How Effective are Macroprudential Policies?
An Empirical Investigation[*]

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Abstract

In recent years, policymakers have generally relied on macroprudential policies to address financial stability concerns. However, our understanding of these policies and their efficacy is limited. In this paper we construct a novel index of domestic macroprudential policies in 57 advanced and emerging economies covering the period from 2000Q1 to 2013Q4. The effectiveness of these policies in curbing bank credit growth and house price inflation is then assessed using a dynamic panel data model. The main findings of the paper are: (1) Macroprudential policies have been used far more actively after the global financial crisis in both advanced and emerging market economies. (2) These policies have primarily targeted the housing sector, especially in the advanced economies. (3) Macroprudential policies are usually changed in tandem with bank reserve requirements, capital flow management measures and monetary policy. (4) Empirical analysis suggests that macroprudential tightening is associated with lower bank credit growth, housing credit growth and house price inflation. (5) Targeted policies, for example those specifically intended to limit the growth of housing credit, seem to be more effective. (6) In emerging economies, capital inflow restrictions targeting the banking sector are also associated with lower credit growth although portfolio flow restrictions are not.

Keywords: Bank Credit, House Prices, Macroprudential Policy, Dynamic Panel Data Model

JEL classification: E32, F41, F44, G15

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1 Introduction

In recent years many countries have experienced boom-bust cycles in credit and asset prices, some of which resulted in severe financial crises. In response to these cycles, authorities in many countries have implemented macroprudential policies as a first line of defense against financial instability risks.[1] Examples of macroprudential tools employed are countercyclical capital requirements, dynamic loan-loss provisioning, credit growth limits in specific sectors, and time-varying loan-to-value (LTV) or debt-to-income ratio (DTI) caps for loans.

Even though macroprudential policies have been used intensively in recent years, our understanding of these policies and their efficacy is limited. This paper focuses on cyclical risks that are primarily associated with elevated asset prices and excessive credit growth, and makes three contributions to the literature: First, it develops a new set of indexes of macroprudential policies in 57 advanced and emerging countries covering the period from 2000Q1 to 2013Q4. Second, it documents how these macroprudential policy indexes are correlated with other policy measures such as monetary policy and capital flow management policies. Third, it uses these indexes in a dynamic panel data model to investigate the effectiveness of macroprudential policies in restraining the growth of credit and of asset prices. The paper focuses on domestic bank credit growth, housing credit growth, and house price inflation to measure the efficacy of these macroprudential tools, given that these variables have often been the target of macroprudential policy because of their links to boom-bust financial cycles.[2]

Several macroprudential policy indexes are constructed in this paper for different types of macroprudential policy tools (e.g. capital requirements, dynamic loan-loss provisioning, caps on LTV or DTI ratios) as well as an aggregate index, with tightening and easing actions in a given month coded separately. The aggregate index used in the baseline dynamic panel data model characterizes the macroprudential policy stance in each country by cumulating the number of tightenings net of easings since 2000. The dependent variables (quarterly growth rate of real bank credit, real housing credit, and real house prices) are regressed on various indexes of macroprudential policy and on control variables, including: real GDP growth; the change in the nominal monetary policy rate; and a global risk aversion variable proxied by the VIX.

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[1]Prior to the global financial crisis, the general consensus was that monetary policy was not well-suited to address financial stability concerns. Since the crisis, many policymakers remain reluctant to shift monetary policy away from targeting core macroeconomic objectives such as inflation and output stabilization, preferring to retain monetary policy as a last line of defense against financial instability risks, with cyclical macroprudential tools constituting the first line of defense.

[2]Recent literature, for example, Schularick and Taylor (2012), Gourinchas and Obstfeld (2012) and Mendoza and Terrones (2012), argue that credit and asset price boom events often end up with financial crises.

The main findings of the paper are: (1) Macroprudential policies have been used far more actively after the global financial crisis in both advanced and emerging market economies. (2) The number of tightening actions significantly outweigh the easing actions in the last decade. (3) These policies have primarily targeted the housing sector, especially in the advanced economies. (4) Macroprudential policies are usually changed in tandem with bank reserve requirements, capital flow management measures and monetary policy. (5) Empirical analysis suggests that macroprudential policy variables exert a statistically significant negative effect on bank credit growth and house price inflation. (6) Targeted policies, which are specifically intended to limit the growth of credit in a certain sector, seem to be more effective. For example, we find that the negative impact of the macroprudential policy variables on housing loans and house price inflation are driven entirely by measures directed at the housing market. (7) In emerging economies, capital inflow restrictions targeting the banking sector are associated with lower credit growth although portfolio flow restrictions are not. The effects of macroprudential policy measures are economically significant as well. Our counterfactual exercise reveals that if the authorities had not used these measures, average credit growth and house price inflation in these countries would have been significantly higher. These results are also robust to several extensions of the empirical specification.

This paper is related to a growing body of empirical research on financial stability. Recent evidence about the effectiveness of macroprudential policy is mixed, and still preliminary. Most empirical work on the subject relies on the 2011 IMF survey data presented in Lim et al. (2011). Using this database, Lim et al. (2011) find that several different macroprudential tools reduce the procyclicality of credit growth by reducing the correlation between credit growth and GDP growth. IMF (2012) explores the relationship between monetary and macroprudential policies using the same IMF survey. Focusing on capital requirements, reserve requirements, and LTV and DTI caps, they find that capital requirements and reserve requirements constrain credit growth but that the effects differ in credit busts versus credit booms for capital requirements. By reviewing case studies, DellAriccia et al. (2012) find that some macroprudential policies can help soften the blow of financial crises.

Although our database suggests that the use of macroprudential policy measures has increased significantly in the past three years, only a few papers use more recent data on these tools. For example, Cerutti et al. (2015a) uses a 2013 IMF survey to create an annual dataset of macroprudential policies in 119 countries. This dataset records, for each year, whether different types of policies were in place, without capturing if and when the instrument was adjusted. They find that an index summing all the different types of policies is correlated with lower credit growth, especially in emerging market economies. Another recent paper by Bruno et al. (2014) also uses the BIS macroprudential policy database and a database

of capital flow management policies to study the effects of these policies on credit, banking flows, and bond flows in 12 Asian countries. They find that monetary policy, banking inflow controls, and macroprudential policies were used as complements in Asia from 2004 to 2013 and that bank inflow controls reduced the growth of bank inflows from 2004 to 2007, but not recently.

More empirical work has been done with regard to housing markets. Several studies using panel data for different regions find that housing measures may reduce mortgage credit booms (Zhang and Zoli (2014) and IMF (2014)). Case studies from emerging Europe (Vandenbussche et al. (2012)) and Asia (Craig and Hua (2011)) show that macroprudential tools, especially housing measures, limited house price growth in those regions. On the other hand, Kuttner and Shim (2014) construct their own database of macroprudential measures covering as far back as 1980 for some countries. Using three different econometric techniques they find evidence for the economic and statistical significance of DTI and housing taxes on house price inflation. LTV, limits on banks exposure to the housing market, and housing taxes are also found to be significant in curbing housing credit, but only in the panel data approach. Only housing-related taxes are found to affect house price growth.

Other studies use bank level data rather than country level data in the empirical analysis. Such micro-level evidence is also mixed about the effectiveness of macroprudential policies: for example, Claessens et al. (2014) use bank balance sheet level data to argue that credit growth declines when credit growth ceilings, LTV caps, and DTI caps are put in place. Zhang and Zoli (2014) present bank-level data on 74 Asian banks in addition to their country-level data to demonstrate that macroprudential policies limited the supply of credit from Asian banks. However, Aiyar et al. (2014) use bank-level data from the UK to show that bank capital requirements were somewhat ineffective due to increased lending (substitution) from resident foreign bank branches. Similarly, Acharya (2013) find that risk weights imposed to achieve macroprudential goals can perversely lead to the buildup of financial risks because risk weights on certain asset classes such as mortgages encourage the buildup of exposure to other assets not deemed as risky, but such concentrated exposure can lead to vulnerabilities later on.

The literature has evidently not reached a consensus about which policies, if any, are effective. Our panel dataset, which includes a variety of advanced and emerging markets, a longer history than most studies, and which includes the recent period in which macroprudential policy use has become much more common, allows us to evaluate these policies with a great deal of breadth and depth. To our knowledge, this is the first paper that uses a systematically created database that is based on a comprehensive set of sources; surveys conducted by the IMF, a BIS database, and incorporating feedback from national central banks and financial

stability authorities. Moreover, we study the impact of macroprudential policies on general credit conditions, as well as more specifically on housing credit and house prices. Finally, we also consider some other aspects of countries' policy toolkit, such as different types of capital controls that might be relevant especially for emerging market economies in achieving financial stability objectives.

The remainder of the paper is organized as follows: Section 2 explains in detail our macroprudential policy tools database and the construction of the macroprudential policy indexes. It also analyzes the incidence and evolution over time of macroprudential measures in our sample and documents how domestic macroprudential policies are used in conjunction with other policies that affect credit conditions. Section 3 discusses the Korean experience with the use of macroprudential instruments as a typical case and analyzes the effectiveness of these instruments using an event study methodology. Section 4 presents the empirical model and estimation results. Section 5 discusses various robustness checks, and section 6 concludes.

2   Macroprudential Policy Measures

This section describes in detail our macroprudential policy tools database and construction of the macroprudential policy index. The use of macroprudential policies over time and across advanced economy and emerging market economy groups is also reviewed.[3]

2.1   Data

The first step in our analysis is to build a database of macroprudential measures. To do this, we relied on national sources wherever possible. A starting point for our database was the 2011 IMF survey database on macroprudential measures presented in Lim et al. (2011). We also supplemented our database using the publicly available macroprudential database presented in Kuttner and Shim (2014). Both these databases extend only until 2011. We used national sources and a 2013 IMF survey, called Global Macroprudential Policy Instruments (GMPI), to update the database through 2013. We also crossed checked our database against a cross country database by Cerutti et al. (2015b). Our database covers the period from 2000Q1 to 2013Q4.

This paper focuses on seven categories of macroprudential tools. Three are targeted at the housing market. The first, caps on LTV ratio for mortgage loans, restrict the amount of the loan to a certain fraction of the total value of the property. In our sample, LTV caps

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[3]For a description of the country classifications into advanced and emerging economies see Appendix Appendix A.

imposed by the authorities range from 40 to 95 percent. More than half the countries in our sample have used LTV caps to limit mortgage lending since 2000, making LTVs the most commonly used macroprudential tool in our sample. Another way to prohibit risky lending is to implement a cap on the DTI of the borrower, that is, to restrict the value of the borrower's debt relative to monthly income. The third category of housing measures considered is not so easily classified: we refer to these tools as "other housing measures" which can include higher regulatory risk weights for mortgage loans, quantitative limits on mortgage lending, property gains taxes, and stricter requirements for mortgage borrower credit-worthiness, among others.

We also examine four broader measures to limit credit growth targeted at banks' balance sheets. Countercyclical capital requirements (CCR) are one such tool. In this category we include countercyclical capital buffers, increases in risk weights used to determine banks' capital adequacy ratios (excluding those on mortgage loans), capital surcharges for banks, and limits on profit distribution. A second measure targeted at banks' balance sheets is dynamic loan loss provisioning, which requires banks to set aside reserves in case of borrower default (we include specific provisioning requirements on housing loans in the "other housing category"). A third is consumer loan limits such as stricter requirements for the creditworthiness of credit card holders. The final macroprudential measure we consider in this category is ceilings on credit growth.

2.2 Construction of Macroprudential Policy Variables

This paper constructs three aggregates indices of macroprudential policy actions based on these seven tools. For each of the seven policy measures, i.e. caps on LTV and DTI ratios, other housing measures, capital requirements, provisioning, credit growth limits, and consumer loan limits, we create a dummy variable assigned a value of positive one if the measure was used to restrict credit growth or asset price growth, and a value of negative one if the measure loosened macroprudential restrictions. If no action was taken in a given month we assigned the variable a value of zero. While we typically know the month of implementation for each macroprudential action taken, we aggregate the tools to a quarterly frequency to match the frequency of our dependent variables. If a tool was used more than once in a quarter we sum all changes over the quarter.

Ideally, we would like to measure the intensity of macroprudential policies; for example, for LTVs we would like to use the actual percentage requirement (that is, the LTV cap was lowered from 70 to 60 percent), but this is more difficult than it seems. In countries like Korea and Hong Kong, which have used LTV caps actively, different borrowers face different LTV caps based on where the home is located, whether it is the borrower's first or second

home, and how expensive the home is. It is not straightforward, then, to record the overall LTV cap in a country and this becomes even more difficult when comparing across countries. The same issue applies to many other types of macroprudential policies. For this reason we chose to use indicator variables instead.[4]

Figure 1: New and Cumulative MAPP Tools in Selected Countries, 2000Q1 to 2013Q4
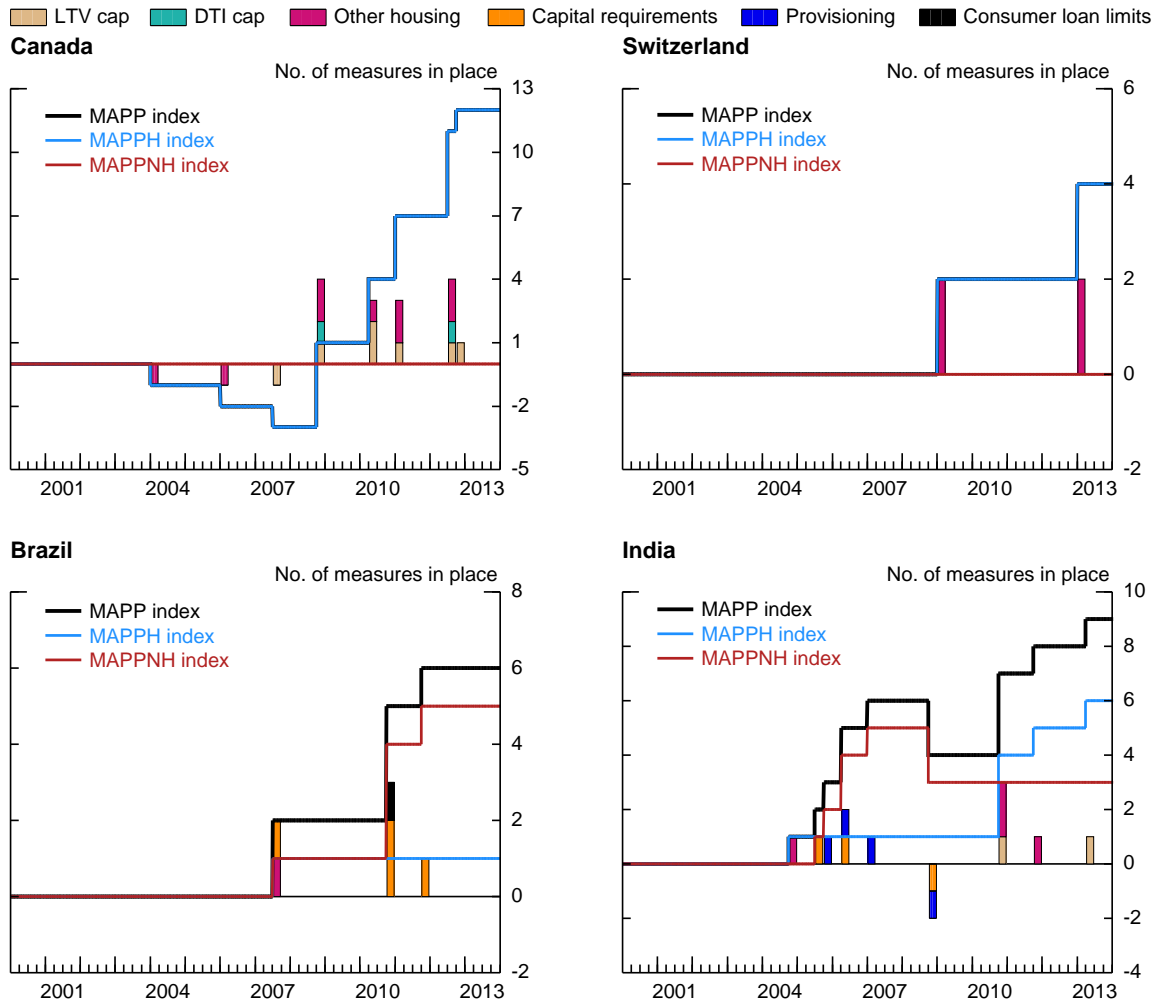
Note: Figures show the cumulative macroprudential policy index (black line), subindex for housing-related prudential policies (blue line), and subindex for nonhousing measures (red line) for four selected countries from 2000 to 2013. The colored bars show the quarter of implementation of individual new measures. Tightenings take a positive value and loosenings take a negative value. Capital requirements and provisioning bars exclude housing-related capital requirement and provisioning measures.

Once we constructed the dummy variables for individual measures in each country, we were able to create cumulative indices of housing and nonhousing measures, as well as a

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[4]In fact, given that the use of indicator variables imperfectly measures magnitude of the policy changes and such measurement error will create attenuation bias for the coefficient estimates on the MAPP variables, we should be especially encouraged if we find a significant relationship between these indicator variables and credit or house price growth despite the measurement error.

cumulative index for all macroprudential tools in place in a given quarter (hereafter referred to as the MAPP index). These cumulative variables sum the dummy variables (tightenings net of easings) to get an idea of a country's "macroprudential policy stance" in a given quarter (see figure 1). We use cumulative indexes in our analysis rather than the quarterly changes because it is difficult to know when macroprudential regulations impose binding constraints on borrowers and lenders–for example, an LTV cap could become binding several quarters after it is imposed, depending on financial conditions.

The housing index (MAPPH) sums the cumulative variables for the LTV, DTI, and other housing measure category. This means that CCRs that target the housing sector (most commonly risk weights on mortgage loans) are included, as are loan loss provisioning requirements for mortgage loans. The nonhousing index (MAPPNH) includes CCR (excluding risk weights on housing loans), provisioning (excluding specific provisions for housing loans), credit growth limits, and consumer loan limits. Summing the housing and nonhousing indices yields the overall MAPP index.

By summing the cumulative indicator variables for each individual measure to create the overall MAPP index, we implicitly assign each of the seven macroprudential measures equal weight in the index. Since it seems plausible that introducing or adjusting some types of measures may constitute more significant tightenings of financial conditions than others, in the robustness analysis (section 5.1) we find that this weighting is appropriate.

The evolution of individual macroprudential measures introduced in each quarter along with the cumulative MAPP, MAPPH, and MAPPNH indices are shown in figure 1 for selected countries. The Canadian and Indian cases demonstrate that macroprudential measures, once introduced, may be adjusted several times over the sample period, with both tightening and easing actions being taken. The Swiss National Bank started to use macroprudential tools only after the global financial crisis, as the Swiss housing sector rebounded quickly while the overall economy was stagnant for a longer period. Faced with signs of overheating in housing sector, and having already increased the bank capital risk weights for high LTV loans, Switzerland activated a countercyclical capital buffer that adds one percentage point of capital requirement for direct and indirect mortgage backed positions secured by Swiss residential property. In Canada, too, macroprudential actions were taken to contain a run-up in house prices and to improve resilience in the event of a housing price decline. Brazilian authorities also implemented a range of macroprudential measures, which were often accompanied by capital control measures (not shown).

2.3 Usage of Macroprudential Policies

To better understand what sort of macroprudential tools have been most popular, figure 2 shows the total incidence of each of the five most commonly used tools we study from 2000-2013.[5] LTV caps on housing loans were the most commonly used macroprudential tool, though capital requirements and other housing measures were also popular. It should be noted that risk weights on housing loans, a type of CCR, are by far the most common "other housing" measure in our sample and are included only in the housing macroprudential category in figure 2. DTI caps and loan-loss provisioning requirements were less popular but nonetheless were each used more than 40 times (when counting tightenings and easings) since 2000. It is clear from this figure that tightenings were much more common than easings across all macroprudential tools.

Figure 2: Use of Various MAPP Tools, 2000Q1 to 2013Q4
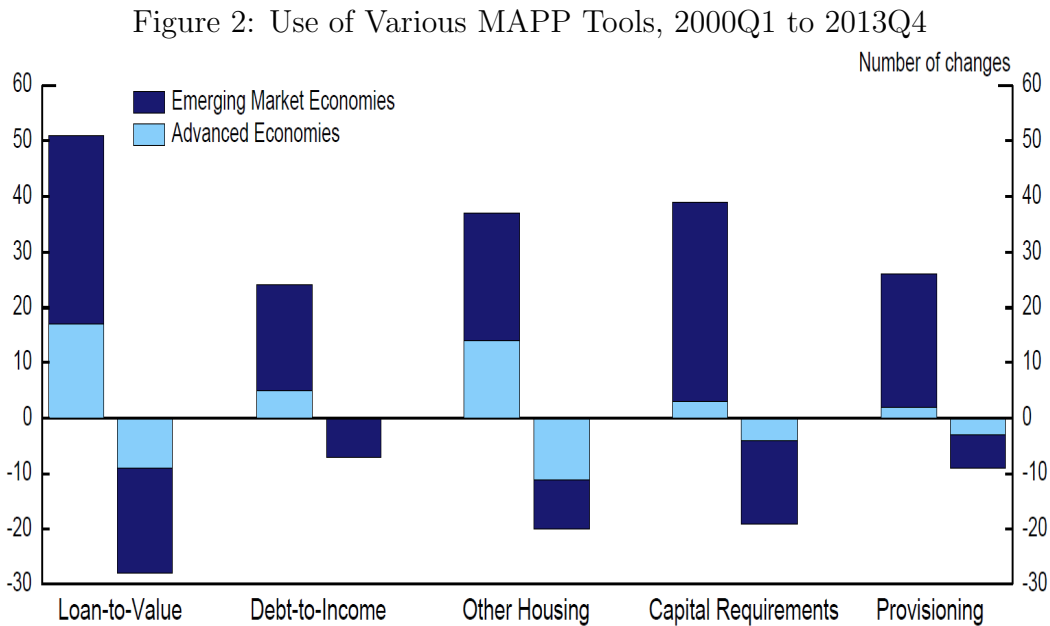
Note: The dark blue bars show the total number of each of the five most common macroprudential instruments summed across all emerging market economies in our sample for the period 2000 to 2013. The light blue bars indicate the number of measures of each type used by advanced economies over the same period. Positive values indicate tightenings and negative values indicate loosenings of macroprudential regulations. Capital requirements and provisioning exclude housing-related measures.

Figure 3 shows the evolution of macroprudential measures introduced in each quarter across the 57 countries in our sample from 2000 to 2013 compared with average credit growth and house price inflation. Macroprudential policies have been used far more actively since the global financial crisis of 2008. Housing measures, the grey bars, have been much more widely used than nonhousing measures, the red bars, particularly since the crisis, as housing markets

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[5]Because credit growth limits and consumer loan limits were used so sparingly, we do not include them in figure 2.

in many countries recovered more quickly than the overall economy and began to overheat in some cases. It appears that policies were tightened during credit and house price booms and loosened when growth in these two variables slowed. Overall, tightenings have been much more common than easings. The largest number of easings came during the global financial crises when countries sought to encourage lending, suggesting that macroprudential tools are being used in a countercyclical manner.

Figure 4 shows macroprudential policy use and average credit and house price growth for advanced and emerging economies separately. It reveals that nearly all of the measures used in the advanced economies targeted the housing sector rather than more general credit conditions. Interestingly, macroprudential policies have been used far more actively in this group after the global financial crisis compared to the precrisis period, despite the fact that real credit growth and real house price growth have been relatively subdued in advanced economies, on average, since the crisis. This is partly because macroprudential tightening has been concentrated in a few advanced economies, especially Canada, New Zealand, and Switzerland, where housing markets remained robust. But this tightening may also have been motivated by increased awareness of macroprudential measures, combined with concerns about the potential effects on financial markets of extended periods of ultra-low interest rates.

In emerging market economies, credit growth has been a bigger concern than house prices and thus nonhousing measures have been used more frequently. As shown in panel B of figure 4, the use of macroprudential measures increased after the global financial crisis in emerging economies as well. But the reasons for this activity are likely somewhat different from those motivating most of the advanced economies. Speedy economic recovery in emerging economies, combined with accommodative monetary policies in advanced economies, attracted capital inflows, contributing to some of the rebound in credit growth and house prices that occurred after the global financial crisis. With output quickly going above potential for several emerging economies, significant monetary tightening might have been warranted, but fears that such tightening would exacerbate capital inflows and currency appreciation likely motivated a heavier reliance on macroprudential tightening instead.

2.4 Macroprudential Policy as Part of the Policy Toolkit

The goal of this section is twofold. First, it studies how much various types of domestic macroprudential policies are synchronized. Second, it explores how the use of domestic macroprudential measures is correlated with other policy actions that may affect credit growth and asset price inflation. Such policy actions include monetary policy rate changes and changes to

Figure 3: Evolution of MAPP Use, 2000Q1 to 2013Q4
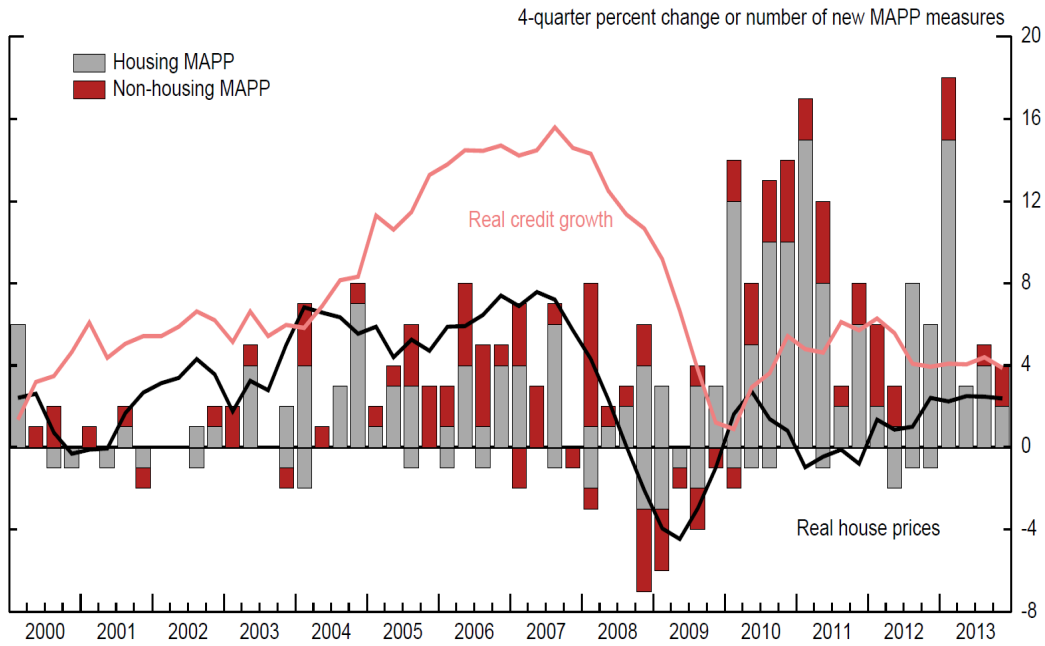
Note: The figure shows average real credit growth (pink line) and average real house price inflation (black line) across all countries. The red bars (gray bars) show the total number of new housing-related measures (nonhousing-related measures) introduced by all countries in our sample in each quarter. Positive values indicate tightenings and negative values indicate easings.

Figure 4: Evolution of MAPP Use in Advanced and Emerging Economies, 2000Q1 to 2013Q4
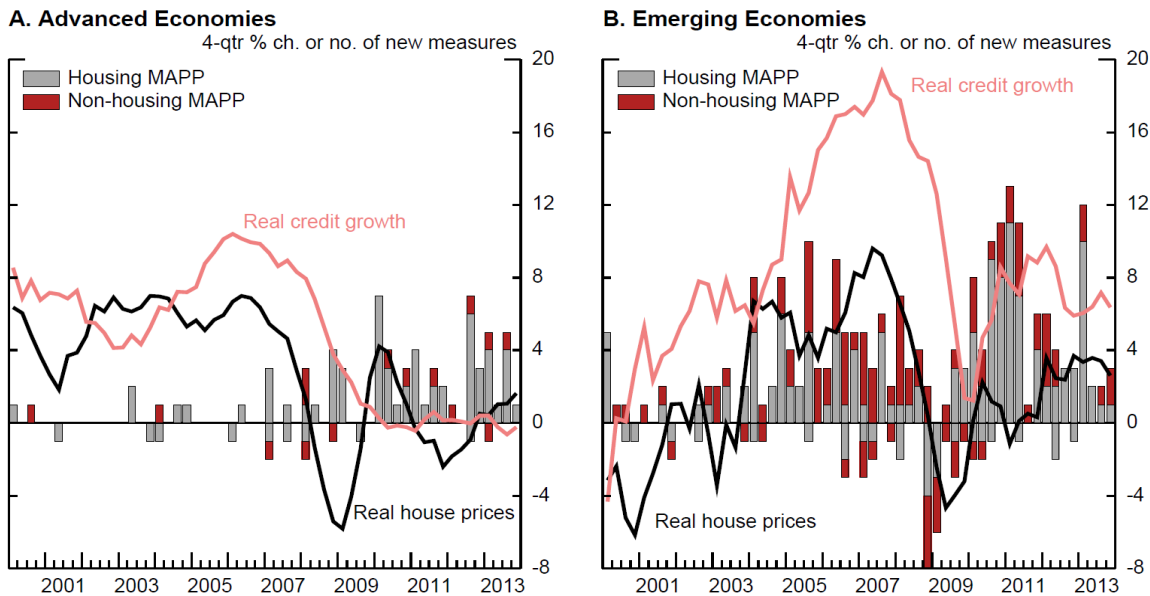
Note: The figure in panel A (panel B) shows average real credit growth and average real house price inflation across advanced economies (emerging economies). The red bars in panel A (panel B) show the total number of new housing-related measures introduced by advanced economies (emerging economies) in our sample in each quarter. The gray bars show the same information for nonhousing measures.

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reserve requirements on domestic currency deposits as well as capital flow restrictions.[6] We find that individual macroprudential measures were often used together. We also document that macroprudential policies are usually changed in tandem with bank reserve requirements, capital flow management measures and monetary policy.

Table 1 shows pairwise correlations of the seven domestic macroprudential policy tools that we study in this paper. Individual macroprudential measures were often used simultaneously by countries in our sample, particularly housing measures. LTV and DTI caps in particular are strongly positively correlated. Positive correlations among housing measures appear in the emerging and advanced economy subsamples as well. Among the measures that target the general credit conditions, capital requirements in particular are strongly positively correlated with all other nonhousing measures. In general, of the seven measures that we study in this paper, most except credit limits are at least weakly positively correlated.[7]

Table 2 shows how the housing and nonhousing macroprudential policy indices are correlated with monetary policy actions (both the policy rate and reserve requirements). It seems that policymakers generally use macroprudential policy measures and monetary policies as complements (the correlations are weakly positive), with the exception of housing-related macroprudential measures and policy rate changes, which are negatively correlated. This is perhaps because several countries, in particular advanced economies, have kept policy rates low since the financial crisis, have simultaneously tightened macroprudential policies related to the housing sector in recent years.[8] This finding might also reflect the difficulty faced by policymakers in dealing with housing booms using monetary policy. By contrast, the correlation between nonhousing macroprudential measures and the policy rate (as well as the reserve requirements) is quite high. Analyzing the pre- and post-crisis periods separately, the relationships among these measures have not changed much since the crisis.

Capital flow measures can also affect the supply of credit. Several countries used capital flow management tools, such as portfolio inflow restrictions and banking inflow restrictions, in addition to macroprudential policies to deal with fast growing bank crediit. As illustrated in figure 5, Brazil, for example, has tightened macroprudential policy along with with capital

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[6]Data on domestic currency reserve requirements comes from **??**. Our data for capital flow measures come from Ahmed and Zlate (2014) and cover 19 emerging market economies from 2002-2012. Capital flow measures include restrictions on portfolio flows and banking flows, with the former consisting of tax on foreign investment and restrictions by asset type or maturity, and the latter including required reserves on banks' foreign exchange liabilities, quantitative limits on banks' foreign exchange exposure and tax on short term external borrowing by banks.

[7]We also checked that these relationships have not changed since the financial crisis. When we compare 2000-2008 with 2009-2013, the results are extremely similar.

[8]When we calculate the same correlations among measures only for advanced economies we find a much stronger negative correlation between housing measures and the policy rate.

flow restrictions, especially restrictions on banking flows, from 2000 through 2012. Policy rate hikes from 2010 through mid-2011 acted to curb inflation but also tempered the rapid expansion of credit. Brazil has also used reserve requirements actively since 2000, tightening them considerably from 2004 to 2005 as well as recently in 2012. Korea, like Brazil, has employed many different policies since 2002. Banking flow restrictions (especially tax on short term borrowing) were successively tightened from 2010 through mid-2011 along with the monetary policy rate. Domestic macroprudential policy actions were mixed in this period: some of the MAPP measures imposed earlier were reversed in 2010 but domestic macroprudential measures were tightened again in 2011 before being eased again since 2012.[9] In contrast, Israel began using macroprudential and other financial stability policies only in 2010, but has tightened such policies considerably since then while keeping the policy rate low. In this respect, Israel stands out among the emerging market economies as an example where monetary policy and macroprudential policy were adjusted in opposite directions. Domestic macroprudential policies targeting the housing sector, along with capital flow measures, have been tightened since mid-2010, but monetary policy has been eased since late-2011 in response to slowing growth in an environment of low inflation. Finally, in Poland, authorities have tightened domestic financial conditions using macroprudential policy, but have relaxed controls on inflows, reserve requirements, and monetary policy recently.

Table 3 displays the correlations between MAPP measures, capital flow measures, and monetary policy for the 19 emerging market economies covered by Ahmed and Zlate (2014)'s capital flow measure database.[10] Even in this subset of emerging markets, the correlations between macroprudential and monetary policy are similar to their relationship in the sample as a whole shown in table 2 which includes a mix of advanced and emerging market economies. In these 19 emerging markets, two different types of capital controls, those on banking inflows and portfolio inflows, are strongly positively correlated with each other. Perhaps not surprisingly, banking inflow restrictions are also positively correlated with nonhousing measures like capital requirements and credit growth ceilings, since tightening these types of measures is likely aimed at reducing bank credit growth. In a similar vein, policy rate increases and banking inflow restrictions are also positively correlated. There seems to be no clear pattern regarding the use of banking inflow restrictions and reserve requirement tightenings or housing-related measures.

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[9]Brazil used an array of policies targeted on capital flows and financial stability while the measures used in Korea, in particular capital control tools such as tax on short term external borrowing, aimed at addressing vulnerabilities revealed by the sudden stop it experienced early in the global financial crisis.

[10]For India, we have assumed no change in capital flow measures over the sample period because the changes recorded in the Ahmed and Zlate (2014) database reflect a structural shift to greater financial openness rather than pursuit of financial stability goals.

Table 1: Correlations Between Individual Measures

Variables	LTV	DTI	Oth. Hous.	CCR	Prov.	Cons. Loan	Cred. Limit
LTV	1.000						
DTI	0.595*	1.000					
Oth. Hous.	0.432*	0.255*	1.000				
CCR	0.064*	0.000	0.040*	1.000			
Prov.	0.260*	0.110*	0.120*	0.239*	1.000		
Cons. Loan	0.060*	0.055*	0.181*	0.306*	0.190*	1.000	
Cred. Limit	-0.049*	0.012	0.000	0.210*	-0.048*	0.113*	1.000

Note: Correlation between the cumulative indexes of seven domestic macroprudential policy tools for 57 countries from 2000 to 2013. LTV=Loan-to-value caps, DTI=Debt-to-income caps, Oth. Hous.=Other housing measures, CCR=Countercyclical capital requirements (excl. those on mortgages), Prov.=Provisioning requirements (excl. those on mortgages), Cons. Loan=Consumer loan limits, Cred. Limit=Credit growth ceilings. An * signifies the correlation is significant to the 5 percent level.

Table 2: Correlations Between MAPP and Other Policy Measures

Variables	Housing MAPP	Nonhousing MAPP	Policy Rate	Reserve Requirements
MAPPH	1.000			
MAPPNH	0.152*	1.000		
Pol. Rate	-0.055*	0.423*	1.000	
Res. Req	0.129*	0.133*	0.058*	1.000

Note: Table showing correlation between the cumulative macroprudential policy indexes for housing measures (MAPPH) and nonhousing measures (MAPPNH), the monetary policy rate (Pol. Rate), and a cumulative index of reserve requirements on domestic currency deposits (Res. Req.) for 57 countries from 2000 to 2013. An * signifies the correlation is significant to the 5 percent level.

Table 3: Correlations Between MAPP and Other Policy Measures in 19 Emerging Market Economies

Variables	MAPPH	MAPPNH	Bank CFM	Port. CFM	Policy Rate	Res. Req.
MAPPH	1.000					
MAPPNH	0.145*	1.000				
Bank CFM	0.049	0.102*	1.000			
Port. CFM	-0.117*	0.018	0.541*	1.000		
Pol. Rate	-0.075*	0.416*	0.131*	0.007	1.000	
Res. Req	-0.098*	0.244*	-0.016	-0.252*	0.180*	1.000

Note: Table showing correlation between the cumulative macroprudential policy indexes for housing measures (MAPPH) and nonhousing measures (MAPPNH), and cumulative indexes of capital controls from Ahmed and Zlate (2014) including portfolio inflow restrictions (Port. CFM) and banking inflow restrictions (Bank CFM), the monetary policy rate (Pol. Rate), and a cumulative index of reserve requirements on domestic currency deposits (Res. Req.) for 19 emerging market economies from 2002 to 2012. An * signifies the correlation is significant to the 5 percent level.

Figure 5: MAPP, Capital Flow Measures and Monetary Policy, 2000Q1 to 2013Q4

— MAPP Index   — Portfolio Flows Index   — Banking Flows Index   — Res. Req. Index   — Policy Rate
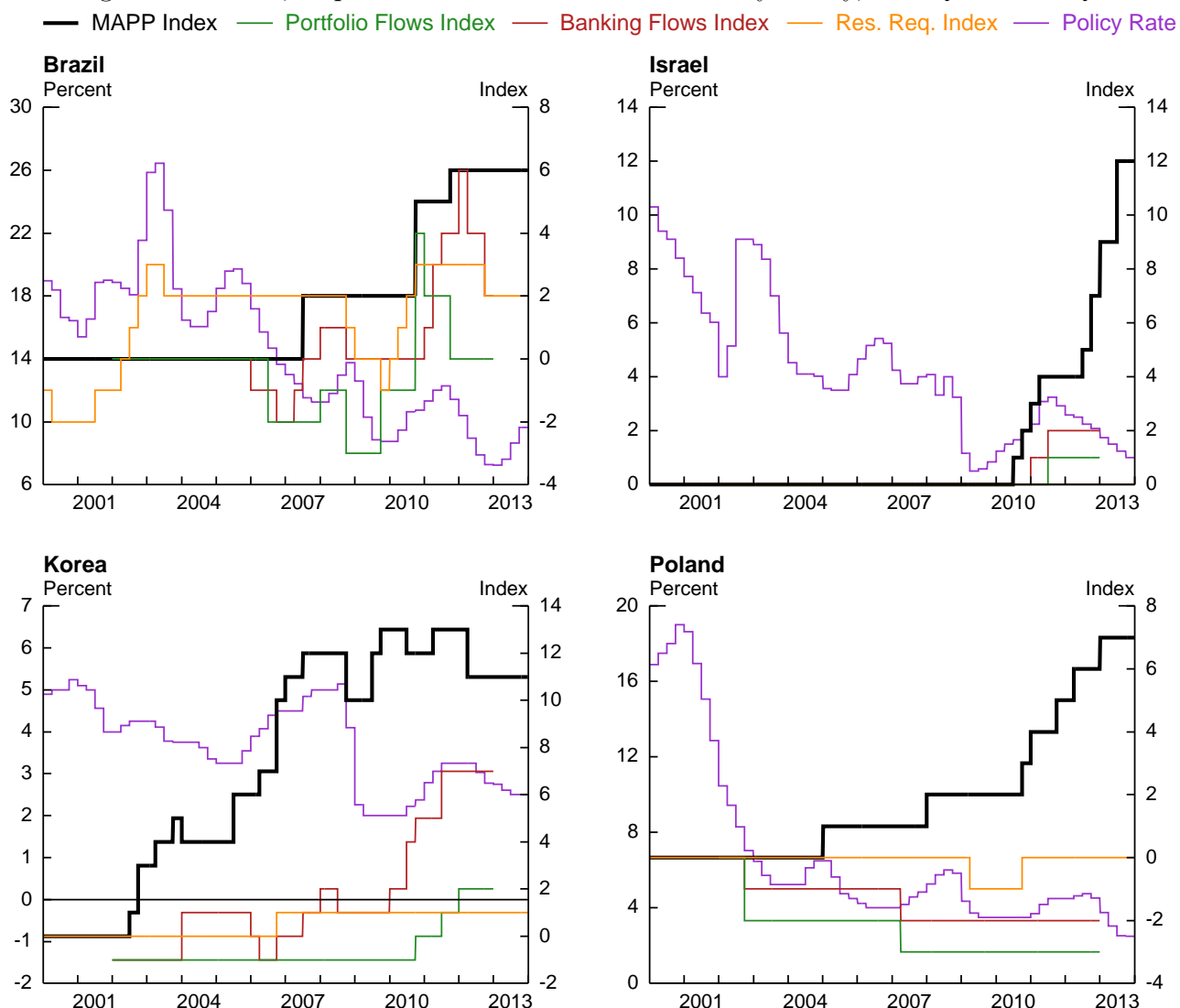
Note: Figures show the cumulative macroprudential policy index (black line), portfolio inflow control index (green line), banking inflow control index (red line), domestic currency reserve requirement index (orange line), and monetary policy rate (purple line, left axis) for four selected countries from 2000 to 2013. Tightenings for the policy indexes take a positive value and loosenings take a negative value.

3   Event Study Analysis: The Case of Korea

This section turns to an event study for Korea to offer some clarity about how macropru-dential tools can be adjusted to address particular vulnerabilities. After the Asian crisis of the late 1990s, house prices and credit to households in Korea began to grow rapidly, starting in 2001. Since then, Korea has experienced both rapid growth and rapid slowdowns in credit and house prices. The Bank of Korea responded with (mostly housing-related) measures to attenuate these cycles. This section explores the success and lessons learned from the Korean

experience with domestic macroprudential tools from 2000-2013.[11]

Figure 6: Case Study: Housing Booms and Busts and Macroprudential Response in Korea
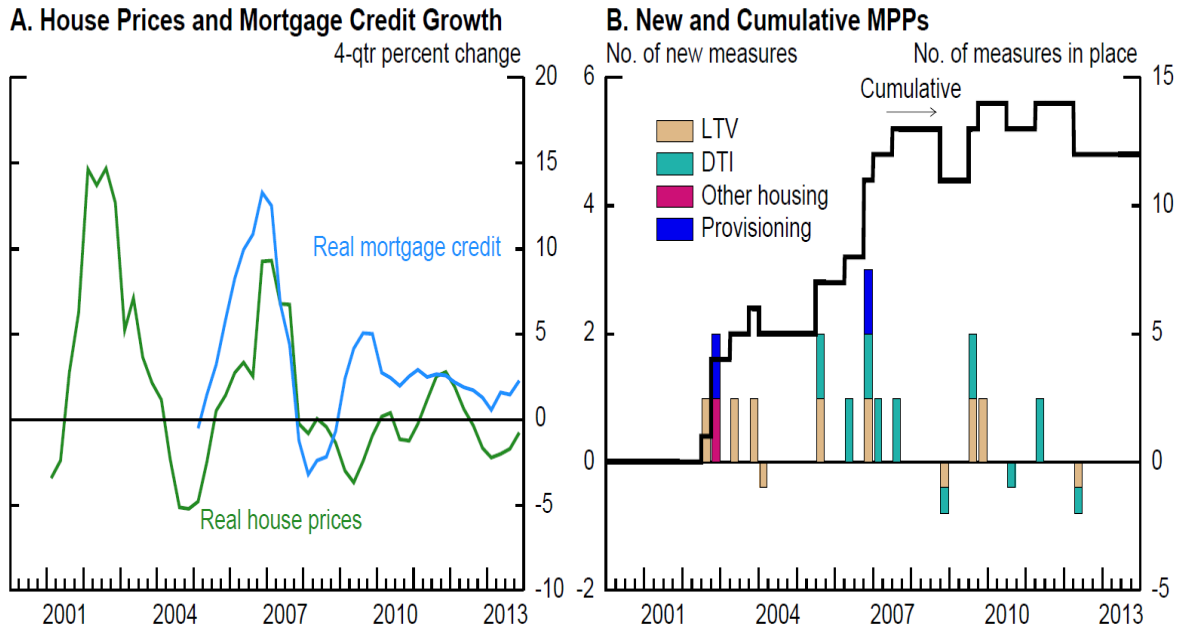
At their peak in 2002, real house prices increased 15 percent compared to a year earlier (Figure 6, panel A). Choongsoo Kim, the governor of the Bank of Korea from 2010-2014, recently argued in a speech at the IMF that rapid increases in mortgage lending fueled the early 2000s housing boom. The boom was largely concentrated in so-called "speculative zones" of Seoul, Korea's capital. In September 2002, at the height of the boom, Korean authorities capped the LTV ratio of mortgage loans from banks and insurance companies at 60 percent in these speculative zones. The following month authorities mandated additional loan loss provisioning for housing loans and raised the regulatory risk weights on mortgages used to calculate the capital base of banks from 50 percent to between 60 and 70 percent.

The LTV ratio was further tightened several times between 2002 and late 2003 before being loosened in March 2004 as credit and house price growth slowed to near zero (figure 6, panel A). The loosening applied only to loans with maturities greater than 10 years. By 2005 growth in mortgage credit and house prices picked up once more and the government introduced a cap on DTI ratios for the first time in August 2005. The ratio was set at 40 percent for

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[11]Korea also used other macroprudential policies to limit foreign exchange exposure during the sample period. During the 2008 financial crisis foreign bank branches and some Korean banks faced liquidity shortages as they tried to roll over their maturing short-term external liabilities but were unable to do so because of tight global financial conditions. To address the maturity and currency mismatches of these banks, Korean authorities have introduced a series of measures to limit foreign exchange exposure of banks.

housing loans by banks in speculative zones if the borrower were single or the borrower's spouse had debt. In November 2006 this cap was extended to cover non-speculative zones in Seoul as well. Later, in August 2007, non-bank financial institutions were subject to DTI caps of between 40 and 70 percent. Panel B of figure 6 illustrates how LTV, DTI, and provisioning requirements were subsequently tightened and loosened in response to movements in credit growth and asset prices.

Figure 7: Event Study: House Prices and Housing Credit in Korea
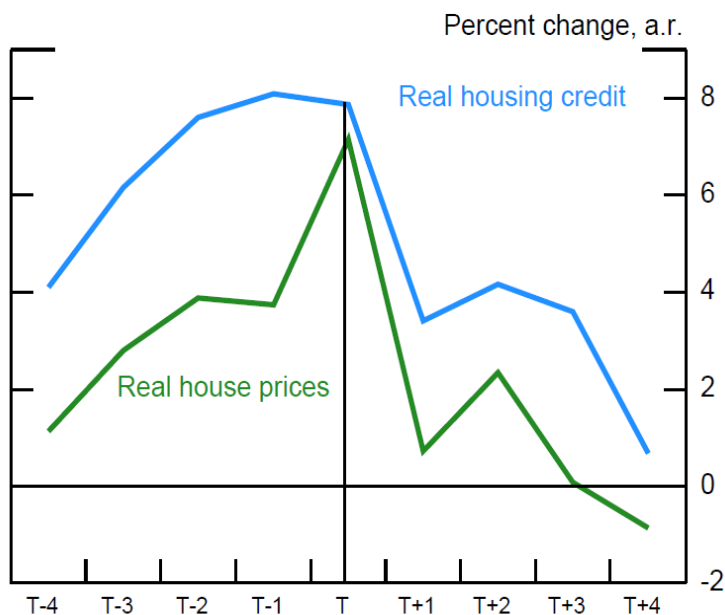
Note: For all macroprudential tightenings in Korea from 2000 to 2013, we study real housing credit growth and real house price inflation for four quarters before and after the event. The blue line displays the average housing credit growth before and after macroprudential tightening measures. The green line shows the average house price inflation around the tightening events. For housing credit, the data begins in 2005, so some early events are lost.

Given the variety and intensity of measures Korea employed, particularly housing measures, we engage in an event study analysis of macroprudential tightening events to evaluate the effectiveness of such measures. For both real house prices and real mortgage credit growth we identify each macroprudential tightening and study a four quarter window before and after the event. In both cases we find that macroprudential tools were effective in reducing house price and credit growth (figure 7).

For house prices, we find that house price inflation falls in the four quarters after a tightening. The reduction is dramatic: average house price inflation in the quarters with MAPP tightenings was 7 percent, while growth in the following quarter fell to just 1 percent. The event study suggests that in subsequent quarters house prices actually began to contract following MAPP tightenings. Since the Korean authorities were particularly concerned with

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mortgage credit booms, we conduct the same analysis for mortgage credit, though the data begins in late 2005 so we lose some events at the beginning of the period. Still, mortgage credit growth also appears to have been contained by the use of housing measures and was likely the driver behind the fall in house prices. In the sections that follow we undertake a more rigorous examination of the effectiveness of macroprudential policies that exploits our large panel dataset, building off the encouraging results of the case study for Korea.

4   Empirical Analysis

This section lays out the empirical model used in the analysis and presents estimates of the macroprudential policies' effects on total bank credit, housing credit and house prices. This section also investigates the impact of other policy tools, such as reserve requirements and capital flow management tools, on these variables. We estimate a dynamic panel data regression model with country fixed effects using the GMM method developed by Arellano and Bond (1991).[12]

4.1   The Empirical Model

The empirical reduced-form regression model used in the analysis is as follows:

$$C_{i,t} = \eta_i + \rho C_{i,t-1} + \beta VIX_t + \sum_{k=1}^{p} \theta_k X_{i,t-k} + \delta MAPP_{i,t-1} + \epsilon_{i,t} \tag{1}$$

where i denotes countries, t indicates time period, and η_i is a country fixed effect. The dependent variable, $C_{i,t}$, denotes the quarterly (annualized) growth rate of *real domestic bank credit.* The variable denoted by $MAPP_{i,t}$ is the macroprudential policy index or the housing or nonhousing subcomponents. As mentioned earlier, we chose to use cumulative measures in the panel data analysis because macroprudential measures can affect credit and house price growth not just in the quarter of implementation but in subsequent quarters as well. Some of these policies may be delayed in their effect: though we record the date the measure was put in place, it could be that these measures do not bind until years later. For these reasons we choose to use the country's overall macroprudential stance as our variable of interest. To address the possible endogeneity of macroprudential measures with respect to financial

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[12]The estimation results using the Least Square Dummy Variable method, which are qualitatively very similar, are available upon request.

conditions, we lag the MAPP index by one quarter and also include a vector of control variables, $X_{i,t}$, that includes two lags of quarterly (annualized) real GDP growth and one lag of the change in the nominal monetary policy rate.[13] A global risk aversion variable proxied by the VIX index is also included in the regression. Real and financial conditions in small open economies have been shown to be highly correlated with global risk conditions which are exogenous to these countries (see, for example, Akinci (2013)). An analogous specification is used for the *real housing credit* and *real house prices* regressions.[14]

We estimate model (1) by pooling quarterly data from 57 foreign economies (23 advanced and 34 emerging market economies) using the the GMM method developed by Arellano and Bond (1991). The sample begins in 2000Q1 and ends in 2013Q4. One concern is the fact that high-risk countries that experienced rapid growth of house prices and credit are most likely to implement macroprudential policies, leading to an endogeneity bias that would increase the correlation between macroprudential policy use and high growth and bias the coefficient estimates. This suggests that if we find some statistical significance of the MAPP indices to constrain growth of the dependent variables, these should really be considered lower bounds for the true coefficients given the endogeneity of macroprudential policy and high growth in the dependent variables. The GMM technique might also mitigate this type of endogeneity concern. [15]

4.2   Estimation Results with MAPP Index

Table 4 reports the regression results for total domestic bank credit growth. The baseline results without our macroprudential indices (column 1) show all control variables entering significantly with the expected sign. The VIX index, which spikes during episodes of financial stress, is negatively correlated with lower real credit growth.[16] High GDP growth in the previous two quarters is associated with higher credit growth, while policy rate increases are expected to lower the rate of credit growth.

The next three columns in table 4 show the effect of macroprudential measures on real

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[13]We chose one lag of the change in the monetary policy rate rather than two lags of the level because using the first and second lags together causes each lag to enter with the same coefficient but opposite sign. Including just one lag of the change allows us to better estimate the effect of the other coefficients.

[14]In the analysis, all nominal variables are deflated by the country's GDP deflator to calculate real variables.

[15]It is also possible that macroprudential policies were implemented at the end of financial boom cycles and credit growth would have naturally declined absent macroprudential policies, but including the VIX in our model helps account for this since domestic financial conditions in small open economies are highly correlated with global financial conditions.

[16]We ran the same regression replacing VIX with country-specific banking crisis dummies derived from Valencia and Laeven (2012) and a dummy variable for Eurozone countries during the Eurozone crisis and found similar results.

credit growth. The coefficients on the control variables do not change much when the MAPP indices are added. Column 2 displays the results for the overall MAPP index which includes both housing and nonhousing measures. An additional macroprudential measure put in place, measured by an increase in the MAPP index, is associated with a 0.7 percentage point decline in credit growth in a given quarter. The magnitude of the effect is roughly three times that of a 1 percentage point decrease in quarterly GDP growth in the previous quarter. As can be seen from columns 3 and 4, both housing and nonhousing measures have played an important role in containing fast growth in total bank credit, with nonhousing measures appearing to have a greater impact than housing-related policies.

To test whether housing measures are more effective at curbing credit growth for housing, we run the same set of regressions for the growth of housing credit as the dependent variable. These results are shown in table 5. The baseline and overall MAPP results for housing credit are much the same as for total bank credit (columns 1 and 2), though GDP growth has a smaller predicted effect on housing credit growth and policy rate increases are not associated with reductions in housing credit growth. From the results in columns 3 and 4, however, it is clear that housing-related measures drive the significance of the overall macroprudential policy index, while nonhousing measures appear to have no significant effect on housing credit growth.

Finally, we investigate whether measures targeted at housing credit can also impact house prices, which can themselves be a source of financial vulnerability. Indeed, in line with our expectation, it seems that housing-related macroprudential measures can significantly lower house price inflation while nonhousing measures do not (table 6). The baseline results are fairly similar as those for total credit. In the next section we use these panel estimates for total credit, housing credit, and house prices to investigate how economically important the macroprudential policy measures were in countries that used them.

4.2.1   Counterfactuals

Are the restraining effects of tighter macroprudential policies economically important? To examine this issue, figure 8 shows actual average quarterly credit growth, the first grey bar, for countries that used at least one macroprudential tool from 2011 to 2013. The actual credit growth that occurred in the presence of macroprudential policy is compared to credit growth implied by the model under the counterfactual that no macroprudential measures were in place, the first blue bar. The measures appear to have made a difference: although average bank credit growth in these countries was still robust even with macroprudential measures in place, it would have been about 25 percent higher in the absence of these measures.

Figure 8: Counterfactuals Illustrating Economic Importance of Macroprudential Measures, 2011-2013
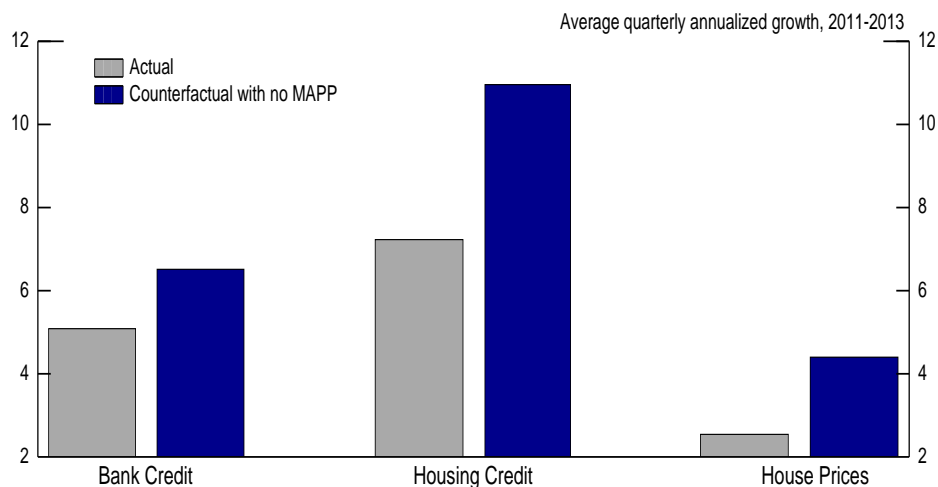
Note: The gray bars show actual average total and housing credit growth and house price inflation across all countries in our sample that had at least one macroprudential policy in place from 2011 to 2013 (or at least one housing-related macroprudential measure for housing credit and house price estimates). The blue bars show, for each dependent variable, our re-estimated average growth, under the counterfactual assumption that no (housing-related) macroprudential policies were in place.

Figure 8 also shows the analogous results for housing credit and house prices[17]. Consistent with the results of the event study for Korea discussed earlier, our model predicts that house price inflation in countries that enacted at least one housing measure would have been, on average, nearly double its actual level if macroprudential measures had not been used. Housing credit growth would have been more than one-and-a-half times more. Clearly the macroprudential measures have had a nontrivial effect on credit growth and house price inflation over the past three years.

4.3   Estimation Results with Individual MAPP Measures

It is of considerable interest to policymakers which instruments in particular are most effective at reducing credit and asset price growth. However, we must proceed with caution when interpreting the results of the regressions with individual measures given that the number of these measures is small, particularly for DTI caps and dynamic provisioning. It may be premature to say that measures not shown to be statistically significant are not effective. With these caveats in mind, this section presents the results of the dynamic panel estimation for the five most common individual macroprudential tools on each of the dependent variables.

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[17]For housing credit and house prices, the figure shows the growth rate of the respective variables for the countries which used at least one housing-related macroprudential measure

For bank credit, three of the five measures are statistically significant as shown in table 7 and all five enter with the correct (negative) sign. The strongest is capital requirements: our model predicts that one additional capital requirement reduces credit growth in the following quarter by 1.7 percentage points, though we again note the relatively small number of capital requirement measures in the sample. Housing measures, including LTV caps and other housing measures (mostly made up of risk weights on mortgage loans), are also significant. This result is in line with the findings in Table 4 for the overall indices, which showed both housing and nonhousing measures have a significant impact on credit. It seems that capital requirements, both sectoral requirements on housing loans and general capital requirements, are quite effective in reducing bank credit growth, and LTV measures targeted at borrowers can also be effective.

Across all five estimations shown in table 7 the control variables enter significantly with the correct sign. One notable result is the fact that in the regressions where the individual measures are significant, the predicted effect of the policy rate declines slightly and loses some significance. This could be because of correlation between policy rate changes and macroprudential policies (see table 2), as these two types of instruments are sometimes used in conjunction to address financial stability concerns.

Turning to housing credit, we expect to find that LTV and DTI caps as well as other housing measures reduce housing credit growth, and we do find the borrower-targeted policies (LTV and DTI) are associated with lower housing credit growth (see table 8). The estimated effect of these measures on housing credit is much larger than for total credit, with LTV caps reducing credit growth by 2.9 percentage points and DTI caps by 4.3 percentage points. Because housing credit growth is much larger on average than total credit growth, and because these measures target mortgage borrowers specifically, these results make sense. The individual nonhousing measures, with the exception of capital requirements, do not appear to significantly affect housing credit. It appears that nonhousing-related capital requirements are positively correlated with housing credit growth, perhaps because banks increase lending for housing when other types of lending are restricted.

Finally, we consider the effect of each individual measure on house prices with the same expectation that the measures targeted at the housing sector will be more effective. This is indeed the case, as shown in table 9. DTI caps have the greatest predicted impact, reducing quarterly house price growth by nearly 2.3 percentage points, followed by LTV caps (1.5 percentage points) and other housing measures (1 percentage point). We do not find any significant relationship between nonhousing measures and house prices.

4.4 The Role of Reserve Requirements as a Macroprudential Tool

Given that we also have data on domestic currency reserve requirements derived from Cordella et al. (2014), which are sometimes used as prudential instruments, we are also able to study the effect of these measures on our three dependent variables in tables 7, 8, and 9. In general, reserve requirements do not have significant impact on credit and house prices when control variables like GDP, global risk, and the policy rate are included in the regressions. Tighter reserve requirements on domestic currency deposits are weakly positively correlated with bank credit in our sample, which is primarily driven by the impact on the euro area of the actions taken by the European Central Bank, which may not be countercyclical for individual countries. There appears no significant relationship between credit and reserve requirements once the euro area is excluded from the sample.[18]

4.5 Capital Controls and Credit Growth in Emerging Countries

Several countries, especially emerging economies, have employed measures aimed at managing fluctuations in cross-border capital flows and risks associated with these inflows. Surges in capital inflows can cause overheating in credit markets and other financial imbalances, such as excessive borrowing in foreign currencies, by increasing the supply of funds and lowering yields and, in a managed exchange rate regime, by triggering foreign exchange market interventions that expand the money supply if not sterilized. Sudden stops or reversals of inflows can trigger financial crises. Policies to dampen the swings in capital flows, including various types of capital controls, may thus enhance financial stability. Examples include taxes on inflows or special reserve requirements on external deposits. In this respect, the purpose of this section is to investigate the role that capital control policies might play for financial stability purposes. In this section we check how capital controls, controls on banking inflows, and controls on portfolio inflows affect credit growth.

The three indices for capital controls and controls on banking inflows used in this section were provided by Ahmed and Zlate (2014). These quarterly, cumulative indexes were constructed using information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database and cover 19 emerging market economies from 2002 to 2012.[19] In contrast to the IMF capital control indexes based on the AREAER database, these indices seek to capture some of the intensity of capital controls by changing

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[18]We also checked whether there was any interaction between the effectiveness of reserve requirements and macroprudential policy and found no significant relationship.

[19]These countries are: Argentina, Brazil, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Poland, Romania, South Africa, Taiwan, Thailand, and Turkey.

as measures are adjusted, not just when they are created or eliminated. All three indices focus exclusively on restrictions on inflows. The overall capital control index cumulates restrictions on foreign direct investment, portfolio investment (divided into bond and equity restrictions), and banking investment into the country. The banking subcomponent includes measures such as taxes on short term external borrowing, quantitative limits on banks' foreign exchange exposure and reserve requirements on foreign exchange liabilities. We focus on the banking inflow restrictions and the portfolio inflow restrictions in addition to the overall capital control index because these measures are most likely to affect bank credit growth.

Table 10, column 1, shows the baseline results for total bank credit growth for the subsample of emerging markets for which there is capital control data. For these 19 countries, the control variables enter with the expected sign and are significant (except for the change in the policy rate.) As with the full panel, the MAPP index is predicted to reduce credit growth. It appears that for these 19 countries from 2002 to 2012, general capital controls (made up of restrictions on banking inflows, foreign direct investment, and restrictions on portfolio inflows) do not significantly reduce domestic bank credit growth. Portfolio inflow restrictions (including restrictions on bond and equity inflows) do not have any significant impact credit either . Tighter banking inflow restrictions, on the other hand, are correlated with lower bank credit growth but the relationship is not significant. When the four Central and Eastern European (CEE) countries in the sample are excluded, however, it is clear that banking inflow restrictions play an important role in the emerging market countries.

5   Robustness Analysis

The results in the previous sections lend support to the view that macroprudential policies are effective in curbing bank credit growth and house price inflation. In this section, we analyze whether our results are robust to alternative ways of constructing the MAPP index and in sub-groups of countries.[20]

5.1   Alternative ways of constructing Macroprudential Policy Index

When cumulating the individual measures into the MAPP index used in the regressions, we assign each individual measure a weight of one. It is possible that certain measures should be assigned a greater weight because they have a larger effect on credit growth or house prices than other measures. This is especially true because we use an indicator variable for the individual measures rather than trying to capture the intensity of each action. For example,

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[20]Regression results and statistical tests for the robustness checks are available upon request.

it is easy to imagine that introducing a general capital buffer reduces credit growth more than a change in the regulatory risk weights on housing loans, but the indicator variable does not capture this difference. In this section we check whether our aggregation of the individual MAPP measures is appropriate. Recall that the MAPP index is the sum of each of the individual macroprudential measures, weighted equally:

$$MAPP_{i,t} = LTV_{i,t} + DTI_{i,t} + Oth.Hous_{i,t} + CCR_{i,t} + Prov_{i,t} + Cred.Lim_{i,t} + Cons.Cr.Lim_{i,t}$$

Is this weighting appropriate for each country? To check, we run our regressions for credit, housing credit, and house prices again and include $n-1$ individual measures in addition to the MAPP index to see whether any individual measure should have a weight different from 1. A Wald exclusion test (F-test for joint significance) checks whether these additional individual measures should be included. For the panel, the exclusion tests generally suggest that the equal weights across measures are appropriate for each of the dependent variables (the hypothesis that all coefficients on the individual measures are zero cannot be rejected) and thus we do not need to include the individual measures separately or re-weight the index. One exception is for the aggregation of the housing subcomponent with regard to housing credit. In this case we find that LTV and DTI indices have a much larger impact on housing credit compared to the other housing measures index. We also run the regressions for each country and find only a few cases where the weights for individual measures are statistically different from one.

5.2 Sub-group analysis

Do our results hold up for both advanced and emerging markets? Or is one group of countries driving the results for the sample as a whole? Several papers have argued that macroprudential regulation is more difficult to implement in emerging markets that may not have the regulatory capacity to enforce macroprudential rules. In this section we investigate how the effects of macroprudential policies vary in advanced versus emerging markets.

In table 11 we show the regression results for bank credit with the sample split into advanced and emerging economies. The control variables do not change much for the subsamples, though it appears that global risk plays a smaller role in determining credit growth in emerging economies. The overall MAPP index is negative and significant for both cases, suggesting that macroprudential policies matter for credit growth in both emerging and advanced economies. An interesting result is that housing measures drive the results for advanced economies while nonhousing policies matter more in emerging markets, consistent with what we observe in fig-

ure 4 that emerging markets have used broad, non-housing policies while advanced economies have generally used policies that specifically apply to the housing sector. The housing-related policies used in emerging markets do not appear to be associated with lower bank credit growth.

For housing credit, as with total credit, we find that macroprudential policies tightenings matter in both advanced and emerging markets (table 12). In both groups, it is housing-related macroprudential policies that drive the results for the overall index. It seems that monetary policy tightenings are weakly associated with higher housing credit growth in advanced economies, which explains why in the sample as a whole (table 5) we did not find the expected relationship between policy rate increases and housing credit growth. The results for house price inflation are very similar to those for housing credit (table 13). Housing-related policies matter for house price inflation while nonhousing measures do not.

6   Conclusion

In this paper we have used a dynamic panel data model to assess the effectiveness of macroprudential policies. To do so, we develop a novel set of indexes for seven macroprudential tools (LTV, DTI, other housing measures, countercyclical capital requirements, dynamic provisioning, consumer loan limits, and credit growth ceilings) as well as an aggregate index to measure the overall macroprudential policy stance of 57 countries. We have used national sources and IMF survey results to update and improve existing databases of macroprudential policies to cover three years more than most of the empirical literature, a period in which macroprudential policies were heavily used.

This analysis is also one of the first to study how a country's macroprudential policy stance with regard to one particular sector, housing, affects housing credit and house prices. We find that bank credit is restrained by both housing and nonhousing measures. Analysis on the individual level suggests capital requirements are effective, along with LTV caps, risk weights on mortgages and other housing measures. Our results predict that only housing macroprudential policies constrain housing credit growth and house price inflation, particularly LTV and DTI caps. Counterfactual simulations from the model assuming countries had not used any macroprudential measures predict that average bank credit growth, housing credit growth, and house price inflation would all have been significantly higher between 2011-2013 in the absence of macroprudential policy.

Future work on the efficacy of macroprudential policy should address several concerns. Although we find little mutual reinforcement of macroprudential policies and capital controls with regard to total credit growth, it is likely that the two policy options both affect capital

flows and this relationship should be investigated further. More research should also be done to understand the domestic spillovers from macroprudential policy in some sectors, especially the effect of housing-related policies on other sectors.

References

Acharya, V. V., Oct. 2013. Adapting macroprudential regulation for emerging markets. In: Canuto, O., Ghosh, S. (Eds.), Deailng with the Challenges of Macro Financial Linkages in Emerging Markets. Ch. 2. 1

Ahmed, S., Zlate, A., 2014. Capital flows to emerging market economies: A brave new world? Journal of International Money and Finance (0), –.
URL http://www.sciencedirect.com/science/article/pii/S0261560614000928 6, 2.4, 10, 3, 4.5

Aiyar, S., Calomiris, C. W., Wieladek, T., 2014. Does macro-prudential regulation leak? evidence from a uk policy experiment. Journal of Money, Credit and Banking 46 (s1), 181–214.
URL http://dx.doi.org/10.1111/jmcb.12086 1

Akinci, O., 2013. Global financial conditions, country spreads and macroeconomic fluctuations in emerging countries. Journal of International Economics. 4.1

Arellano, M., Bond, S., April 1991. Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. Review of Economic Studies 58 (2), 277–97.
URL http://ideas.repec.org/a/bla/restud/v58y1991i2p277-97.html 4, 4.1

Bruno, V., Shim, I., Shin, H. S., Oct. 2014. Comparative Assessment of Macroprudential Policies. Tech. rep., Bank for International Settlements. 1

Cerutti, E., Claessens, S., Laeven, L., 2015a. The Use and Effectiveness of Macroprudential Policies: New Evidence. IMF Working Papers 15/61, International Monetary Fund. 1

Cerutti, E., Correa, R., Fiorentino, E., Segalla, E., 2015b. Changes in prudential policy instruments a new cross country database. 2.1

Claessens, S., Ghosh, S. R., Mihet, R., 2014. Macro-Prudential Policies to Mitigate Financial System Vulnerabilities. IMF Working Papers 14/155, International Monetary Fund.
URL http://www.imf.org/external/pubs/ft/wp/2014/wp14155.pdf 1

Cordella, T., Federico, P., Vegh, C., Vuletin, G., Feb. 2014. Reserve requirements in the brave new macroprudential world. Policy Research Working Paper Series 6793, The World Bank.
URL http://ideas.repec.org/p/wbk/wbrwps/6793.html 4.4

Craig, R. S., Hua, C., 2011. Determinants of Property Prices in Hong Kong SAR: Implications for Policy. IMF Working Papers 11/277, International Monetary Fund.
URL https://www.imf.org/external/pubs/ft/wp/2011/wp11277.pdf 1

DellAriccia, G., Igan, D., Laeven, L., Tong, H., 2012. Policies for Macrofinancial Stability: How to Deal with Credit Booms. IMF Staff Discussion Note 12/06, International Monetary Fund.
URL http://www.imf.org/external/pubs/ft/sdn/2012/sdn1206.pdf 1

Gourinchas, P.-O., Obstfeld, M., January 2012. Stories of the twentieth century for the twenty-first. American Economic Journal: Macroeconomics 4 (1), 226–65.
URL http://ideas.repec.org/a/aea/aejmac/v4y2012i1p226-65.html 2

IMF, Dec. 2012. The Interaction of Monetary and Macroprudential Policies–Background Paper. Tech. rep., International Monetary Fund.
URL https://www.imf.org/external/np/pp/eng/2013/012713.pdf 1

IMF, 2014. United Kingdom: Selected Issues. IMF Country Report 14/234, International Monetary Fund.
URL http://www.imf.org/external/pubs/ft/scr/2014/cr14234.pdf 1

Kuttner, K., Shim, I., 2014. Can non-interest rate policies stabilize housing markets? evidence from a panel of 57 economies.
URL http://www.cemla.org/PDF/investigacion/other/ks2a.pdf 1, 2.1, Appendix C

Lim, C. H., Costa, A., Columba, F., Kongsamut, P., Otani, A., Saiyid, M., Wezel, T., Wu, X., 2011. Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences. IMF Working Papers 11/238, International Monetary Fund.
URL http://ssrn.com/abstract=2169749 1, 2.1

Mendoza, E. G., Terrones, M. E., Sep. 2012. An anatomy of credit booms and their demise. NBER Working Papers 18379, National Bureau of Economic Research, Inc.
URL http://ideas.repec.org/p/nbr/nberwo/18379.html 2

Schularick, M., Taylor, A. M., 2012. Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870-2008. American Economic Review 102 (2), 1029–61.
URL http://www.aeaweb.org/articles.php?doi=10.1257/aer.102.2.1029 2

Valencia, F., Laeven, L., Jun. 2012. Systemic Banking Crises Database: An Update. IMF Working Papers 12/163, International Monetary Fund.
URL http://ideas.repec.org/p/imf/imfwpa/12-163.html 16

Vandenbussche, J., Vogel, U., Detragiache, E., 2012. Macroprudential Policies and Housing Prices-A New Database and Empirical Evidence for Central, Eastern, and Southeastern Europe. IMF Working Papers 12/303, International Monetary Fund.
URL http://ssrn.com/abstract=1956385 1

Zhang, L., Zoli, E., 2014. Leaning Against the Wind: Macroprudential Policy in Asia. IMF Working Papers 14/22, International Monetary Fund.
URL https://www.imf.org/external/pubs/ft/wp/2014/wp1422.pdf 1

Table 4: Panel Estimation Results: Bank Credit

	Baseline	With MAPP	With MAPPH	With MAPPNH
L.Real Cred. Growth	0.325***	0.311***	0.315***	0.316***
	(0.04)	(0.04)	(0.04)	(0.04)
VIX (log)	-1.877**	-2.059**	-2.144**	-1.797*
	(0.91)	(0.95)	(0.96)	(0.93)
GDP growth, 1st lag	0.262***	0.241***	0.245***	0.254***
	(0.06)	(0.06)	(0.06)	(0.06)
GDP growth, 2nd lag	0.305***	0.287***	0.290***	0.298***
	(0.05)	(0.04)	(0.04)	(0.04)
Chg. in pol. rate, 1st lag	-1.162*	-0.995	-1.066	-1.033
	(0.68)	(0.68)	(0.69)	(0.67)
MAPP, 1st lag		-0.728***		
		(0.27)		
MAPPH, 1st lag			-0.834**	
			(0.38)	
MAPPNH, 1st lag				-1.139**
				(0.49)
Observations	2728	2728	2728	2728
No. of countries	55	55	55	55

Note: Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 5: Panel Estimation Results: Housing Credit

	Baseline	With MAPP	With MAPPH	With MAPPNH
L.Real Housing Cred. Growth	0.517***	0.506***	0.500***	0.517***
	(0.07)	(0.07)	(0.07)	(0.07)
VIX (log)	-1.993*	-2.350**	-2.457**	-1.977*
	(1.02)	(1.03)	(1.01)	(1.04)
GDP growth, 1st lag	0.164***	0.146***	0.141***	0.166***
	(0.06)	(0.06)	(0.05)	(0.06)
GDP growth, 2nd lag	0.129**	0.117**	0.113*	0.130**
	(0.06)	(0.06)	(0.06)	(0.06)
Change in policy rate, 1st lag	0.496	0.608	0.591	0.478
	(0.64)	(0.60)	(0.61)	(0.62)
MAPP, 1st lag		-0.709*		
		(0.37)		
MAPPH, 1st lag			-1.125***	
			(0.40)	
MAPPNH, 1st lag				0.266
				(1.08)
Observations	2382	2382	2382	2382
No. of countries	53	53	53	53

Note: Robust standard errors clustered by country are in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 6: Panel Estimation Results: House Prices

	Baseline	With MAPP	With MAPPH	With MAPPNH
L.Real House Price Growth	0.198***	0.193***	0.191***	0.198***
	(0.07)	(0.07)	(0.07)	(0.07)
VIX (log)	-4.918***	-5.174***	-5.249***	-4.927***
	(1.21)	(1.24)	(1.24)	(1.21)
GDP growth, 1st lag	0.254***	0.239***	0.239***	0.252***
	(0.08)	(0.08)	(0.08)	(0.08)
GDP growth, 2nd lag	0.212***	0.198***	0.199***	0.209***
	(0.06)	(0.06)	(0.06)	(0.06)
Change in policy rate, 1st lag	-1.374**	-1.241**	-1.241**	-1.357**
	(0.61)	(0.61)	(0.61)	(0.60)
MAPP, 1st lag		-0.521***		
		(0.18)		
MAPPH, 1st lag			-0.706***	
			(0.23)	
MAPPNH, 1st lag				-0.277
				(0.50)
Observations	2350	2350	2350	2350
No. of countries	53	53	53	53

Note: Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 7: Individual Measures: Panel Estimation Results: Bank Credit

	(1)	(2)	(3)	(4)	(5)	(6)
L.Real Cred. Growth	0.316***	0.318***	0.322***	0.320***	0.319***	0.315***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
VIX (log)	-2.078**	-1.793**	-2.100**	-1.868**	-1.776*	-2.047**
	(0.95)	(0.89)	(0.95)	(0.91)	(0.94)	(0.94)
GDP growth, 1st lag	0.249***	0.254***	0.252***	0.252***	0.260***	0.268***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
GDP growth, 2nd lag	0.294***	0.299***	0.297***	0.297***	0.303***	0.305***
	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
Chg. in pol. rate, 1st lag	-1.086	-1.125	-1.112	-1.067	-1.102	-1.325**
	(0.69)	(0.69)	(0.68)	(0.66)	(0.68)	(0.65)
LTV, 1st lag	-1.458*					
	(0.86)					
DTI, 1st lag		-2.543				
		(1.79)				
Other Housing, 1st lag			-1.027**			
			(0.52)			
CCR, 1st lag				-1.684**		
				(0.75)		
Prov., 1st lag					-1.992	
					(1.25)	
Res. Req., 1st lag						0.417*
						(0.24)
Observations	2728	2728	2728	2728	2728	2698
No. of countries	55	55	55	55	55	55

Note: Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 8: Individual Measures: Panel Estimation Results: Housing Credit

	(1)	(2)	(3)	(4)	(5)	(6)
L.Real Housing Cred. Growth	0.495***	0.493***	0.515***	0.512***	0.516***	0.517***
	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
VIX (log)	-2.551**	-1.928*	-2.181**	-1.861*	-1.992*	-2.093**
	(1.06)	(1.01)	(0.99)	(1.07)	(1.03)	(1.01)
GDP growth, 1st lag	0.138**	0.150**	0.158***	0.177***	0.164***	0.162***
	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)
GDP growth, 2nd lag	0.111*	0.115**	0.126**	0.137**	0.129**	0.130**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Chg. in pol. rate, 1st lag	0.622	0.566	0.514	0.467	0.431	0.354
	(0.62)	(0.62)	(0.63)	(0.64)	(0.65)	(0.64)
LTV, 1st lag	-2.872***					
	(1.09)					
DTI, 1st lag		-4.337**				
		(2.12)				
Other Housing, 1st lag			-0.797			
			(0.92)			
CCR, 1st lag				2.735*		
				(1.42)		
Prov., 1st lag					2.143	
					(1.97)	
Res. Req., 1st lag						0.234
						(0.63)
Observations	2382	2382	2382	2382	2382	2363
No. of countries	53	53	53	53	53	53

Note: Robust standard errors clustered by country are in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 9: Individual Measures: Panel Estimation Results: House Prices

	(1)	(2)	(3)	(4)	(5)	(6)
L.Real House Price Growth	0.191***	0.193***	0.195***	0.197***	0.196***	0.197***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
VIX (log)	-5.283***	-4.914***	-5.143***	-4.934***	-4.950***	-4.929***
	(1.25)	(1.22)	(1.24)	(1.21)	(1.21)	(1.19)
GDP growth, 1st lag	0.240***	0.247***	0.246***	0.251***	0.256***	0.256***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
GDP growth, 2nd lag	0.199***	0.203***	0.205***	0.208***	0.212***	0.210***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Chg. in pol. rate, 1st lag	-1.241**	-1.284**	-1.312**	-1.361**	-1.399**	-1.385**
	(0.61)	(0.61)	(0.61)	(0.60)	(0.61)	(0.60)
LTV, 1st lag	-1.519***					
	(0.51)					
DTI, 1st lag		-2.302*				
		(1.23)				
Other Housing, 1st lag			-0.986**			
			(0.42)			
CCR, 1st lag				-0.584		
				(0.91)		
Prov., 1st lag					1.418	
					(1.02)	
Res. Req., 1st lag						-0.056
						(0.23)
Observations	2350	2350	2350	2350	2350	2330
No. of countries	53	53	53	53	53	53

Note: Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 10: Capital Flow Management: Panel Estimation Results: Bank Credit

	(1)	(2)	(3)	(4)	(5)	(5A: Ex. CEE)
L.Real Cred. Growth	0.237***	0.234***	0.233***	0.234***	0.232***	0.192***
	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.07)
VIX (log)	-2.478*	-2.362*	-2.607*	-2.637*	-2.662**	-3.480**
	(1.30)	(1.27)	(1.34)	(1.38)	(1.27)	(1.45)
GDP growth, 1st lag	0.244**	0.238**	0.241**	0.241**	0.240**	0.168*
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
GDP growth, 2nd lag	0.383***	0.383***	0.381***	0.382***	0.379***	0.252***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.07)
Chg. in pol. rate, 1st lag	-0.724	-0.630	-0.680	-0.670	-0.661	-0.515
	(0.95)	(0.90)	(1.04)	(1.04)	(1.03)	(1.19)
MAPP, 1st lag		-0.414*				
		(0.25)				
Overall CFM, 1st lag			0.153			
			(0.23)			
Port. CFM, 1st lag				0.288		
				(0.29)		
Bank CFM, 1st lag					-0.354	-0.624**
					(0.39)	(0.32)
Observations	799	799	774	774	774	618
No. of countries	19	19	19	19	19	15

Note: Robust standard errors clustered by country are in parentheses. Sample period is 2002-2012 and includes 19 emerging market economies. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 11: Subsample Panel Estimation Results: Bank Credit

	AE	EME	AE	EME	AE	EME
L.Real Cred. Growth	0.379***	0.318***	0.380***	0.322***	0.389***	0.316***
	(0.07)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
VIX (log)	-1.746**	-1.690	-1.720**	-1.727	-1.640**	-1.452
	(0.82)	(1.30)	(0.81)	(1.31)	(0.81)	(1.30)
GDP growth, 1st lag	0.214***	0.255***	0.213***	0.260***	0.227***	0.257***
	(0.06)	(0.07)	(0.06)	(0.07)	(0.07)	(0.07)
GDP growth, 2nd lag	0.296***	0.278***	0.295***	0.283***	0.308***	0.280***
	(0.09)	(0.05)	(0.09)	(0.05)	(0.09)	(0.05)
Chg. in pol. rate, 1st lag	-1.147	-0.960	-1.145	-1.015	-1.252*	-0.922
	(0.74)	(0.73)	(0.75)	(0.74)	(0.76)	(0.72)
MAPP, 1st lag	-0.490*	-0.401**				
	(0.29)	(0.18)				
MAPPH, 1st lag			-0.479*	-0.334		
			(0.29)	(0.24)		
MAPPNH, 1st lag					-0.660	-0.986***
					(0.94)	(0.38)
Observations	1143	1585	1143	1585	1143	1585
No. of countries	22	33	22	33	22	33

Note: Robust standard errors clustered by country are in parentheses. AE=Advanced economies, EME=Emerging market economies. * p<0.1, ** p<0.05, *** p<0.01

Table 12: Subsample Panel Estimation Results: Housing Credit

	AE	EME	AE	EME	AE	EME
L.Real Housing Cred. Growth	0.140	0.587***	0.139	0.582***	0.155	0.594***
	(0.13)	(0.06)	(0.13)	(0.06)	(0.13)	(0.06)
VIX (log)	-3.009**	-2.292*	-2.972**	-2.429*	-2.706*	-1.900
	(1.44)	(1.28)	(1.42)	(1.25)	(1.41)	(1.29)
GDP growth, 1st lag	0.325***	0.166**	0.323***	0.166**	0.346***	0.180**
	(0.11)	(0.08)	(0.11)	(0.07)	(0.11)	(0.08)
GDP growth, 2nd lag	0.303***	0.100	0.300***	0.101	0.325***	0.106
	(0.09)	(0.07)	(0.09)	(0.07)	(0.08)	(0.08)
Chg. in pol. rate, 1st lag	-3.170***	0.999*	-3.149***	0.973*	-3.308***	0.888
	(1.09)	(0.56)	(1.07)	(0.57)	(1.05)	(0.59)
MAPP, 1st lag	-1.034*	-0.563*				
	(0.59)	(0.29)				
MAPPH, 1st lag			-1.095*	-0.934***		
			(0.64)	(0.35)		
MAPPNH, 1st lag					0.555	-0.020
					(2.72)	(0.83)
Observations	1142	1240	1142	1240	1142	1240
No. of countries	22	31	22	31	22	31

Note: Robust standard errors clustered by country are in parentheses. AE=Advanced economies, EME=Emerging market economies. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 13: Subsample Panel Estimation Results: House Prices

	AE	EME	AE	EME	AE	EME
L.Real House Price Growth	0.312**	0.163*	0.313**	0.161*	0.323**	0.163*
	(0.13)	(0.09)	(0.13)	(0.09)	(0.13)	(0.09)
VIX (log)	-3.350***	-5.235***	-3.322***	-5.284***	-3.200***	-5.069***
	(0.99)	(1.95)	(0.98)	(1.95)	(0.97)	(1.88)
GDP growth, 1st lag	0.136**	0.359***	0.135**	0.361***	0.146**	0.370***
	(0.06)	(0.12)	(0.06)	(0.12)	(0.06)	(0.12)
GDP growth, 2nd lag	0.282**	0.141**	0.280**	0.144**	0.292**	0.147**
	(0.11)	(0.06)	(0.11)	(0.06)	(0.12)	(0.06)
Chg. in pol. rate, 1st lag	-2.679**	-0.513	-2.672**	-0.523	-2.789**	-0.569
	(1.17)	(0.47)	(1.16)	(0.48)	(1.21)	(0.46)
MAPP, 1st lag	-0.582*	-0.313				
	(0.34)	(0.20)				
MAPPH, 1st lag			-0.574*	-0.459*		
			(0.34)	(0.27)		
MAPPNH, 1st lag					-0.628	-0.180
					(0.80)	(0.45)
Observations	1156	1194	1156	1194	1156	1194
No. of countries	23	30	23	30	23	30

Note: Robust standard errors clustered by country are in parentheses. AE=Advanced economies, EME=Emerging market economies. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Appendix A   Country Groupings

Advanced Economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Emerging Economies: **Asia** (China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand); **Latin America** (Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay); **CEE** (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia, Serbia, Ukraine); **Others** (Israel, South Africa, Turkey).

Appendix B   Macroprudential Dataset

Tables B1 and B2 display our coding of policy measures in the 57 countries for each quarter from the first quarter of 2000 to the last quarter of 2013 for housing and nonhousing measures, respectively. Table B1 demonstrates that housing measures have been used actively by many countries, particularly since 2007. Asian and Eastern European countries used such measures most frequently, and often adjusted LTV caps, DTI caps, and risk weights on housing loans several times over the sample period. During the financial crisis many countries relaxed their macroprudential stance on mortgage lending. We do not observe as many nonhousing measures in table B2, but these measures were nonetheless used by nearly half the countries in our sample at some point from 2000 to 2013. Nonhousing measures were also adjusted by many countries that used them, especially during the financial crisis, and tightenings were much more common than easings across all measures. The most popular nonhousing measures were capital requirements and loan-loss provisioning requirements, while consumer loan measures and credit growth limits were used more sparingly.

Appendix C   Dataset for Other Variables

Finding data on credit and house prices for 57 countries with a relatively consistent definition is a difficult task, particularly for the emerging markets in our sample. For some countries, data is unavailable for the beginning of the sample period. Definitions and reporting methodologies vary across countries. This section provides a brief discussion of our selection criteria for the dependent variables used in our panel data analysis and event studies.

Our data on bank credit comes primarily from the Bank for International Settlements (BIS) dataset on credit to the private sector. The series we use is credit from domestic banks to

the non-financial private sector. We chose to study domestic credit because macroprudential policies govern domestic banks. Since this public database does not cover all countries in our sample, we supplement the BIS data with data from national sources supplied by Haver Analytics, again using domestic credit to the private sector, although the definition may vary across countries. Table C3 describes the exact definition and source for each country.

Housing credit is the most difficult to locate out of the three dependent variables. We collect the same data used in Kuttner and Shim (2014) for housing credit, using BIS databases, central bank websites, and the commercial sources Datastream and CEIC. This data should be understood as a subset of total bank credit; that is, we select the series that is closest to domestic bank credit to households for home purchase for each country. Table C4 describes the definition and source for each country.

Our house price data also comes from the BIS for most countries and is supplemented with data from national sources when necessary. Many countries have a variety of different house price indices covering different types of homes and geographic locations. Since macro-prudential regulations are generally issued on a national level and typically cover all types of residential properties, we select the broadest house price index available, ideally one covering the entire geographic area of the country and both new and existing homes. Table C5 describes the exact definition and source for each country.

The real gross domestic product data comes from national sources collected by Haver Analytics. We use the national source's seasonally adjusted series where available, and use the U.S. Census Bureau's X12-ARIMA Seasonal Adjustment program on national sources for countries that do not seasonally adjust their own GDP series.

The VIX index is an index of implied volatility of S&P500 index options. The data comes from Bloomberg.

For monetary policy, we use each country's official policy rate. To convert the data to quarterly frequency we average the policy rate at the end of each of the three months in that quarter. The data comes from Bloomberg, CEIC, and Haver.

Table B1: Macroprudential Policies: Housing

	1. Loan-to-Value Cap	2. Debt-to-Income Cap	3. Other Housing Measures Excl. CCR and Prov.	4. Countercyclical Capital Requirements (Housing Related)	5. Loan-Loss Provisioning (Housing Related)
2000-Q1	Colombia (1), Hong Kong (2)	Colombia (1), Hong Kong (2)	Norway (1), Portugal (1), South Africa (1)	Norway (1), Portugal (1), South Africa (1)	
2000-Q2					
2000-Q3	Hong Kong (-1)		Philippines (1)		
2000-Q4					
2001-Q1					
2001-Q2				Norway (-1)	
2001-Q3	Iceland (-1)		Singapore (1)		
2001-Q4	Hong Kong (-1)				
2002-Q1					
2002-Q2					
2002-Q3	Korea (1), Philippines (-1)				
2002-Q4				Korea (1)	
2003-Q1					
2003-Q2	Denmark (1), Korea (1)		Denmark (1)	Argentina (1)	
2003-Q3					
2003-Q4	Korea (1), Thailand (1)		Denmark (-1)		
2004-Q1	Korea (-1), Romania(1)	Romania (1)	Canada (-1), Hungary (1)	Argentina (2)	
2004-Q2					
2004-Q3	China (1), Sweden (1)	China (1)			
2004-Q4	Iceland (-1), Serbia (1)	Serbia (2)	Estonia (1), Serbia (1)	Australia (1), India (1)	
2005-Q1	China (1)				
2005-Q2	Bulgaria (1)			Bulgaria (1), Malaysia (1)	
2005-Q3	Korea (1), Singapore (-1)	Korea (1), Romania (1)			
2005-Q4		Greece (1)			Greece (1)
2006-Q1			Canada (-1)	Estonia (1)	
2006-Q2	Bulgaria (1), China (1)	Korea (1)		Ireland (1)	
2006-Q3	Argentina (-1), Iceland (1)			Uruguay (1)	
2006-Q4	Croatia (1), Korea (1)	Croatia (1), Korea (1)			
2007-Q1	Iceland (-1)	Korea (1), Netherlands (1)	Netherlands (1)	France (1), Italy (1), Lithuania (1)	
2007-Q2					
2007-Q3	Canada (-1), China (1), Denmark (1), Latvia (1)	Korea (1), Latvia (1)	Brazil (1)		
2007-Q4					
2008-Q1		Latvia (1)	Philippines (-1)	Estonia (-1), Latvia (-1), Poland (1)	
2008-Q2	Iceland (-1)			Spain (1)	
2008-Q3	Serbia (1)			Serbia (1)	
2008-Q4	Canada (1), China (-1), Korea (-1), Luxembourg (-1)	Canada (1), Korea (-1)			
2009-Q1	Serbia (-1)		Switzerland (1), United Kingdom (1)	Estonia (-1), Latvia (-1)	Switzerland (1)
2009-Q2	Thailand (-1)				
2009-Q3	Chile (-1), Denmark (-1), Korea (1)	Korea (1)	Singapore (1)		
2009-Q4	Hong Kong (1), Korea (1)		Hong Kong (1), Iceland (-1)		
2010-Q1	Finland (1), Hungary (1), Netherlands (1), Norway (2), Singapore (1)	Hungary (1), Norway (2)	Australia (1), Finland (1), Malaysia (1), Singapore (1)	Bulgaria (-1)	
2010-Q2	Canada (2), China (1)	Serbia (-1)	Canada (1), China (1)		
2010-Q3	China (1), Hong Kong (1), Singapore (1)	Hong Kong (1), Korea (-1)	China (1), Hong Kong (1), Hungary (2), Singapore (1)		Israel (1)
2010-Q4	Hong Kong (1), India (1), Malaysia (1), Sweden (1), Taiwan (1)	Poland (1)	Hong Kong (1)	India (1), Israel (1), Thailand (1)	India (1)
2011-Q1	Canada (1), China (2), Poland (1), Romania (1), Singapore (1), Turkey (1)		Canada (2), China (1), Israel (1), Mexico (1), Singapore (1)	Malaysia (1), Thailand (1)	
2011-Q2	Hong Kong (3), Serbia (2)	Korea (1)	Hungary (-1), Israel (1), Serbia (1), Taiwan (1)		
2011-Q3	Netherlands (1)		Netherlands (1)		
2011-Q4	Malaysia (1), Norway (2)	Poland (1)	India (1), Singapore (1)		
2012-Q1			Malaysia (1),	Thailand (1)	
2012-Q2	Indonesia (1), Korea (-1)	Korea (-1)			
2012-Q3	Canada (1), Hong Kong (1)	Canada (1), Hong Kong (1)	Canada (2), Hong Kong (1), United Kingdom (-1)	Israel (1)	
2012-Q4	Canada (1), Israel (2), Serbia (1), Singapore (1)	Serbia (-1)	Hong Kong (1)	Peru (1), Serbia (-1)	
2013-Q1	China (1), Hong Kong (1), Netherlands (1), Poland (1), Singapore (1)	Hong Kong (1), Singapore (1)	China (1), Malaysia (1), Singapore (1)	Hong Kong (1), Israel (1), Switzerland (2)	Israel (1)
2013-Q2	India (1)	Singapore (1)		Sweden (1)	
2013-Q3	Indonesia (1)	Israel (1)	Israel (1)	Israel (1)	
2013-Q4	China (1)		New Zealand (1)		
2014-Q1	Netherlands (1)	Switzerland (1), Taiwan (1), United Kingdom (1)	Switzerland (1)		
2014-Q2					

Note: The number in parentheses indicates the number of tightenings (postive value) or loosenings (negative value) in each quarter.
Note: The "other housing" index used in the paper is the sum of columns 3-5.

Table B2: Macroprudential Policies: Non-Housing

	1. Countercyclical Capital Requirements	2. Loan-Loss Provisioning	3. Consumer Loan Measures	4. Credit Growth Limits
2000-Q1				Greece (1)
2000-Q2		Philippines (1)		Greece (-1)
2000-Q3		Peru (1), Spain (1)		
2000-Q4				
2001-Q1	Mexico (1)			
2001-Q2				
2001-Q3		Uruguay (1)		
2001-Q4		Philippines (-1)		
2002-Q1				
2002-Q2				
2002-Q3				
2002-Q4		Korea (1)		
2003-Q1				Croatia (2)
2003-Q2	Argentina (1)			
2003-Q3				
2003-Q4				Croatia (-1)
2004-Q1		Croatia (1), Spain (1)	Romania (1)	
2004-Q2	Argentina (-1)		Thailand (1)	
2004-Q3				
2004-Q4	Argentina (1)			
2005-Q1		Greece (-1)	Thailand (1)	
2005-Q2				Bulgaria (1)
2005-Q3	India (1)	Romania (1)		Romania (1)
2005-Q4		Bulgaria (1), China (1), Greece (1), India (1)		
2006-Q1	Serbia (1)			Bulgaria (1)
2006-Q2	Bulgaria (1), Croatia (1), India (1)	Croatia (1), India (1)		
2006-Q3	Serbia (1)	Peru (1), Uruguay (1)		Serbia (1)
2006-Q4		Korea (1)		
2007-Q1	Latvia (-1)	India (1), Ukraine (1)		Croatia (1), Romania (-1), Serbia (1)
2007-Q2	Turkey (1)	Colombia (1)	Thailand (1)	
2007-Q3	Brazil (1)			
2007-Q4	Argentina (-1), Slovenia (1)			
2008-Q1	Croatia (2), Latvia (-1), Romania (1), Turkey (2)	Romania (1)		
2008-Q2		Colombia (1)		
2008-Q3		Serbia (1)		
2008-Q4	Colombia (1), India (-1)	India (-1), Peru (1), Spain (-1)		Serbia (-1)
2009-Q1		Bulgaria (-1), Croatia (-1), Switzerland (1)		Serbia (-1)
2009-Q2				Serbia (-1)
2009-Q3	Romania (-1)	Mexico (1), Russia (-1)		
2009-Q4				Croatia (-1)
2010-Q1	Bulgaria (-1), Russia (1)		Hungary (1)	
2010-Q2			Turkey (1)	Turkey (1)
2010-Q3	China (1)	China (1), Israel (1)		
2010-Q4	Brazil (2)	India (1), Spain (1)	Brazil (1)	
2011-Q1	Malaysia (1)	Mexico (1)		
2011-Q2	Turkey (1)	Turkey (1)	Turkey (1)	Turkey (1)
2011-Q3	Peru (1)			
2011-Q4	Brazil (1), Russia (1)			
2012-Q1	Russia (2)	Romania (1)		
2012-Q2	Poland (1)		Indonesia (1)	
2012-Q3				
2012-Q4				
2013-Q1		Israel (1), Russia (1)	Singapore (1)	
2013-Q2				
2013-Q3	Russia (1)			
2013-Q4		Turkey (1)	Turkey (1)	
2014-Q1	New Zealand (1), Switzerland (1)			
2014-Q2				

Note: The number in parentheses indicates the number of tightenings (positive value) or loosenings (negative value) in each quarter.

Table C3: Data Sources: Total Credit

NOMINAL CREDIT DATA

Country name	Data Source	Time span	Explanation	Units
Argentina	BIS	2003Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA.	Bil. Argentine Pesos
Australia	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Australian Dollars
Austria	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Belgium	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector.Seasonally adjusted with X12-ARIMA	Billions of Euros
Brazil	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Brazil Reais
Bulgaria	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA.	Thousands Bulgarian Lev
Canada	Haver	2000Q1-2013Q4	Canada: Business and Household Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Canadian Dollars
Chile	Haver	2000Q1-2013Q4	Bal. Sheet of Banking Sect.:Domestic Credit: Pvt Sec (NSA). Seasonally adjusted with X12-ARIMA.	Billions Chilean Pesos
China	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Renminbi Yuan
Colombia	Haver	2000Q1-2013Q4	Fin Sect: Gross Domestic Credit to Private Sector (NSA). Seasonally adjusted with X12-ARIMA	Billions Colombian Pesos
Croatia	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). I take the end month value to convert to quarterly and Seasonally adjusted with X12-ARIMA.	Millions Croatian Kuna
Czech Republic	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Czeh Koruna
Denmark	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Danish Krone
Estonia	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). I take the end month value to convert to quarterly and Seasonally adjusted with X12-ARIMA.	Millions of Euros
Finland	BIS	2001Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
France	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Germany	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Greece	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Hong Kong	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions HK Dollars
Hungary	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Hungarian Forint
Iceland	None			
India	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Indian Rupees
Indonesia	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Indonesia Rupiah
Ireland	BIS	2005Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Israel	Haver	2004Q1-2013Q4	Domestic Credit in Domestic Currency. I take the end month value to convert to quarterly and seasonally adjust using X12.	Millions New Israeli Shekels
Italy	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Japan	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Japanese Yen
Korea	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Korean Won
Latvia	Haver	2004Q3-2013Q4	Sum of two series: "Loans: Private Nonfinancial Corps" plus "Loans: Households". Sum is seasonally adjusted with X12-ARIMA.	Millions of Euros
Lithuania	Haver	2000Q1-2013Q4	Private Sector Credit. Seasonally adjusted with X12-ARIMA	Millions LTL
Luxembourg	BIS	2004Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Malaysia	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Malaysian Ringgit
Malta	Haver	2009Q1-2013Q4	Credit to Domestic Private Sector (NSA). Seasonally adjusted with X12-ARIMA	Millions of Euros
Mexico	BIS	2001Q4-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Mexican Pesos
Netherlands	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
New Zealand	Haver	2000Q1-2013Q4	Credit Aggregates: Private Sector Credit. Seasonally adjusted with X12-ARIMA	Millions NZ Dollars
Norway	BIS	2009Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Norwegian Krone
Peru	Haver	2000Q1-2013Q4	Adj Credit of Fin Sys to Pvt Sector: Domestic Currency (NSA). Seasonally adjusted with X12-ARIMA	Millions New Peruvian Soles
Philippines	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Philippines Pesos
Poland	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions New Polish Zloty
Portugal	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Romania	Haver	2006Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Romanian Leu
Russia	Haver	2002Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Russian Rubles
Serbia	Haver	2005Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Serbian Dinars
Singapore	BIS	2000Q1-2008Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Singapore Dollars
Slovakia	Haver	2004Q1-2013Q4	Harmonized Money Supply: M3: Credit to Other Residents. Seasonally adjusted with X12-ARIMA	Billions of Euros
Slovenia	Haver	2008Q1-2013Q4	Private Sector Credit (EOP, NSA). Seasonally adjusted with X12-ARIMA	Millions of Euros
South Africa	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions South African Rand
Spain	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
Sweden	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Swedish Krona
Switzerland	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Swiss Francs
Taiwan	Haver	2000Q1-2013Q4	Private Sector Credit (EOP, NSA). Seasonally adjusted with X12-ARIMA	Millions NT$
Thailand	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Thai Baht
Turkey	BIS	2002Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions New Turkish Lira
UK	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Pounds
Ukraine	Haver	2003Q4-2013Q4	Private Sector Credit (EOP, NSA). Seasonally adjusted with X12-ARIMA	Millions UAH
Uruguay	IFS	Excluded	IFS line 22d: "Claims on Private Sector" plus IFS line 42d: "Claims on Private Sector". Seasonally adjusted with X12-ARIMA	Uruguayan Pesos

Table C4: Data Sources: Housing Credit

NOMINAL HOUSING CREDIT DATA

Country name	Data Source	Time span	Explanation	Units
Argentina	BIS dbsonline	2003Q1-2013Q4	CREDIT INSTITUTIONS, CREDIT (=LOANS)TO HHOLDS,HOUSE PURCHASE,M-END NSA. Seasonally adjusted with X12-ARIMA	Thousands Argentine Pesos
Australia	BIS dbsonline	2000Q1-2013Q4	FIN. INST., CREDIT (=LOANS) TO HOUSEHOLDS, HOUSE PURCHASE, M-END SA	Millions Australian Dollars
Austria	Central bank	2003Q1-2013Q4	Domestic Debt Secured by Mortgages and Housing Loans. Seasonally adjusted with X12-ARIMA	Millions of Euros
Belgium	Datastream	2000Q1-2013Q4	MFI'S: LOANS TO HOUSEHOLD FOR HOUSE PURCHASE- TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
Brazil	BIS dbsonline	2000Q1-2013Q4	FIN.SYST,CREDIT (=LOANS)TO HHOLDS,HSE PURC, MKT&NON-MKT COND,M-END NSA. Seasonally adjusted with X12-ARIMA	Millions Brazilian Reais
Bulgaria	BIS dbsonline	2001Q1-2013Q4	BANKS (MFI), MORTGAGE LOANS TO HOUSEHOLDS, TOTAL, NSA. Seasonally adjusted with X12-ARIMA	Thousands Bulgarian Lev
Canada	BIS dbsonline	2000Q1-2013Q4	HOUSEHOLDS LIABILITIES, RESID. MORTGAGE CREDIT, TOTAL NSA. Seasonally adjusted with X12-ARIMA	Millions Canadian Dollars
Chile	BIS dbsonline	2002Q1-2013Q4	CREDIT INSTITUTIONS, CREDIT(=LOANS) TO HHOLDS,HOUSE PURCHASE,M-END NSA. Seasonally adjusted with X12-ARIMA	Billions Chilean Pesos
China	CEIC	2006Q1-2013Q4	CN: Loan: Real Estate Housing Mortgage. Seasonally adjusted with X12-ARIMA	Billions Renminbi
Colombia	Datastream	2000Q1-2013Q4	CREDIT INSTITUTIONS - MORTGAGE LOAN CURN. Seasonally adjusted with X12-ARIMA	Billions Colombian Pesos
Croatia	Datastream	2005Q1-2013Q4	LOANS - HOUSEHOLDS & NPISH - HOUSING - IN KUNA CURN. Seasonally adjusted with X12-ARIMA	Thousands Croatian Kuna
Czech Republic	BIS dbsonline	2002Q1-2013Q4	BANKS, MORTGAGE LOANS TO HOUSEHOLDS, HOUSING LOANS, TOTAL NSA. Seasonally adjusted with X12-ARIMA	Millions Czech Koruna
Denmark	Datastream	2003Q1-2013Q4	Sum of "LENDING-HOUSEHOLD HOUSING PURPOSES,0-1 YEAR; 1-5 YEAR;5+ YEARS". Seasonally adjusted with X12-ARIMA	Millions Danish Krone
Estonia	Datastream	2002Q1-2013Q4	CDT INSTS STK OF LNS GRANTED - HOUSING LOANS, TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
Finland	BIS dbsonline	2000Q1-2013Q4	CREDIT INST., LOANS (IN EUR/FIM) TO HOUSEHOLDS, HOUSING LOANS, NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
France	BIS dbsonline	2000Q1-2013Q4	CREDIT INST., CREDIT (=LOANS) TO HOUSEHOLDS, HOUSE PURCHASE, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
Germany	Datastream	2000Q1-2013Q4	LEND TO DOM ENTP&HH,HSG LOAN TO EMPL&OTH IND,TOTAL,ALL BNKS. Seasonally adjusted with X12-ARIMA	Millions of Euros
Greece	BIS dbsonline	2000Q1-2013Q4	CREDIT INSTI.& CENTRAL BANK, CREDIT TO HOUSEHOLDS, HOUSE PURCHASE, NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
Hong Kong	CEIC	2009Q1-2013Q4	Total Residential Property Loans. Seasonally adjusted with X12-ARIMA	Millions Hong Kong Dollars
Hungary	BIS dbsonline	2003Q1-2013Q4	BANKS(MFI),MORTGAGE LOANS TO HOUSEHOLDS,TOTAL, M-END NSA. Seasonally adjusted with X12-ARIMA	Billions Hungarian Forint
Iceland	None			
India	None			
Indonesia	BIS dbsonline	2004Q1-2013Q4	BANKS, CREDIT (= LOANS) TO HOUSEHOLDS, MORTGAGES, Q-END NSA. Seasonally adjusted with X12-ARIMA	Billions Indonesian Rupiah
Ireland	Datastream	2000Q1-2013Q4	CREDIT ADVANCED TO IRISH PRIV SCT: HSLDS-LOANS FOR HOUSE PURC. Seasonally adjusted with X12-ARIMA	Millions of Euros
Israel	Datastream	2004Q1-2013Q4	Sum of "LOANS GRANTED: PUBLIC. - HOUSING(DISC.) CURN" and "HOUSING LOANS: BANKS FUND(DISC.) CURN". Seasonally adjusted with X12-ARIMA	Millions Israeli New Shekels
Italy	BIS dbsonline	2000Q1-2013Q4	MFI's EX. CENTRAL BANK, CR(=LOANS) TO HHOLDS, HOUSE PURCHASE, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
Japan	CEIC	2000Q1-2013Q4	Sum of "Lia: Stock: Households: Loans: By Private FI: Housing Loans" and "Lia: Stock: Households: Loans: By Public FI: Housing Loans". Seasonally adjusted with X12-ARIMA	Billions Japanese Yen
Korea	CEIC	2000Q1-2013Q4	Loans of CSB: CH: Household: Mortgage Based. Seasonally adjusted with X12-ARIMA	Billions Korean Won
Latvia	BIS dbsonline	2003Q3-2013Q4	BANKS(MFI), MORTGAGE LOANS TO HOUSEHOLDS, TOTAL, NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
Lithuania	BIS dbsonline	2004Q1-2013Q4	BANKS(MFI), MORTGAGE LOANS TO HOUSEHOLDS, TOTAL, NSA. Seasonally adjusted with X12-ARIMA	Millions Lithuania Litas
Luxembourg	Central bank	2001Q1-2013Q4	Credit granted by credit institutions to euro area households and NPISH by type and original maturity: Loans for house purchases - total. Seasonally adjusted with X12-ARIMA	Millions of Euros
Malaysia	CEIC	2000Q1-2013Q4	Loans: BS: Term Loans: Housing Loans. Seasonally adjusted with X12-ARIMA	Millions Malaysian Ringgit
Malta	Central bank	2000Q1-2013Q4	OTHER MONETARY FINANCIAL INSTITUTIONS LOANS TO RESIDENTS OF MALTA BY ECONOMIC ACTIVITY - Households - Lending for house purchase. Seasonally adjusted with X12-ARIMA	Millions of Euros
Mexico	BIS dbsonline	2000Q1-2013Q4	BANKS, CREDIT (=LOANS) TO HOUSEHOLDS, HOUSE PURCHASE, Q-END NSA. Seasonally adjusted with X12-ARIMA	Millions Mexican Pesos
Netherlands	Datastream	2000Q1-2013Q4	Sum of "MFI LOANS TO HOUSEHOLDS: HOUSE PURCHASE 0-1 YEARS;1-5 YEARS; 5+YEARS". Seasonally adjusted with X12-ARIMA	Millions of Euros
New Zealand	BIS dbsonline	2000Q1-2013Q4	CREDIT INSTIT.,CREDIT TO HHOLDS,HOUSE PURCHASE CREDIT,M-END NSA. Seasonally adjusted with X12-ARIMA	Millions NZ Dollars
Norway	BIS dbsonline	2000Q1-2013Q4	BANKS, ASSETS, CREDIT TO HOUSEHOLDS, HOUSING, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions Norwegian Krone
Peru[1]	Datastream	2002Q1-2013Q4	CREDIT TO PRIVATE SECTOR: MORTGAGE CURN. Seasonally adjusted with X12-ARIMA	Millions New Peruvian Soles
Philippines	CEIC	2010Q1-2013Q4	CL: PBS: Real Esate: Residential. Seasonally adjusted with X12-ARIMA	Billions Philippine Pesos
Poland	Datastream	2000Q1-2013Q4	MFI LOANS - HOUSING LOANS CURN. Seasonally adjusted with X12-ARIMA	Millions Polish Zloty
Portugal	BIS dbsonline	2000Q1-2013Q4	CREDIT INSTIT.,CREDIT(=LOANS)TO HHOLDS,HOUSE PURCHASE CREDIT,M-END NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
Romania	Datastream	2008Q1-2013Q2	CREDIT TO HOUSEHOLDS - HOUSING LOANS, LEI (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions New Romanian Leu
Russia	BIS dbsonline	2008Q1-2013Q4	CREDIT INSTIT.,CREDIT(=LOANS) TO INDIVIDUALS, HOUSING LOANS, Q-END NSA. Seasonally adjusted with X12-ARIMA	Millions Russian Roubles
Serbia	None			
Singapore	CEIC	2000Q1-2013Q4	DBU: Loans & Advances: Qtr: Housing & Bridging Loans. Seasonally adjusted with X12-ARIMA	Millions Singaporean Dollars
Slovakia	Datastream	2006Q1-2013Q4	MFI'S: LOANS TO HOUSEHOLD FOR HOUSE PURCHASE- TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
Slovenia	Datastream	2005Q2-2013Q4	MFI'S: LOANS TO HOUSEHOLD FOR HOUSE PURCHASE- TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
South Africa	Datastream	2000Q1-2013Q4	CREDIT EXTENSION: DOM.PRIVATE SECTOR - MORTGAGE ADVANCES CURN. Seasonally adjusted with X12-ARIMA	Millions South African Rand
Spain	Datastream	2000Q1-2013Q4	CREDIT INSTITUTION LOANS TO HOUSEHOLDS - MORTGAGES CURN. Seasonally adjusted with X12-ARIMA	Thousands of Euros
Sweden	Datastream	2002Q4-2013Q4	LENDING TO HOUSEHOLDS INCL NPISH - HOUSING - MFI CURN. Seasonally adjusted with X12-ARIMA	Millions Swedish Krona
Switzerland	BIS dbsonline	2000Q1-2013Q4	BANKS (180 BANKS), ASSETS, MORTGAGE CREDIT, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions Swiss Francs
Taiwan	CEIC	2000Q1-2013Q4	Consumer Loans: Outstanding: DB: House Purchasing. Seasonally adjusted with X12-ARIMA	Millions New Taiwanese $
Thailand	CEIC	2000Q1-2013Q4	Housing Loans: Qtr: Total. Seasonally adjusted with X12-ARIMA	Millions Thai Baht
Turkey	Datastream	2007Q1-2013Q4	BANK LENDING TO PRIVATE SECTOR - HOUSING LOANS CURN. Seasonally adjusted with X12-ARIMA	Thousands New Turkish Lira
UK	Datastream	2000Q1-2013Q4	HN: LOANS SECURED ON DWELLINGS CURN. Seasonally adjusted with X12-ARIMA	Millions Pounds
Ukraine	Datastream	2007Q1-2013Q4	LOANS: HOUSEHOLDS - LENDING FOR HOUSE PURCHASE CURN. Seasonally adjusted with X12-ARIMA	Millions Ukranian Hryvnia
Uruguay	None			

1/ For Peru we exclude 2008Q4.

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Table C5: Data Sources: House Prices

NOMINAL HOUSE PRICE DATA

Country name	Data Source	Time Span	Explanation
Argentina	None		
Australia	BIS	2000Q1-2013Q4	RESID. PROPERTY PR.,ALL DETACHED HOUSES (8 CITIES,PURE PRICE,PURE PRICE,Q-ALL,NSA. Seasonally adjusted with X12-ARIMA
Austria	BIS	2001Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Belgium	BIS	2006Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Brazil	BIS	2002Q1-2013Q4	RESID. PROPERTY PRICES, ALL DWEL. (METROPOL. AREA) PER DWEL, M-ALL NSA. I take the end month to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Bulgaria	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PR., EXIST.FLATS (BIG CITIES),PER SQ.,M,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Canada	Dallas Fed	2000Q1-2013Q4	Quarterly house price series for existing bungalows and two story executive dwellings located in ten main metropolitan areas of Canada . Seasonally adjusted with X12-ARIMA
Chile	Haver	2005Q1-2013Q4	Real New Housing Price Index: Gran Santiago (NSA) I take end month to convert to quarterly and . Seasonally adjusted with X12-ARIMA. NOTE THIS IS ALREADY REAL!!!!
China	CEIC	2000Q1-2013Q4	China_propindex_new
Colombia	Haver	2000Q1-2013Q4	Existing Home Price Index, Real (NSA) . Seasonally adjusted with X12-ARIMA.
Croatia	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PURE PRICES, NSA SA with 12
Czech Republic	BIS	2009Q1-2013Q4	RESID. PROPERTY PRICES,ALL OWNER OCCUP. DWELL, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Denmark	BIS	2000Q1-2013Q4	RESID. PROPERTY PRICES,ALL SINGLE-FAMILY HOUSE,PURE PRICE,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Estonia	Haver	2004Q3-2013Q4	Res Prop Prices: Whole Cntry: All Flats . Seasonally adjusted with X12-ARIMA
Finland	BIS	2006Q1-2013Q4	RES.PROPERTY PRICES, EXIST.DWELLINGS,TOTAL, PER SQ.M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
France	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, EXISTING DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Germany	BIS	2001Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Greece	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL FLATS(URBAN AREAS),PER SQ.M.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Hong Kong	BIS	2009Q1-2013Q4	RESIDENTIAL PROPERTY PR.,ALL DWELLINGS, PER SQUARE M., M-ALL NSA I take the end month to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Hungary	BIS	2008Q1-2013Q4	RESID. PROPERTY PRICES, ALL DWELLINGS, PER SQ.M.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Iceland	BIS	2000Q1-2013Q4	RESIDENTIAL PROP.PR.,ALL DWELLINGS(GR. REYKJAVK),PER SQ.M,M-ALL NSA . Seasonally adjusted with X12-ARIMA
India	Haver	2011Q1-2013Q4	House Price Index (NHB) Residex): Delhi . Seasonally adjusted with X12-ARIMA
Indonesia	BIS	2003Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, NEW HOUSES (BIG CITIES), PER DWELING,NSA . . Seasonally adjusted with X12-ARIMA
Ireland	Dallas Fed	2000Q1-2013Q4	Nationwide house price series for all types of existing (second-hand) dwellings. . Seasonally adjusted with X12-ARIMA
Israel	BIS	2002Q1-2013Q4	RESIDENTIAL PROP.PR.,OWNER-OCCUPIED DWELLINGS, PER DWELLING, M-ALL NSA I take the end month value to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Italy	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Japan	BIS	2009Q2-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PURE PRICE, M-ALL NSA . Seasonally adjusted with X12-ARIMA
Korea	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS PER DWELLING, M-ALL NSA I take the end month value to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Latvia	BIS	2007Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PURE PRICE, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Lithuania	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PR., ALL DWELLINGS, PER SQUARE M., Q-ALL, NSA . Seasonally adjusted with X12-ARIMA
Luxembourg	BIS	2008Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL FLATS, PURE PRICES, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Malaysia	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, UNIT, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Malta	BIS	2001Q1-2013Q4	RESID. PROPERTY PRICES,ALL DWELLINGS, PRICE PER DWELLING,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Mexico	Haver	2006Q1-2013Q4	SHF Housing Price Index (NSA) . Seasonally adjusted with X12-ARIMA
Netherlands	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, EXISTING DWELLINGS,PER DWELLINGS,M-ALL NSA I use end month and . Seasonally adjusted with X12-ARIMA
New Zealand	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Norway	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-AVG,NSA . Seasonally adjusted with X12-ARIMA
Peru	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, FLATS (LIMA), PER SQ.M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA.
Philippines	BIS	2009Q1-2013Q4	RESID. AND COMMERC. PROP. PRICES, FLATS (MAKATI), PER SQ.M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Poland	Haver	2000Q1-2013Q4	Average House Price: Residential Bldgs . Seasonally adjusted with X12-ARIMA
Portugal	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER SQUARE METER,M-ALL NSA . Seasonally adjusted with X12-ARIMA
Romania	BIS	2010Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Russia	BIS	2002Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,EXISTING DWELLINGS,PER SQUARE M,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Serbia	None		
Singapore	BIS	2000Q1-2013Q4	RESID. PROPERTY PRICES, ALL DWELLINGS, PER SQ.M.,Q-ALL . Seasonally adjusted with X12-ARIMA
Slovakia	BIS	2006Q1-2013Q4	RESIDENTIAL PROP. PR., ALL DWELLINGS, PER SQUARE METER, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Slovenia	BIS	2008Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELL., TOTAL, PER SQ. M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
South Africa	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PR.,ALL MIDDLE-SEGMENT DWELL.,PER DWELL.,M-ALL SA . Seasonally adjusted with X12-ARIMA
Spain	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER SQUARE M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Sweden	BIS	2000Q1-2013Q4	RESIDENTIAL PROP.PR., OWNER-OCCUP. HOUSES, PER DWEL.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Switzerland	Dallas Fed	2000Q1-2013Q4	Nationwide quarterly house price index for new and existing, single-family dwellings . Seasonally adjusted with X12-ARIMA
Taiwan	CEIC	2001Q1-2013Q4	Sinyi Residential Property Price Index: Taiwan Area . Seasonally adjusted with X12-ARIMA
Thailand	Haver	2000Q1-2013Q4	Combined two haver series by reindexing them to same year. Haver description for both: House Prices: Single-detached Houses incl Land (NSA) . Seasonally adjusted with X12-ARIMA. New series begins in 2009Q1
Turkey	BIS	2011Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER SQUARE METER,M-ALL NSA I take the end month value to convert to quarterly and . Seasonally adjusted with X12-ARIMA
UK	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS (ONS), PER DWEL.,M,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Ukraine	None		
Uruguay	None		