available weighting schemes is limited and in no case provides an ideal solution. For an inflation index nominal weights should be used, but whether they refer to the flow of transactions or the stock of dwellings depends on the final purpose of the index. Increased country coverage of national accounts balance sheets may provide an appropriate answer in the medium term. Simulations with available data suggest that a properly measured weighting scheme would produce quite different results depending on this decision, especially with regard to the relative share of new and existing dwellings in the overall index. Given the unsatisfactory characteristics of the alternatives, it is suggested to continue using GDP weights until a more appropriate harmonised data set becomes available.

**Annex 1:  
Overview of national series used in the ECB  
euro area residential property price indicator (overall index)**

Country (GDP weight)	Frequency	Timeliness	Data source	Dwelling type	Geographical coverage	Cash/ mortgages	Quality adjustment	Regional weighting
BE (3.8%)	Quarterly	5-6 months	Mortgage bank	Existing small/ medium-sized dwellings	Whole country	Mortgages only	...	...
DE (30.3%)	Annual	3 months	Research institute/central bank	Separate series for new/existing terraced houses and flats	60 cities	Both	Flats: price per square metre; Terraced houses: only of about 100 square metres, medium to good areas	Population
GR (1.9%)	Quarterly	5 months	Research institute/central bank	All dwellings	Urban areas	Both	Price per square metre	Size of dwelling stock
ES (9.5%)	Quarterly	3 months	Government	All dwellings except subsidised dwellings	Whole country	Mortgages only	Price per square metre, subindices by postcode	Population
FR (21.5%)	Quarterly	5 months	Notary/NSI	Existing dwellings	Whole country	Both	Hedonic regression (surface area, number of rooms, bathrooms, age, garage, parking, size of plot and others)	Transaction values
IE (1.7%)	Quarterly	3 months	Government	New and existing dwellings (separate series)	Whole country	Mortgages only	None (unit values)	...
IT (17.9%)	Semiannual	1 month	Newspaper/ central bank	New and existing dwellings (separate series)	96 provincial capitals	Both	Price per square metre; according to proximity to city centre	Size of dwelling stock
LU (0.3%)	Annual	19 months	Central bank/ NSI	Dwellings built after 1944	Whole country	Both	None (unit values)	None

**Annex 1 (cont):  
Overview of national series used in the ECB  
euro area residential property price indicator (overall index)**

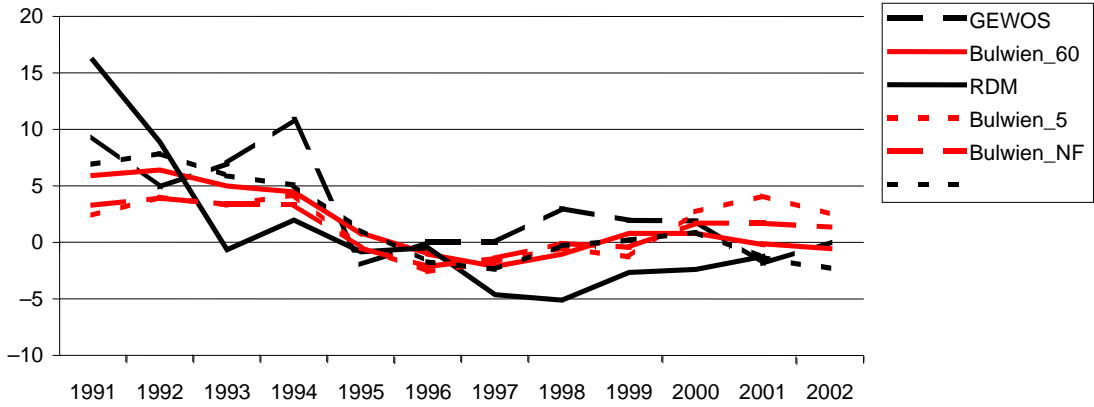
<b>Country (GDP weight)</b>	<b>Frequency</b>	<b>Timeliness</b>	<b>Data source</b>	<b>Dwelling type</b>	<b>Geographical coverage</b>	<b>Cash/ mortgages</b>	<b>Quality adjustment</b>	<b>Regional weighting</b>
NL (6.2%)	Monthly	1 month	Land registry/ central bank	Existing dwellings	Whole country	Both	None (unit values)	None
AT (3.1%)	Semiannual	1 month	Estate agents/ university	All dwellings	Whole country (since 2000), Vienna only (since 1987)	Both	Price per square metre	...
PT (1.8%)	Monthly	1 month	Real estate newspaper/ central bank	All dwellings	30 large/medium- sized towns	Both	Price per square metre	...
FI (2.0%)	Quarterly	1 month	Administrative data	Existing dwellings	Whole country	Both	Hedonic regression (floor size, age, number of rooms, location) and classification approach combined	Dwelling stock (number of houses per cell)



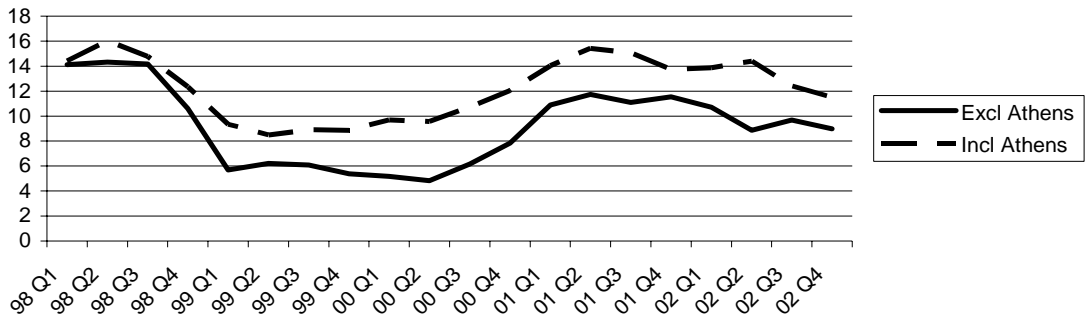
## Annex 2: Alternative national series

Annual changes, in per cent  
(for series description see below)

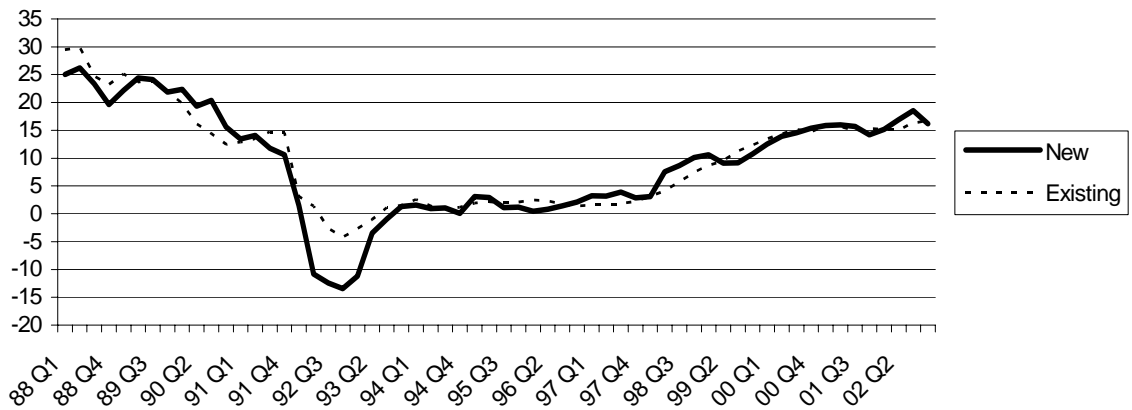
### Germany



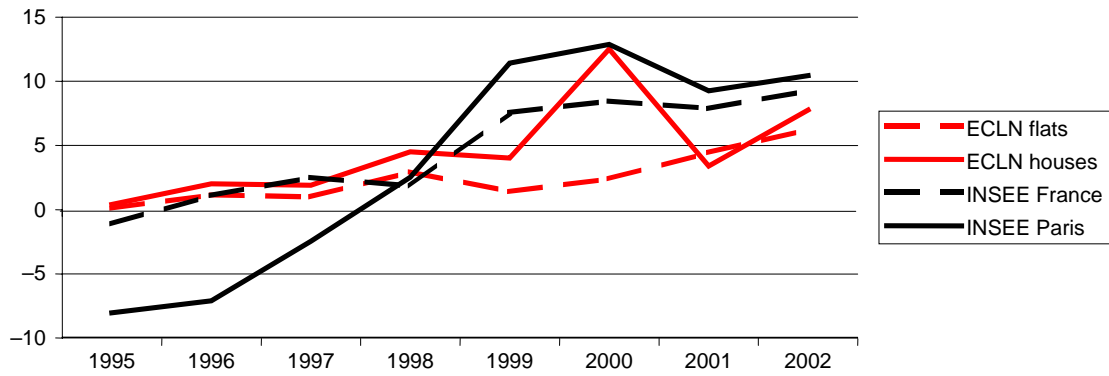
### Greece



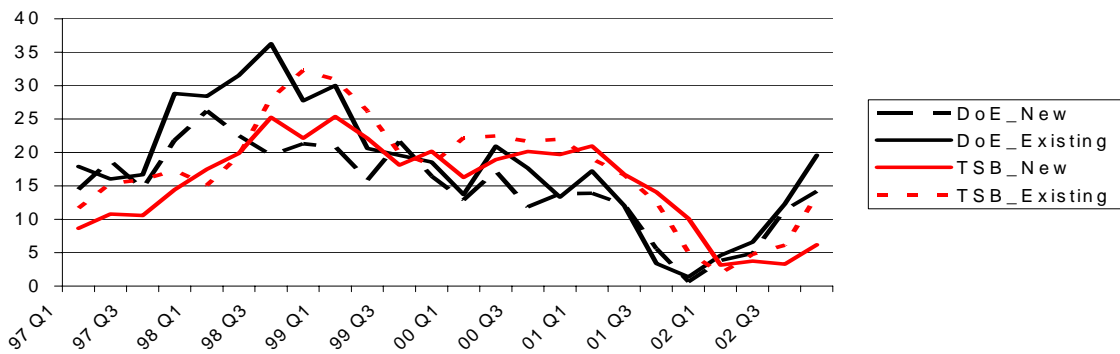
### Spain



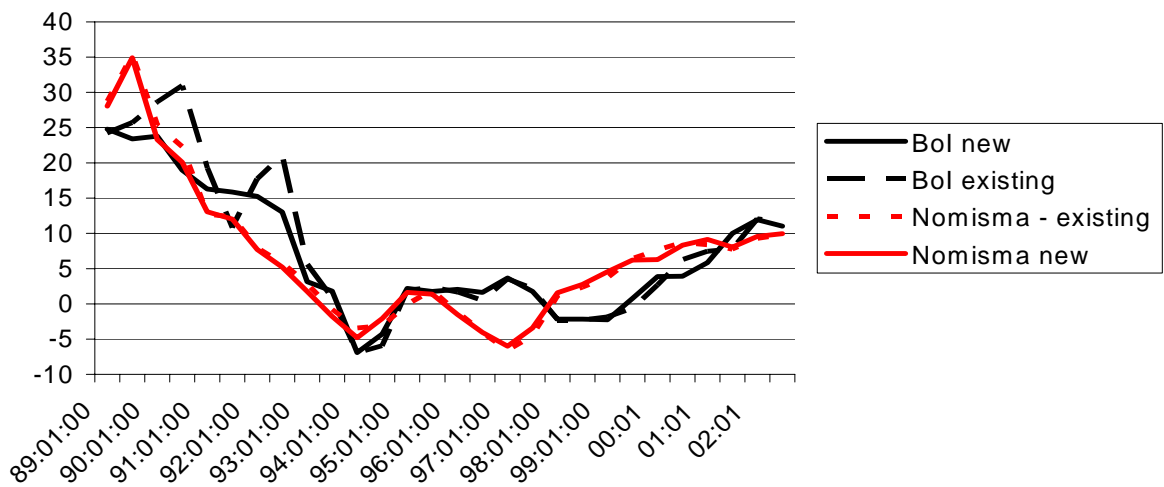
### France



### Ireland



### Italy



## Description of the national series used above

Germany (from 1995, whole of Germany, to 1994, West Germany)

- Bulwien 60 - new and existing dwellings - average of 60 cities - series used in the ECB euro area aggregate, described in Annex 1. Source: Bulwien AG.
- Bulwien 5 - new and existing dwellings - average of largest five cities (Berlin, Hamburg, Munich, Cologne, Frankfurt). Source: Bulwien AG.
- Bulwien NF - new flats - average of 60 cities. Source: Bulwien AG.
- Bulwien EH - existing flats - average of 60 cities. Source: Bulwien AG.
- RDM - average of five largest cities, previously used in BIS *Annual Report*. Source: Ring Deutscher Makler (real estate federation).
- GEWOS - average prices for houses and flats, whole country. Source: GEWOS (Hamburger Institut für Stadt-, Regional- und Wohnforschung GmbH).

Greece

- Excl Athens - new and existing dwellings in 15 cities excluding Athens. Source: Bank of Greece.
- Incl Athens - aggregation of Excl Athens series, with a series from a private research institute for Athens. Source: Bank of Greece.

Spain

- New - dwellings less than one year old. Source: Ministerio de Fomento.
- Existing - dwellings older than one year. Source: Ministerio de Fomento.

France

- ECLN Flats - new flats excluding own construction. Source: Ministry of Equipment.
- ECLN Houses - new houses excluding own construction. Source: Ministry of Equipment.
- INSEE France - existing dwellings sold in whole of France. Source: INSEE/notaires.
- INSEE Paris - existing dwellings sold in Paris. Source: INSEE/notaires.

Ireland

- DoE New - new dwellings (all mortgage transactions). Source: Department of the Environment.
- DoE Existing - existing dwellings (all mortgage transactions). Source: Department of the Environment.
- TSB New - new dwellings (mortgage transactions financed by TSB Permanent. Source: TSB Permanent (mortgage bank).
- TSB Existing - existing dwellings (mortgage transactions financed by TSB Permanent. Source: TSB Permanent (mortgage bank).

Italy

- Bol New - new dwellings, 96 cities. Source: Bank of Italy based on data from Il Consulente Immobiliare.
- Bol Existing - existing dwellings, 96 cities. Source: Bank of Italy based on data from Il Consulente Immobiliare.
- Nomisma New - new dwellings, 13 largest cities. Source: Nomisma (private research institute).
- Nomisma Existing - existing dwellings, 13 largest cities. Source: Nomisma (private research institute).

**Annex 3:**  
**Contribution of national data to the euro area  
 aggregate under different weighting schemes**

Table 1

**Contributions to the annual percentage  
 change for the year 1992**

	National data (annual change, in per cent)	Weighting scheme used					
		No of transactions (EMF)	Housing stock (census data)	Actual + imputed rents	Gross fixed capital formation in housing	GDP (market exchange rates)	Population
DE	6.2	1.1	1.7	2.2	2.4	1.9	1.7
ES	-1.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2
FR	2.5	0.6	0.5	0.6	0.4	0.5	0.5
IT	19.4	3.6	3.9	3.4	2.8	3.5	3.8
NL	8.4	0.8	0.4	0.4	0.6	0.5	0.5
Others	.	0.6	0.7	0.4	0.6	0.6	0.7
Euro area	.	6.5	7.1	6.8	6.7	7.0	7.0

Source: ECB calculations.

Table 2

**Contributions to the annual percentage  
 change for the year 2002**

	National data (annual change, in per cent)	Weighting scheme used					
		No of transactions (EMF)	Housing stock (census data)	Actual + imputed rents	Gross fixed capital formation in housing	GDP (market exchange rates)	Population
DE	-0.2	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
ES	16.6	2.2	2.2	1.1	1.6	1.6	2.2
FR	9.3	2.3	1.9	2.1	1.5	2.0	1.8
IT	11.9	2.2	2.3	2.0	1.7	2.1	2.2
NL	6.2	0.6	0.3	0.3	0.4	0.4	0.3
Others	.	1.0	0.9	0.9	0.8	0.8	1.0
Euro area	.	8.2	7.6	6.4	6.0	6.9	7.5

Source: ECB calculations.

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# Experience with constructing composite asset price indices

Stephan V Arthur<sup>1</sup>

The Bank for International Settlements has variously published, over the past decade, papers where use is made of its aggregate asset price indices for over a dozen industrial countries. This paper explains the methodology used and recent changes in that methodology as well the extended country coverage.

## Introduction

Following preliminary work done by the BIS in 1992, Borio et al published a paper exploring aggregate asset price fluctuations across different countries in 1994.<sup>2</sup> One of the objectives of the paper was to develop an aggregate asset price index for several of the major industrialised countries,<sup>3</sup> thereby summarising the information contained in the separate movements of the three asset prices - equities and residential and commercial real estate - exhibiting major fluctuations. The intention was that such an index would facilitate comparison of broad asset price movements over time and across countries, give some empirical content to notions of general asset price “inflation” and “deflation” and highlight patterns of behaviour that would otherwise remain undetected. The paper also provided a first analysis of the possible determinants of movements in the index as well as preliminary evidence on the usefulness of such an index as an input in the design of monetary policy. Their work has since become seminal and has spawned much research in other institutions. More recently, in work done within the Bank, the index of aggregate asset prices has been included in a set of indicators that attempt to predict financial crises. This note explains the original methodology used by Borio et al to construct aggregate asset prices and documents how the methodology has been adapted over time.

## The aggregate asset price index

The aggregate asset price index (AAPI) was defined as being a weighted average of national price indices for equities and residential and commercial real estate, since these make up the majority of private sector wealth.<sup>4</sup> Although a simple (unweighted) average would have been a possibility,<sup>5</sup> a weighted average, where the weights represent estimates of the (normalised) shares of those assets in total private sector wealth, was seen to be more relevant.

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<sup>2</sup> C E V Borio, N Kennedy and S D Prowse (1994): “Exploring aggregate asset price fluctuations across countries: measurement, determinants and monetary policy implications”, *BIS Economic Papers*, no 40, April.

<sup>3</sup> Australia, Belgium, Canada, Denmark, Finland, France, Germany, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States.

<sup>4</sup> For those countries where balance-sheet data are available, this amounts to over 80% of the total. Although private sector holdings of government and other bonds are not insignificant, their prices vary little, and would tend only to dampen an aggregate in which they were included. In addition, as their *price* (but not, of course, their *return*) plays no role in monetary policy, bond prices were excluded from an AAPI.

<sup>5</sup> Indeed, as will be shown later, within a limited range, the weighting pattern used affects the aggregate index little.

The frequency of the three national price indices used varies considerably. Equity indices are available electronically on a daily basis<sup>6</sup> and, in several countries, several series can be, for one purpose or another, be considered “representative”. Residential property prices are generally disseminated on a quarterly basis, although a few countries publish monthly data; several industrial countries, however, are still only able to provide lower-frequency data,<sup>7</sup> while data from emerging market economies, in particular, is often rudimentary and, almost by definition, annual. Commercial property prices are typically annual, but there are some isolated instances of quarterly availability; most data are collected and provided as “spin-offs” for business purposes and will vary greatly in coverage.<sup>8</sup> Annual national<sup>9</sup> balance-sheet information was used to establish the weighting pattern, so that Borio et al originally restricted their data to the same frequency. Recently, work has been done to construct, for those countries where data availability allows, a quarterly AAPI.<sup>10</sup>

## Nominal and inflation-adjusted

An AAPI in nominal terms is only of limited use, and especially so when the inclusion of high-inflation countries or periods is considered. Consequently, the AAPI was deflated by consumer prices, and it is this inflation-adjusted AAPI which was used by Borio et al in their various papers, especially in the areas discussing monetary policy implications.

## The equations

The nominal AAPI is a simple weighted average of the form:

$$\sum w(a_t) p(a_t) \tag{1}$$

for  $a = 1, 2, 3$ , and  $\sum w(a_t) = 1$ , where  $p$  is the price index of asset  $a$  at time  $t$  and  $w$  the corresponding weight. The weights were allowed to vary over time to capture significant changes in the composition of the portfolio, but intervals of five years were taken to reduce noise. The inflation-adjusted AAPI is a simple variant of this equation, taking the form:

$$\sum w(a_t) p(a_t)/i(a_t) \tag{2}$$

for  $a = 1, 2, 3$ , and  $\sum w(a_t) = 1$ , where  $i$  is the price deflator as measured by nationwide consumer (or retail) prices.

## The individual components

*Equity prices.* Data availability for equities provided the least problem: more so was the “correct” choice of index. As, however, the long-term trends varied little between indices purporting to be “general” or “total” within a country, recognised indices were taken in favour of, possibly, lesser known ones.<sup>11</sup> The additional criterion of creating an index back to (at least) 1970 also governed, in several cases, the choice of index.

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<sup>6</sup> And, increasingly, on a tick-by-tick basis.

<sup>7</sup> For example, France, Germany, Italy and Japan.

<sup>8</sup> For example, commercial data providers like Investment Property Databank or private real estate associations like Jones Lang LaSalle.

<sup>9</sup> And, where this was not available, the UN System of National Accounts (see below).

<sup>10</sup> Annual wealth data do not prove to be a problem, since the distribution across asset classes changes only slowly and simple interpolation techniques can be used.

<sup>11</sup> Ie for the United States, Standard and Poor’s 500 Composite rather than the Wilshire 5000.

*Residential property prices.* The above was equally true, but far less frequently, when a choice was possible for residential property prices. As the focus on the construction of an AAPI was, and is, to obtain an indicator for the whole economy, country-wide indices were used whenever possible and were given precedence if “splicing” (with, for example, a discontinued series) was required. This was and remains a challenge when trying to create such an index for additional countries, especially emerging markets, or when trying to “fine-tune” an existing index. In the case of residential real estate, nationwide indices were available for all countries except Germany,<sup>12</sup> since replaced.<sup>13</sup>

*Commercial property prices.* Country-wide commercial property price indices were, however, unavailable at the time for a number of industrial economies,<sup>14</sup> being based solely on data referring to the capital city. The problem was further exacerbated in that, for several countries, the data referred to a particular, and by nature volatile, subset: the (capital) value of prime property in the capital’s centre. Although the situation has since improved somewhat, nationwide data now available indicate that a commercial property price index typically has 80% of the total drawn from property in that country’s capital. Fortunately, the share of commercial property in total private sector wealth is only 5-20%, so that its influence on the AAPI was fairly minor. This, of course, is especially true as long as price developments in the three asset classes were more or less synchronised, and this was indeed the case for the period which Borio et al originally considered. However, almost immediately after publication of their 1994 paper, this co-movement largely disappeared (see Graphs 2 and 4) and would provide the basis for further research.

## The weighting pattern

In order to calculate the weights, Borio et al used the private sector balance sheets in the national flow of funds accounts for Australia, Canada, Japan, the United Kingdom and the United States, and a combination of the data from the United Nations System of National Accounts (SNA) 1968<sup>15</sup> and the OECD Financial Statistics (Part 2) for Finland, (western) Germany and Sweden. They applied the same weighting pattern as Germany for Belgium, France and the Netherlands, and the Swedish weighting pattern for Denmark and Norway.

The calculation of the weights involved two steps: the first, and by far the most important (and difficult) was to identify and estimate the proportions of the three asset categories. The second was to eliminate any “double-counting” that may arise from the fact that listed companies themselves own commercial real estate, thus simultaneously changing both the price of equity and commercial property. It is difficult to obtain reliable estimates of the proportion (denoted by Borio et al as  $\alpha$ ) of total commercial property held by listed companies. Callen (1991)<sup>16</sup> had estimated this proportion to be 0.6 for Australia, while Borio et al found a value of 0.68 for the United States from flow of funds data. They assumed a similar value for the United Kingdom, one equal to the Australian ratio for Japan, and 0.5 for the other economies, where it was reasoned that their stock markets were rather less capitalised. Based on this proportion, a “net” commercial property weight was calculated, and the three components were normalised to unity. In the early part of the period under review, not all weights (largely those for commercial property) were available, so that only the two remaining components were normalised to unity (ie the weight for commercial property was set to zero). Co-movement of the indices, as mentioned earlier, supported this decision.

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<sup>12</sup> Where an unweighted average of prices in (west) Berlin, Frankfurt, Hamburg and Munich was calculated. In fairness, detailed documentation is not always available for other countries, so that similar restrictions may also apply elsewhere. In addition, both Australia and Italy construct an index from a relatively small number of cities, but both are, at least, weighted averages.

<sup>13</sup> By a series calculated by the Bundesbank, based on data, provided by Bulwien AG, from 60 cities.

<sup>14</sup> For example, Australia, Belgium, Finland, France, the Netherlands and Norway.

<sup>15</sup> Which they erroneously refer to as the Standardised National Accounts.

<sup>16</sup> T Callen (1991): “Estimates of private sector wealth”, *Research Discussion Paper* 9109, Reserve Bank of Australia, October.



## The results

Results obtained at the time can only be viewed in Borio et al's paper, as the country coverage has since been extended and the methodology slightly modified (see below). Graphs 1-4 in the Appendix illustrate the results of present-day calculations but differ little for the countries and period covered in 1994: Graphs 1 and 3 plot the AAPI in nominal and inflation-adjusted terms respectively, while Graphs 2 and 4 show, in addition, the individual asset classes for each country.

## Statistical work done at the BIS since 1994

*Changes to the equations.* Following the significant increase in equity prices, and the equivalent expansion in the private sector's equity holdings, in most countries from around the mid-1990s, it became clear that an AAPI was going to be increasingly driven and overshadowed by its equity component. Not only would the relative price of equity increase, but also its weight in private sector wealth. It was therefore agreed that a geometric weighting scheme, which, unlike an arithmetic weighting scheme, was index-level independent, would be preferable and would "dampen" indices that appeared to be historically high due to the choice of base year.<sup>17</sup> Consequently, the nominal and inflation-adjusted indices now take the form:

$$\prod w(a_t) p(a_t) \quad (3)$$

for  $a = 1, 2, 3$ , and  $\sum w(a_t) = 1$ ,

which is equivalent to:

$$\exp \sum w(a_t) \ln p(a_t) \quad (4)$$

and:

$$\prod w(a_t) p(a_t)/i(a_t) \quad (5)$$

for  $a = 1, 2, 3$ , and  $\sum w(a_t) = 1$ ,

which is equivalent to:

$$\exp \sum w(a_t) \ln (p(a_t)/i(a_t)) \quad (6)$$

A further change was the use of the personal consumption deflator rather than consumer (or retail) prices, which was seen to be more relevant for private sector wealth. The differences were, however, minimal.

*Changes to the individual components.* Efforts have been made to expand the country coverage, which essentially requires research into property prices. To date, Italy, Spain and Switzerland have been added (qv Graphs 1-4) and work on Hong Kong SAR, Ireland, New Zealand, Singapore and South Africa are nearing completion.<sup>18</sup> The BIS is greatly interested in expanding its country coverage, especially for emerging markets, but is dependent on, especially, reliable property price data.

Preliminary work has also been done on calculating a quarterly AAPI to feed into a set of leading indicators to predict financial crises. However, certain assumptions have had to be made when interpolating the largely annual commercial property price data. Given that another problem with such data is cross-country comparability, a further avenue to explore would be to construct an AAPI consisting of only the two components equity and residential real estate. However, it is unclear at the moment whether such an index would remain sufficiently representative.

*Changes to the weighting pattern.* The final area in which work has been done since Borio et al's first publication is a review of the weights. First and foremost, the weights were extended to include a

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<sup>17</sup> Borio et al used 1980 as the base year, but this has been since changed to 1985.

<sup>18</sup> Although lack of data back to the 1970s will, however, result in shorter time series.

figure for the five-year period 1995-99.<sup>19</sup> Also, continued data “cleaning” revealed errors made in the original calculations affecting, especially, Japan. Of course, during a 10-year period, other changes to the base data<sup>20</sup> are inevitable, but these have had little effect; even the inclusion of former eastern Germany as from 1990 only led to a redistribution of 1 percentage point! Finally, for the additional countries, weights also had to be approximated by using those of other countries in the data set. The Table in the Appendix illustrates, for selected countries, the weights used by Borio et al and those in use at present. More work is certainly required in this area, but, since the AAPI is so dominated by the scale of price increases of its various components, applying weights intuitively makes little difference when compared with the results obtained when using the “correctly estimated” weighting pattern.<sup>21</sup>

Most recently,<sup>22</sup> the five-year weighting pattern has been replaced in favour of an annual weighting system (“moving weights”) where possible. This is clearly preferable to a stepwise change in the weights, as it eliminates the resulting “shocks” at the changeover year, and which have become increasingly apparent in recent times (see also footnote 19). Future work will need to evaluate - and find! - annual asset holdings of the private sector.

## Empirical work done at the BIS since 1994

Asset prices, especially in discussions on monetary policy, have been frequently mentioned and analysed in papers either presented at the Bank (at, for example, various conferences) or published by its economists. Worthy of particular mention, however, due to their direct bearing on the subject are the following:

- The Conference on Asset Prices and Monetary Policy organised by Centre for Economic Policy and Research and the BIS in January 1998. The conference volume's<sup>23</sup> foreword states, “The widespread liberalisation of financial markets in the 1980s has increased the interest of central banks in asset price developments in two ways. First, as the use of intermediate targets has become unreliable in many countries, central banks have sought other indicators to guide policy actions. A natural place to look has been various asset markets. Second, the greater role of asset prices in the monetary transmission mechanism, combined with their sustained volatility, has led to an increased concern that large changes in asset prices might disrupt economic activity and price stability as well as lead to financial fragility.”
- The paper by Borio and Lowe,<sup>24</sup> in which they argue that “... financial imbalances can build up in a low inflation environment and that in some circumstances it is appropriate for policy to respond to contain these imbalances. While identifying financial imbalances ex ante can be difficult, this paper presents empirical evidence that it is not impossible. In particular, sustained rapid credit growth combined with large increases in asset prices appears to increase the probability of an episode of financial instability.”

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<sup>19</sup> In reality, the same weighting pattern was used for the period 1995 to date, since a weighting scheme that would include 2000 data would have captured equity holdings at its peak. As they have since dropped sharply, such weights could therefore be considered as not representative for the period as a whole.

<sup>20</sup> For example, the introduction of the European System of Accounts (ESA) in the euro area.

<sup>21</sup> Such an argument is barely convincing to a statistician, however. It is, for example, extremely unlikely that the distribution of asset classes is similar within the German and French private sector; with an increasing country coverage, the situation will only become exacerbated.

<sup>22</sup> And since the IMF/BIS conference. Indeed, the graphs are the result of this most recent development.

<sup>23</sup> BIS (1998): “Asset prices and monetary policy: four views”, August.

<sup>24</sup> Claudio Borio and Philip Lowe (2002): “Asset prices, financial and monetary stability: exploring the nexus”, *BIS Working Papers*, no 114, July.

- The paper by Filardo,<sup>25</sup> in which he states, “The issue of monetary policy and asset prices has been receiving much attention not only because it is an interesting topic for macroeconomists but also because central banks have faced daunting challenges from large swings in various types of asset prices. To some extent, the achievement of a low, stable inflation environment has not simultaneously brought about a more stable asset price environment. The record over the past decade, in fact, has raised the prospect of asset price booms and busts as a permanent feature of the monetary policy landscape.”
- The paper by Borio and Lowe,<sup>26</sup> in which they argue, and demonstrate, “One important indicator that risk is building up is unusually sustained and rapid credit growth occurring alongside unusually sustained and large increases in asset prices (‘financial imbalances’). Building on previous work, we show that empirical proxies for financial imbalances contain useful information about subsequent banking crises, output and inflation beyond traditional two-year policy horizons.”

## Concluding remarks

Work at the BIS, and elsewhere, has indicated that aggregate asset price indices could represent a welcome addition to the set of variables considered by policymakers from the perspective of both monetary and financial stability. The index developed and currently used is far from perfect, both in terms of methodology and data availability. Such indices could, of course, be further refined and better data on their individual components, particularly residential and commercial property, would help to make the indices more relevant.

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<sup>25</sup> Andrew Filardo (2004): “Monetary policy and asset price bubbles: calibrating the monetary policy trade-offs”, *BIS Working Papers*, no 155, June.

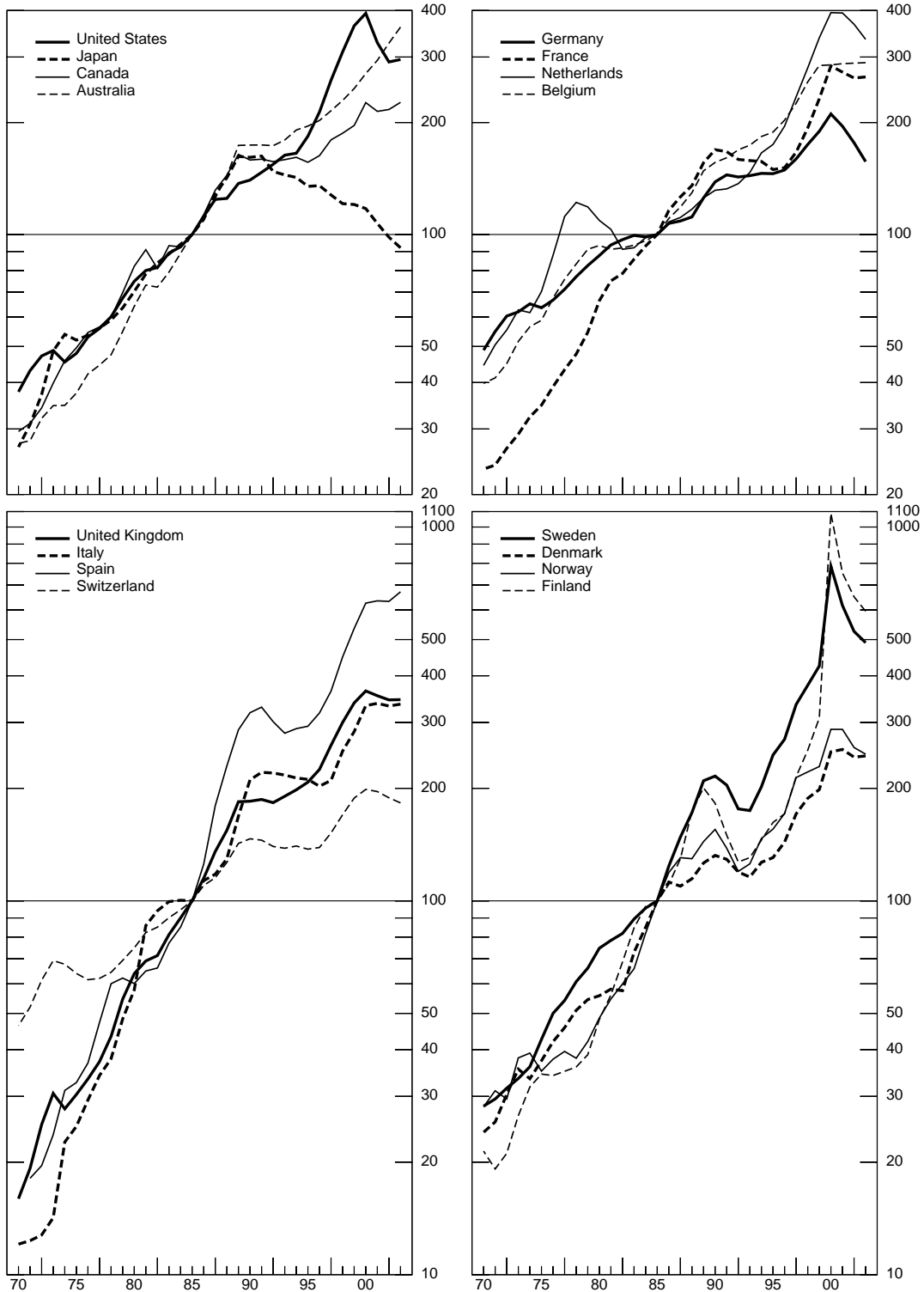
<sup>26</sup> Claudio Borio and Philip Lowe (2004): “Securing sustainable price stability: should credit come back from the wilderness?”, *BIS Working Papers*, no 157, July.

# Appendix

Graph 1

## Nominal aggregate asset prices

1985 = 100; semi-logarithmic scales

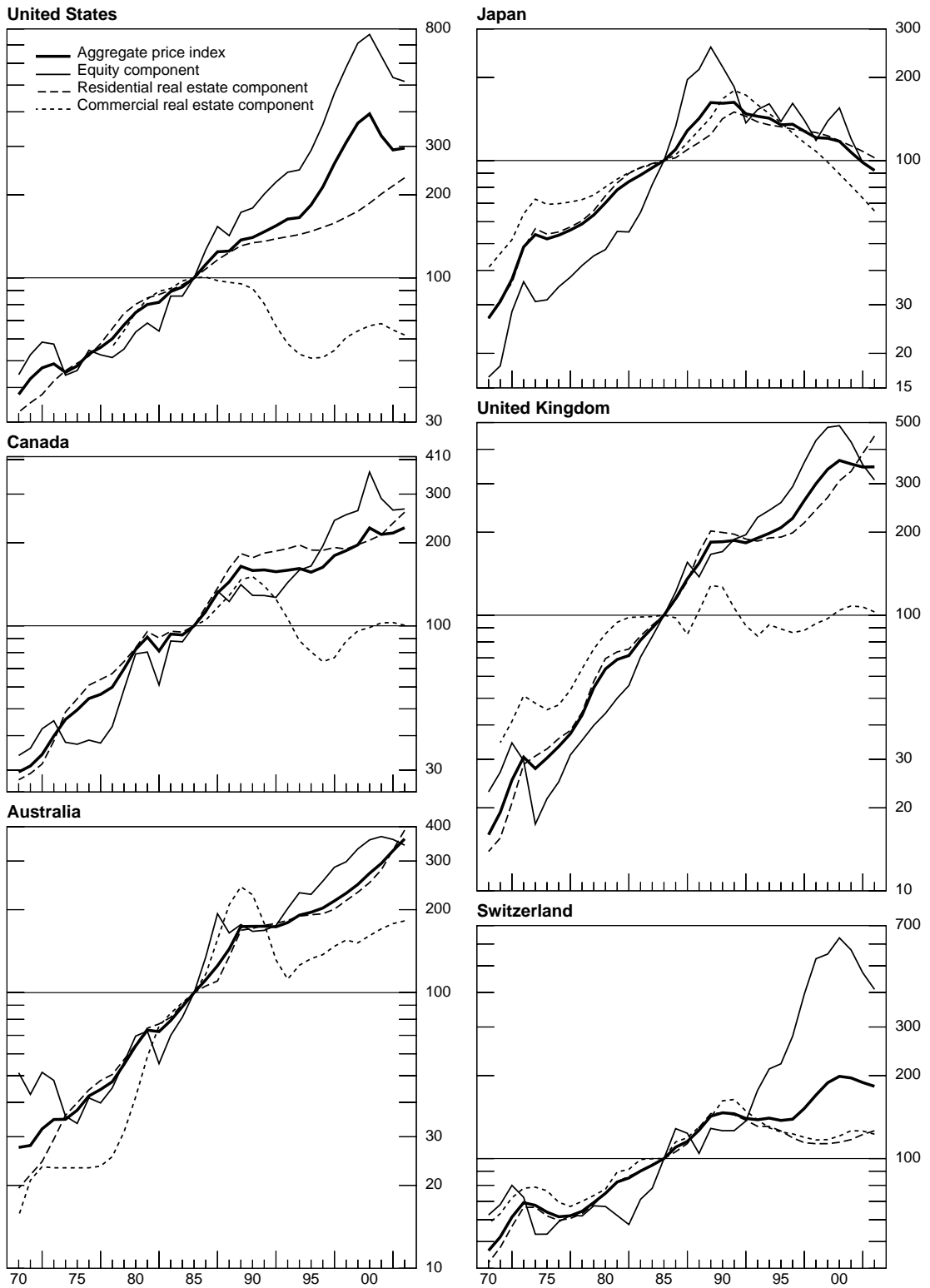


Note: For an explanation of the methodology and sources, see the notes to Graph 2.

Graph 2

**Nominal asset prices: aggregate and components**

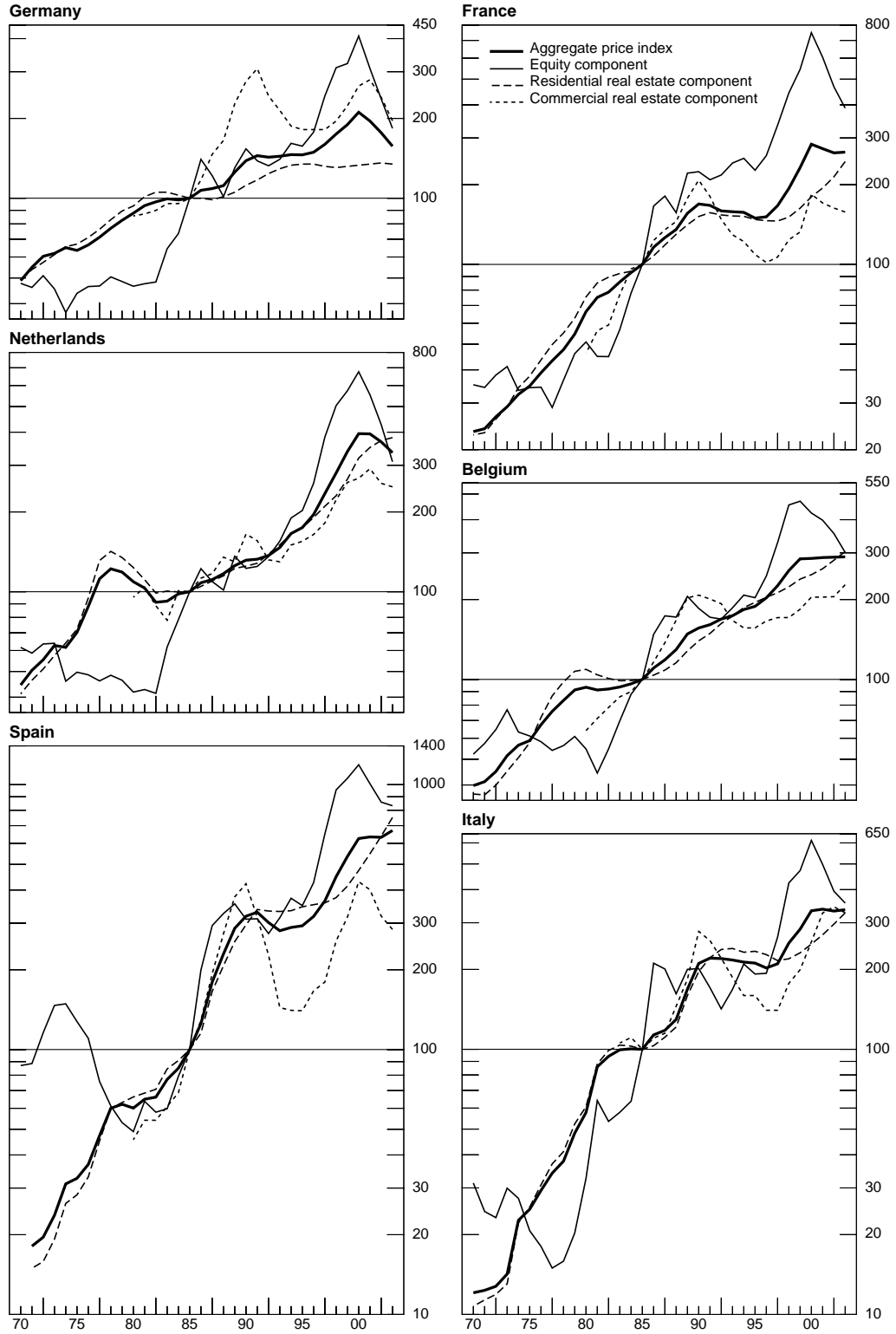
1985 = 100; semi-logarithmic scales



Graph 2 (cont)

**Nominal asset prices: aggregate and components**

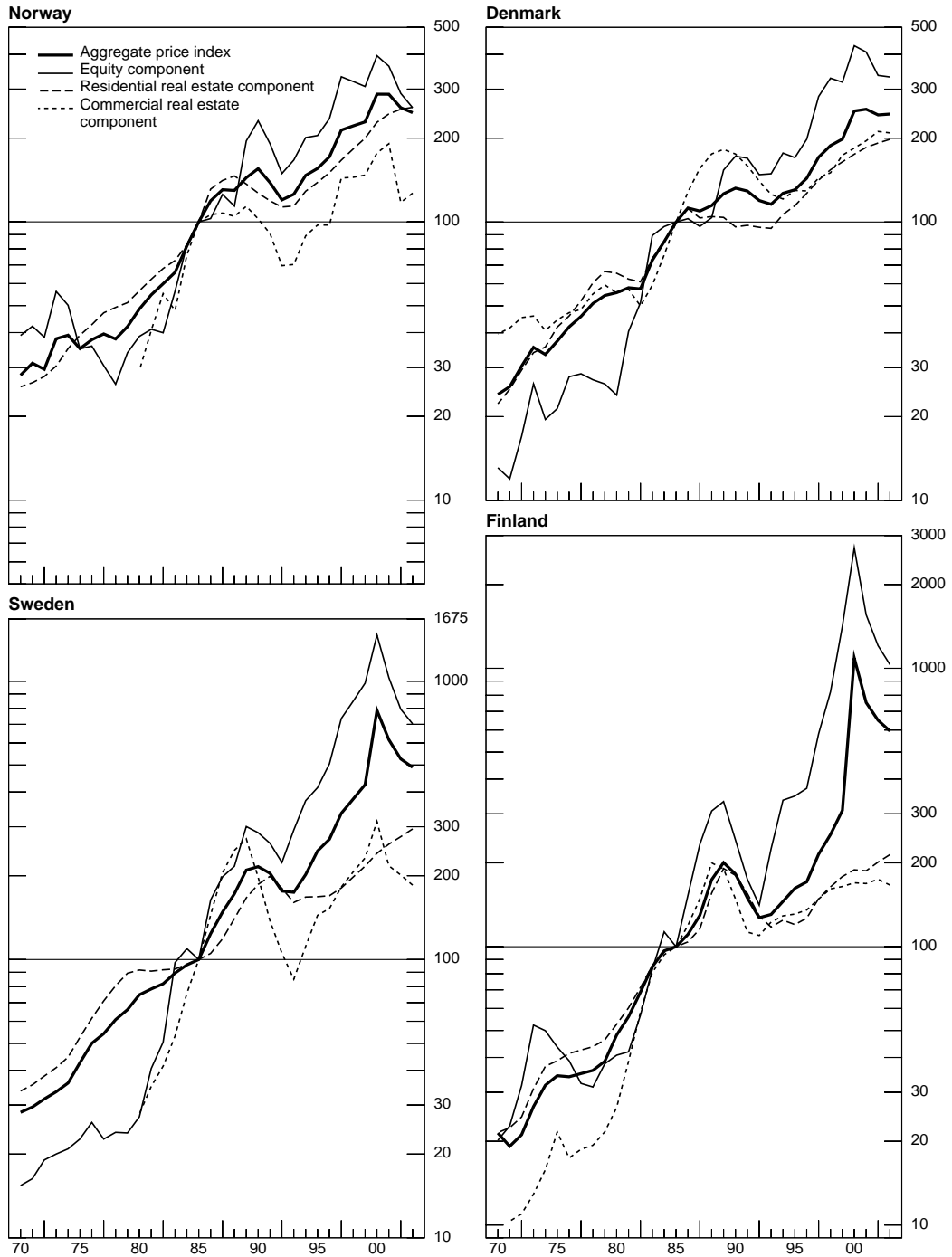
1985 = 100; semi-logarithmic scales



Graph 2 (cont)

**Nominal asset prices: aggregate and components**

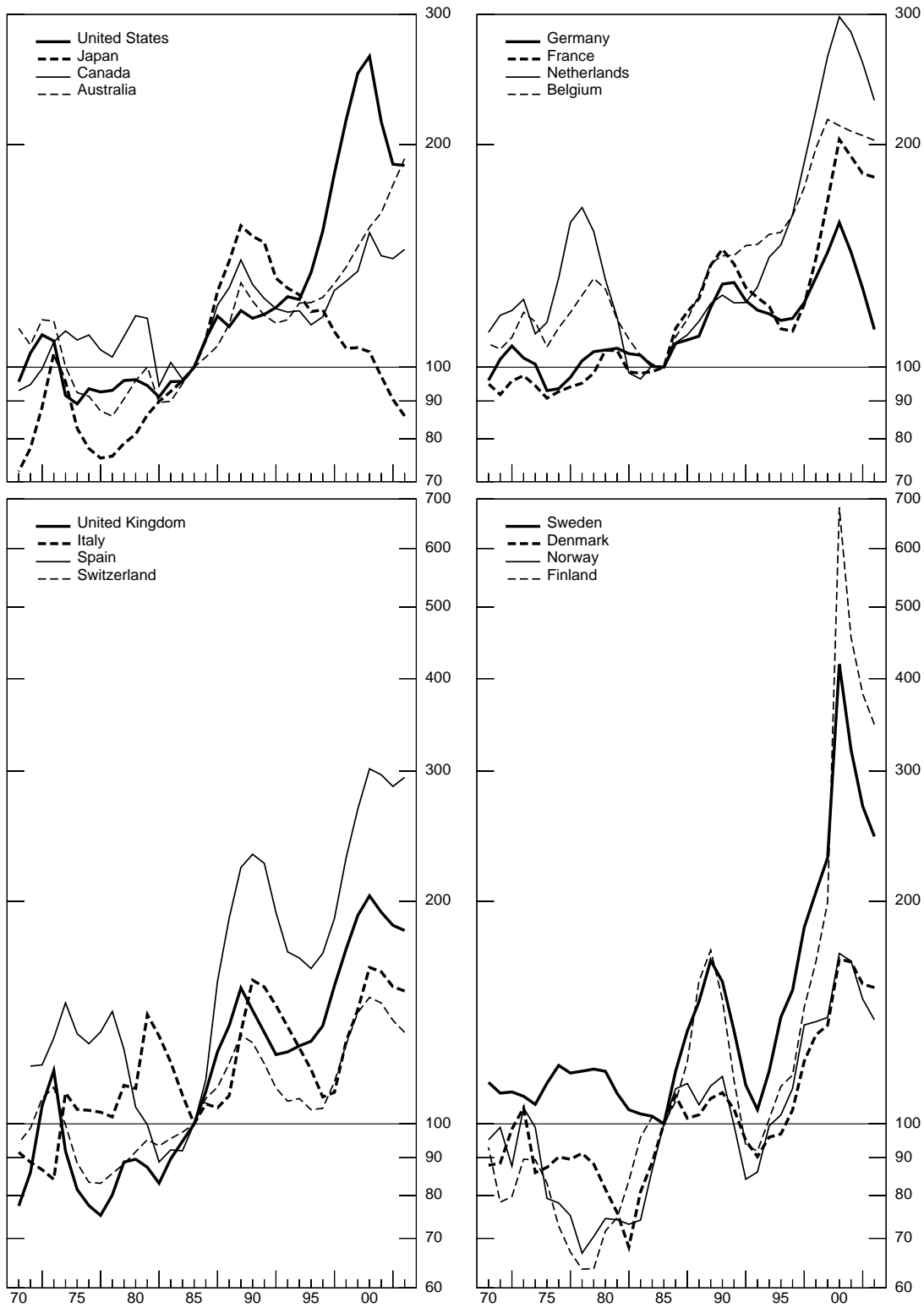
1985 = 100; semi-logarithmic scales



Notes: The aggregate price index is calculated as a weighted geometric mean of the three components. The weights are based, where available, on net wealth data, but in some cases are supplemented by the price change of each component. The calculation uses, where possible, moving weights; a five-year window, starting in 1970, is used where annual weights are not available. Where a component is not available, the geometric mean is calculated on the other two. For Belgium, France, Germany, the Netherlands, Norway and Sweden, the commercial real estate component is not shown in the 1970s as it is proprietary information.

Sources: Various private real estate associations; national data; BIS estimates and calculations.

Graph 3  
**Inflation-adjusted aggregate asset prices**  
 1985 = 100; semi-logarithmic scales



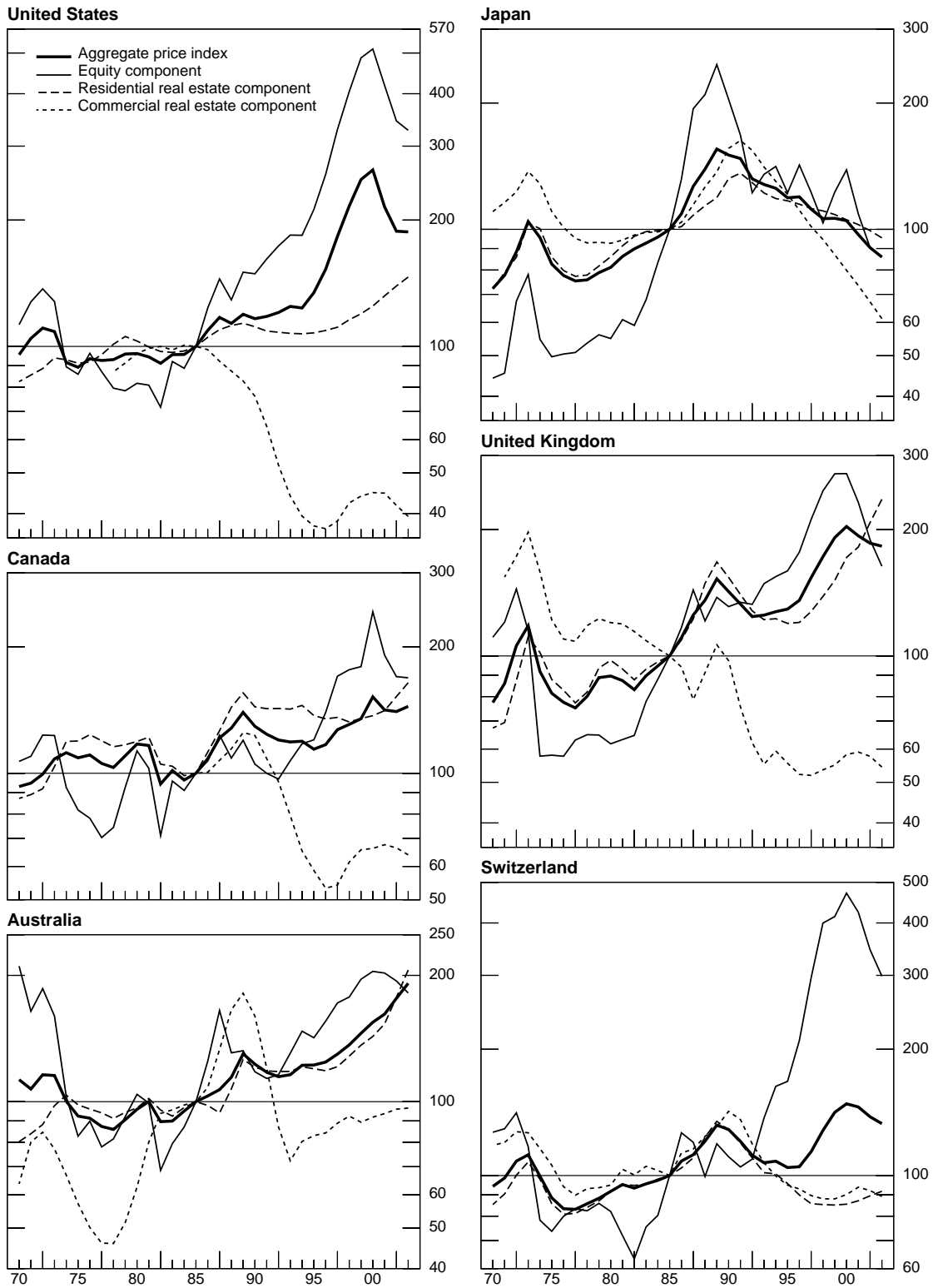
Note: For an explanation of the methodology and sources, see the notes to Graph 4.



Graph 4

**Inflation-adjusted asset prices: aggregate and components**

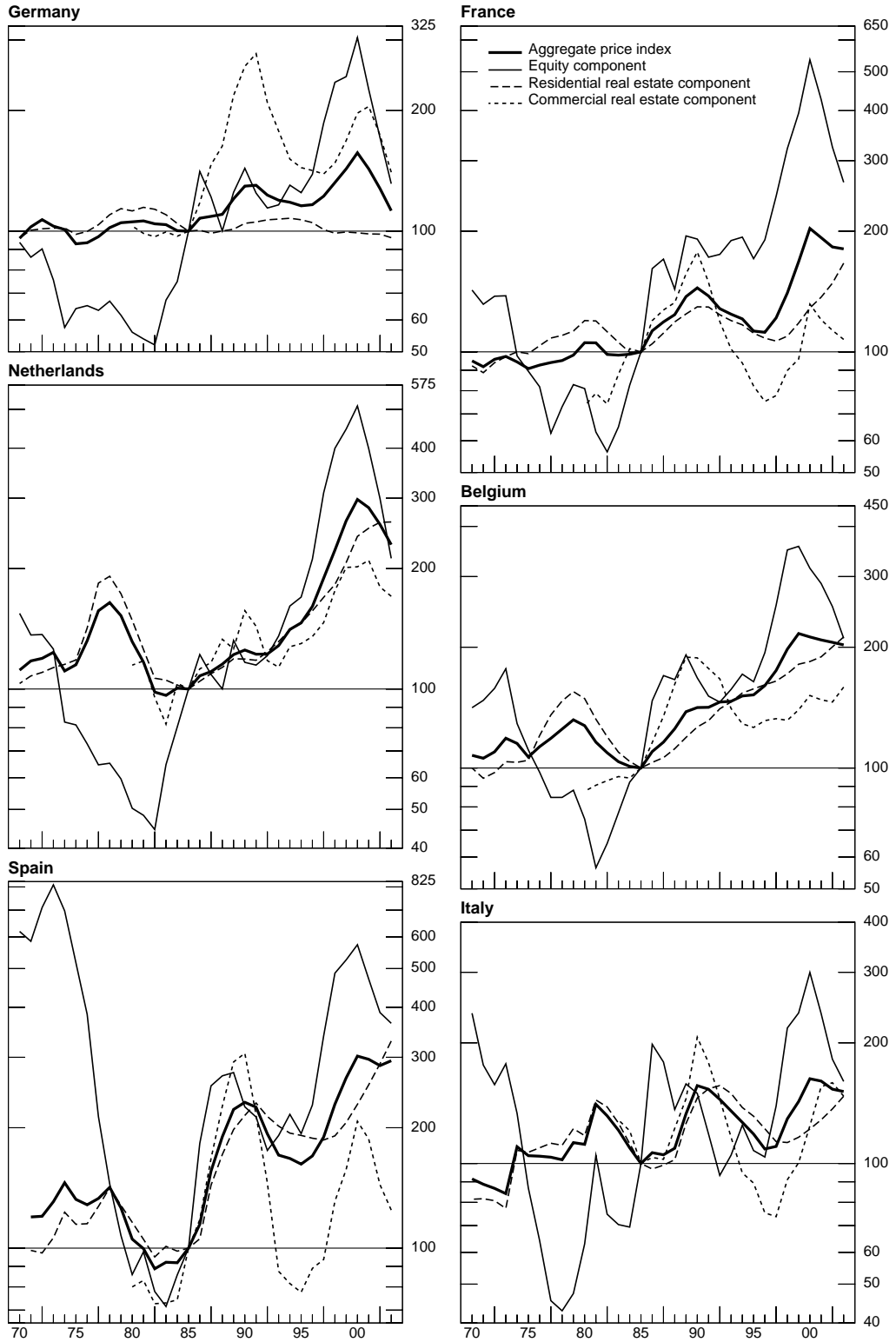
1985 = 100; semi-logarithmic scales



Graph 4 (cont)

**Inflation-adjusted asset prices: aggregate and components**

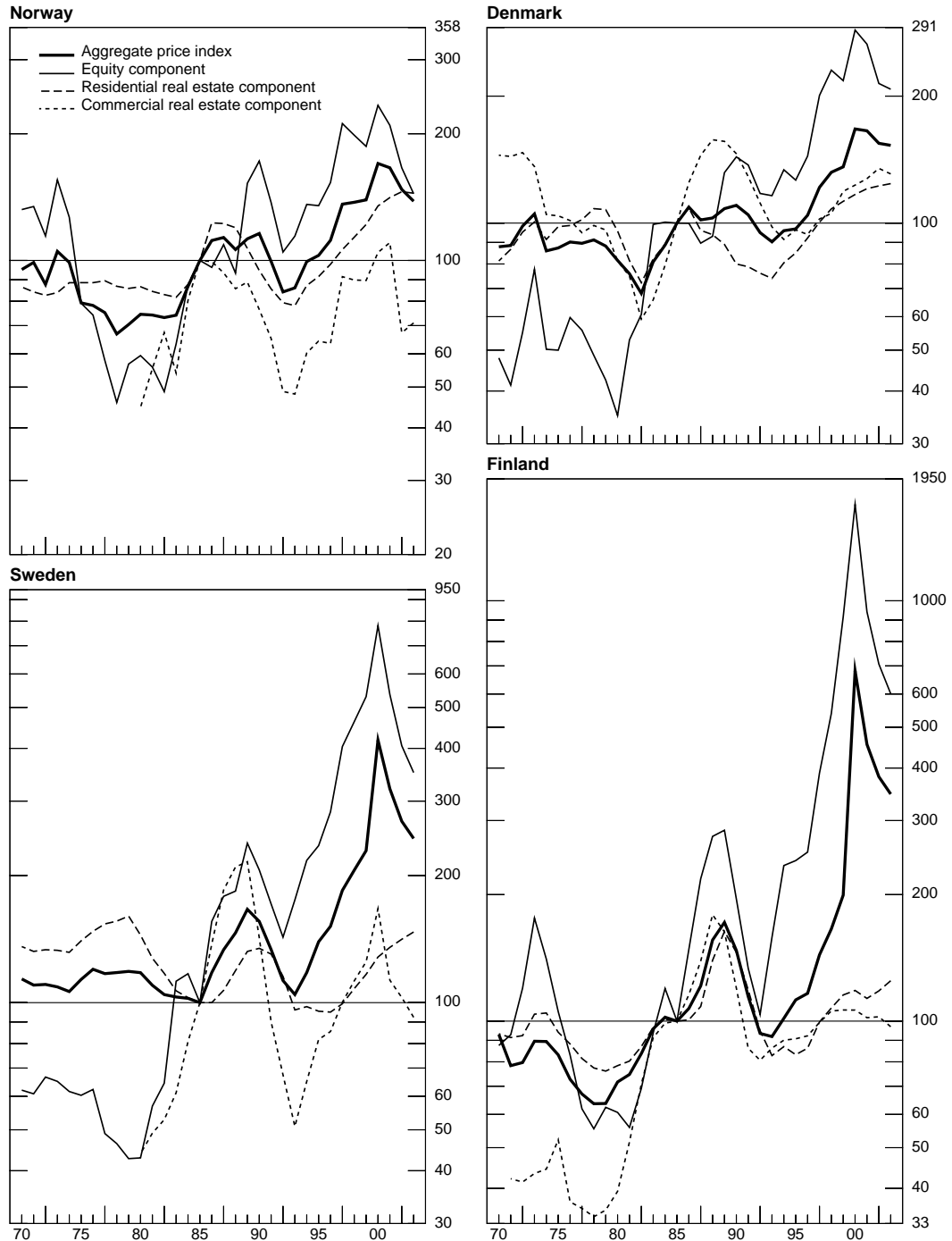
1985 = 100; semi-logarithmic scales



Graph 4 (cont)

**Inflation-adjusted asset prices: aggregate and components**

1985 = 100; semi-logarithmic scales



Notes: The aggregate price index is calculated as a weighted geometric mean of the three components. The weights are based, where available, on net wealth data, but in some cases are supplemented by the price change of each component. The calculation uses, where possible, moving weights; a five-year window, starting in 1970, is used where annual weights are not available. Where a component is not available, the geometric mean is calculated on the other two. For Belgium, France, Germany, the Netherlands, Norway and Sweden, the commercial real estate component is not shown in the 1970s as it is proprietary information. All indices are calculated as the nominal price indices deflated by the personal consumption deflator.

Sources: Various private real estate associations; national data; BIS estimates and calculations.

Table 1

## Aggregate asset prices: a comparison of the weights

In percentages

Country	Borio et al (April 1994)				Arthur update (October 2000)			
	Period	Equity	Residential	"Net" commercial	Period	Equity	Residential	"Net" commercial
United States	1968-76	27	73	-	1972	45	45	10
	1977-82	25	68	7	1980	25	61	14
	1983-87	27	65	8	1985	26	62	13
	1988-92	31	61	8	1989	29	60	10
					1995	42	51	7
					2000	56	39	5
Japan	1960-77	5	74	21	1975	16	66	19
	1978-82	4	76	20	1980	16	66	18
	1983-87	21	62	16	1985	21	62	17
	1988-92	31	56	13	1988	31	56	14
					1995	23	59	18
					2000	18	62	19
Germany	1970-78	9	71	20	1974	8	72	20
	1979-82	8	75	17	1980	6	73	21
	1983-87	13	72	15	1985	11	70	19
	1988-92	15	69	16	1990 <sup>1</sup>	11/12	69/68	20/19
					1995	16	66	18
					2000	32	53	15
United Kingdom	1968-76	30	70	-	1976	25	65	9
	1977-84	27	63	10	1982	27	62	11
	1985-92	34	59	7	1987 <sup>2</sup>	34/33	58/60	8/7
					1995	46	47	7
					2000	49	46	5
Canada	1970-82	29	71	-	1976	18	56	26
	1983-87	34	66	-	1985	23	53	24
	1988-92	30	70	-	1989	24	56	20
					1995	30	53	17
					2000	37	48	15
Australia	1970-82	17	77	6	1970	37	56	7
	1983-87	19	75	6	1975	17	77	6
	1988-92	21	71	8	1980	19	76	5
					1985	19	75	6
					1990	21	71	8
					1995	25	69	6
					2000	28	67	5

<sup>1</sup> The first set of weights, and those prior to 1990, are for the former West Germany; the second set and those thereafter include the former East Germany. <sup>2</sup> The first set of weights, and those prior to 1987, are based on ESA 79; the second set and those thereafter on ESA 95.

# Aggregation bias and the repeat sales price index

Anthony Pennington-Cross<sup>1</sup>

## Introduction

A house price index is by definition a summary indicator of spatial and/or intertemporal house prices. House price indices provide a basis for measuring real estate values and their growth through time. But, all housing is not created equal. The attributes of the home (the square feet, number of baths, quality of materials, etc) as well as the location of the home add substantial heterogeneity to the value of housing in any location. As a result, any index will measure individual house prices with an error and is best thought of representing overall market conditions. This is even true for house price index estimates at a detailed level of geography such as census tracts or zip codes.

The objective of a house price index is to accurately describe the level or change in prices for a location. In the United States, house prices are typically reported for metropolitan areas or states. For instance, the National Association of Realtors (NAR) reports median house prices for a range of metropolitan areas. In addition, the Office of Federal Housing Enterprise and Oversight (OFHEO) reports a constant quality house price index for all metropolitan areas and states. The index attempts to hold quality constant by measuring the average growth in house prices using only multiple transactions associated with the same home.

Because housing is a local phenomenon and heterogeneous in space and across time, these measures of house prices provide a highly aggregated view of house prices. As a result there is substantial evidence of heterogeneous price appreciation and sample selection issues when estimating house price indices (Dreiman and Pennington-Cross (2004), Englund et al (1998), Gatzlaff and Haurin (1997)). In addition, housing is a unique commodity because it trades infrequently. This is in contrast to other markets such as commodities, stocks, and bonds which have active centralised markets that establish market clearing prices through multiple transactions each business day. There are even intraday markets that are used to promote transactions and non-business day pricing estimates. In the housing market, if a home sells only once a year it would be extremely unusual. In fact, it would be impossible, given the time required to sell a home, for a home to sell everyday. As a result, transactions are sparse relative to the outstanding stock of homes.

Both the NAR and OFHEO price indices are best described as transaction-based house price indices. The question examined in this paper is whether transaction-based house price indices differ from true or housing stock-based house price indices.

## Motivation

Consider the following, stylised representation of the housing market. This presentation focuses on the importance of differences between transactions and the stock of housing and how these differences can impact house price estimates. In a region there are two cities, *A* and *B*, with housing stock of  $Q_A$  and  $Q_B$ . The total housing stock is  $Q = Q_A + Q_B$ . For simplicity assume that all homes are identical within each city and that the housing stock and housing quality are time invariant. Also assume that there is no noise or a stochastic process associated with house prices. House prices in City *A* and City *B* are  $P_{A,t}$  and  $P_{B,t}$  in each time period  $t$ . Therefore, the prices and their growth through time within

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<sup>1</sup> The views expressed in this research are those of the author and do not represent policies or positions of the Office of Federal Housing Enterprise Oversight or other officers, agencies, or instrumentalities of the US Government. Anthony Pennington-Cross, Office of Federal Housing Enterprise Oversight, 1700 G Street, 4th Floor, Washington, DC 20052; e-mail: apennington@ofheo.gov or anmpc@yahoo.com; tel: 202-414-8937.

each city is the same for all houses. The only difference between the two cities is how much housing stock is in each city, the price of housing in each city, and the appreciation rate of house prices through time. The region's average or true house price is defined as:

$$P_t = (Q_A/Q) \times P_{At} + (Q_B/Q) \times P_{Bt} \quad (1)$$

Each city's price is weighted by the city share of the housing stock. The change in house prices over time can also be expressed as:

$$\Delta P_t = (Q_A/Q) \times \Delta P_{At} + (Q_B/Q) \times \Delta P_{Bt} \quad (2)$$

Note again that each city's price is weighted by the city share of the housing stock.  $\Delta P_t$  can be viewed as an index.<sup>2</sup> In contrast, for an index based only on observed transactions,  $\Delta P_{Tt}$ , a different weighting scheme applies. A transaction-based index can be represented as:

$$\Delta P_{Tt} = (Q_{TA_t}/Q_{Tt}) \times \Delta P_{At} + (Q_{TB_t}/Q_{Tt}) \times \Delta P_{Bt}, \quad (3)$$

where  $Q_{TA_t}$  is the total quantity of city A's housing stock that transacted,  $Q_{TB_t}$  is the total quantity of city B's housing stock that transacted,  $Q_{Tt}$  is the total amount of housing stock transacted and is defined as  $Q_{TA_t} + Q_{TB_t}$ , and  $\Delta P_{Tt}$  is the transaction-based index. The transaction quantities are bounded by zero and the quantity of available housing stock. Therefore,  $Q_{TA_t} < Q_A$ ,  $Q_{TB_t} < Q_B$ , and  $Q_{Tt} < Q$ . In contrast to the quantity of housing, which is held constant by assumption, the quantity of housing that transacts can also vary through time. The observed transactions, or prices, are not weighted by the share of the housing stock they represent, but instead by the share of total transactions. As a result, under certain conditions the transaction-based index can be the same or deviate from the true index.

$$(Q_A/Q) = (Q_{TA_t}/Q_{Tt}) \quad \text{and} \quad (Q_B/Q) = (Q_{TB_t}/Q_{Tt}) \Rightarrow \Delta P_{Tt} = \Delta P_t,$$

$$\Delta P_{At} = \Delta P_{Bt} \Rightarrow \Delta P_{Tt} = \Delta P_t \quad (4)$$

For example, if the propensity to transact equals the fraction of the housing stock in each city then the transaction and true index will be the same. In addition, if prices increase at the same rate in both city A and city B, regardless of the propensity to transact, then the transaction and true indices will be identical.

But, when city prices increase at different rates and the propensity to transact differs then the transaction index will diverge from the actual index. Assume that homeowners are more likely to sell their homes when prices are increasing. For example, if prices are increasing faster in city A than city B and the propensity to transact is also higher in city A then the true and transaction-based indices will deviate.

$$\text{If } \Delta P_{At} > \Delta P_{Bt} \quad \text{and} \quad (Q_{TA_t}/Q_{Tt}) > (Q_{TB_t}/Q_{Tt}) \Rightarrow \Delta P_{Tt} > \Delta P_t \quad (5)$$

In this scenario, using the transaction index, the price index will be estimated to be increasing at an artificially high rate. This is the source of the systematic bias in the transaction-based index. The opposite bias would be found if transactions are less likely to occur in higher appreciating locations. Supporting the first hypothesis, Genesove and Mayer (2001) found some evidence that homeowners do not like to sell their homes for a loss and are therefore less likely to transact when prices are down and more likely to transact when prices are up. This indicates that locations with robust housing markets may receive too much weight leading to a systematic upward bias in the transaction-based index. In contrast, Redfearn (2003) has found that transaction rates are sometimes positively and sometimes negatively correlated with house price movements in Sweden.

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<sup>2</sup> As explained in the following sections, the index does not provide any information on the level of house price. Instead, for all locations, the index is normalised to one or 100 in the initial period and the growth rates derived from the resulting index.

## Repeat sales models

The following section introduces a repeat sales model of house price appreciation rates to examine empirically the impacts of any systematic bias caused by using transactions to estimate average appreciation rates. This section will initially explain the repeat sales approach, which is implicitly a transaction-based index, and then introduces a new weighting scheme based on housing units to approximate the “true” or population wide price index.

Repeat sales models attempt to hold quality constant by examining only properties with repeat transactions to estimate average appreciation rates for particular locations. In this paper we include estimates at the state level. This will help to introduce a variety of appreciation rates across different cities within a single state. The house price index preserves the intuitively simple interpretation of any index. For example, if the index is 100 in state  $j$  in 2000 and increases to 105 in state  $j$  in 2001, the average house price in state  $j$  increased by 5% over the period 2000-01. The basic procedure dates back to Bailey et al (1963) and has remained essentially the same for over 40 years as is evidenced by Dreiman and Pennington-Cross (2004). Following the approach utilised by Case and Shiller (1987) and later modified by Abraham and Schauman (1991). It is assumed that the natural logarithm of price,  $P_{it}$ , of an individual house  $i$  at time  $t$ , can be expressed in terms of a market price index  $\beta_t$  and an individual house idiosyncratic deviation from the market index  $v_t$ .

$$\ln(P_{it}) = \beta_t + v_t \quad (6)$$

The market index is expected to be correct on average so that  $E(v_t) = 0$ . This specification allows us to express the percentage change in price for house  $i$  which transacts in time periods  $s$  and  $t$  as:

$$\Delta V_i = \ln(P_{it}) - \ln(P_{is}) = \beta_t - \beta_s + v_t - v_s \quad (7)$$

Using  $D_{i\tau}$  a dummy variable that equals one if the price of house  $i$  was observed for a second time at time  $\tau$ ,  $-1$  if the price of house  $i$  was observed for the first time at time  $\tau$ , and zero otherwise the growth in house prices can be estimated by:<sup>3</sup>

$$\Delta V_i = \sum \beta_\tau D_{i\tau} + \varepsilon_i, \quad \text{where } \varepsilon_i = v_t - v_s \quad (8)$$

Assuming  $E(\varepsilon_i) = E(v_t) - E(v_s) = 0$ , the parameters  $\beta_\tau$ ,  $\tau = 0, 1, 2, \dots, T$  for the market index can be estimated by ordinary least squares (OLS) regression.<sup>4</sup> Abraham and Schauman (1991) introduced the concept that the variance of the house prices around this estimated mean appreciation rate is likely to increase the longer it is between transactions. Therefore, OLS is not an efficient estimator because we cannot assume that the variance of the error term is constant. The squared deviations of observed house prices from the market index are given by:

$$\varepsilon_i^2 = (\Delta V_i - \sum \beta_\tau D_{i\tau})^2 \quad (9)$$

It is assumed that the squared deviations of observed house price changes around  $\beta_\tau$  will provide us with an estimate for the variance of the error term. The estimated variance of the error term will change for each combination of  $s$  and  $t$ .

$$E[\varepsilon_i^2] = A(t-s)_i + B(t-s)_i^2 + C \quad (10)$$

The expected values, from the estimate parameters  $A$ ,  $B$ , and  $C$  and  $t-s$ , of the squared deviations,  $E[\varepsilon_i^2]$ , are used to derive the expected standard error,  $E(se_i)$ , which is defined as the square root of  $E[\varepsilon_i^2]$ . The expected errors are then used as the weights needed to obtain GLS estimates of the  $B_\tau$  parameters in the following regression:

$$\Delta V_i / E[\varepsilon_i^2] = \sum \beta_\tau D_{i\tau} / E[\varepsilon_i^2] + \varepsilon_i / E[\varepsilon_i^2] \quad (11)$$

<sup>3</sup> Note that the time period  $\tau$ , which indicates the time period for which the index is estimated, is different from  $t$ , which was used previously to denote the time period of the second transaction.

<sup>4</sup> It is necessary to restrict one of the market index parameters to avoid perfect co-linearity among the explanatory variables. It is convenient to use  $\beta_r = 0$ , where  $r$  is the base period of the reported index.

This specification is estimated to derive house price indices. Index numbers for periods  $\tau = 1, 2, 3, \dots, T$  are given by:

$$I_{\tau} = 100e^{\beta_{\tau}^*} \quad (12)$$

where  $\beta_{\tau}^*$  are the GLS parameter estimates of the market index.<sup>5</sup> The market index is a transaction based index because it only includes properties that transacted. If there are 1,000 observed repeat transactions then there are 1,000 observations in the estimation data set. Each observation is implicitly weighted equally. As hypothesised in the previous section, the propensity for a house to transact may be positively correlated with increasing house prices. If this is true, then transactions in locations with rising house prices represent less housing stock than transactions in locations where house prices are not increasing as much or declining. Therefore, the implicit equal weighting used to estimate the transaction-based market index is inaccurate and would bias the estimates from the true appreciation rate.

To create a housing-stock based or true market index, each observed change in house price (from the repeated observations) is weighted by the fraction of the housing stock in the neighbourhood. In this paper, the index estimated is at the state level and census tracts define the neighbourhoods. The US Census Bureau reports housing units in each tract in census years from [www.census.gov](http://www.census.gov), for download by county. The weights are defined using the 1990 and 2000 census tract housing units data. Because the transactions can span a considerable time period a decision rule is developed to assign the correct weight: (1) If both transactions are prior to 1991 then the 1990 census weights are used, (2) If both transactions are after 2000 the 2000 census weights are used, (3) If one of the transactions occurred during the years 1991 through 1999, then the median year of the period in which the loan was alive is used. The median year is used to identify the weight to be used from a straight-line spline of the 1990 and 2000 weights.

## Results

Table 1 provides a graphical representation of the estimated annual appreciation rate for house prices for six representative states (California, Massachusetts, Maryland, Missouri, Nevada, and Ohio). The six states include locations where house prices have experienced large cycles (California and Massachusetts), locations where prices have been fairly stable through time (Ohio and Missouri), and a smaller state with a dominant and growing metropolitan area (Nevada). Some states such as Nevada or Missouri are dominated by one or two cities. In contrast, California includes a wide variety of cities with vastly different types of economies ranging from agricultural economies to high tech and financial economies. This heterogeneity should help to create deviations in house price appreciation rates and deviations in the propensity to transact. These are the conditions identified as ingredients that should make the transaction-based index deviate from the true index.

In contrast to the theory, the results provide very little evidence of any aggregation bias associated with the transaction based sample. For instance, in California there is almost no discernable difference between the index using transaction weights and the one using housing stock weights. Recall that one plausible hypothesis was that the propensity to transact should increase the more house prices are rising in a particular location. This should help to create a divergence of the transaction-based index and the housing stock based index if the propensity to transact is procyclical. But, in California there is almost no difference between the two indices, proving little support for the theory.

The same is true in Massachusetts, another location that has experienced a large run-up in house prices during the mid-1980s, price deflation and stagnation from 1988 through 1993 and modest inflation until the end of the time period. Again in this scenario, assuming heterogeneity in transaction propensities the indices should diverge. Instead, the transaction and housing stock indices are almost identical.

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<sup>5</sup> If the restriction  $\beta_1 = 0$  is imposed in estimation, then  $I_1 = 100$ .



The state of Maryland is substantially smaller, but is dominated by Washington DC suburban neighbourhoods and Baltimore. Again, there is almost no difference between the transaction and the housing stock based indices.

Ohio also experienced the run-up in house prices from 1985 through 1987, but the magnitude of the increases was much smaller than for Maryland, Massachusetts or California. In, contrast though, Ohio has not experienced any declining prices, but has roughly held at a 3% appreciation rate from 1990 through the end of 2000. Despite these different housing market experience the two indices are, again, almost identical.

In the two remaining states (Nevada and Missouri) the transaction and housing stock indices do diverge. In both states the peak of the run-up in house prices is over-stated in the transaction index. This is apparent in Nevada during in 1988 and 1989 and in Missouri 1986 as well as in 2000 for both states. Nevada is a unique state because the rapid growth of Las Vegas throughout the 1990s and the relative abundance of developable land in the desert. In contrast, Missouri's housing market is dominated by St Louis, which is a city that has experienced a steady decline in population. But the area still includes some major employers such as a several large mortgage corporations. The deviations are much larger in Nevada and are especially apparent from 1992 through 1994 when house price growth was moderating after larger increases in the late 1980s. In fact, the housing stock index smoothes the transaction index. The results in Nevada are not consistent with a procyclical propensity to transact theory. Instead they indicate that in Nevada the propensity to transact was higher in locations with faster increasing prices during the price run-up in the late 1980s. But during the price decline/stagnation of the early 1990s the propensity to transact was higher in neighbourhoods experiencing the worst declines in prices.

In summary, there is no consistent evidence supporting the need for focus on housing stock rather than transactions when creating a repeat sales house price index or the existence of a procyclical propensity to transact across cities.

### Home owner negative equity

For an individual home,  $i$ , the probability of negative equity,  $\pi$ , can be calculated as follows:

$$\pi_{\tau, t-s} = \Theta((\log \text{upb}_{t-s} - \log P_{\tau}) / (E(\text{se}_{t-s}))) \quad (12)$$

where  $\pi_{\tau, t-s}$  is the probability that the property is worth less than the mortgage and depends on the  $\tau$ , the current time period, as well as how long it has been since the last transaction ( $t-s$ ),  $\text{upb}_{t-s}$  is the unpaid balance on the mortgage and depends on how long the borrower has been paying the mortgage,  $P_{\tau}$  is the value or price of the home,  $E(\text{se}_{t-s})$  is the expected or estimated standard error from equation (10), and  $\Theta$  is the cumulative normal density function (see Pennington-Cross (2004), Deng (1997), Deng et al (1994)).<sup>6</sup> Assume that the mortgage interest rate is fixed at 8% for the life of the loan, the term is fixed at 30 years, the home initial value is 100 dollars, and a 10 dollar down payment was made. In addition, the borrower is assumed to make all payments on time so that the unpaid balance is reduced on schedule through the 30 years. Lastly, to isolate the impact of new price index estimate from the impact of the standard error estimates assume that prices in all states are constant at 100.

Using these assumptions Figure 2 shows the difference between the transactions estimated  $\pi$  and the housing stock based  $\pi$ . For instance, if the transaction  $\pi = 7\%$  and the housing stock  $\pi = 8\%$  the percent deviation is 1%. For all states, except Nevada, the deviations reported for the first five years of the mortgages life is always negative and always less than 1%. In Nevada the deviations are positive and can exceed 3%. Therefore, while the dispersion of house prices around the mean is usually larger using the transaction index, the dispersion estimates are very similar in terms of overall magnitude. This leads to a slight overestimate of the probability that the borrower has negative equity. Again, in Nevada the results are the opposite.

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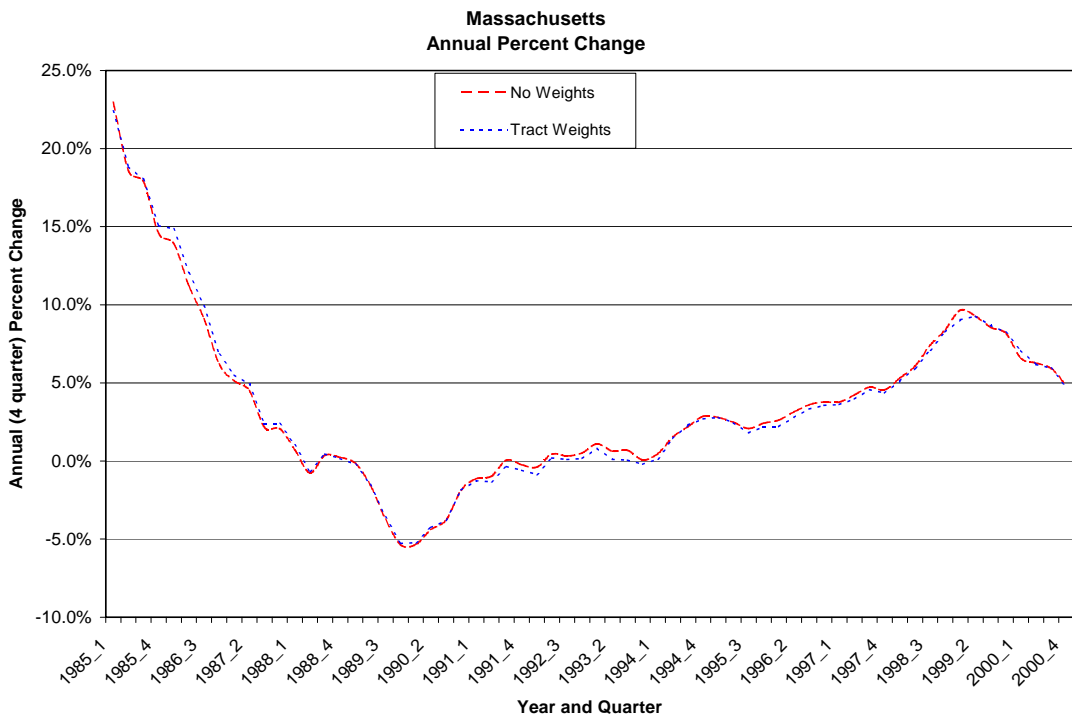
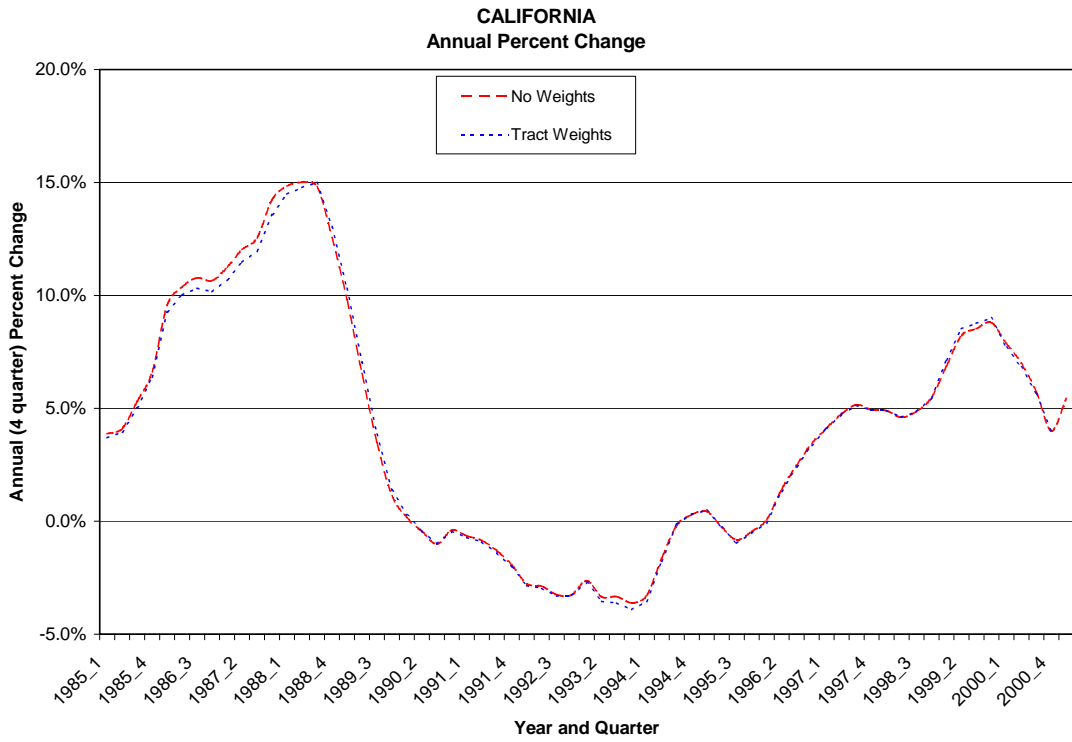
<sup>6</sup> The expected variance is time varying as defined by the parameter estimates of  $A$ ,  $B$ ,  $C$  and the time between transactions ( $t-s$ ).

## Conclusion

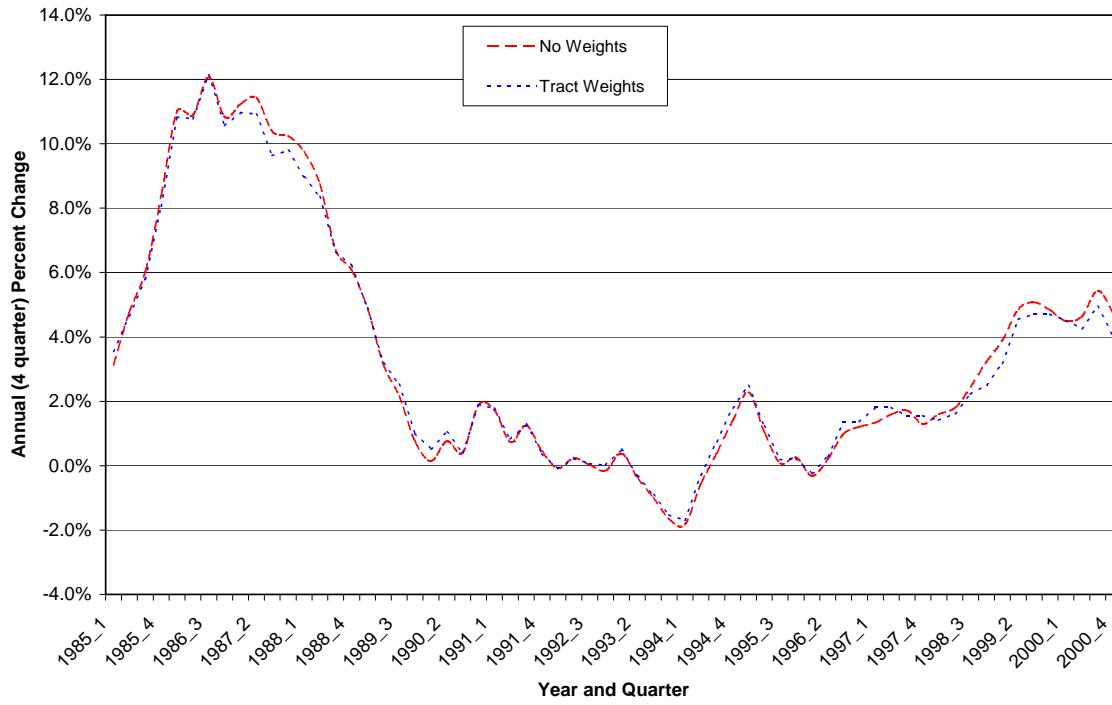
The construction of any price index must rely on actual transactions to create the index. By construction the index is an aggregate representation of individual prices. This aggregation contains a variety of property types and neighbourhood types. It is unlikely that all neighbourhoods experience the same appreciation rates or the same propensity to transact. As a result of this heterogeneity the construction of a transaction-based index may suffer from asymmetric appreciation and selection issues, which could bias the house price index.

This paper examines whether any consistent bias can be found in the creation of a repeat sales price index at the state level. This is done by comparing a transaction-based index with a housing-stock-based index. The housing-stock-based index weights each observed repeat transaction by the amount of housing it represents. Therefore, the aggregate or regional index should reflect the true appreciation of house prices. But, the empirical results do not indicate any substantial revisions in the index nor do the results show any large differences on the dispersion of individual house prices around the mean appreciation rate. In particular, in large states and in states that have experienced strong housing cycles almost no discernable difference between the two indices is apparent.

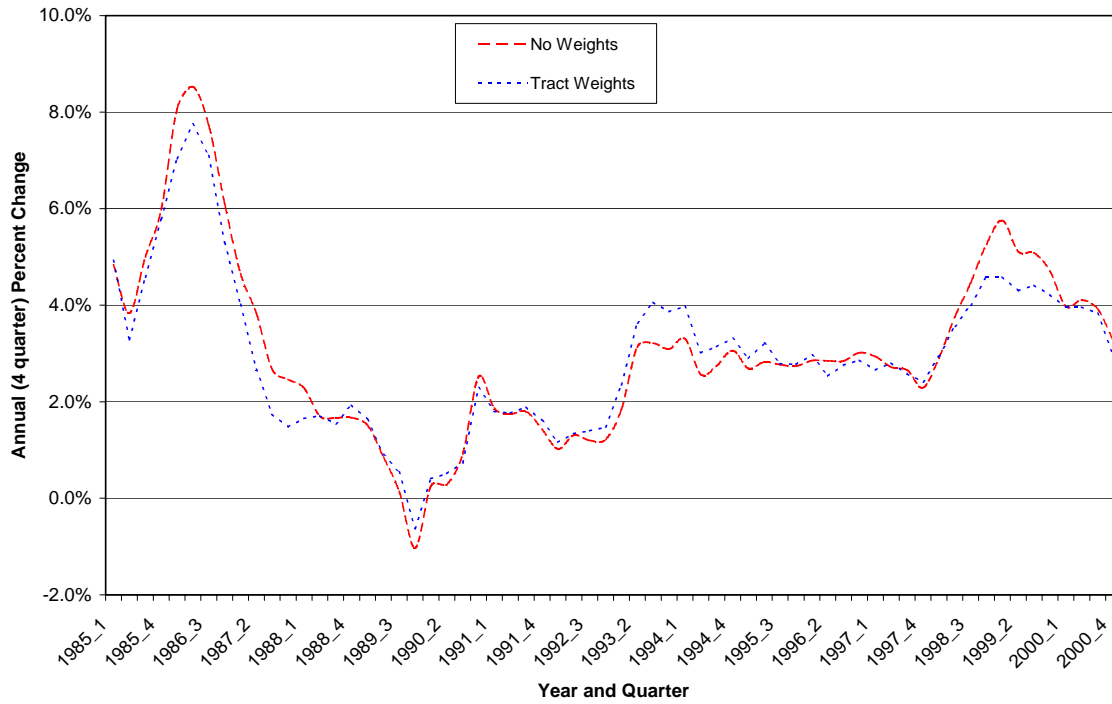
Figure 1  
**Index comparisons**



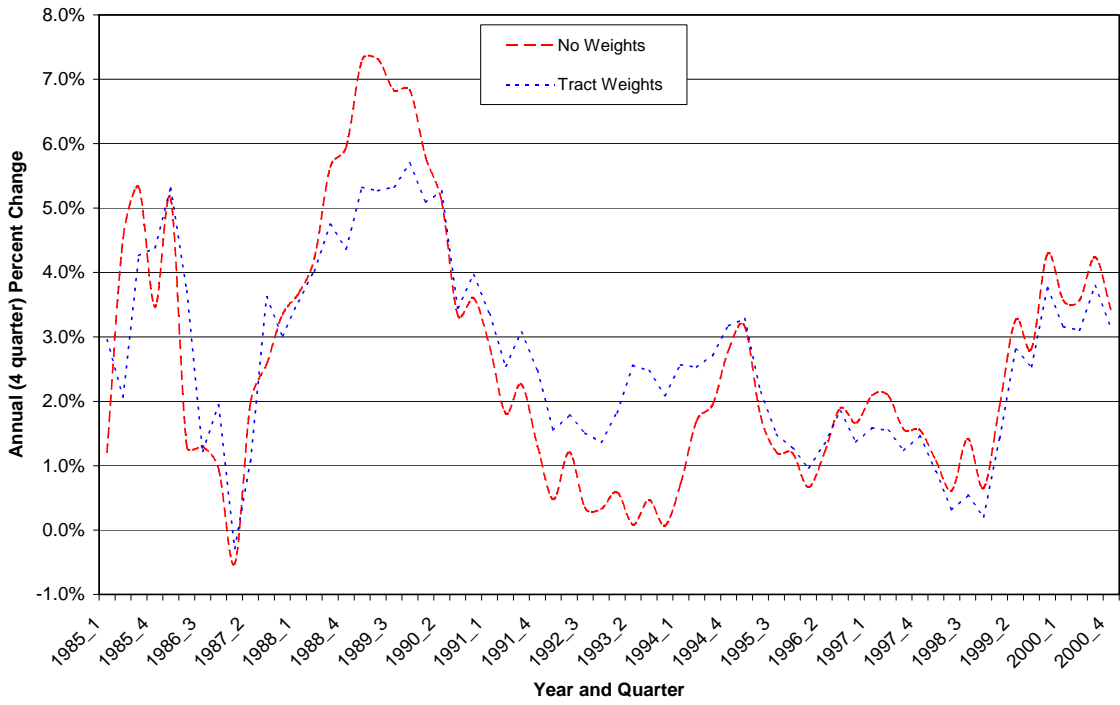
**Maryland  
Annual Percent Change**



**MISSOURI  
Annual Percent Change**



**NEVADA  
Annual Percent Change**



**OHIO  
Annual Percent Change**

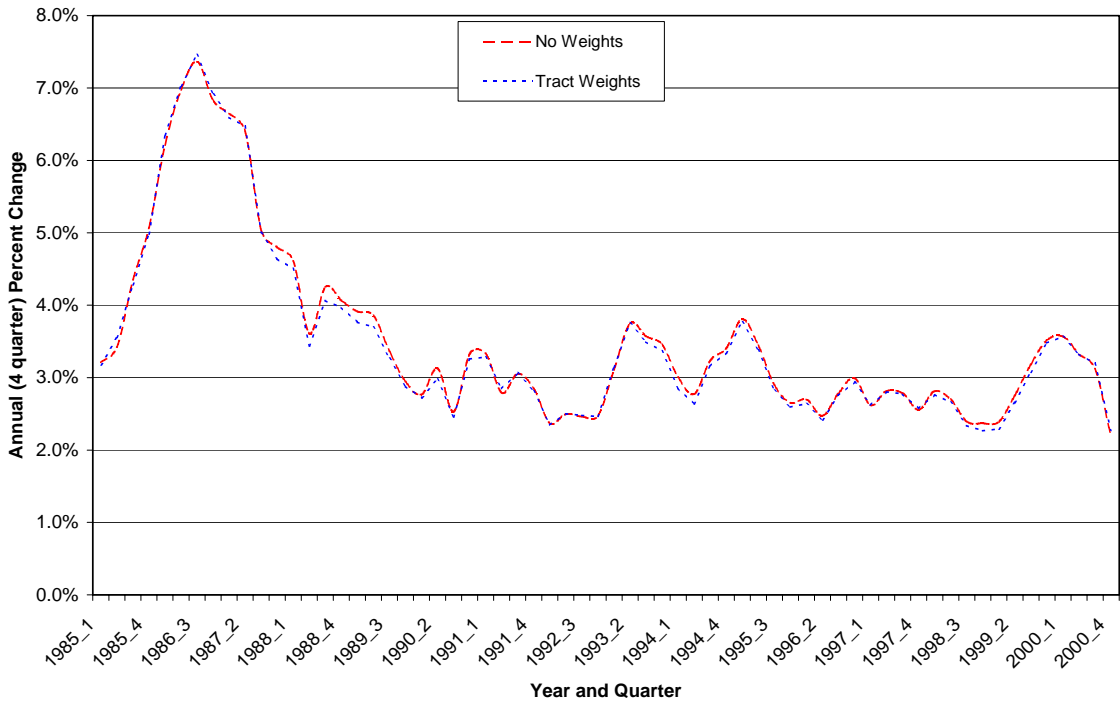
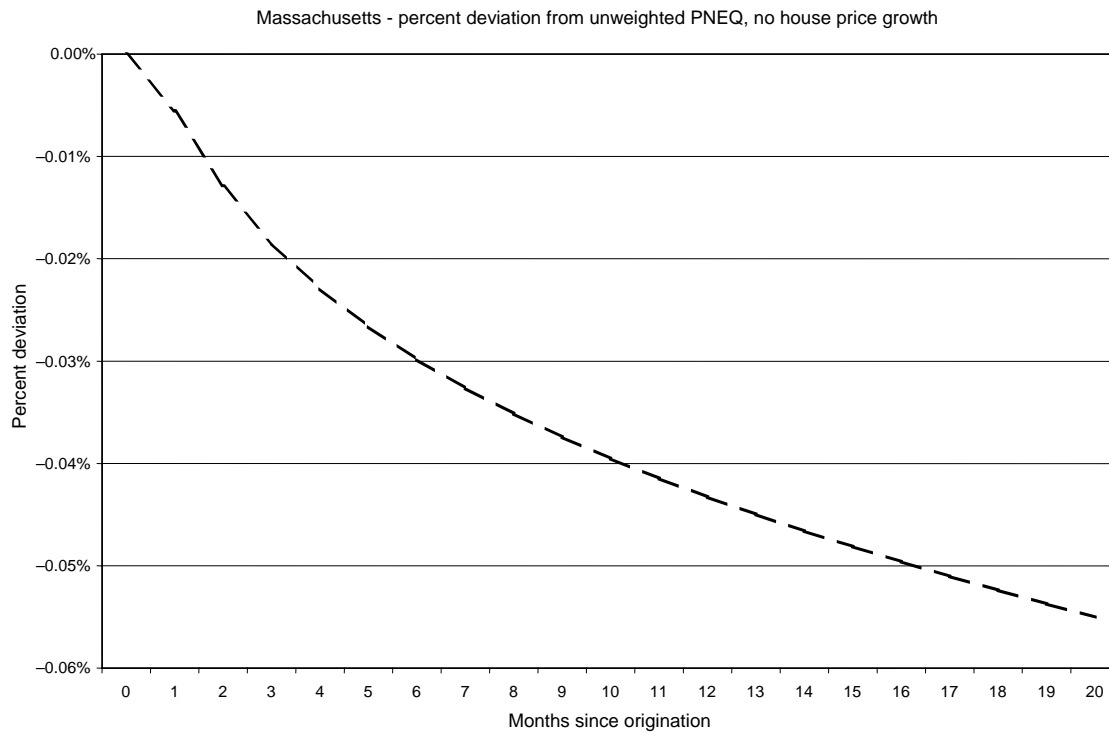
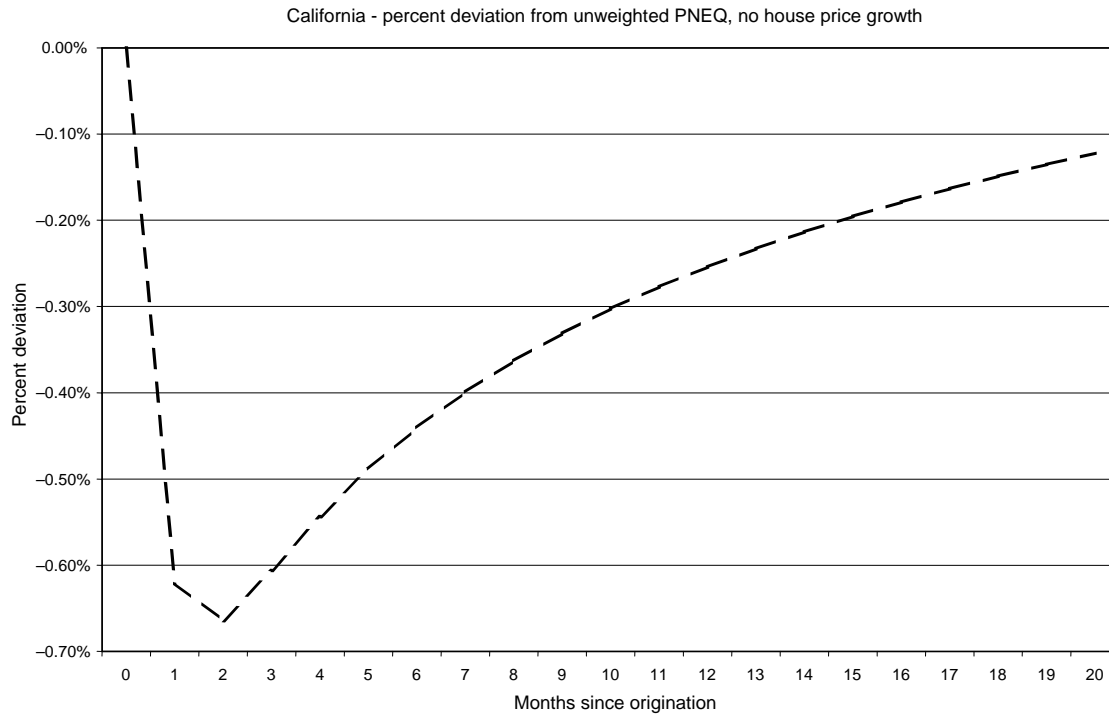
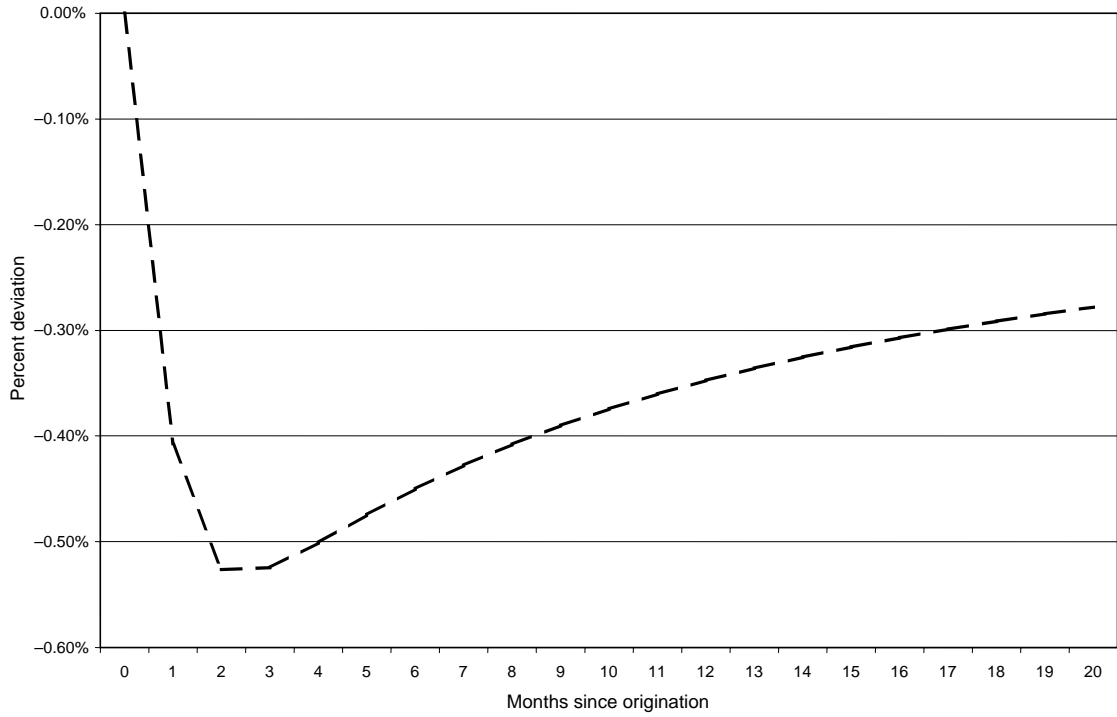


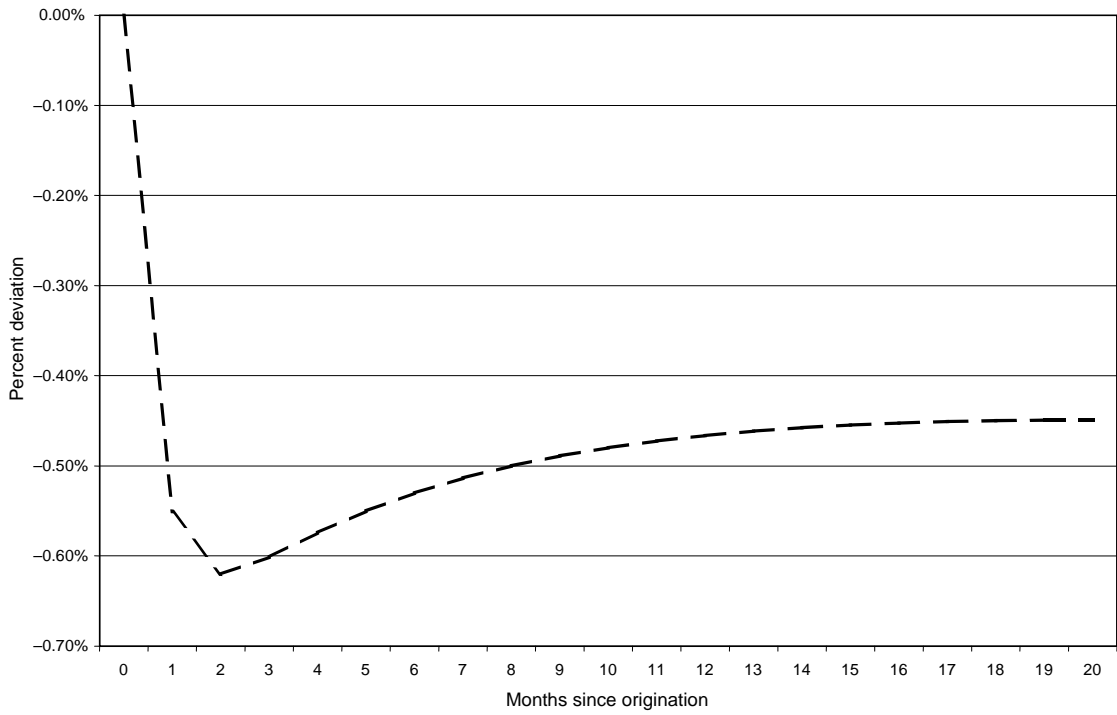
Figure 2  
PNEQ deviations



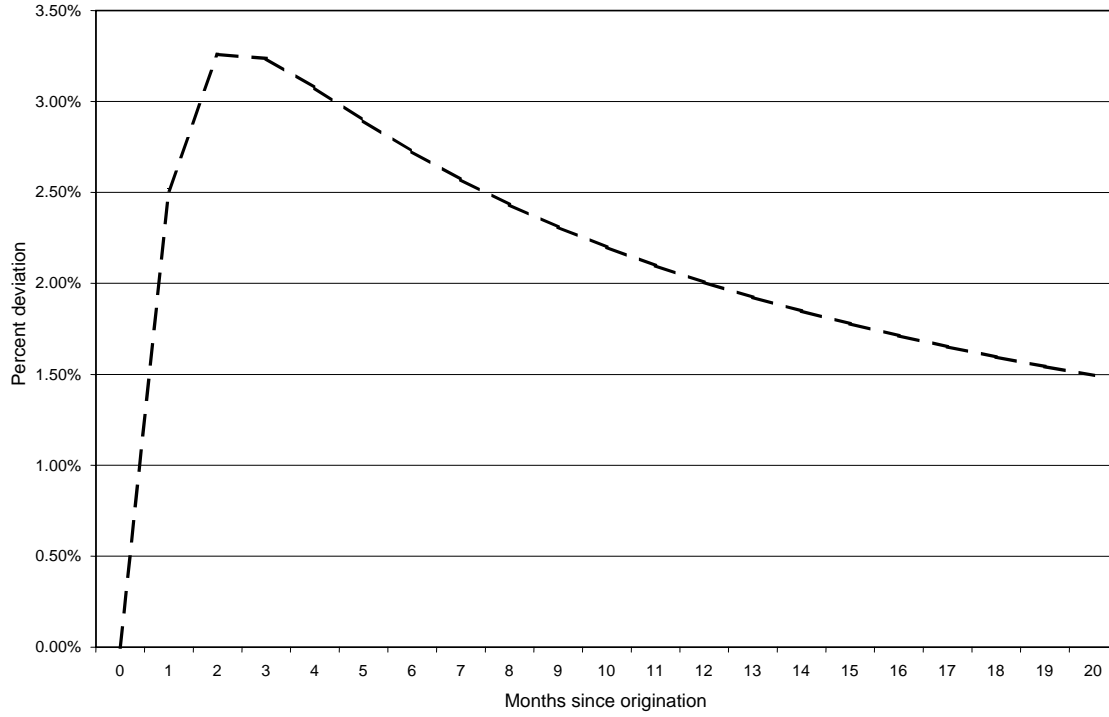
Maryland - percent deviation from unweighted PNEQ, no house price growth



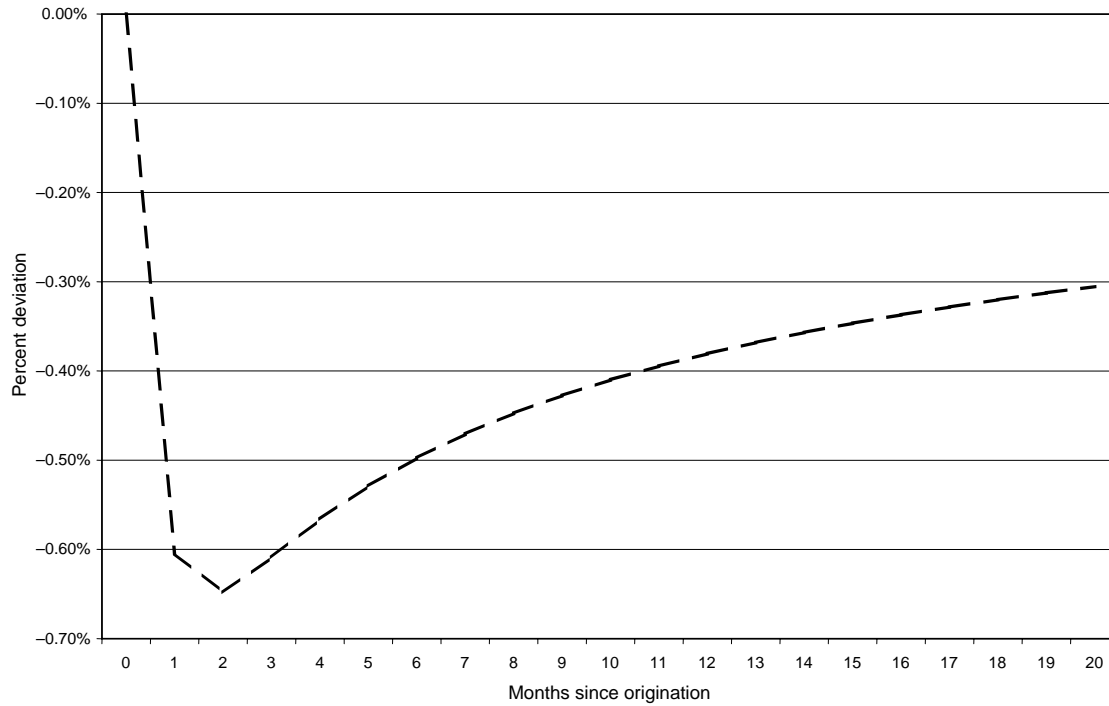
Missouri - percent deviation from unweighted PNEQ, no house price growth



Nevada - percent deviation from unweighted PNEQ, no house price growth



Ohio - percent deviation from unweighted PNEQ, no house price growth





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**Comments on session “Aggregation issues”,  
David Fenwick, Chair, with three papers:**

**1. Henning Ahnert and Adrian Page,  
“Euro area residential property prices:  
the aggregation of non-harmonised national data”**

**2. Stephan V Arthur, “Experience with  
constructing composite asset price indexes”**

**3. Anthony Pennington-Cross, “Aggregation bias  
and the repeat sales price index”**

Robert J Shiller

The papers in this session impress on me how far we have come in the construction of real estate price indexes, but also about the distance we still have to go.

First, let me say that the progress in the construction of home price indexes, as revealed by the papers in this session, is stunning. When I first got involved in the construction of home price indexes in 1987, there were really no really good indexes available for any country, as far as Karl Case, my colleague, and I could determine. In the United States, there was the median sales price computed by the National Association of Realtors for major US cities, but at that time at least the median was often quite erratic through time. There was the Constant Quality Index produced by the Commerce Department, but it was a price for new homes only, and of course new homes tend not to be built in neighbourhoods with declining prices, and so this was an essentially biased estimate. In 1987, with only such data available, people hardly knew what the course of real estate prices were. There is always going to be uncertainty about the future, but in those days there was about as much uncertainty about the past: historical home prices were just not known accurately.

Now, looking at both the Stephan Arthur results and the Ahnert-Page results we can see a detailed account of what is happening to residential property prices. The Bank for International Settlements has done us all a great service by assembling its multi-country data set of asset price indexes for 13 countries. Until they had done this, the world had not seen the detailed international price data for residential properties, and the magnitude and covariability of these price movements were an eye-opener. The BIS data were of such news quality that the popular news magazine *The Economist* has gone to the sources that the BIS tapped and is giving much press to these indexes.

Stephan Arthur's computation of an aggregate asset price index (AAPI), and a plot of this total with its breakdown (in Graph 2) for 16 countries, gives us yet another powerful indicator of the wealth of nations, and new insights into the changes through time. The rather different behaviour across these components in the time paths reveals how much the stability of aggregate wealth in each country is the result of diversification across the three main asset classes, equity, residential real estate, and commercial real estate. The time paths of any one of the components differs a lot across countries, but the time path of the aggregate is fairly similar across all countries. (I only wish he had also included fixed incomes on these charts, which would have rounded out the remaining major asset class.)

The Ahnert-Page paper gives a good indication of the data and methods that underlie the European Central Bank (ECB) euro area residential property price indicator. They also show the remaining weaknesses in these indexes. Annex 1 reveals that for three of the 12 countries no quality adjustment at all is made, and for another five the quality adjustment is only based on square metres.

Regional weighting, for which Ahnert and Page (as well as Pennington-Cross) present a good theoretical case, is either not attempted at all or not defined in half of the countries. One might well surmise that regional weighting can make a great difference, if it is really done right. The Ricardian model of a city shows prices increasing like a rising pyramid on a plane, with prices zero in

the undeveloped lands around the city, with the base of the pyramid expanding through time, and with the highest amount of sales occurring at the perimeter of the base of the pyramid, where prices stay near zero. While the Ricardian model is an extreme case, it does suggest that without regional weighting, a price index may show no increase even as the pyramid grows larger and larger.

It is fortunate that the results of Pennington-Cross suggest that such weighting was not so important in his examples. But, it is still possible that a more detailed study would show bigger effects. A spatial map of price levels would likely show irregular contours with some sharp peaks in urban areas.

Another problem for constructors of price indexes which ought ideally to be addressed is the resistance of sales prices to declines (downward rigidity). David Genesove and Christopher Mayer have shown, with some detailed data from the United States, that homeowners are reluctant to sell at a loss, apparently for psychological reasons related to the pain of regret. In down markets, the volume of sales drops dramatically, and so the sales in all regions can become unrepresentative of the actual prices that might be arrived at in actual markets.

There is also a fundamental distinction between new construction and existing homes. New construction goes on mostly in areas where land is not scarce, and only when price rises above construction cost. In those areas, there are forces to keep home prices in line with construction costs. Sales are biased towards new homes, tending to misrepresent the change in prices overall.

In the United States, Karl Case and I found a sharp distinction between states whose prices track the price of construction and states whose prices show wild departures from the price of construction. We concluded that states whose cities have an abundance of buildable land show very little price volatility, and the real estate market in those cities never becomes speculative. In contrast, states whose cities have little buildable land, and particularly in the glamorous cities within those states, a speculative sensitivity tends to infect the thinking of homebuyers, causing sometimes erratic moves in home prices. We see a hint of this in the Ahnert-Page data, that show the glamour city of Paris with much more volatile prices than France overall.

I was struck that, according to Ahnert and Page, none of the European data producers used the repeat-sales method. This seems most unfortunate, since the repeat-sales method would eliminate a number of problems, including the problem of excessive weight being given to new construction. Ahnert and Page dismiss this method because they say it demands a large amount of data. But, in fact, in our modern electronic age the volume of accessible data is growing by leaps and bounds, and the repeat-sale method ought to be considered for the future in Europe.

The original repeat-sales index idea is due to Baily et al (1963). The idea is to base price index construction exclusively on the change in price of individual homes. To construct a repeat-sales price index along lines outlined by Baily et al, one regresses change in log price between sale dates on time dummies,  $-1$  for first sale period and  $+1$  for second sale period except for the base period for which there is no dummy. Here, period refers to the unit of time, whether year, quarter or month. The estimated coefficients of time dummies become the log price index, and the log price index is zero in the base period by construction. For example, with four sales pairs, the first two of which were bought in period zero and sold in period one, the third in period zero and period two, and the fourth in period one and period two, we set up the regression model  $Y = X\beta + \varepsilon$  where:

$$X = \begin{bmatrix} 1 & 0 \\ 1 & 0 \\ 0 & 1 \\ -1 & 1 \end{bmatrix}, \quad Y = \begin{bmatrix} p_{11} - p_{10} \\ p_{21} - p_{20} \\ p_{32} - p_{30} \\ p_{42} - p_{41} \end{bmatrix}$$

and where  $P_{ht}$  is log price of house  $h$  at period  $t$ ,  $t = 0, 1, 2$ , and the coefficient corresponding to the first column of  $X$  is the log price index for  $t = 1$  and the coefficient corresponding to the second column of  $X$  is the log price index for  $t = 2$ . This is essentially the method that Karl Case and I developed further, and that my firm Case Shiller Weiss, Inc, pioneered, and that is now used by Fannie Mae, Freddie Mac, and the Office of Federal Home Equity Oversight in the United States.

The repeat-sales method is very attractive because it solves the missing hedonic variables problem (so long as homes' characteristics are unchanging), and homes whose characteristics have changed in a major way can sometimes be excluded (as by accessing data on building permits).

The Ahnert and Page paper describes repeat-sales regression and hedonic regression as fundamentally different methods. But, in fact, they are both regression methods, and all regression methods are fundamentally related. It is just a matter of what one controls for in the regression. In fact, there is a natural hybrid between repeat-sales method and the hedonic method, as I described in my 1993 book *Macro Markets* and in a 1993 article. I defined there the hedonic repeat-sales method, which is an extension of the repeat-sales regression method. To create a price index using hedonic repeated measures method, one must regress the change in log price of house between sales on dummies for individual house and also on interactions of hedonic variables with dummies for individual house.

To continue the above example, suppose that we have for each of the four homes the hedonic variable  $s_{ht}$ , the square feet of floor space of home  $h$  at time  $t$ , which can change if new construction expands the house. We then set up the regression:

$$X = \begin{bmatrix} 1 & 0 & s_{11} & 0 \\ 1 & 0 & s_{21} & 0 \\ 0 & 1 & 0 & s_{32} \\ -1 & 1 & -s_{41} & s_{42} \end{bmatrix}, \quad Y = \begin{bmatrix} p_{11} - p_{10} \\ p_{21} - p_{20} \\ p_{32} - p_{30} \\ p_{42} - p_{41} \end{bmatrix}$$

This regression model takes account of all factors that are constant for a single house as well as allowing for square feet of floor space that changes through time for the house. From the estimated coefficients we can define a log price index for a standard house, for period one equal to the coefficient of the first column plus the coefficient of the third column times  $s$ , and for period two equal to the coefficient of the second column plus the coefficient of the fourth column times  $s$ , where  $s$  is the square feet of floor space for the standard house.

The perfection of our price indexes is very important because the home price indexes play many roles, going far beyond the role of detecting financial instability, as was emphasised in an earlier session in this conference. The desiderata for good indexes that reveal financial instability is that the indexes should capture national trends well, that the indexes should have associated with them some measure of earnings or rents so that a price-earnings ratio can be computed, and that indexes might be broken out between speculative glamour cities (where price bubbles tend to occur) and other areas. But, there are other purposes for price indexes and these other purposes suggest other desiderata.

An important application of real estate price indexes has been for automatic valuation models (AVMs) for homes. These models update past selling prices of individual homes with a real estate price index for its locale as a way of estimating the value of the homes. There is now great demand for AVMs, as the mortgage industry is going increasingly electronic and online, and so quick electronic access to home values is increasingly important. There is now a substantial industry which produces AVMs for sale to mortgage originators, home equity lenders, and others who have an interest in valuation of individual homes.

The desiderata for price indexes for use in AVMs are that the indexes should be finely disaggregated by region and by property type, as indeed price trends can differ significantly from one part of a city to another, and from one class of housing to another. Moreover, we do not want to purge the indexes from the effects of quality change in the homes, since the indexes are meant to compute the price of the houses with all the quality changes. On the other hand, we would ideally like to correct the indexes for the problem of downward rigidity of asking prices, and failure to sell homes whose prices have really declined.

Another very important use for real estate price indexes is in the settlement of financial contracts that allow the management of risks associated with real estate. The first such contract was a UK property futures market set up by the London Futures and Options Exchange (London Fox) in 1991. Although that market failed, successors are now succeeding. Also in London, City Index and IG Index set up index-based UK property futures markets in 2002. In 2003 Goldman Sachs launched certain real estate warrants in London that settle in terms of the Halifax residential property indexes. In the United States, there are several firms with plans to launch index-based futures markets in real estate: Hedgestreet.com, Realliquidity.com and Advanced e-Financial Technologies. A firm that I helped found, Macro Securities LLC, has been working with the American Stock Exchange to produce securities whose dividends depend on indexes, such as real estate price indexes. As these markets develop it will become increasingly possible to hedge real estate risks.

Designing indexes for use in contract settlement suggests different desiderata. When applied to contract settlement, it is important that the indexes be provided with great frequency and little time lag, and with great assurance that the index will be produced on time. The index should ideally not be revised after it is first announced, lest contracts be settled on erroneous values. The index construction method must be simple and replicable, and at the same time robust to criticism, so that market participants can have faith in the values. Since we will not have markets for every neighbourhood or property type, aggregate indexes are most important. Invulnerability to manipulation or early release of data to insiders have to be avoided.

I think that the progress that is being made in real estate price index construction as revealed by the papers in this session is an important beginning. But, with all the uses that will be made in the future for such indexes, and with all the improved electronic data transmission facilities, we have a lot more work cut out for us in the future.

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# Fair valuation of real estate

Elvin Fernandez<sup>1</sup>

## 1. Introduction

The International Valuation Standards Committee was founded as The International Assets Valuation Standards Committee (TIAVSC) in 1981 with the following objectives:

- To formulate and publish, in the public interest, valuation Standards for property valuation and to promote their worldwide acceptance; and
- To harmonise Standards among the world's States and to identify and make disclosures of differences in statements and/or applications of Standards as they occur.

In 1994 the Committee changed its name to the International Valuation Standards Committee as it had by then shifted considerably from its earlier remit to focus on harmonising standards solely for financial reporting purposes to a much broader spectrum to cover real estate valuations for all purposes.

The scope of the Committee is continuing to widen as seen from the four broad areas that it now seeks to be involved in, namely (a) real property, (b) personal property, (c) businesses and (d) financial interests, although so far the Committee has not ventured deeply in the last of the said areas.

The current set of Standards, in a publication known as IVS 2003, is in fact the sixth edition of the Standards and it can be obtained from the IVSC at a cost of US\$ 25. Orders can be made through the website of the IVSC which is [www.ivsc.org](http://www.ivsc.org). The Standards are also freely available on the website of IVSC for all valuers, users of valuations, and the general public who can either peruse it or download it.

IVS 2003 is in fact the final publication that concludes a special IVSC Standards Project that ran from the year 2000 to 2003. In these years, with the objective of preparing a set of comprehensive and robust Standards to facilitate cross-border transactions involving property as well as contribute to domestic and international financial stability, three publications were concluded, in tandem. Although the project itself is completed, work is still in progress on new Standards as well as revision of old Standards.

The IVSC is managed by a Management Board made up of member States and this Board meets in various places around the globe, twice a year. Under the Management Board is a Standards Board that is charged with Standards setting and this Board is also made of member States but allows for outside contributions such as from regional valuation groupings, prominent valuation associations and "expert groups" who are setup on an ad hoc basis to complete specific projects.

Funding is from subscriptions by member States and organisations ranging from regional valuation groupings, valuation firms and the big accounting firms. Support from the Bank of International Settlements and the International Monetary Fund will not only be welcome but would certainly constitute a worthy cause for the two bodies.

## 2. Market value

Much of the work of an ordinary valuer revolves around carrying out *market value estimates* for various purposes. Such estimates are needed by most *market economies*.

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It has been no surprise then that almost the first task that the International Valuation Standards Committee (IVSC) set for itself, upon its formation in the early 1980s, was to arrive at an *international consensus* as to the definition of market value.

After much debate, which mostly centred on differing cross-border legislative and judicial considerations, a common definition acceptable to all was arrived at. Today this definition is not only the accepted definition by the global valuation fraternity, but it is also accepted by most regulators and users of valuation, including the courts.

The definition reads: “The estimated amount for which a property should exchange on the date of valuation between a willing buyer and willing seller in an arm’s-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently, and without compulsion.”

Throughout IVS 2003, and in this paper, the terms real estate and property are used interchangeably.

Each element of the definition has its own conceptual framework:

- (i) “*The estimated amount ...*” refers to a price expressed in terms of money payable for the Property in an arm’s length market transaction. *Market Value* is measured as the most probable price reasonably obtainable in the market on the date of valuation in keeping with the *Market Value* definition. It is the best price reasonably obtainable by the seller and the most advantageous price reasonably obtainable by the buyer. This estimate specifically excludes an estimated price inflated or deflated by special terms or circumstances such as atypical financing, sale and leaseback arrangements, special considerations or concessions granted by anyone associated with the sale, or any element of *Special Value*.
- (ii) “*... the Property should exchange ...*” refers to the fact that the value of the *Property* is an estimated amount rather than a predetermined amount or actual sale price. It is the price at which the market expects a transaction that meets all other elements of the *Market Value* definition should be completed on the date of valuation.
- (iii) “*... on the date of valuation ...*” requires that the estimated *Market Value* is time-specific as of a given date. Because markets and market conditions may change, the estimated value may be incorrect or inappropriate at another time. The valuation amount will reflect the actual market state and circumstances as of the effective valuation date, not as of either a past or future date. The definition also assumes simultaneous exchange and completion of the contract for sale without any variation in price that might otherwise be made.
- (iv) “*... between a willing buyer ...*” refers to one who is motivated, but not compelled to buy. This buyer is neither over-eager nor determined to buy at any price. This buyer is also one who purchases in accordance with the realities of the current market, and with current market expectations, rather than in relation to an imaginary or hypothetical market that cannot be demonstrated or anticipated to exist. The assumed buyer would not pay a higher price than the market requires. The present Estate owner is included among those who constitute “the market”. A Valuer must not make unrealistic assumptions about market conditions nor assume a level of market value above that which is reasonably obtainable.
- (v) “*... a willing seller ...*” is neither an over-eager nor a forced seller, prepared to sell at any price, nor one prepared to hold out for a price not considered reasonable in the current market. The willing seller is motivated to sell the Property at market terms for the best price attainable in the (open) market after proper marketing, whatever that price may be. The factual circumstances of the actual Property owner are not a part of this consideration because the “willing seller” is a hypothetical owner.
- (vi) “*... in an arm’s-length transaction ...*” is one between parties who do not have a particular or special relationship (for example, parent and subsidiary companies, or landlord and tenant) that may make the price level uncharacteristic of the market or inflated because of an element of *Special Value*. *The Market Value* transaction is presumed to be between unrelated parties, each acting independently.
- (vii) “*... after proper marketing ...*” means that the Property would be exposed to the market in the most appropriate manner to effect its disposal at the best price reasonably obtainable in accordance with the *Market Value* definition. The length of exposure time may vary with market conditions, but must be sufficient to allow the Property to be brought to the attention of an adequate number of potential purchasers. The exposure period occurs prior to the valuation date.

- (viii) “... wherein the parties had each acted knowledgeably and prudently ...” presumes that both the willing buyer and the willing seller are reasonably informed about the nature and characteristics of the Property, its actual and potential uses, and the state of the market as of the date of valuation. Each is further presumed to act for self-interest with that knowledge, and prudently to seek the best price for their respective positions in the transaction. Prudence is assessed by referring to the state of the market at the date of valuation, not with benefit of hindsight at some later date. It is not necessarily imprudent for a seller to sell property in a market with falling prices at a price that is lower than previous market levels. In such cases, as is true for other purchase and sale situations in markets with changing prices, the prudent buyer or seller will act in accordance with the best market information available at the time.
- (ix) “... and without compulsion ...” establishes that each party is motivated to undertake the transaction, but neither is forced or unduly coerced to complete it.

The widespread use of market value in the valuation profession is central and established, and equal in importance to the “fair value” and “mark to market” movements that are now taking place in the accounting and investment circles.

### 3. Fair value

How then does “market value” differ from “fair value” which is the term used in the title of this paper?

Paragraph 8.1 of the General Valuation Concepts and Principles of IVS 2003 reads:

- (i) “The expression **Market Value** and the term **Fair Value** as it commonly appears in accounting standards are generally compatible, if not in every instance exactly equivalent concepts. **Fair Value**, an accounting concept, is defined in International Accounting Standards and other accounting standards as *the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm’s-length transaction. Fair Value is generally used for reporting both Market and Non-Market Values in financial statements.* Where the *Market Value* of an asset can be established, this value will equate to *Fair Value*. Where the *Market Value* of an asset cannot be established, its value is arrived at using a surrogate such as Depreciated Replacement Cost (DRC).”

Much of the interplay between the terms “fair value” and “market value” from the standpoint of the IVSC has arisen when valuations for financial reporting are considered. The Standard for Financial Reporting is an Application in IVS 2003’s known as International Valuation Application 1 (IVA 1), Valuation for Financial Reporting, the objective of which is to explain the principles that apply to valuations prepared for use in financial statements and related accounts of business entities.

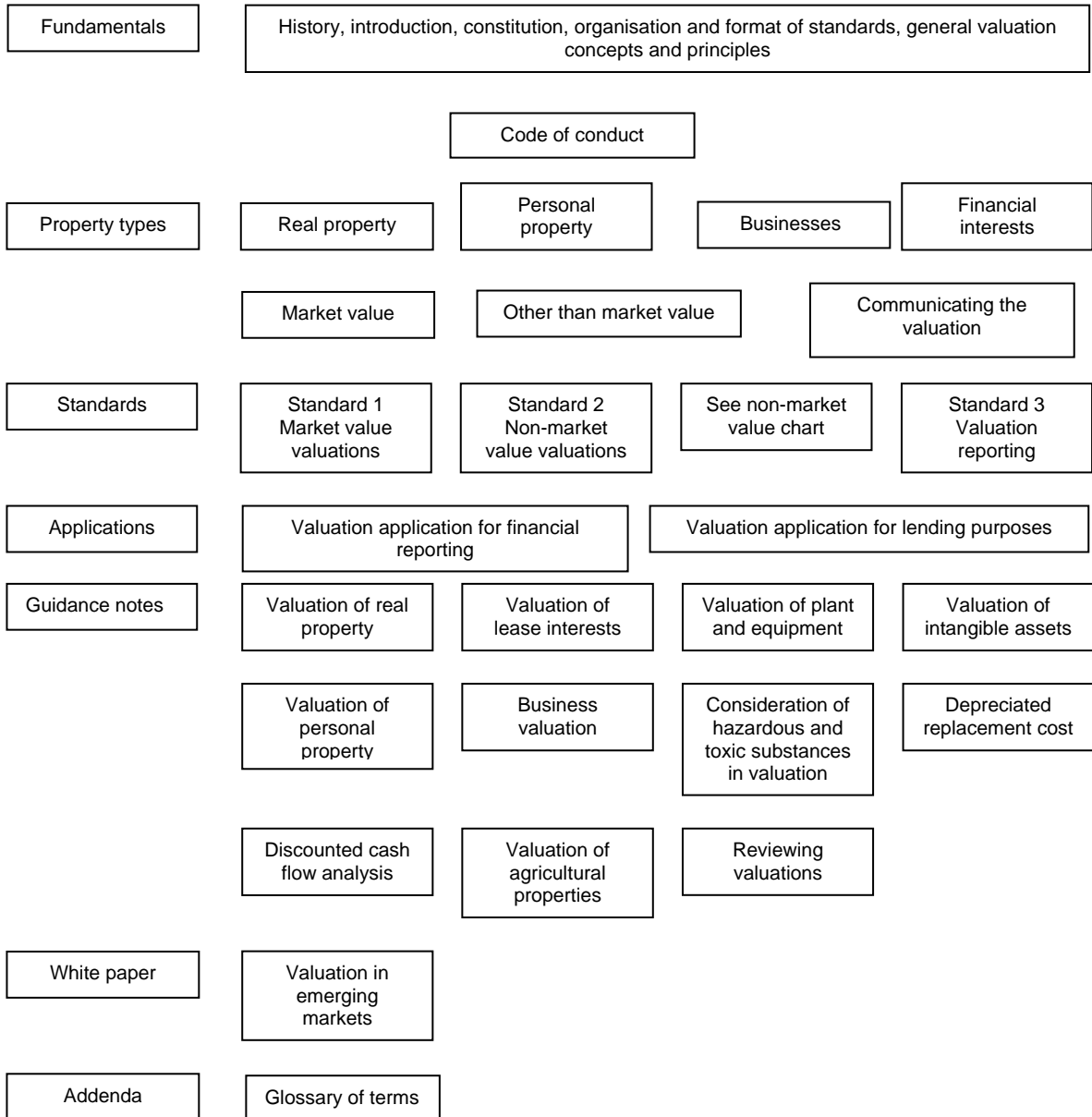
IAS 16 or International Accounting Standards 16 (paragraph 6) as “the amount for which an asset could be exchanged, or a liability settled, between knowledgeable willing parties in an arm’s-length transaction”.



#### 4. The structure of IVS 2003

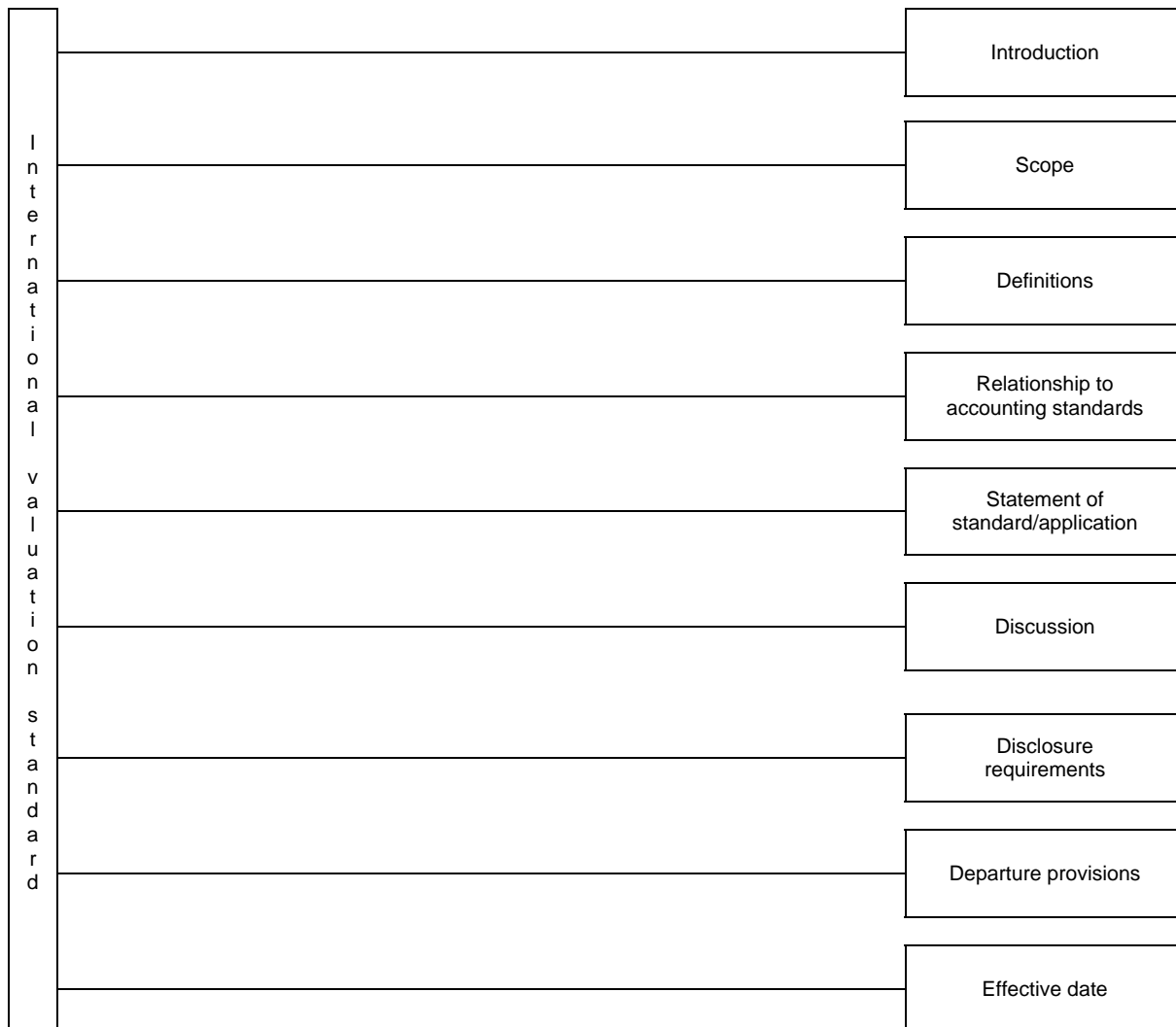
IVS 2003 is structured in the following manner:

##### Structure of the standards document



## 5. Format of the standards and applications

Each Standard, Application or Guidance Note in turn is structured as follows:



IVS 2003 begins with some introductory material including the Constitution of the IVSC, followed by two important chapters (General Valuation Concepts and Principles and Code of Conduct) which are of general application and then proceeds to detail out the various Standards, Applications, and Guidance Notes before concluding with a White Paper and a Glossary.

## 6. General valuation concepts and principles

The first of the important chapters is on General Valuation Concepts and Principles. This chapter defines and distinguishes the concepts of land, real estate, real property and discusses at length some of the important concepts related to valuation such as market value, fair value, highest and best use and other concepts.

## **7. Code of conduct**

The next chapter, the Code of Conduct emphasizes that valuations should be provided by honest and competent professional Valuers, free of bias and self interest, whose reports are clear, will not mislead and will disclose all matters essential to the proper understanding of the valuation. Valuers are required to always promote and preserve the public trust.

## **8. Four property types**

IVS 2003 identifies four property types, namely, real property, personal property, businesses, and financial interests.

## **9. The standards**

There are three main Standards, the Market Value Basis of Valuation, Valuation Bases Other than Market Value, and Valuation Reporting.

### **9.1 The market value basis of valuation**

The market value basis of valuation is recognised as the most widely required and main basis of valuation for most valuations around the globe. The valuations are required for purposes such as purchasing property, selling property, for accounting purposes (both private and governmental), for securing loans (personal or business), for submission to regulatory authorities and for statutory purposes including taxation.

Market Value is a representation of value in exchange, or the amount a property would bring if offered for sale in the (open) market at the date of valuation under circumstances that meet the requirements of the market value definition.

To determine market value, a Valuer must first determine the highest and best use of the property.

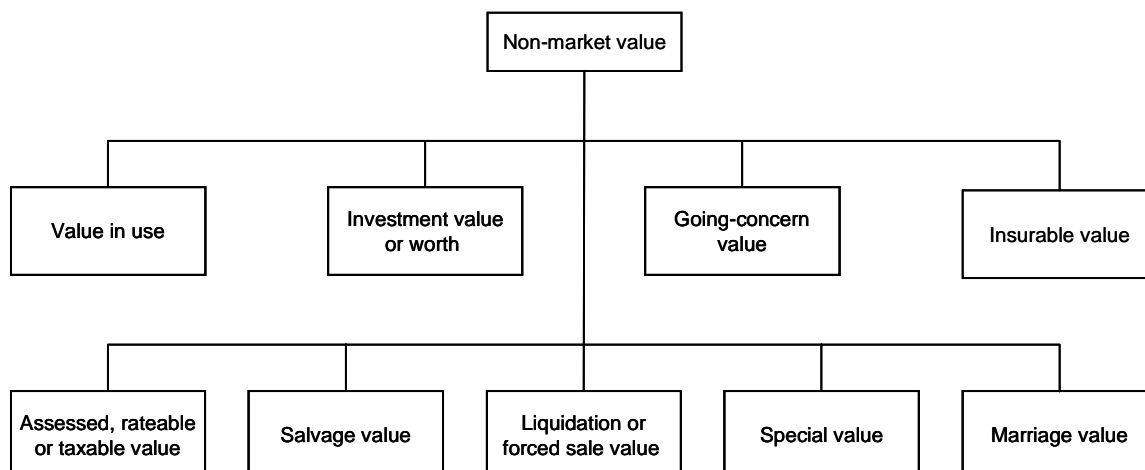
The highest and best use of a property is the most probable use of the property. That use may be for continuation of a property's existing use or for some alternative use.

The most common methods used to estimate market value include the cost approach, sales comparison approach and the income capitalisation approach, including discounted cash flow analysis but fundamental to the determination of market value by these methods is that they are arrived at based on market derived data.

### **9.2 Valuation bases other than market value**

Valuation bases other than market value or non-market based values include non-market based valuations of property use methods that consider the economic utility or function of an asset, other than its ability to be bought and sold by market participants, or the effect of unusual or atypical conditions.

## Non-market value components



- Value in Use is a value to a particular user or owner and is not Value in Exchange which is a market value concept.
- Investment Value or Worth is again a value to a particular user using an approach which recognises a specific requirement of the user such as a target discount rate.
- Going-Concern Value is a value ascribed to an established business, not to any of its constituent parts.
- Insurable Value is a value for insurance purposes.
- Assessed, Rateable or Taxable Values are usually values that are determined under specific situations for tax purposes.
- Salvage Value is ordinarily used to express the current price expected for property, that has reached the end of its useful life.
- Liquidation or Forced Sale Value is a value estimated for disposition of property under extraordinary or atypical circumstances.
- Special Value may accrue to a property by reason of a unique location, a temporary situation under exceptional market conditions, or a premium payable by a purchaser having a special interest.
- Marriage Value is additional value created by the possibilities of amalgamating interests or adjoining lands.

The objective of MVS 2, Valuation Bases Other than Market Value, is to identify and explain bases of value other than Market Value and to establish standards for their application and to **distinguish** them (bases) from Market Value.

### 9.3 Valuation reporting

The IVSC considers the reporting of the findings of a Valuer to be of such importance that it has accorded Valuation Reporting a status equal to the two main bases of valuation. An important requirement is the inclusion of a compliance statement that the valuation has been performed in accordance with IVS. Each compliance statement is meant to confirm that:

- (i) The statements of fact presented in the report are correct to the best of Valuer's knowledge;
- (ii) The analyses and conclusions are limited only by the reported assumptions and conditions;
- (iii) The Valuer has no (or if so, a specified) interest in the subject property;
- (iv) The Valuer's fee is or is not contingent upon any aspect of the report;

- (v) The valuation was performed in accordance with an ethical code and performance standards;
- (vi) The Valuer has satisfied professional education requirements;
- (vii) The Valuer has experience in the location and category of the property being valued;
- (viii) The Valuer has (or has not) made a personal inspection of the property; and
- (ix) No one, except those specified, has provided professional assistance in preparing the report.

The importance of the compliance statement to IVS underscores the fact that IVS, unlike national valuation standards, cannot in any way be enforced on Valuers around the globe. Its use is market driven, required ultimately by users who insist on compliance.

## 10. Applications

The three main Standards are followed by three Applications, for financial reporting, for lending purposes and for public sector financial reporting.

### 10.1 International Valuation Application 1 (IVA 1) - valuation for financial reporting

The objective of IVA 1, Application for Financial Reporting, is to explain the principles that apply to valuations prepared for use in financial statements and related accounts of business enterprises in both the private and public sectors.

This application addresses the criteria that Valuers must observe in preparing valuations for financial statements and related accounts. It also discusses concepts that must be understood by accountants, regulatory authorities, and other users of valuation services.

IVS 1 is developed with particular regard to the requirements of International Accounting Standards or IAS (now International Financial Reporting Standards or IFRS).

IFAS is one of two main accounting standards in the world today, the other being USGAAP which applies in North America.

At present both IFAS and USGAAP conventions are essentially historic cost conventions in most respects save for the different treatment afforded to assets.

US GAAP (Generally Accepted Accounting Principles) requires that historical cost be the sole basis for the continued recognition of the asset, while IAS allows two options, either historical, known as the benchmark treatment, or revalued amount, known as the allowed alternative treatment.

There is at present a drive towards harmonisation of global accounting standards, the conventions represented by IAS and US GAAP are predominant.

### 10.2 International Valuation Application 2 (IVA 2) - valuation for lending purposes

- (i) IVA 2 deals in performing valuations of property where the results will be used to obtain loans, mortgages, and debentures. Valuers shall normally estimate the Market Value of such assets in accordance with these International Standards.
- (ii) Valuers shall have a comprehensive understanding of the requirements of such institutions, and the structure of loan agreement terms and arrangements. Any unusual volatility in the value of the specific property or the market of comparable properties should be mentioned in the valuation report or certificate.
- (iii) Related to lending is the Basel Accord, an international agreement on banking solvency. The present solvency ratio is 8% which means, for example, that a bank should allocate US\$ 8 of its owned capital to every US\$ 100 (on a risk-adjusted basis) it lends.
- (iv) The New Bank Accord (due 2005) may give banks greater scope for assessing their risk in their lending.

### **10.3 International Valuation Application 3 (IVA 3) - valuation of public sector assets for financial reporting**

This Application is not incorporated into IVS 2003 as yet as the final draft has only recently been endorsed by the Management Board of IVSC. It will be published shortly as an exposure draft before adoption as an Application.

IVA 3 is about valuation of public sector assets for financial reporting.

Public sector assets are those assets owned by governmental or quasi-governmental entities to provide goods or services to the general public within a given jurisdiction.

The valuation of public sector property may be undertaken for a range of purposes including financial reporting, privatisation planning, loan origination, bond issuance and cost-benefit or economic analyses performed by governments either to determine whether a public sector asset is being used and managed efficiently or to set pricing for monopoly services.

Property in the public sector comprises conventional property types as well as specialised asset types, including heritage and conservation assets, infrastructure assets, public utility plants, recreational assets and public buildings (eg military facilities). As with private sector assets, public sector assets fall into operational and non-operational categories. Non-operational assets include investment and surplus assets.

## **11. Guidance notes**

The valuation Applications are followed by Guidance Notes. However Guidance Notes under the IVS 2003 *are mandatory*, like the main Standards and Application in order for compliance with IVS.

### **11.1 Guidance note 3 - valuation of plant and equipment**

When valued for financial reporting purposes, plant and equipment are valued in the same manner as other assets, applying Market Value and Depreciated Replacement Cost (DRC) concepts in accordance with International Valuation Application 1.

When the purpose of the valuation is other than financial reporting, plant and equipment are valued by applying an appropriate valuation bases and by clearly distinguishing the results from Market Value if a non-Market Value basis is applied.

Non-market valuations include liquidation value, salvage value, insurable value, auction realisable value, reinstatement value and indemnity value.

Plant and equipment may broadly be divided into four categories, namely, machinery and equipment, equipment that includes such items as furniture and fittings, stocks and moulds, factory and industrial buildings that are highly integrated with the enclosed process or equipment they support and structures of a specialised nature and building services that are normally included in valuations of land and building.

### **11.2 Guidance note 6 - business valuations**

Business valuations are commonly sought and performed on the Market Value basis of valuation applying the provisions of International Valuation Standard 1 (IVS 1). Where other bases of valuation are used, with proper explanation and disclosure, the provisions of IVS 2 are applied.

In general the concepts, processes, and methods applied in the valuation of businesses are the same as those for other types of valuations. Certain terms may have different meanings or uses. Those differences become important disclosures wherever they are used.

A description of a business valuation usually includes an identification of the business, business ownership interest, or security to be valued, the effective date of the valuation, the definition of value, the owner of the interest and the purpose and use of the valuation.

### 11.3 Guidance note no 8 - Depreciated Replacement Cost (DRC)

For purposes of financial reporting, DRC (which is essentially a non-market value) is considered an acceptable method to arrive at a surrogate for the Market Value of *specialised* or *limited market properties* for which the market evidence is unavailable.

DRC is based on an estimate of the Market Value for the Existing Use (MVEU) of the land plus the current gross replacement (or reproduction) costs of improvements less allowances for physical deterioration and all relevant forms of obsolescence (functional or technical and economic or external) and optimisation. DRC may be described either as a valuation methodology or as a basis for value/defined value.

When an asset has been valued by reference to DRC, *adequate profitability* is the test that the directors/manages of the entity should apply to ensure that the entity is able to support the DRC estimate. Where the directors/managers of the entity find the DRC estimate fails to meet the test of *adequate profitability*, the written down estimate represent the asset's *value in use* which then becomes its fair value.

### 11.4 Guidance notes on discounted cash flow analysis

The Discounted Cash Flow Method of Valuation is an income based method or approach and has a growing following around the world due to its easy use that has come about because of computer spreadsheets and computing power. The method which essentially comprises three major elements, namely the cash inflows, the cash outflows and the discount rate can be applied to most **complex**, investment properties. Where the Comparison Method falls short in its ability to take into account **explicitly** the differences between the comparable sale and the property being valued the discounted cash flow (DCF) triumphs, as it can make explicit in the cash flows, the differences.

Due to the need to address the issues and to ensure the proper use of DCF analyses in valuation, the IVSC set itself the task of coming up with a Standard and setup an Expert Group (a usual approach) to look into the issues and to draw up a Standard.

The Expert Group, in coming up with the Guidance Note that will be in the 6th Edition, made the following distinctions:

- In arriving at *market value*, a DCF valuation must recognise *market derived* inflows, outflows and the discount rate. In practice this will be achieved by a valuer constructing DCF models for known sale comparables and then applying the "market derived" inflows, outflows and discount rate to value the property under consideration. Should the valuer adhere to this he cannot abuse the DCF as the value is based on market derived data. In past valuations there has been some confusion among valuers when they have not been focussed in ensuring that for the estimation of market values, just as in any of the other methods of valuation; they ought to base it on market derived data. In many instances valuers did differ in the construction of inflows and outflows without reference to models of previous known sales and in the determination of discount rates it was not strictly based on market analyses of known sales.
- A DCF valuation to arriving at Market Value on the one hand and a DCF valuation for the determination of a *non-market value* on the other must be distinguished. For example where a valuer is asked to do a valuation based on a certain rate of return specific to the requirements of the client, it is a non-market valuation and he must distinguish this valuation from a market valuation.
- The GN distinguishes between market and non-market valuations done by a valuer and a *value-in-use* (using the DCF) done by Accountants under the International Accounting Standards (IAS). A value-in-use valuation is a non-market estimate based on a strict continuing use of the asset in its existing use whereas a market value estimate (value-in-exchange) done by a valuer will include not only the continued use of the asset in its existing use but its full potential use. Inherent in a market value estimation is the concept of the highest and best use.
- The GN distinguishes between valuations for market and non-market valuations and the use of the DCF for investment analyses purposes where the merits of one property investment or

project with another are assessed. The GN notes that it relates only to *valuation* (market or non-market) and does not relate to *investment analyses*.

- The GN distinguishes between the use of DCF valuations for real property and businesses.
- Perhaps most important of all it requires all data used in the method to be adequately substantiated.

In arriving at its recommendations the Expert Group took particular pains to steer away from being prescriptive, which is an underlying principle upon which the other Standards in IVS have been constructed. This will allow valuers to employ the latest techniques in computing cash flows including the use of various probability techniques, such as the Monte Carlo Simulation technique to establish more accurately the certainty of cash inflows.

In emerging markets, the use of the DCF for valuation is perhaps even more popular and this is because there is usually a lack of sale comparables in sufficient numbers to undertake accurate valuations based on the Comparison Method. With the limited sale comparables however models can be constructed from the limited known sales for application in various similar situations.

The IVSC is acutely aware that for specialised properties such as forests and mineral rights, valuers around the world find that the use of the DCF is the principal means to the determination of value.

Like in the case of all other approaches, more day-to-day use of the DCF method or approach to valuation will usually lead to higher levels of proficiency. Lastly, it is not the method itself that provides an accurate answer; rather it is the knowledge and skill of the person using it that is more important to the level of accuracy desired.

### **11.5 Guidance notes note no 10 - valuation of agricultural properties**

Agricultural properties are valued similarly as other properties with market value being the main basis of valuation.

For Financial Reporting under International Accounting Standards IAS 16 (Property, Plant and Equipment), IAS 40 (Investment Property), and 41 (Agriculture) apply to the valuation of agricultural property. An entity follows IAS 16 or IAS 40, depending on which standard is appropriate in the circumstances. IAS 16 requires that land be measured either at its cost less any accumulated depreciation and accumulated impairment losses or at a revalued amount. IAS 40 requires land that is investment property to be measured at its fair value, or cost less any accumulated depreciation and accumulated impairment losses. IAS 41, which requires that biological assets physically attached to land (eg trees in a plantation forest) be measured at their fair value less estimated point-of-sale costs, separately from the land.

## **12. Intangible assets (related to business valuations)**

Intangible assets are assets that manifest themselves by their economic properties. They do not have physical substance; they grant rights and privileges to their owner and usually generate income for their owner. Intangible assets can be categorised as arising from Rights (supply contracts, distribution contracts, licensing permits), Relationships (assembled workforce, customer relationship, supplier relationship), Grouped intangibles (goodwill), and Intellectual property (brand names, trademarks, copyrights, patents).

The basis is usually market value by the Cost, Income and/or Sale comparison approach. IAS 38 prescribes the accounting treatment.

## **13. White paper on emerging markets**

As an addition to the Standards, Applications and Guidance Notes there is a White Paper in IVS 2003 Commentary. This has come about because one of the three objectives that the IVSC has set for itself



is “to provide Standards of valuation that meet the needs of emerging and newly industrialized countries”.

The White Paper on Valuation is twofold:

- (i) provide specific guidance to Valuers in emerging markets; and
- (ii) contribute to the efforts of international, regional and national development banks and institutions in restructuring and/or strengthening financial systems in emerging markets.

The special economic, legal and institutional characteristics of emerging markets pose particular problems for Valuers working in these markets. Some of these characteristics may also be evident more developed markets, but would tend to be more prevalent in emerging markets and include:

- A poor or inadequate legal framework that does not allow for the efficient functioning of the property market.
- The lack of published information or difficulty in obtaining information regarding transactional as well as other data requisite for proper valuations.
- Greater volatility of property markets.
- Lack of adequately trained professional Valuers.
- Outdated National Valuation Standards.
- External pressure.
- Excessive or insufficient government intervention.
- Growing importance of intangible property.

Broadly, the White paper requires that Valuers carrying out valuations in emerging markets adhere to all the principles and practices that are required for compliance with IVS 2003. Where this is not possible, Valuers should do “the next best thing”.

There is an advisory to bank and other lenders to recognise the characteristics that exist in emerging market and to seek to promote efficient property markets in these States by way of their policy advisories.

## **14. Conclusions**

In very simple terms, IVS 2003 says:

- (i) The main basis of valuation of real estate or interests in real estate is market value which also fair value.
- (ii) Where not market based, the valuation must be clearly stated and distinguished as a non-market valuation.
- (iii) Market value can be arrived at by various “methods” but the inputs must be market derived.
- (iv) The Depreciated Replacement Cost when applied to specialised properties or properties with limited markets is a surrogate for market value for financial reporting purposes.
- (v) The different types of real properties or interests in real estate may warrant differing emphases and treatment.
- (vi) Valuers are required to ensure a high degree of disclosure in their valuation reports.
- (vii) The Valuer must be competent and have integrity.
- (viii) The valuation report must communicate all facts and the findings in a comprehensive manner. It must not mislead the reader in any way.

Valuation Standards help to promote efficient property markets and property markets underpin market economies around the world. Seen in this context Valuation Standards are important for financial stability.

# CMBS loan losses: property type highlights and trends

Mary O'Rourke and Susan Merrick  
FitchRatings

## Summary

Fitch Ratings recently published the results of its annual default and loss studies (see Fitch Research on "2003 Conduit Loan Default Study", dated 27 May 2003, and "2003 Loan Loss Study", dated 5 August 2003, available on Fitch's website at [www.fitchratings.com](http://www.fitchratings.com)). The data reported in those studies have been further refined to provide an analysis of defaults and losses within the major property types.

The property type sector analysis highlights how certain default resolution characteristics and outcomes differ by property type and addresses differences in disposition modes, as well as in the timing, frequency, and size of losses experienced within particular property sectors. The analysis also contrasts the disproportionate representation each property type has in the universe of defaults and losses, measured against its contribution to the overall commercial mortgage-backed securities (CMBS) universe, and further examines loss severities based on property type.

The largest loss severity, 46.6%, is occurring in the retail sector, which contributes almost 29% of all CMBS collateral on a dollar basis. Retail loan losses represented 48% of the almost \$306 million in total losses. Hotel loans, which account for less than 10% of CMBS collateral on a dollar basis, represented 29% of experienced losses.

Approximately one half the dispositions that had losses, 77 of 144 loans, were liquidations of real estate-owned properties (REO), which, on average sustained the highest loss severities. Another 40% of the loans with losses were disposed of by discounted payoffs (DPOs), resulting in much lower average loss severities.

At the start of 2003, 400 unresolved CMBS loans were in special servicing with an aggregate balance of \$2.7 billion. Fitch anticipates approximately \$2.87 billion in new defaults in 2003 and another \$400 million in losses.

## Methodology

The pool of loans used to track defaults and losses in Fitch's studies includes only fixed-rate conduit, large loan, and fusion CMBS transactions rated by Fitch from 1993 to 2002. It includes 29,542 loans in 200 multiborrower transactions, representing approximately 72% of the market share of similar transactions during that period. The defaulted loan population includes only those loans in default 60 days or more. In the presentation of defaults and losses by property type, multifamily and manufactured housing loans are combined.

## Summary of defaults, resolutions, and losses

During calendar year 2002, 228 defaulted loans, totalling \$1.15 billion, were resolved. By count, 55% of the loans either paid off in full or were sold without experiencing a loss. By dollar balance, those 125 loans accounted for 48% of the dollar balance of those resolutions. Total realised losses on the other 103 loans were \$241.5 million, or 21% of the dollar balance of all 2002 resolved loans.

REO dispositions experienced the highest loss severity at 64.3%, followed by foreclosure sales with losses of 41.2%. It should be noted that of the pool of 144 loans with losses, only three were foreclosure sales. Note sales had an average severity of 39%, while negotiated DPOs had the lowest loss severity at 28.9%. As was cited in the aforementioned 2003 default study, the average loss

severity for loans held in special servicing for 24 months or more was 62%, up from 42.4% in the previous Fitch study.

Cumulatively, of the almost 30,000 loans in the conduit universe in this study, 807 experienced at least one period of default. Those loans represent a 2.66% default rate by dollar balance and a 2.73% default rate by loan count. Cumulative losses totalling \$305.9 million were realised in 144 of the total 416 resolutions of defaulted loans, representing 0.17% of the \$177.2 billion of original loan balances in the CMBS transactions in this study and 14.9% of the original loan balance of the 416 resolved defaulted loans.

On a cumulative basis, REO dispositions experienced an average 51.6% loss severity, foreclosure sale losses 41.2%, losses on note sales 39%, and DPO resolutions 27.1%. As noted in Fitch's previous 2003 loss study, although it appears DPO dispositions result in lower losses than REO dispositions, loans resolved through DPOs likely reflect higher quality assets with upside potential.

## **Resolutions and dispositions by property type**

### **Multifamily resolutions**

In the multifamily sector, 112 loans totalling \$366.2 million were resolved, with 70% of the loans either becoming current or paying off in full. On average, multifamily loans were resolved in 19.1 months, the longest period of the four core property types. Of the multifamily loans resolved, 29, or 26.8% on a dollar basis, had realised losses averaging 30.6%. On a dollar basis, 68.8% of the multifamily loans were REO liquidations that experienced an average loss of 33.8%. DPO resolutions experienced an average loss of 23.2%. Losses on note sales, accounting for 17.6% of the multifamily resolution dollar amount, averaged 24.2%.

### **Retail resolutions**

While the number of retail loan resolutions was only slightly more than in the multifamily cohort, 119 versus 112, the dollar balance of retail resolutions far exceeded the balance of each of the other property types (\$683 million). On average, retail loans were resolved in 15.7 months.

On a dollar basis, 48.4% of retail resolutions experienced losses averaging 46.6%, the highest loss severity of any property type. By dollar amount, DPO resolutions accounted for 60.9% of retail resolutions and experienced an average loss of 33.5%. REO liquidations, making up almost 36% of retail dispositions, experienced an average loss of 64.7%. The highest losses, at 82.4%, occurred among note sale dispositions, representing only 3.2% of retail dispositions.

### **Office resolutions**

While office loans represent almost 21% of the dollar balance of CMBS collateral in this study, the third largest share behind retail and multifamily, this property type has experienced the fewest defaults and the lowest loss severity to date. The 22 resolved office loans represented just 3.9% on a dollar basis of all 416 default resolutions. Almost 73% of defaulted office loans became current. Six loans, representing almost 41% of the office loan defaults on a dollar basis, experienced losses averaging 22%. Office resolutions were the speediest of any property type, averaging 15 months. Three loans resolved by note sales experienced an average loss of 23.3%, while DPO liquidations realised average losses of 14.4% and REO resolutions 29.4%.

Fitch has a guarded outlook on office loans for the near future. Both the number of office loan defaults and the size of the losses taken by resolved office loans are expected to increase.

## Cumulative resolutions by property type

As of 31 December 2002

	Multifamily	Retail	Office	Industrial	Hotel	Health care	Other <sup>1</sup>
<b>Resolved loans</b>							
Number of loans	112	119	22	28	97	19	19
Original loan balance (\$)	366.2	683.0	79.6	109.8	430.7	285.5	91.6
Average months to disposition	19.1	15.7	15.0	17.9	16.7	33.6	15.1
<b>Loans with losses</b>							
Number of loans	29	42	6	7	49	7	4
Loss balance (\$)	30.1	148.0	7.1	8.6	89.5	18.8	3.6
Property type with losses (%)	26.8	46.5	40.7	18.4	20.8	10.3	3.8
Property type average loss (%)	30.6	46.6	22.0	36.2	46.0	40.8	10.6

<sup>1</sup> Includes various nontraditional property types.

### Industrial resolutions

On a dollar basis, industrial loans make up only 6.8% of all CMBS collateral and 6.7% of defaults resolved in this study. As of year-end 2002, 28 defaulted industrial loans, totalling \$109.8 million, had been resolved with seven loans experiencing losses averaging 36.2%. Those seven loans represent only 18.4% on a dollar basis of the resolved industrial loans, almost 82% of which became current or paid off without losses. By balance, 37.7% of the loans with losses were resolved through REO dispositions, experiencing a loss severity of 52.1%. The remaining loans were resolved by DPOs, experiencing an average loss of 25.3%. Fitch's outlook for industrial loans is similar to that for office loans; however, because industrial loans make up a relatively small portion of CMBS collateral, the anticipated rise in defaults and losses is expected to have less of an impact on total CMBS losses.

### Hotel resolutions

A total of 97 defaulted hotel loans, with a collateral balance of \$430.7 million, had been resolved by year-end 2002, the second largest group on a dollar basis behind retail. Of the total defaulted loans, 42.4% were resolved by either becoming current or paid in full. The 49 loans with losses, which on a dollar basis represented 20.8% of the resolved hotel loans, experienced average losses of 46% and took 16.7 months to resolve. REO liquidations accounted for 39.6% of the dispositions by dollar balance and experienced losses averaging 76.2%. Loans resolved by DPOs, roughly half the dispositions, experienced average losses of 24.1%. Hotel loans account for less than 9% of the collateral in this study. Because Fitch often does not rate hotel-only transactions, the relatively small hotel collateral contribution in this pool may understate the impact of hotel losses on the larger CMBS conduit universe. Hotel properties continue to be the most vulnerable to market changes.

### Health care resolutions

In the health care sector, 19 defaulted loans totalling \$285.5 million were resolved, with 57.9% becoming current. Seven loans, which only represented 10.3% of the dollar balance of resolved health care loans, experienced average losses of 40.8%. Health care loans took an average of 33.6 months to resolve, more than twice the time of most other property types. No health care loans were resolved through DPOs. By loan balance, 84% were resolved by REO liquidations, experiencing an average loss of 41.5%. The loss for health care loans disposed of through note sales was 73.6% and through foreclosure, 20.5%. Health care loans make up only 2.54% of CMBS collateral and, as such, are overrepresented in the group of loans with losses representing more than 6% of the total balance of losses. Nonetheless, the current decline in health care loan contributions to CMBS is expected to continue, minimising the impact this property type will have on CMBS performance in the long term.

**Cumulative dispositions by  
property type - disposition method**

As of 31 December 2002

	Multi-family	Retail	Office	Industrial	Hotel	Health care	Other	Total no of loans	% of dispositions
No of liquidated REO assets	20	16	1	4	23	5	2	71	49.31
% of original PT balance	68.8	35.9	37.2	37.3	39.6	84.0	50.0	–	–
WA loss on original balance (%)	33.8	64.7	29.4	52.1	76.2	41.5	37.5	–	–
No of discounted payoffs	5	25	2	3	20	0	2	57	39.58
% of original PT balance	13.5	60.9	39.5	62.7	50.5	0.0	50.0	–	–
WA loss on original balance (%)	23.2	33.5	14.4	25.3	24.1	0.0	20.5	–	–
No of foreclosures	0	0	0	0	2	1	0	3	2.08
% of original PT balance	0.0	0.0	0.0	0.0	3.3	10.4	0.0	–	–
WA loss on original balance (%)	0.0	0.0	0.0	0.0	58.6	20.5	0.0	–	–
No of note sales	4	1	3	0	4	1	0	13	9.03
% of original PT balance	17.6	3.2	23.3	0.0	6.6	5.6	0.0	–	–
WA loss on original balance (%)	24.2	82.4	23.3	0.0	32.8	73.6	0.0	–	–

REO - real estate owned; PT - property type; WA - weighted average.

### Proportional property type contributions

With a combined contribution of 76%, the CMBS universe is dominated with collateral from the retail, multifamily (including manufactured housing), and office sectors. The retail sector, which makes up almost 29% of the CMBS universe, maintains an almost proportionate share of the default universe. However, in the loss universe, retail loans account for more than 48% of CMBS realised losses and have the highest property type weighted average loss, 46.6%.

Hotel loans, which make up 8.8% of CMBS collateral, account for more than 29% of the defaulted loan balance and represent roughly the same disproportionate share of the loss universe. Hotel loans are experiencing, on average, realised losses of 46%. On the other hand, multifamily loans, while

accounting for more than 26% of all CMBS collateral, are significantly underrepresented in the default and loss universes.

The under representation of the office and industrial sectors in the default and loss universes is expected to change over the next 18-24 months, as both sectors continue to demonstrate increased defaults and losses. The health care sector, with disproportionately high defaults and losses, will likely remain a small contributor to CMBS collateral, but Fitch expects that it will continue to be overrepresented in both the default and loss universes for some time. Health care facilities, as is the case with hotels, are operating business subject to acute vulnerability to market events.

### Proportional property type contributions

%, As of 31 December 2002

Property type	Balance of CMBS universe	Defaults in total default universe	Losses in total loss universe	WA loss severity by property type
Multifamily	26.38	13.97	9.84	30.61
Retail	28.98	28.01	48.37	46.60
Office	20.62	6.66	2.33	21.98
Industrial	6.80	4.45	2.82	36.18
Hotel	8.82	29.41	29.26	45.98
Health care	2.54	13.73	6.15	40.82
Other	5.87	3.76	1.23	10.75
Average loss severity - core property types <sup>1</sup>	–	–	–	33.84
Average loss severity - all property types	–	–	–	33.27

CMBS - commercial mortgage-backed securities; WA - weighted average.

<sup>1</sup> Include multifamily, retail, office and industrial properties.

The table above presents a summary of how each property type has performed in CMBS compared with other property types. It summarises default and loss history within each property type, as well as each property type's weighted average loss severity.

### Defaults and losses in each property type universe

On a dollar basis, more than 14% of all health care collateral has experienced defaults. Total experienced losses in that sector represent 0.42% of all health care collateral. In the hotel sector, 8.9% of collateral has defaulted, but 0.57% has taken losses, the highest percentage of any property type sector. Retail loans, which account for such a disproportionate portion of the loss universe, have experienced defaults in 2.57% of collateral and losses of 0.29%. The remaining property types have all experienced less than a 0.1% loss in their total collateral. Overall, of the \$177.2 billion in CMBS loans in this study, loans totalling \$4.7 billion have defaulted at least once (2.66% of the collateral), with only 0.17% (\$305.9 million) in realised losses. The 144 loans that experienced losses had original loan balances totalling \$748 million. Almost 41% of that original loan balance, \$306 million, was lost in the resolution of those defaulted loans.

The weighted average loss severity for all property types is 33.3%. For core properties, including multifamily, retail, office, and industrial loans, the weighted average loss is 33.8%.

## Defaults and losses by property type

As of 31 December 2002

Property type	Balance of CMBS universe (\$ bn)	No of loan defaults	Default balance (\$ m)	% of defaults by property type	No of loans with losses	Original balance loans with losses (\$ m)	Balance of losses (\$ m)	Loss as % property type universe	Property type contribution to loss universe (%)
Multifamily	46.7	185	658.8	1.41	29	98.4	30.1	0.06	9.84
Retail	51.3	210	1,320.7	2.57	42	317.6	148.0	0.29	48.37
Office	36.5	58	314.2	0.86	6	32.4	7.1	0.02	2.33
Industrial	12.1	53	209.9	1.74	7	23.8	8.6	0.07	2.82
Hotel	15.6	207	1,386.5	8.87	49	194.8	89.5	0.57	29.26
Health care	4.5	61	647.5	14.41	7	46.1	18.8	0.42	6.15
Other <sup>1</sup>	10.4	33	177.4	1.71	4	34.9	3.8	0.04	1.23
<b>Total</b>	<b>177.2</b>	<b>807</b>	<b>4,715.1</b>	<b>–</b>	<b>144</b>	<b>748.0</b>	<b>306.0</b>	<b>0.17</b>	<b>–</b>
Defaults as % of originations			2.66						
Losses as % of original loan balances			0.17						

Note: Numbers may not add due to rounding.

<sup>1</sup> Includes various nontraditional property types.

The table on page 5 summarises, by dollar balance and number of loans, the default and loss experience of each property type in the CMBS universe.

### Problem loan pipeline

At the close of 2002, 400 unresolved CMBS loans were in special servicing - 261 delinquent loans, 42 loans with pending foreclosures, and 97 loans that were already REO properties. The total balance of those loans was \$2.7 billion, 60% of which consists of hotel (\$950.7 million) and retail (\$682.6 million) loans. Also included in that pool were 52 loans that, at that time, had been in special servicing for longer than 24 months.

In the second quarter of this year, the Fitch Loan Delinquency Index grew to 1.62%, a 23 basis point (bp) increase over first-quarter 2003. Based on ongoing performance analytic efforts, Fitch expects to see similar increases in the loan delinquency index in the third and fourth quarters of 2003, with an overall CMBS delinquency of 2% by year-end. In all, Fitch anticipates an additional \$2.87 billion of loan defaults for the year. Furthermore, a preliminary evaluation of completed 2003 resolutions indicates that losses have increased by almost \$300 million thus far, almost doubling the amount of losses on the books when the year started.

### Forecast

Using the various property-specific default and loss rates that have been generated by the loss study, as well as the data gathered from ongoing performance analytics, Fitch estimates that final losses for 2003 will total around \$400 million. Within the various property sectors, Fitch expects defaults in the multifamily, office, and industrial sectors to continue rising and that losses, on a percentage basis, will

remain proportionally higher in the hotel and retail sectors, particularly within the 2003 pool of resolutions.

Despite weakened real estate fundamentals and a frustratingly slow economic recovery, CMBS investments remain a bright spot in the structured finance world. When analysing losses, it is easy to overlook how startlingly small these losses have been over the course the 10-year history of CMBS. Actual default and loss experience in CMBS is considerably lower than earlier expectations when CMBS was a fledgling investment vehicle.

While forecasting increases in defaults and losses as the universe of transactions expands and matures and acknowledging that net operating income in most property types has been declining over the past 18-24 months, Fitch believes investment-grade CMBS will continue to be well protected. The diversity of collateral in conduit transactions, along with higher levels of technology in the servicing sector and lower interest rates, has helped CMBS performance outpace that of other structured finance investments.

The characteristics of defaults and losses, when evaluated by property type, will continue to illuminate differences and inherent risks in each property type sector and allow investors and rating agencies to further hone their risk analysis.



# US commercial real estate indices: the NCREIF property index

Jeffrey D Fisher

## Overview of NCREIF

NCREIF is a Not-for-Profit Industry Association that was founded in 1982. Its members include investment managers,<sup>1</sup> pension fund plan sponsors, professionals (eg, real estate appraisers and accountants), and academics. Those members of NCREIF who have qualifying data<sup>2</sup> on properties under management contribute their data each quarter to the NCREIF Property Index (NPI). NCREIF aggregates the confidential individual property data provided by members and provides indices based on aggregate data for use by its members and the real estate industry.

The mission of NCREIF is as follows:

- Collect and validate real estate performance data
- Calculate and publish performance measures
- Promote and publish Real Estate Information Standards
- Foster and support independent research
- Provide education; field of performance measurement

## NCREIF property index

The NCREIF Property Index (NPI) provides returns for institutional grade real estate held in a fiduciary environment in the United States. Properties are managed by investment fiduciaries on behalf of tax-exempt pension funds. As of the second quarter of 2003 the index contains 3,967 properties with an aggregate market value of \$127 billion.

Figure 1 shows the breakdown of the index by property type. Office is the dominant property type at 40% of the market value of the index with apartment, retail and industrial properties being about 20% each.

Figure 2 shows the percentage of properties in each region of the country. The western region has the greatest proportion of properties (34%) followed by the East (29%), South (22%) and Midwest (15%).

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<sup>1</sup> Also referred to as investment advisers. These include insurance companies and other organisations that specialise in acquisition, management and disposition of real estate income properties purchased in a fiduciary capacity for investors such as pension funds and wealthy investors.

<sup>2</sup> Managers must have at least \$100 million of properties under management that are at least partially held in tax exempt accounts such as open end funds, closed end funds or separate accounts.

Figure 1

**Allocation of NPI by property type**

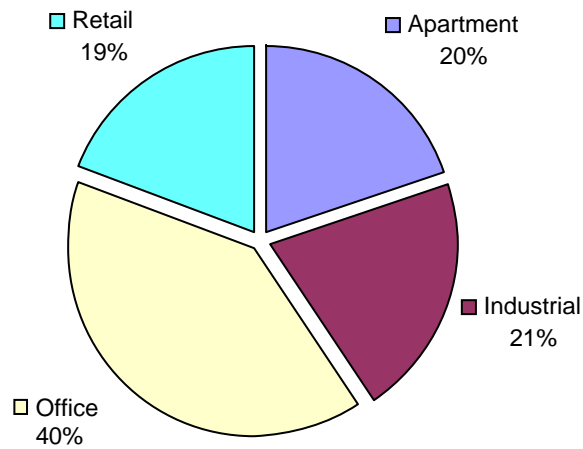
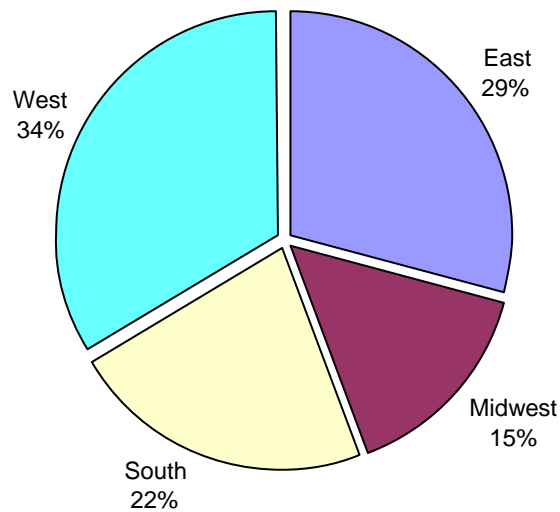


Figure 2

**Allocation of NPI by region**



**Why was the NCREIF index created?**

The NCREIF index was the first available index to measure the performance of income producing real estate and is still the primary index that institutional investors rely on for benchmarking the performance of real estate. It was created to understand how the performance of real estate compares with other asset classes such as stocks and bonds and also to provide a better understanding of the risk and return for commercial real estate.

The index is often used as a basis for developing diversification strategies such as the percentage allocation to real estate to minimise risk for a target portfolio return. Also, sub-indices such as for office, retail, industrial and apartment properties are used to determine how to diversify by property type. Similarly, sub-indices by regions of the country are used for geographic diversification.

Investment managers also use the index as a “benchmark” to evaluate the performance of their portfolio against index. Incentive fees paid by clients to investment managers might be based on out-performing the NCREIF index.

## Calculation of index

In simple terms, the index measures the return each quarter “as if” the property was purchased at the beginning of the quarter at the beginning of quarter appraised value and sold at the end of the quarter at the ending appraised value. The return is the change in value plus the cash flow received for the quarter. Cash flow is net operating income (NOI) less any capital expenditures (Capex).<sup>3</sup> The index is calculated on an “unleveraged” basis, ie, as if the property did not have any debt financing.<sup>4</sup> It is also calculated on a before tax basis. In fact, because the properties in the NPI are held in tax-exempt accounts, federal income taxes would be irrelevant. Returns are calculated for each individual property and then value weighted to produce the index.<sup>5</sup>

## Marked-to-market valuation

Members of NCREIF revalue their properties every quarter because ERISA<sup>6</sup> required pension funds to report the value of investments in retirement plans. As pension funds started adding real estate to their portfolios in the 1970s their real estate investment managers faced the problem that public market pricing wasn’t available for the real estate holdings as was the case for other assets like stocks and bonds. Hence the investment managers used appraisals to mark their properties to market each quarter.

The financial statements that include marked-to-market valuation are in accordance with generally accepted accounting principles (GAAP) except for the valuation of real estate being based on appraisals instead of historical cost less depreciation. However, GAAP allows for use of “prevailing industry practice” in the absence of other guidance. Fair market value accounting for real estate held by pension funds was incorporated into the Real Estate Information Standards (REIS) developed by NCREIF and other organisations.

## Appraisal process for NCREIF

Appraisals are based on “market value”<sup>7</sup> for client reporting. Investment value, which is the value to the particular investment manager, might also be estimated for buy-hold analyses but financial reporting (and the NCREIF index) is based on market value. There is usually an external appraisal at least once per year, which means that an independent appraiser, usually with an MAI designation,<sup>8</sup> does the appraisal. Internal appraisals are usually done the other quarters. The emphasis is on the income approach and use of discounted cash flow analysis (DCF) when doing appraisals for NCREIF

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<sup>3</sup> Capital expenditures are for items like roof replacement, leasing commissions, tenant improvements, etc that are “capitalised” rather than “expensed” and included in NOI.

<sup>4</sup> Some properties are purchased with loans but the index is calculated as if there was no loan.

<sup>5</sup> Value weighting produces a return for all the properties in the database as if they were a portfolio.

<sup>6</sup> Employee’s Retirement Income Securities Act.

<sup>7</sup> Market value can be thought of as the most probable selling price for the property. In the United States, market value assumes that the property has already been exposed to the market for a reasonable period of time and there is no discounting for time on the market.

<sup>8</sup> The MAI designation means “Member of the Appraisal Institute” and is awarded appraisers after completion of experience, coursework and a demonstration appraisal. See [www.AppraisalInstitute.org](http://www.AppraisalInstitute.org).

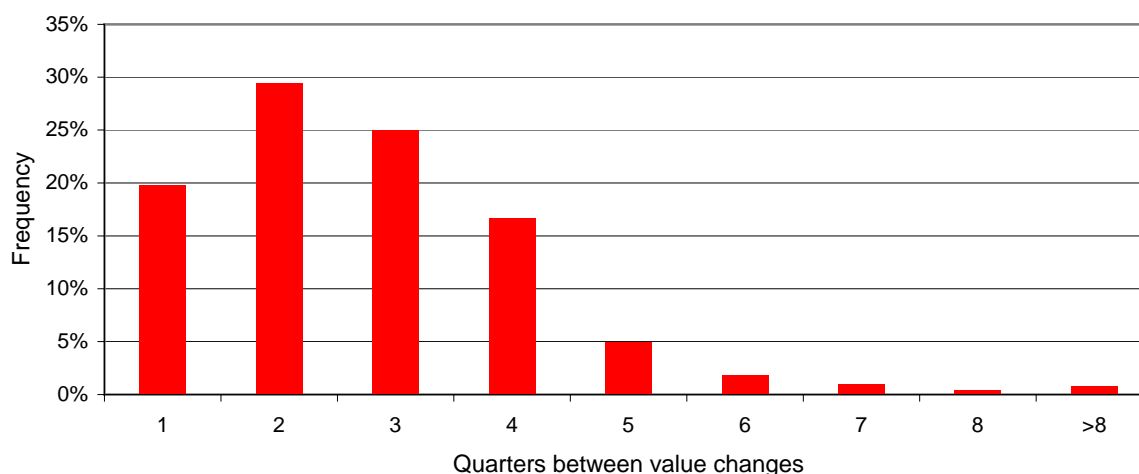
members. The analysis is often done using lease-by-lease financial software such as ARGUS or Dyna<sup>9</sup> that is designed for real estate income property investments with a variety of leases such as office, retail and industrial properties.

## Appraisal issues

As noted earlier, the beginning and ending values used to calculate the NCREIF index are based on appraisals. This is because the real estate in general, and properties in the index do not transact on a regular basis. Thus, appraisals rather than transaction prices are used to calculate the index.

Appraisal based indices such as the NPI tend to have less volatility and lag changes in the market for two reasons: First, all properties are not actually revalued each quarter. Although investment managers report a value every quarter, managers don't always spend the time and money to do a complete revaluation of the property. They may just adjust the value for any additional capital expenditures and have a policy of only revaluing the property if they believe there has been a significant change in value. Figure 3 shows on average how many properties in the NPI are revalued each quarter.

Figure 3  
Average time between  
revaluations of properties in NPI

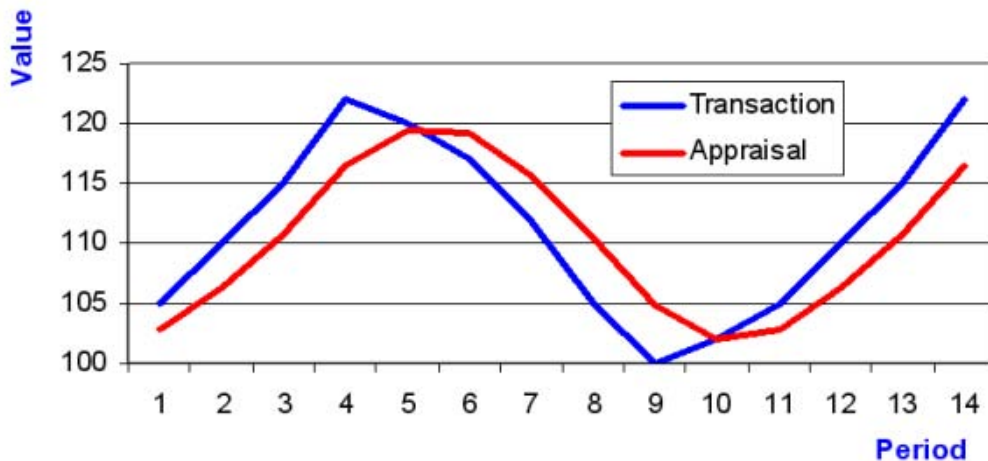


Second, appraisals themselves tend to lag transaction price due to the nature of the appraisal process. Information on transactions is often sparse and by nature historical - especially by the time the data is collected and verified. Market conditions often change more rapidly than can be reflected in data available to appraisers. This causes appraised values to be less than transaction prices in an up market and vice versa. This is illustrated using hypothetical data in Figure 4.

<sup>9</sup> Both ARGUS and Dyna are available from the Realm ([www.Realm.com](http://www.Realm.com)).

Figure 4

Appraised values vs transaction prices



It should be noted that this does not mean the appraiser is not doing the best job possible to estimate value. But the appraiser can not rely just on the most recent comparable sale (comp) because there may be something unusual about that sale that causes it to not be representative of the value of the subject property being appraised. The appraiser needs to receive sufficient evidence that there has been a shift in market prices.

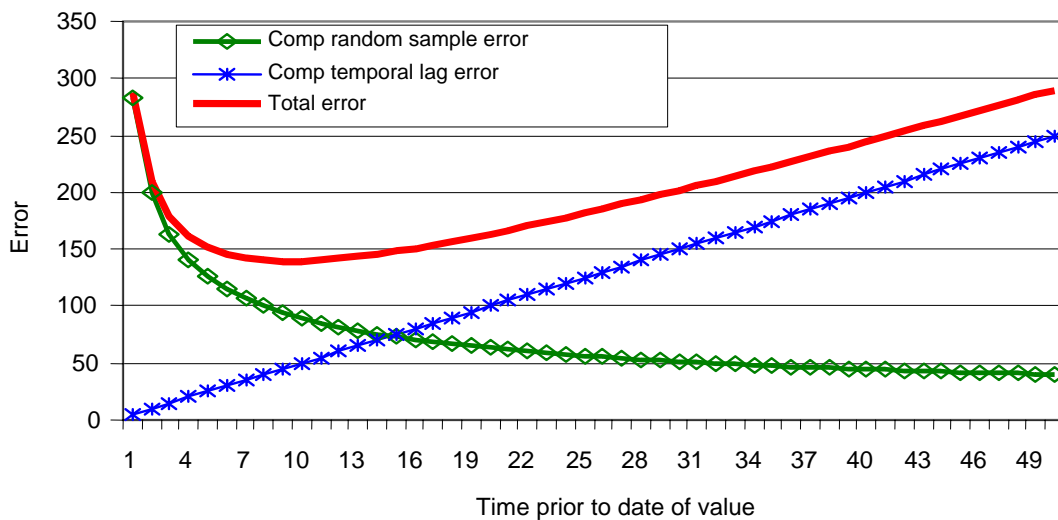
There are two kinds of error in the appraisal of individual properties:

- **Comp sample error.** The comp sample error is due to random differences between the comparable sale (comp) and the subject property.
- **Comp lag error.** This is due to the time that has elapsed since the comparable property (comp) sold and the date of value for the subject property.

There is a trade-off between the reduction in random comp error versus reduction in comp temporal lag error in property value estimation. The appraiser in a sense tries to minimise the sum of the two errors. This is illustrated in Figure 5.<sup>10</sup>

Figure 5

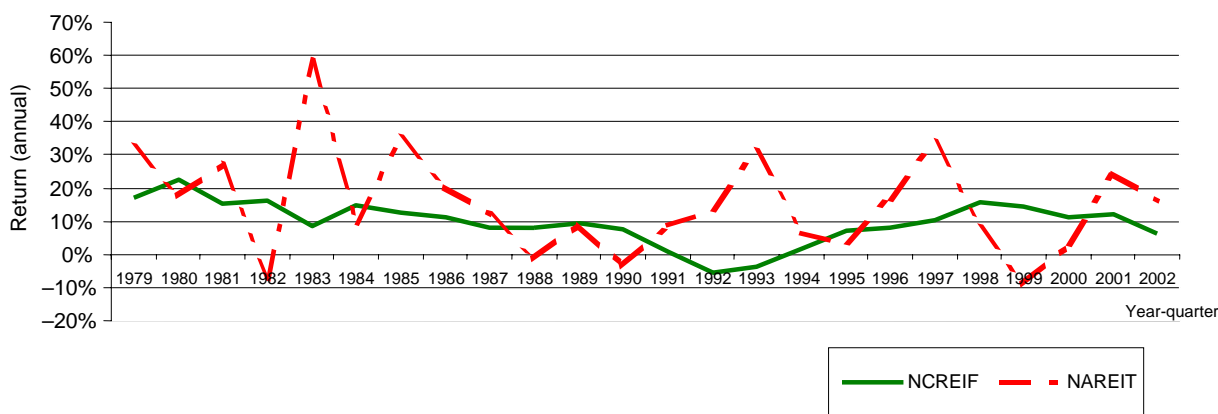
Appraisal error



<sup>10</sup> From Fisher and Ong, "The tradeoff between comp sample error and comp lag error", presented at AREUEA, January 2001.

Figure 6 shows returns for the appraisal based NCREIF Property Index (NPI) versus an index of publicly traded REITs (NAREIT Index) that is based on stock transaction prices. Note the greater volatility of the NAREIT index. Part of the reason for this could be due to REITs being traded in the public market, which has more volatility due to the nature of the market. But the NCREIF index is also smoother due to the use of appraised values.

Figure 6  
Returns for NCREIF property index vs NAREIT REIT index



### Correcting for appraisal lag

Several approaches have been suggested in the literature to “correct” or adjust for the lag inherent in appraisal based indices.<sup>11</sup> The first is to “un-smooth” the index. This approach involves modelling appraisal behaviour and then in effect “reverse engineering” the appraisal process in order to get an unsmoothed index.<sup>12</sup> Appraisal behaviour is modelled as a moving average of the value indicated by current and prior comparable sales (comps) for the reasons discussed earlier. We have

$$V_t^* = \alpha V_t + \alpha(1 - \alpha)V_{t-1} + \alpha(1 - \alpha)^2 V_{t-2} \dots \text{ (moving average)}$$

where

$V_t^*$  is the optimal appraised value in period  $t$

$V_t$  is the value from comps in period  $t$

This reduces to  $V_t^* = \alpha V_t + (1 - \alpha)V_{t-1}^*$

We can now solve for the “true” value as follows:

$$V_t = V_t^*/\alpha - (1 - \alpha)/\alpha V_{t-1}^*$$

Empirical evidence suggests an  $\alpha$  of 0.4 for the NCREIF Property Index (NPI) when estimating annual returns. Thus we can develop a simple unsmoothing model as follows:

$$V_t = V_t^*/0.4 - (1 - 0.4)/0.4 V_{t-1}^*$$

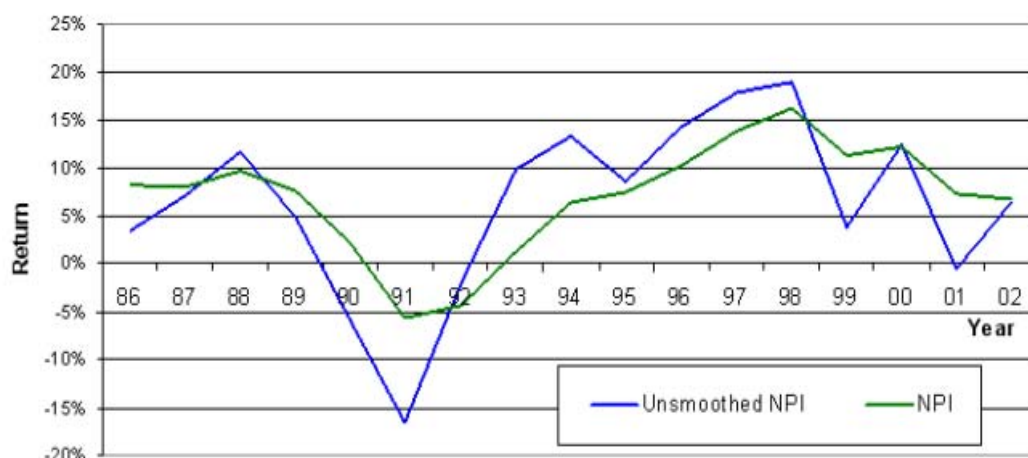
$$V_t = 2.5 V_t^* - 1.5 V_{t-1}^*$$

This adjusts for stale appraisals and lag in the appraisal process. Figure 7 compares the regular NPI with the “unsmoothed” version using the above methodology.

<sup>11</sup> See Quan and Quigley, “Price formation and the appraisal function in real estate markets”, *Journal of Real Estate Finance and Economics*, 1991.

<sup>12</sup> See Geltner and Miller, *Commercial Real Estate Analysis and Investments*, p 684.

Figure 7  
 “Unsmoothed” NPI



### Repeat appraisal methodology

Another approach is to use only the reported appraised values that reflect attempts to revalue the property. That is, instead of using appraised values every quarter, only use quarters that are believed to involve a serious attempt to revalue the property. This is analogous to “repeat sales” indices but uses “repeat appraisals”. The problem with this approach is that it is still based on appraised values. So the problem of “stale” appraisals is eliminated, but not the lag due to the appraisal process discussed above. This involves use of an econometric technique (repeated measures regression) to estimate the index because revaluations do not occur every quarter. Figure 8 illustrates this approach with a simplified example. Year zero is the dependent variable in the regressions (even for properties purchased later) and the coefficients of the cash flow estimates for each year provide index levels.

Figure 8  
 Repeat appraisal methodology

Property	Year 0	Year 1	Year 2	Year 3	Year 4
1	-100	10	125		
2	-150	15	18	180	
3	0	-125	15	28	132
4			-130	17	150

Properties 1 and 2 purchased in Year 0, Property 3 purchased in Year 1 and Property 4 purchased in Year 2

$$100 = a_1 10 + a_2 125$$

$$150 = a_1 15 + a_2 18 + a_3 180$$

$$0 = a_1 (-125) + a_2 15 + a_3 28 + a_4 132$$

$$0 = a_2 (-130) + a_3 17 + a_4 150$$

$$a_1 = 1/(1 + R_1)$$

$$a_2 = 1/[(1 + R_1) \times (1 + R_2)]$$

etc.

$$1/a_1 = (1 + R_1)$$

$$1/a_2 = (1 + R_1) \times (1 + R_2)$$

etc.

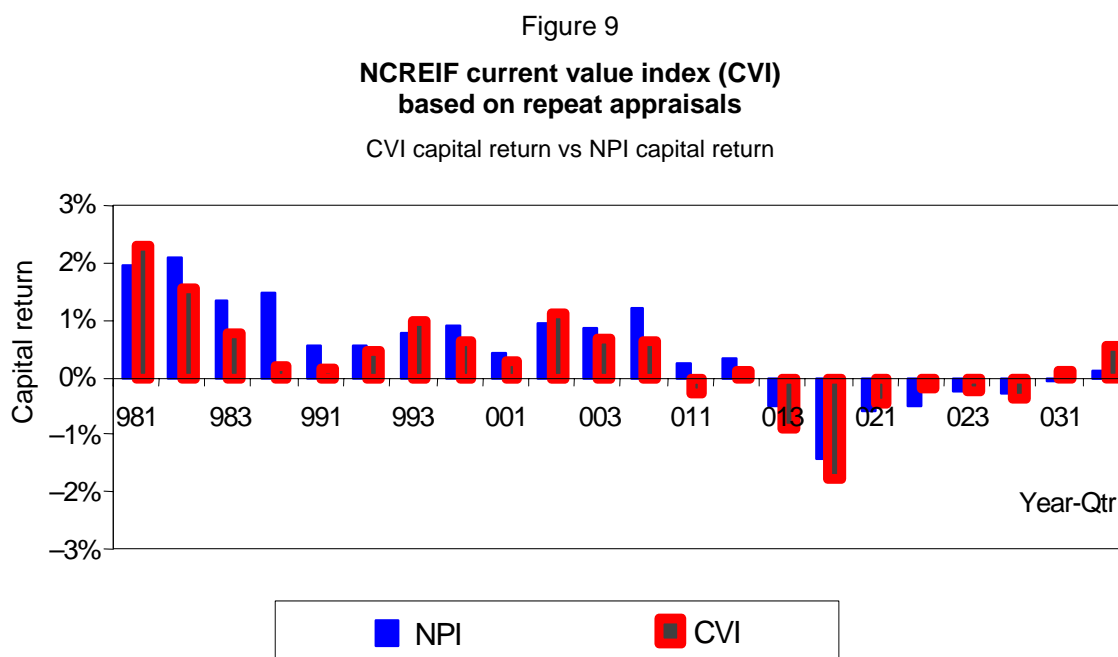
where  $R_1$  is the return for year 1

where  $R_2$  is the return for year 2

index level in year 1

index level in year 2

Figure 9 shows the difference in the capital return (change in value component of the NPI return) using the above methodology versus the capital return for the NPI using the regular quarterly appraised values. NCREIF refers to the index using the repeat valuations methodology as the “Current Value Index” or CVI.



### Transactions indices

A third approach to dealing with the appraisal lag issue is to actually use transaction prices to develop the index instead of appraisals. The disadvantage of this, as noted earlier, is the lack of transactions for the same property. However, if there are a sufficient number of transactions of properties, econometric techniques can be used to estimate an index based on the available transactions. Often this involves the use of “repeat sales” where you have more than one sale of the same property even though there is a significant amount of time between sales. This approach is often used for housing indices where there is a lot of transaction data but is difficult to apply to commercial real estate with less frequent transactions. Another method is to develop “hedonic price indices” that model transaction prices as a function of characteristics of the property such as its size, age, location, quality of construction, etc. This does not require repeat sales of the same property. The date of the transaction is included as a “dummy variable” in the model and the coefficient of this variable is used to develop a price index.

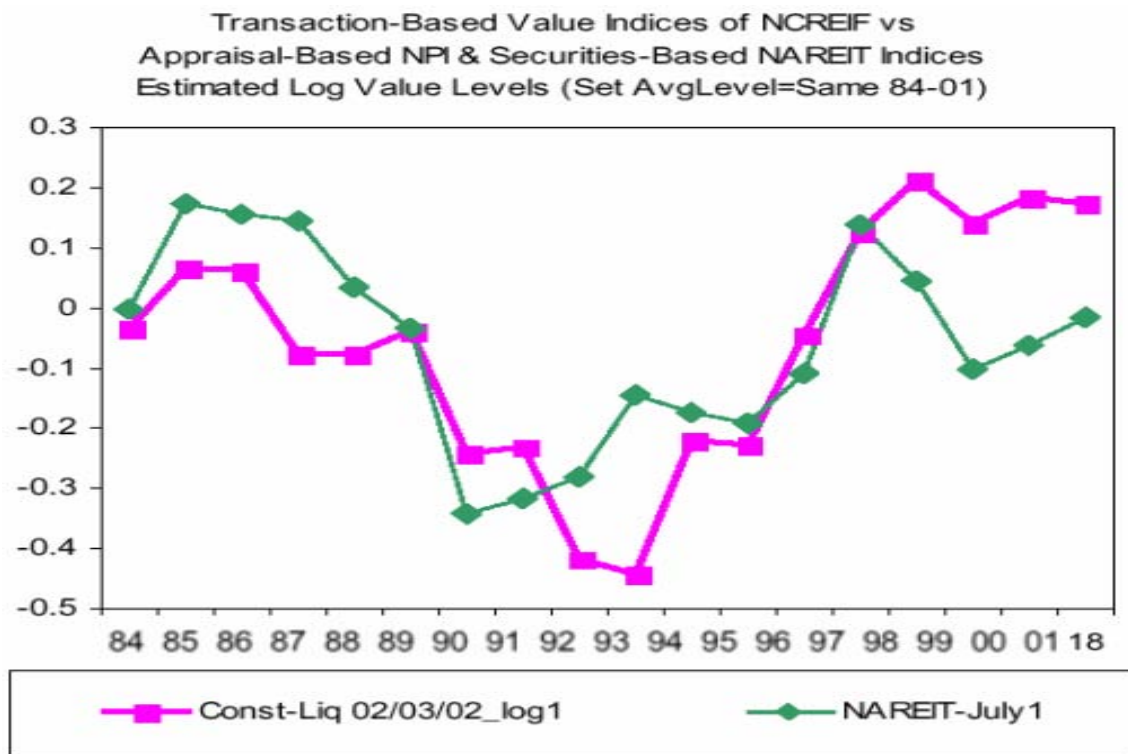
Fisher, Geltner, Gatzlaff and Haurin (FGGH)<sup>13</sup> developed an extension of the hedonic approach that involves (1) controlling for selectivity bias (properties that sell can differ from those that do not sell and we want an index representative of all properties) and (2) adjusting for variations in liquidity over the real estate cycle (properties are more likely to sell and markets are more liquid in an up-market versus a down-market). Details of this methodology are beyond the scope of this paper. Figure 10 compares the FGGH constant liquidity index with the NAREIT index mentioned previously. Note that the constant liquidity index has more volatility and a greater correlation with REITs than suggested by Figure 6 discussed previously.

<sup>13</sup> Jeffrey Fisher, Dean Gatzlaff, David Geltner and Donald Haurin, “Controlling for the impact of variable liquidity in commercial real estate price indices”, *Real Estate Economics*, vol 31, no 2, Summer 2003.



Figure 10

**Comparison of constant liquidity index with NAREIT index**



**Conclusion**

The NCREIF Property Index (NPI) is the primary index used by institutional investors in the United States to analyse the performance of commercial real estate and use as a benchmark for actively managed real estate portfolios. But the use of quarterly appraised values does result in some “smoothing” and lagging of the returns compared to indices based on actual transactions. Several approaches have been used in the literature to deal with the appraisal issues. The most promising is a new methodology that uses sales of properties to develop transaction-based indices for private commercial real estate. As data on transactions becomes more available these indices will become more reliable and allow for better evaluation of the performance of commercial real estate.

# Statistics on real estate prices: the need for a strategic approach

David Fenwick<sup>1</sup>

## The strategic issue

This note considers the strategic issues that arise in connection with the future evolution of statistics on real estate prices and argues for the development of a conceptual framework based on a systematic analysis of user requirements. Such a framework can then be applied in the context of individual national circumstances, including domestic demand for statistics and the availability of the latter as a by-product of the legal process for the sale and purchase of real estate, to identify suitable data sources and corresponding data gaps. The systematic analysis associated with such a framework can also be used for the formulation of standardised meta-data and in the longer-term to inform progress towards a coherent family of price indicators in a national context and greater international comparability in statistics on real estate prices.

The note is written from the perspective of both a producer and a user of house price statistics. It focuses on house prices but can in principle be extended to real estate prices more generally. The thinking underlying this strategic approach emerged from the author's participation in the Conference on Real Estate Indicators and Financial Stability, which was jointly organised by the International Monetary Fund and the Bank for International Settlements and held in October 2003.

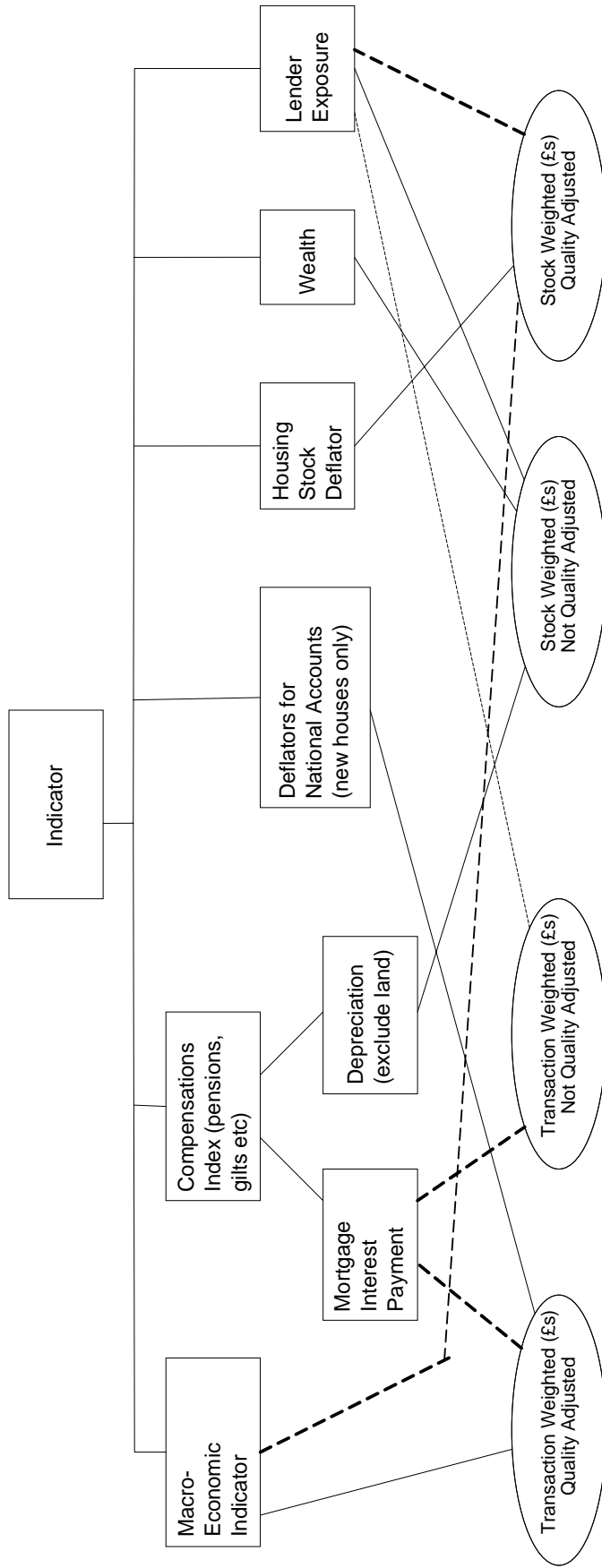
## User requirements and conceptual frameworks

A systematic analysis of user requirements for statistics on house prices may take the form of a series of questions reflecting the different reason why users may want information on house prices. For instance, whether an index of house prices is to be used as one of a suite of general macroeconomic indicators, as an input into the measurement of consumer price inflation, as an element in the calculation of household wealth or as a direct input into an analysis of lenders' exposure. Such an analysis can then be transformed into a statistical user requirement and an associated conceptual framework by expressing the needs in statistical terms and identifying the common linkages and corresponding relationships at a micro and macro level. A first attempt at the preliminary stages of such an exercise for house price statistics is given in Diagram A. It is produced for illustrative purposes and may usefully be expanded to cover a number of additional dimensions. Its primary aim in the context of this paper is to initiate discussion rather than to present a definitive view based on current consensus. As such it can raise more questions than it answers.

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Diagram A  
**Derivation of the primary house price indices**  
 (illustrative only)



Notes: 1. For depreciation and National Accounts deflators (to deflate the GFCF housing stock value) land should be excluded from the acquisition value. 2. Land should also be excluded from a general macroeconomic indicator where the intention is to restrict the latter to private household consumption. 3. A calculation of mortgage interest payments would require the use of a number of historical indices to estimate mortgage outlay at time of purchase and should include separate information on re-financing. 4. Only basic house price indices are covered in this table, not derivatives used in subsequent calculations. For example, the UK Retail Prices Index's treatment of owner-occupier housing costs, which is based on its historical roots in a compensation index, is essentially based on a mixture of the payments and user cost approaches although the RPI itself can be considered an acquisitions index. Under the *acquisition* approach the total value of all goods and services delivered during a given period, whether or not they were wholly paid for during the period, is taken into account. With *payments*, the total payments made for goods and services during a given period, whether or not they were delivered, is taken into account. Finally, *user cost (or consumption)* considers the total value of all goods and services consumed during a given period. The distinction between the three approaches is particularly important for purchases financed by some form of credit, notably houses, which are acquired at a certain point of time, used over a considerable number of years, and paid for, at least partly, some time after they were acquired, possibly in a series of instalments. The RPI mortgage interest payments calculation uses a mix/quality adjusted transaction-weighted index to provide an historical profile of past houses purchases. 5. Depreciation can be thought of as the costs of major repairs and renovations, with minor maintenance and decorating costs covered elsewhere in the index. In the United Kingdom it is priced using a smoothed house price index. 6. The treatment of mortgage payments in a compensation index depends on what the owner-occupier is being compensated for. For example, whether the historical calculation to estimate current levels of mortgage debt should include the change in profile of houses acquired over the years. 7. Clearly, in reality in some instances the primary calculation is unlikely to involve a single house price index. For instance, the calculation of wealth where separate price indices may be used to up-rate the prices of separate sectors of the housing stock (eg apartments in Central London, detached houses in rural areas of Scotland) for subsequent summation to produce a total value for the United Kingdom.

The analysis can also be simplified to provide a basic conceptual framework of fundamental principles. This is attempted in Diagram B.

Diagram B  
Use matrix

	Transactions		Stock	
	Volume	Value (£s)	Volume	Value (£s)
Quality adjusted	Market monitoring, price of a typical house sold?	Macroeconomic indicator. Deflators for National Accounts. Mortgage interest payments (MIPs) for compensation index?	Market monitoring, price of a house typical of the stock?	Housing stock deflator. Macroeconomic indicator. Lender exposure?
Not quality adjusted		Total expenditure (weights data for MIPs in compensation index?) Lender exposure?		Wealth. Depreciation. Lender exposure.

It can be noted that the articulation in conceptual and statistical terms of user needs is not a trivial exercise. A key element for the successful delivery of statistics that are fit for purpose is to define precisely user requirements. This requires absolute clarity about what the statistic, in this case a house price index, is aiming to measure – a clarity that may not necessarily be forthcoming from users. Judgments will also need to be made.<sup>2</sup> The exercise is a challenging one in much the same way as with similar exercises for consumer price indices.<sup>3</sup>

A number of observations can be made even on the basis of such a limited exercise. For example:<sup>4</sup>

- Weighting schemes are an important conceptual issue that impact on the use to which an index is put. The construction of an index using expenditure weights based on housing stock and with no quality adjustment provides a measure of the increase in the average value of

<sup>2</sup> For example, whilst the correct conceptual basis and statistical definition of a house price index for the purposes of deflating national accounts might be clear and uncontentious (because the framework for national accounts is agreed and relatively well-defined) it might be considered less clear in the construction of a house price index to be used as a general macroeconomic indicator of trends in economic activity, for example for modelling purpose, where measurement is less prescriptive. In the latter context, a transactions-weighted acquisition index might be appropriate for tracking inflationary trends in the economy but there are differing views about whether such an index should be restricted to new houses only and whether the index should include the price of land – issues which, in part, are also reflected in the alternative formulations used in constructing consumer price indices. Also there is a strong argument, in the context of financial stability indicators, for the separate identification of re-finances of mortgages as past experience indicates that the latter can surge to significant levels when interest rates drop.

<sup>3</sup> As with consumer price indices and the debate about cost of living indices (COLIs) and non-COLIs, the choices are not necessarily either/or. Different formulations should not necessarily be viewed as competing with one another. For instance, an alternative specification of a house price index for macroeconomic purposes might be one measuring the change in the value of the total housing stock. Such an indicator might be considered useful because owners get a “feel happy” factor from increasing house values and an opportunity to free up equity. Both could fuel inflation. Such an index would be stock-weighted, cover all houses and include the price of land. National statistical offices may decide to construct it as an additional rather than sole measure. Similar debates arise in connection with other uses of a house price index such as in the treatment of owner occupier housing costs in a compensation index.

<sup>4</sup> The issues become less trivial and more complex the greater the depth of analysis undertaken for the user requirement and associated conceptual framework.

the housing stock and is therefore a relevant measure for estimating wealth and lender exposure. In contrast, a quality-adjusted index restricted to “new” houses and expenditure weighted according to transactions may be more appropriate for inclusion in a consumer price index (CPI) that is being constructed as a general economic indicator.

- Quality adjustment<sup>5</sup> is also an important conceptual issue. It is relevant for inclusion in a transaction-based “Laspyres-type” CPI constructed as a macroeconomic indicator (as stated above) but has no place in the calculation of wealth, which like a house stock deflator should be weighted by stock but unlike the latter should not be quality adjusted.

## Data sources and gap analysis

The next stage is to compare this framework with the currently available statistics and data sources to identify:

- major gaps in data provision;
- options for filling these gaps cost effectively from readily available sources;
- data coherence issues;
- the scope for further data integration and the need for new data sources.

This approach is analogous in part to the stage of production and stage of processing approaches that have been used as analytical frameworks for determining the development of consumer and producer price indices.<sup>6</sup>

At their most simple the frameworks described above can be mapped against a house price timeline.<sup>7</sup>

Such an analysis provides basic metadata. It also indicates the compromises made in using one all-purpose house price index and the corresponding data gaps. For example, that the main official house price index published in the United Kingdom by the Office of the Deputy Prime Minister (ODPM) uses transaction expenditure weights and is appropriate for inclusion in, for example, a CPI used for indexation of benefits but does not fully suit the needs of users who want to calculate “wealth” where stock rather than transaction (expenditure) weights are most appropriate. The latter may be addressed either by a re-weighting of the official index or by reference to one of the many indices published by lenders. However, the latter can suffer from limited coverage. Thus re-weighting of the official index provides a cost-effective solution to filling this particular data gap.

A more detailed gap analysis may point to solutions involving synthetic estimates, based on the integration of data from different sources. For example, it can be noted that the ODPM House Price Index referred to above has the advantages of being timely and not subject to revision but has the drawback that it excludes cash purchases. The systematic approach being championed in this paper might conclude that it may be possible to supplement the official index with information on cash purchases from the UK Land Registry. The latter is less up-to-date due to the time lag in registering transactions in the official registry but time series modelling may be able to address this misalignment. Some preliminary work was done on this in the United Kingdom but no firm conclusions reached, although it was clear that potential developments in this direction were for the longer-term.

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<sup>5</sup> Specifically adjustments for improvements such as central heating and double glazing. It does not cover changes in the mix of different house-types such as the relative numbers of four-bedroom detached-properties to one-bedroom apartments – any form of weighting implies mix adjustment to get a unit value.

<sup>6</sup> Wider Inflation Measures: the current state of the art and outstanding issues. Fenwick and Wall, Conference of the International Association for Official Statistics, 1998.

<sup>7</sup> A Comparison of UK Residential House Price Indices. Robert Wood, IMF/BIS Conference on Real Estate Indicators and Financial Stability, 2003.

## **Coherence and international comparability**

The above strategic approach to the construction of house price indices not only provides a structured method for identifying data gaps but also a formal mechanism for obtaining greater coherence in national statistical systems and greater international harmonisation. Greater coherence of national statistical systems will be achieved within the context of a coherent family of house price indices, within real estate prices more generally and also within the broader family of price indices constructed as macroeconomic indicators and as part of the process of constructing other official statistics such as national accounts. Greater international harmonisation will be assisted from the availability of better metadata and from an emerging consensus of the statistical requirements of users and how these can best be addressed. Both aims will benefit from the identification and resolution of data gaps and differences, and an increased conceptual and technical understanding together with a better analytical capability.

## **Conclusion**

The development of a conceptual framework for statistics on real estate prices based on a systematic analysis of user requirements and a corresponding gap analysis will generate standardised metadata and will greatly assist progress in the construction of a more complete and coherent family of statistics on real estate prices of increased relevance to users and based on agreed international standards.

## Summary of the discussion on areas of future work

### Carol Carson

This session presents a way to bring together the various strands that we have heard throughout the meeting and to look toward the future. This seems to be a particularly useful focus because I'm sure many of us are starting from the point that while progress is being made in this area in some respects, we do hope that the future will lead to a wider spread of information about real estate indicators, and perhaps even some attempt to bring the various players among the users and producers of such data together to make progress at a more rapid rate into the future.

The way we have structured this session is to have panellists who will give their ideas, and then to have open discussion. We hope that in this way the panellists, who might even have some differences of opinion, would stimulate the discussion in this session.

### Donald Haurin

In the introductory session, Carol and Paul posed the right set of questions for us. However, I do not think we have answered them well. But, asking the right questions is an important aspect of problem-solving.

I have been quite surprised by the involvement of private market vendors and other groups with the creation and distribution of price indexes. It is greater than I had anticipated. I knew of National Council of Real Estate Investment Fiduciaries (NCREIF) and Investment Property Databank (IPD). I did not know of the activities in South Africa or in some of the other countries. This observation suggests the possibility of private sector-public sector collaboration in the creation of these data in ways that is quite atypical, I think, for most data sources.

I'll turn to some issues raised at the conference, the first being "aggregation". There are clearly different price movements depending on whether one looks at a country as a single aggregate, or regionally within a country, or at different metropolitan areas, or at different property types. Given that these indexes move quite differently, the question arises as to whether we should aggregate them or leave them as a set of disaggregated indexes. Examples of using disaggregated indexes drawn from this conference include Susan Wachter mentioning differences in regional US home price indexes and Robert Wood mentioning differences between the price evolutions of low-priced and high-priced houses in the United Kingdom.

How do we judge this issue? Eventually, we want to talk about financial stability. Within this context, do we need a single price index that will merge together all of the disparate indexes at lower levels of aggregation into a single national index or do we need to keep all the indexes disaggregated? My initial reaction is that creating one aggregate index should not be the sole goal. For example, while the OFHEO national index of US house prices is useful, it is the one I use least in my research. Rather, I use indexes for regional or state levels, and often the metropolitan level indexes. I believe that this observation can be generalised, resulting in the claim that for research purposes, disaggregated house price indexes are more useful. A caveat is that the size of the country is important, but as long as there are identifiable regions and separate metropolitan areas, then the question of disaggregation arises.

If one is thinking about financial stability and the concern is about the effect of real estate price bubbles, at what level do bubbles arise? Most often, the US experience has been that bubbles are localised. The locality might be a metro area such as Boston, a state such as California, or even a region such as New England. But national bubbles, that is, the occurrence of real estate price increases that are not causally linked to changes in fundamentals or the expected future paths of fundamentals, have not been typical in the United States and may never have occurred at the national level. Thus, if you study only a single national house price index, there may be no evidence of a price bubble because localised bubbles are a relatively small component of the national market. Even so, a

localised house price bubble could have implications for financial instability, the major concern of this conference.

So it strikes me that creating house price indexes at the regional or other localised levels is the right way to go. It also would, in a sense, solve some of the aggregation issues. Thus, those countries currently developing real estate price indexes should not always jump to aggregating localities and property types. Rather, create a series indexes and study their joint movements or lack thereof. An interesting set of questions about the dissemination of price changes across different housing types and across regions can be addressed only if multiple house price indexes are available.

My second set of comments addresses the choice of best method to create a house price index, that is, what is the “best” index. This issue is relevant for and important to transitional economies because they are now choosing methods to create real estate price indexes. There were many examples presented at this conference where researchers reported on how they are collecting new datasets in order to develop price indexes for residential or commercial properties, or where they are selecting a particular methodology to create an index.

I think there is a choice among two options. One could look at the available data and then, based on that data, create the best feasible price index. Or, one could take a much different approach and first try to identify the “best” index. That is, first determine what type of index is needed to link price indexes to financial stability, then select the methodology to create that index, and finally figure out what data you need. As an academic, I much prefer the latter approach to the former. I would rather make a decision of what is needed for research purposes and then find and collect the appropriate data. Or, if need be, start a procedure to collect the data.

We are at a turning point in terms of recognising the importance of real estate prices on national financial stability and instability. Perhaps we could seize this opportunity and try to enforce the second mechanism; that is, try to decide what it is that we want for a standard index. For example, we could adopt a hedonic price methodology as being the appropriate method for creating real estate price indexes. Then we know we need a particular type of data and the goal becomes clear: collect the data needed for this method of creating the indexes. Perhaps it will take a decade to be able to organise a way to collect these data and collect sufficient amounts to create the price indexes, but then you end up with indexes that will be reasonably comparable across countries.

Some of the papers presented at this conference compare, numerically or graphically, indexes that were created with quite different methodologies. However, I really do not know whether or not the price movements that were displayed were due to differences in true movements in prices or where they were simply due to differences in the methods used to create the indexes. In contrast, the French experience seems to be the right way to approach and solve this problem of index creation. They developed a method to get the data they needed to create valid price indexes, even though this took substantial time and effort.

How can we achieve the needed degree of consensus and comparability? Perhaps the IMF and BIS have a role here, or perhaps other national or transnational entities. These agencies could, minimally, state the characteristics of a desirable index, endorse a methodology, and describe the type of data that you need to collect.

Which method among the alternative methods described at this conference should you choose? If you limit the discussion to the hedonic model, the question arises as to what is the best estimation method? We have heard about choices that have to be made regarding functional form and the set of explanatory variables; for example, do you include interaction terms or not or allow for nonlinearities? Other choices, closer to the frontier of research, involve including spatial interactions and spatial autocorrelation. These are methods that have been found to be very useful in terms of increasing predictive ability, and that seems to be one of our goals. As an economist, when I am formulating and testing behavioural models, I am not looking for the model that has the highest explanatory power. Rather, I am looking for sensible models of behaviour whose form is guided by theory. Whether spatial hedonic models are the best for this goal is unclear, but for prediction accuracy, they often are superior. Right at the research frontier are a set of hedonic models that allow for spatio-temporal autocorrelated errors. These are the so-called STAR models, and there are a number of researchers, perhaps a few dozen or so in the United States, that are working on these models. However, the data requirements for these models are much stricter than for the standard hedonic model. Agreeing on a general approach such as the hedonic model would provide a framework, and then advances in methodology within this framework could be disseminated over time.



A third set of my comments is about transmission mechanisms. The issue is how you link movements of prices in the various real estate sectors with issues of financial stability and instability. Other than one paper at this conference, this linkage has not been made. Our concerns were mostly with the measurement question which is, of course, a primary question. There also were some papers about stability, but we were pretty silent with regard to describing the exact mechanisms linking housing or commercial properties and their price changes with financial stability and instability. So I think we need to be thinking about transmission mechanisms. My example of a mechanism, based on household wealth, follows.

Assume that you are observing a residential real estate market and a price increase occurs. Thus, homeowners' wealth rises. What happens? Presumably, consumption and savings behaviour change. There are a couple of papers that measure these responses, but only a couple, and the ones that I know are only about the US experience. Thus, even though wealth has been studied a lot, relatively little is known about how house price changes affect wealth and what happens to the consumption of durables and nondurables at the household level. Clearly more research is needed on this microeconomic question.

Next, how do you aggregate these micro responses to an economy-wide macro response? There's a great deal of modelling that needs to be done to forge this link. And, even though I am interested in and study real estate and real estate prices, I have not thought about the consequences of price changes for macro-level financial stability issues. Further, what also is apparent from this conference is that those who are thinking about financial stability have not been aware that real estate could be an important component. We need to bridge this gap, and a lot of serious modelling needs to be done.

A series of questions follows, these being examples of possible research topics. First, are households' responses to house price appreciation that is part of a bubble the same as that for households who have experienced continuous but low rates of appreciation, for example, the Midwestern United States? In the Midwest, you can count on this modest appreciation and my guess is that consumption behaviour adjusts. But, if you were living in California and experienced a 25 percent increase in house prices for three years in a row, will you behave differently than a Midwesterner because you guess that this appreciation is part of a bubble that will likely burst? I would guess that those experiencing a bubble respond to their wealth gains differently. But we have no models of these behaviours or any empirical evidence.

Second, what are the behavioural reactions to reductions in house prices? Once again, we know very little. We know something about default behaviour, if the price reductions are large enough. Also, there are a few recent papers that look at an issue called nominal loss aversion; that is, if house prices are falling, do people not sell their homes? A related question is that if house prices fall, how is mobility affected? A very small literature investigates this question with, thus far, ambiguous results. A full model of the link between mobility, consumption, and savings behaviour at the individual level has not been formulated. However, this issue is important. If there were significant reductions in house prices that shut down labour mobility, very significant macro consequences could ensue in the United States.

A third example combines the above two. What happens if there is a house price bust soon after a boom? Is the effect on household behaviour the same as when there is only a bust? I suspect not, but testing really has not been done.

A fourth example elaborates on the consequences of what appears to be a trend in the United States. Previously, loan-to-value (LTV) ratios fell as households aged; that is, people paid down their loans. Over time, this behaviour appears to be changing. With the advent of home equity loans and relatively cheap refinancing, LTVs are staying high even as people age. What is its likely effect? We know little for sure, but if house prices change and LTVs are high then households may be much more sensitive to these price changes. And if they are more sensitive, then the macro consequences might be much more substantial than they were in the past. That is, perhaps the relatively low LTVs of elderly people were a buffer in the system. That buffer is declining and may be gone in the future. Again, a whole set of analysis is needed to study the macrofinancial stability consequences of this trend.

My last point is about the accuracy of house price indexes. In order to link price index changes with macroeconomic change, understanding the timing of real estate price cycles is very important. We need to accurately measure price changes in periods as short as 18 months in order to be able to draw causal inferences. Thus, to model transmission mechanisms, we certainly need accurate house price data. Accuracy of the price indexes is highly important for being able to do these modelling exercises because the impact of the house price change could be transmitted to the macro economy within one- or two-year periods, or even shorter. And if our house price and commercial real estate

price data are not as accurate within that time period, then we have a significant problem in estimating models and inferring causality.

## **Ivan Matalik**

I would like to make some remarks on the importance of real estate prices, mainly from the point of a central bank in a transition country. All central banks feel the growing importance of financial stability issues. This is a big challenge for central banks, whether they are formally responsible for financial stability or not. There is an ongoing discussion as to whether central banks should be responsible for supervising financial markets and whether banking supervision should be a function of central banks. Even if some central banks are losing their banking supervision responsibilities in the future (there is a discussion about this in the Czech Republic at present), information regarding real estate prices is still needed because they are an important indicator of monetary developments. In other words, we need all or most of the financial soundness indicators to meet both monetary and financial stability targets. I welcome the IMF initiative to introduce guidelines for the compilation of financial soundness indicators, including those for real estate prices.

Thinking about future areas of work, I see a very important question of implementation of these guidelines. First, there is the issue of how to obtain data, and second, how to interpret the data. Obtaining data is a major challenge. Interpreting data means studying empirical evidence. In transition countries the record is too short so the link between real estate prices and financial stability is difficult to establish.

I heard many interesting reports from developed countries at the conference and I learned how they solved different questions and problems, such as improved timeliness of data and more effective ways of collecting data. But in the case of transition countries, we basically start from scratch. We face basic questions like, for example, which kind of the price index is the best, which institutions will be responsible for data collection, how often to collect the data and which reporting structure to apply. Transition economies are really at a different stage than developed countries. From this point of view, the role of international institutions, such as the IMF and the BIS, is very important. It would be very good to see other international institutions more involved in this area, for instance Eurostat and the ECB. A special seminar in the framework of technical assistance for our countries could, for instance, be very useful.

I heard at the conference that it is very difficult to find one standard unified methodological approach. However, there seems to be agreement on the key issues that need to be addressed, particularly on the choice of index and the frequency required for the construction of the index. Knowing what we do not know but need to know makes it easier to find the right way to move forward.

## **David Fenwick**

There is a general agreement emerging about what needs to be done and this is very good because it reinforces the important messages that are emerging. I have a dual perspective of a statistician who is both a provider and a user of data. For instance, I chaired a committee to develop house price indices in the United Kingdom and I use real estate data in the UK Retail Prices Index.

Two things have struck me about this conference. Firstly, the universal agreement that statistics on real estate prices are very important. Perhaps this is not surprising, given the nature of the conference and the specific interests of the delegates. But I think it adds to the growing realisation that this is an area of statistics that for some time now has been given less attention than is warranted by its importance. For example, if you consider house price indices, these are useful in their own right as an economic indicator but can also feed into the analysis of household income, wealth, distribution of wealth, output, government finance, and inflation through consumer price indices (CPIs). The range of uses for statistics on real estate prices is vast.

The second thing that has struck me is that the availability of data is not uniform across countries and, in general, statistical offices have been very slow in reacting to user need. In part this is because the demand for statistics has not been well-articulated by users. And, following on from that, there has not

been a fully inclusive discussion of the conceptual issues and how user needs translate into a statistical design.

Producer and user communities have generally been in a reactive mode, and this has meant that statistics on real estate prices have rarely reached the top of the priority list of statistics for development. Of course, this is made more difficult by the inherent measurement issues associated with real estate indices that have been discussed in some detail during the course of the conference.

We have a situation where there is a lack of comparability between administrative sources, both in terms of definition, coverage and time lags, and where conducting customised surveys is very expensive. So, at least for the foreseeable future, we need to look at the further exploitation of administrative systems to produce data which are fit for purpose and comparable between countries.

Having set the background, I would now like to make a few specific observations which I hope will help to take the debate forward. The first one is that the need for house price statistics is multi-dimensional. I have already listed the numerous direct and indirect uses of house price statistics and more generally statistics on real estate prices. This is self-evident, but is not always recognised in the statistical community. And it is certainly not reflected in data availability. We need to ask ourselves if one price index can suit all purposes. This cannot be answered without comparing systematically data availability against user needs. Discussions at this conference point to a family of indices; for instance, to reflect the need for indices weighted by transaction and by stocks.

Now, sometimes the choice between transactions and stocks makes a numerical difference and on other occasions it does not. But each represents a different concept. The choice of index depends on use and what you are trying to measure. This re-enforces the need to understand and to articulate in statistical terms what we are aiming to measure, based on the purpose of the statistics, before we go through the process of measurement.

This leads to a second observation relating to differences in data availability. Too much data can be nearly as problematic as no data at all, particularly if there is a lack of coherence and resolution. We need to look no further than the recent quote about statistical fog by the Governor of the Bank of England when he was reviewing the trend in house prices in the UK, when it was unclear whether UK house price inflation had come to a turning point or not. The problem was that there were a number of alternative official and unofficial statistical sources with different conceptual bases measuring different things, with different methodologies and datasets confounding interpretation. And that was made worse by the differing time lags in the data. At a particular point in time, the analyst had access to a variety of indices referring to different points in time with different methodologies, which at least superficially showed different stories. This causes possible confusion not only from a domestic viewpoint, but also from an international perspective where the associated problems become more acute. The underlying cause is a lack of clarity about user needs and the best statistical construct and also a lack of international consensus and guidelines on statistical measurement.

My third observation relates to the requirement for detailed data to give users the analytical capability to interpret data. This includes the geographical dimension, old versus new property, and houses bought as the primary dwelling versus those bought as second homes. Without that analytical capability, the challenge of actually using data becomes quite overwhelming.

A number of questions were asked at the beginning of this conference, and in particular whether we can identify a specific set of real estate indicators for macroeconomic policy and financial stability. The discussions over the last two days have drawn us in that direction. A set of real estate indicators needs to be constructed within a well-articulated framework of an integrated and coherent family of indices. The lack of a framework has the potential to cause all sorts of problems and should be considered a serious omission that needs to be addressed.

The starting point for such a framework should be a review of the relevant conceptual basis for each index and how those indices then relate to one another. The framework can then be used to identify data gaps. This is my first recommendation.

That leads to a second recommendation relating to the harmonisation of methods and application of best practice. A clear message has come across over the last two days that there are differences in index construction that not only relate to the conceptual basis of these various indices, but also have a bearing on their technical rigour. In addition, differences in index construction can lead to significant differences in measured real estate inflation and interpretation.

Harmonisation also involves more detailed technical issues such as mix adjustment. There has been quite a lot of discussion on mix adjustment, whether a matrix approach or hedonics should be used. It is essential to arrive at a position where there is a consensus of opinion about preferred methods and an understanding of the pros and cons of alternative approaches.

We can take by way of example the discussion this morning on the relative merits of geometric and arithmetic means. Such an issue is not a trivial one. In certain circumstances, it can have a major impact on the measurement and perceived level of real estate inflation. And indeed there are various arithmetical and conceptual issues relating to the use of each. Issues like this warrant further investigations to increase understanding and to facilitate recommendations on best practice. This can only be achieved by more research, innovation, and sharing of experience. This conference provides a good basis for taking such work forward.

Another issue to emerge is the need to look for more creative solutions to some of the data and index number constructions problems that need to be confronted. I'll just give an example here. I have already mentioned that, in the United Kingdom, we have a number of different house price indices, reflecting different conceptual bases and measuring prices at different points in the time line. Compilers of statistics need to consider how to better exploit the best characteristics of each dataset to combine them to produce a single definitive index, using, for example, modelling techniques. In the United Kingdom the most up-to-date official indices exclude the 25 percent of purchases where dwellings are bought by cash. It is legitimate to ask whether it is possible to link the different sources of data and use the mortgage purchases to give an early estimate of the price trend in cash and total purchases.

Now, it might be terribly difficult, and indeed this is indicated by some initial research done in the United Kingdom, but there is a strong case for a systematic investigation into whether more robust and relevant statistics that better meets user needs, can be derived from available data sources. So my third recommendation is for the facilitation of more research, innovation, and sharing of experience.

How do we go about this? We have achieved a great deal over the last two days in terms of identifying the issues and we now need to consolidate this and take the work forward.

The first is to properly articulate user needs, and the second is to translate this into best statistical practice within an appropriate conceptual framework. Given the importance of real estate price statistics, serious consideration should also be given to producing an official manual or set of best practice guidelines. The latter will not only provide a useful reference document but will also empower statistical offices to further develop their statistics. This is my fourth and final recommendation.

## **Naseer Ahmad**

It was a few months ago that the Governor of the State Bank of Pakistan desired that we should construct a housing price index so that the private sector - especially the financial sector - could make use of the index. We had no idea how to construct a housing price index. We searched the web. There is a lot of material and we decided to take constant-quality price indices based on hedonic regression as the methodology and started working.

Data collection posed many difficulties. You have administrative records from centuries ago, but when you look at the data available from them; you will find that they are mostly useless; you cannot take a single standard unit out of it. Acquiring data is difficult: people are often not available and sometimes they are not willing to give you any information. At some point early in the project we complained that the State Bank of Pakistan was not the best placed to construct a housing price index and that some other agency should take over the initiative. But it was the wish of our Governor that we remain in charge so we continued.

This project was handed to me on 1 July 2003 and within a few months we had collected data from Karachi, the largest city of Pakistan. We decided to start by constructing a housing price index only for Karachi City. Sampling turned out to be a major challenge and we decided that we needed technical advice regarding the sample selection procedure, as we are not familiar with all the issues. We referred this to our Federal Bureau of Statistics, which has a division for sample selection.

The fact that we needed to construct an index that would meet international standards was a challenge and an opportunity. The data should not only be useful for domestic users but should also

be of sufficient quality to use in various international forums. That meant that our data should meet minimum requirements in line with international best practice. That has turned out to be a useful benchmark for our work.

At the conference I have received plenty of information and met various renowned experts. I hope to receive some useful feedback on the project we are undertaking in Pakistan so that our final deliverable will be useful to domestic and international users and that it meets best practices.

Like other methodological manuals like those for Balance of Payments Statistics, Monetary and Financial Statistics Manual, Data Dissemination Standards and Data Quality Assessment Frameworks, the compilation guide for Financial Soundness Indicators will prove to be very useful. Perhaps it will be possible at some point to also develop a more detailed compilation guide for real estate indices.

## **Estrella Domingo**

For a country like the Philippines, which intends to start the construction of a real estate price index, the meeting proved to be very informative and useful. Regarding the user requirements, I have to admit that when the issue of the need for a real estate price index was first brought to our attention, we had a limited view of what the index would be used for. Having heard the various presentations at the conference, I am now more convinced of the importance of the project despite the problems that we foresee regarding the compilation of the index, in particular as a result of the limitations of the existing real estate valuation system in the Philippines.

Regarding the data issues, I was enlightened on the type and extent of data that are needed for the construction of an appropriate index. At this point I feel that we actually have the basic data to start the compilation of the index, except for some data quality issues. Regarding the methodology, I learned quite a bit from the experience of countries, for instance with respect to the use of hedonics.

As we will not need to start from zero, we can start by applying the methodologies explained to us at the conference. I am therefore confident that the Philippines will be able to come up with its first real estate price index by next year.

I have two recommendations. The first is that for the purpose of international comparability, countries need a standard guideline which can be adopted by the countries in pursuing their work on the real estate price index. The second is for the IMF to put up a networking group through which national experts can exchange information on their activities regarding real estate price indices. There would be clear benefits if countries that have very good experiences could share these with the countries that are just starting.

## **Open discussion**

**Mr Landefeld:** Accurate measurement of the real housing values is extremely important to the analysis of consumer spending, business cycles, and productivity. In recent years, for example, the data were important in providing an overall picture of household wealth and the economy. They showed that the precipitous fall in equity prices was at least partly offset by large increases in residential property values, which helped explain the surprising strength in consumer spending (and continued low saving) that offset large declines in investment spending; all of which resulted in the US avoiding a major downturn in 2000-01. Tracking these changes in household wealth required up-to-date and accurate data on changes in relative prices.

Another example relates to productivity growth in construction, where despite rapid innovation - increased energy efficiency, pre-fab construction, and a dramatic increase in amenities - we have flat to declining productivity in this sector. This conundrum has raised concerns among data users that while we may know the relative trends in asset prices, we have not adequately adjusted for quality improvements - in both residential and non-residential construction. Hence, we are overstating inflation and understating real output and productivity growth in the United States.

In the session on methodological issues regarding residential real estate prices, we are heard from Susan Wachter and Bradford Case about their research suggesting that there is not enough quality adjustment in residential housing prices. This is a topic of much discussion in recent years, and there is research on both sides of this difficult issue, partly reflecting the lack of adequate data to fully assess the impact of changes on prices. The other serious problem in measuring the value of residential real estate is the old saw - location, location, location - and how we can capture neighbourhood effects, such as the quality of schools, crime, pollution, and other amenities, in our quality adjustments. How are we going to measure those things? I frankly do not know, but it will clearly require the development and compilation of source data and innovative research.

In the session on methodological issues on commercial real estate price indices, one of the major problems was how to interpret series constructed from various types of source data. One of the benefits of complete sets of accounts is that it confronts the problems that are identified when data based on different source data and methods are used. Not too many years ago, we - the staff of the Bureau of Economic Analysis (BEA) and the Federal Reserve Board (FRB) - noted that if you took the value of corporate non-residential (commercial) fixed assets from BEA's national wealth accounts and subtracted it from what the FRB was carrying for the overall value on its national balance sheets, we ended up with a negative value. This sparked research and changes at both agencies - including a new quality-adjusted price index for non-residential housing at BEA - but as of yet, the conundrums relating to both the BEA-FRB balance sheets and the low to declining productivity in construction remain with no clear solution in sight.

What struck me was the multiplicity of indicators discussed during the conference. I'm not sure all of us were aware of just how many indicators there are and how many new indicators are probably needed. Moreover, for conceptual and empirical reasons the choice of the indicator can be very important to the results that we get. The difficulty - given the multiplicity of things we have to consider - in constructing appropriate indices is formidable to say the least. This is true especially when one considers cross-country comparisons and the differences in factors influencing housing demand and supply tastes, rates of technological change and innovation, and the resulting differences in the characteristics of housing stocks. The transfer of research findings and experience across countries, for example, might be practical in the case of commercial property, where there is more commonality across countries, but not for residential properties, where differences across countries are larger.

**Mr Case:** It seems to me that there are three key messages that come out of this conference, particularly regarding development of price indexes in emerging market countries.

Firstly, the costly piece of the process is data collection, so the question is how to leverage data collection efforts. In the United States, the most widely used price index is the OFHEO repeat sales price index. Why does that even exist? Because the data are already there. That was not a data collection effort for the purpose of putting together that price index. So the choice of methodology is driven by where you can get the data at a reasonably good quality cheaply.

Another example is the NCREIF index for commercial properties based on quarterly appraisals. Now, you can do a little bit better by recognising that not all of those are real appraisals and restricting it to just real appraisals. You could do a little bit better if you restrict it to transactions. But that is a question of degree. The fundamental thing is that the data are available from quarterly appraisals, and those are there because of accounting rules, not because we set out to do a price index. So the first lesson is to leverage data collection efforts.

Secondly, collecting data from scratch, I think there is no substitution for going for data on market transactions data.

Thirdly, legal institutions are very important in getting the data that are critical to developing a good price index. This was brought out in the discussion on the situation in the Czech Republic. The problem there is that the transaction prices that are reported are not necessarily the real transaction prices. Transparency is very important. By developing the legal situation that will give you the good data, you also promote transparency more broadly, that is a great side benefit.

**Mr Verbrugge:** I wanted to make one comment on hedonics. It seemed to have received mostly positive reviews here and I wanted everyone to be aware of recent work by Ariel Pakes at Harvard University. There is some criticism of traditional hedonic methods and some alternatives which are easy to implement. So I would encourage anyone who is seriously considering moving to hedonics or who uses it intensively to take a look at that research.

**Mr Renaud:** I worked in Thailand after the crisis and I jokingly told officials that for the price of one single house they could have saved themselves a fortune by monitoring the real estate market. I would like to bring to your attention the importance of the institutional environment, in particular the legal framework. I would like to cite Malaysia as an example, in particular how they have dealt with the question of proprietary data. In Malaysia, they have a valuation law and they created a valuation institute. I do not know how many people are aware of the annual real estate reports that Malaysia puts together. The question is, whether the legal framework they have developed is working well, could be improved or is necessary. We have focused on the macroeconomic needs and statistical needs, but the legal environment that might facilitate the collection of data may also deserve some attention.

Finally, Rupert Nabarro told a very interesting story. I would like him to write a paper about how he got started, because a lot of the owners of commercial data do not want to share them for commercial reasons.

**Mr Fisher:** I have been thinking about Don Haurin's point that maybe we do not want to aggregate. It seems to me that when there is really a problem affecting financial soundness, it is that everybody, every area is moving in the same direction. And I guess I am always amazed at how correlated indices across different countries seem to be, at least in terms of major turning points. It makes me think of Brad Case's comments that what we really care about are asset correlations, or maybe to say that differently, the correlations across different regions and across different countries. I do not know whether we know a lot about the extent to which different areas are correlated in different countries. Or whether, if one country is in trouble, other countries are going to follow shortly. Maybe we need to give some more thought to that.

**Mr Ahnert:** I think it would be worthwhile to try to search for partners, for collaborating institutions when setting out to construct real estate price indices. I somehow have the expectation that no statistical office will be ready to immediately jump into producing such indices because it is now a financial stability indicator. Up to now, some statistical offices have not produced these statistics. The requirements which have been spelt out at the conference are unlikely to change this situation.

I have a concrete comment in this respect. For European countries, Eurostat is working on a pilot project for residential property prices in the context of developing harmonised consumer price indices. If the project is adopted, this will result in these indices for about 30 countries in the Europe. As far as I can judge it, however, there is a certain likelihood that the project will fail simply because the resource requirements to carry it through are judged to be too high. Therefore, it would be important that the requirements of the IMF and the BIS as well as the arguments made at the conference on the importance of real estate indicators for financial stability analysis are presented to the statistical authorities in Europe, ie Eurostat.

A second point that I wanted to make is closely linked to this. If it is believed that residential property prices are very important, and everybody said that at the conference, then why not include them in the list of core financial soundness indicators instead of encouraged indicators?

My final point is that, apart from prices of real estate, it would be important to also have a very basic set of accompanying structural indicators. The draft compilation guide for FSIs mentions some of these and I think they are very useful. Moreover, information on the stock of dwellings is important. Though this should normally be provided in the national accounts' balance sheet data, this is in most cases, even in the current 15 EU countries, completely lacking.

**Mr Van den Bergh:** I was struck from the presentations in the last two days of the number of stakeholders or constituents involved in real estate statistics. Just to list some of them, not in order of importance: the tax authority; notaries; registrars; banks, obviously; specialised mortgage lending institutions or other intermediaries that are specialised in this; supervisors; the buyers and sellers, individual consumers, households and corporations; those are the ones that purchase the valuation information; the valuers themselves, the assessors. There are also various social departments and urban developers, I suppose, and other interested parties in the economy or in the political area; investors, domestic and international; real estate agents; national statistical institutes. And then the analysts and economists are very interested in these data both from a monetary and from a financial stability perspective. I have probably missed one or two categories. That is an impressive list of potential interested parties. Some are compilers, others users of data. It should be possible to get the stakeholders around the table at one point or another and to leverage their expertise.

**Mr Helbling:** From the perspective of financial stability, two important points have come out. First and foremost, turnover data are extremely important, and I think we should not exclusively focus on prices. The other point relates to the work done at the IMF on banking crises across a large number of countries. There is pretty strong evidence that when you have problems in the real estate sector that have stability implications, they are far more likely to emanate from the commercial sector than from the residential sector. There has been quite a lot of focus on the residential sector at this conference, but we have to bear in mind that it is extremely important to pick up information on the commercial sector as well.

**Ms Laferrere:** The use of “hedonics” has sounded as a source of difficulties, whereas it is not. It is just the use of an econometric technique. Some prices we do not observe, so we need a model to estimate these. That is just what hedonics is about and it is really something quite simple. But perhaps dropping the word hedonics and using econometrics instead would make it easier to understand what it involves. Also, the models that are estimated using hedonics are revised only every five years. We do not change the adjustment we make with hedonics or econometrics every quarter. So the message for an emerging market country is that it is a useful method to consider. It is not that difficult.



## Closing remarks

### Paul Van den Bergh

This very interesting and useful conference has confirmed the importance of real estate indicators for financial and monetary stability. It has also confirmed the importance to improve approaches and statistical methodologies for the collection, compilation and dissemination of real estate prices. Let me briefly summarise what I believe has come out of the discussions and what could be the steps ahead.

First, the impetus for this conference came from discussions related to the development of the Compilation Guide on Financial Soundness Indicators. The Guide includes a chapter with a preliminary discussion of real estate information and the construction of real estate price indices. As work on real estate price indices continues and deepens, the issue is how the Compilation Guide can be refreshed over the years. The Guide could, for instance, spell out a structured approach to collect real estate statistics and to develop a framework for the family of indices that could serve a variety of uses.

Second, emerging market countries are asking for guidance and technical assistance to develop real estate indicators. Consideration may be given as to how such assistance could be provided and the expertise that would be available. The conference has helped to identify some of the questions that need to be addressed when embarking on the development of property price indices. It will be useful to continue to share experiences of different countries in developing such statistics. Two venues where the discussion could be continued are the Conference of the Irving Fisher Committee on Central Bank Statistics in Basel in September 2004 and the April 2005 Session of the International Statistical Institute in Sydney, where FSIs are already on the agenda.

Third, the networking established during the conference will hopefully be useful. The conference has brought together many stakeholders: users of various sorts with a variety of needs, suppliers of data, and public and private compilers of real estate indicators. We have learned about the different needs and perspectives and have had a chance to exchange views. That interchange will hopefully continue after the conference.

Fourth, the conference has shown that the issue of real estate and financial stability will not go away. Risk managers, for instance, will continue to press for better and more timely data and benchmarks on values, prices, and default histories. The securitisation of mortgage loans will call for reliable data on real estate prices in order to assess the value of collateral used to secure the credit risk in mortgage lending and its transfer. Professor Shiller has indicated how property price indices could be used to create new instruments for investing in real estate and for pricing and trading underlying risk exposures. Pressure from analysts at commercial banks and central banks for quality property price statistics will also not go away.

In summary, I feel that the conference has met its objectives. Bringing together experts with different perspectives has proven to be useful to gain an overview of issues and how we move forward in the future to address them. Hopefully the conference will be the start of ongoing discussions that will move us forward in understanding the methodological questions. The work on the Compilation Guide for Financial Soundness Indicators should benefit from our discussions. On behalf of the BIS, I would like to thank all the participants for their very active contributions.

### Carol Carson

Let me outline what I see as some of the useful results from this conference.

First, the conference has highlighted the strong and varied demand for data related to real estate. Traditionally, statisticians have focused on value and price information for use in national accounts or consumer price indices, but this conference has shown that there is now a need for new types of data related to FSIs. These new types include data such as real estate lending to construction industry, or default history, or leading indicators of risk. As our existing work on price indices progresses, we can strive to develop an "integrated framework" that encompasses more prices.

Second, we have learned a lot about the supply of data and how the various kinds of institutions in different countries that have access to information may lead to different perspectives about what to put together. Data sources could include records of tax offices, deeds, value information from appraisals, and the like. Recognising this diversity, it would be useful to assess the different types of data and look at the experience from a range of countries. This type of assessment would seek to recognise what types of price indices are available, which would in itself tend to create additional demands for information. It would be the intention of such an assessment to work with different types of partners and to stress the different sources of supply and the range of players, including official institutions, the private sector, and non-profit institutions. Each type of player may be involved in data collection, analysis, and dissemination, and can offer some unique contribution to the mix.

Third, the conference has shed light on a range of methodological issues. One important lesson is there is not a single best practice for all countries in all situations, although we do recognise that some practices may be better than others. Thus, awareness of the technical aspects of the methods is needed as well as judgment on how to apply them properly in various situations. In looking at methodologies, the development of methodologies that promote international comparability of real estate price information may be key, which, as mentioned by our Mexican colleague, can be an incentive to promote investment. In this regard, good documentation is a key need to help the user understand how to make comparisons between information drawn from diverse sources and compiled according to different methodologies. The conference has also helped provide guidance for those who may be starting from scratch in the development of real estate price indicators that may help start thinking about basic sources and to undertake long-range planning.

Fourth, we want to encourage greater dissemination of data on real assets, along with suitable documentation.

What are the implications for work at the IMF? We will seek to feed some of the thoughts from this conference into our general work on price indices for use in areas such as the national accounts and producers' price indices. We will also work, over the longer term, toward the identification of a generalised set of good practices in real estate prices and transactions. Within the draft *Compilation Guide* in the chapter of real estate indicators, we can outline a framework for metadata to identify differences in price indices, which will assist in understanding the properties of the data and in making comparisons between countries. Regarding technical assistance, we will take every opportunity in our TA efforts to make available materials on the discussions held at this conference. And in our technical assistance efforts, my department is committed to work collaboratively with the range of stakeholders - authorities, international and regional organisations, and private sector organisations. This is an area where we will continue working, but there necessarily will be continued balancing of resources with needs. However, the intention is to have an "active, but constrained program".

Thank you for your contributions.