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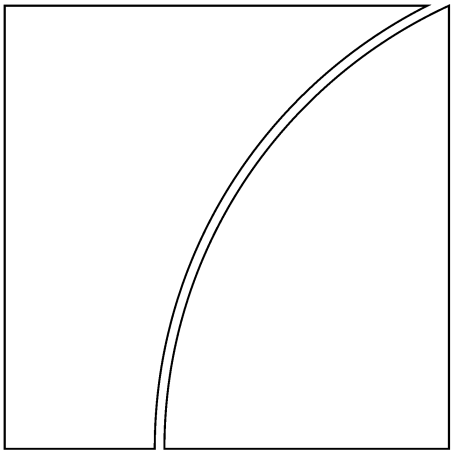

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No 70

Globalisation and inflation dynamics in Asia and the Pacific

Proceedings of a research workshop organised by the BIS in Hong Kong SAR on 18–19 June 2012

Monetary and Economic Department

January 2013

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Foreword

Andrew Filardo and Aaron Mehrotra

The Bank for International Settlements (BIS) organised a research workshop on globalisation and inflation dynamics in Asia and the Pacific on June 18–19 in Hong Kong SAR. The topic was endorsed by the Asian Consultative Council in February 2012 as the new monetary stability research theme for the two-year research programme of the BIS Representative Office for Asia and the Pacific. The conference venue was provided by the Hong Kong Monetary Authority.

The goal of the event was to bring together researchers and policymakers to present the latest developments in the research area of globalisation and inflation. The workshop also helped to sharpen the focus on the key aspects of this topic in the research programme of the BIS Asian office going forward. There were 34 participants, including academics, researchers and policymakers from central banks and international organisations from the Asia-Pacific region, Europe and the United States.

The workshop presentations revolved around five key themes: economic globalisation and inflation dynamics in the region; financial globalisation and its impact on exchange rate pass-through to inflation; the importance of commodity price swings; the difficulties measuring economic slack in small, open economies; and understanding how to interpret inflation expectation data from different sources. Emphasis was put on the changing economic and financial environment and the implications for monetary policymaking. In addition to presentations of research papers, the workshop included two high-level policy panel discussions focused on monetary policy challenges in the Asia-Pacific region.

There was a broad recognition among the central bankers and academics of the importance of this topic for Asia and the Pacific. The discussions identified various theoretical channels through which global developments influence domestic inflation dynamics. In addition to the theoretical channels, there were questions about how labour market dynamics in Asia, especially in China, are spilling over to the region and elsewhere, and how new supply chain relationships in the region can amplify the transmission of inflation shocks. Several presenters noted the deep conceptual and empirical challenges related to the measurement of economic slack in dynamic, open economies of the type in Asia. The event also cast new light on the debate on how monetary policy should respond to commodity price swings.

This volume is a collection of presentations during the workshop.

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Panel Discussion 2 – Monetary policy frameworks in Asia-Pacific – beyond inflation targeting?

List of participants

Central banks

Australia	Reserve Bank of Australia **Adam Cagliarini** Head, Asian Economies Research Unit
Austria	Central Bank of the Republic of Austria **Doris Ritzberger-Grünwald** Head, Foreign Research Division
Canada	Bank of Canada **Rhys Mendes** Director, International Department
China	People's Bank of China **Wang Yu** Deputy Director General, Research Bureau
Hong Kong SAR	Hong Kong Monetary Authority **He Dong** Executive Director, Research Department
Indonesia	Bank Indonesia **Perry Warjiyo** Director Executive
Japan	Bank of Japan **Kenji Nishizaki** Director, Research and Statistics Department **Yuko Kawai** Chief Representative, Hong Kong Representative Office
Korea	Bank of Korea **Jun Il Kim** Deputy Governor and Chief Economist
Malaysia	Central Bank of Malaysia **Sukhdave Singh** Assistant Governor **Mohd Helmi Ramlee** Manager
New Zealand	Reserve Bank of New Zealand **John McDermott** Assistant Governor/Head of Economics

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Singapore	Monetary Authority of Singapore **David Ong** Economist
Switzerland	Swiss National Bank **Raphael Auer** Deputy Head, International Trade and Capital Flows Unit
Thailand	Bank of Thailand **Vararat Khemangkorn** Team Executive
United States	Federal Reserve Bank of Dallas **Mark Wynne** Vice President
	Federal Reserve Bank of New York **Paolo Pesenti** Vice President

Academic and policy institutions

Australia	Australian National University **Shaun Vahey** Professor
Canada	University of British Columbia **Michael Devereux** Professor
	Wilfrid Laurier University **Pierre Siklos** Professor of Economics
Cyprus	**Athanasios Orphanides** Former Governor, Central Bank of Cyprus
France	Aix-Marseille University **Eric Girardin** Professor of Economics

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Korea	Hangyang University **Hangyong Lee** Professor
Philippines	Asian Development Bank **Changyong Rhee** Chief Economist
United States	University of Wisconsin **Charles Engel** Rudiger Dornbusch Professor of Economics
BIS	BIS Representative Office for Asia and the Pacific **Andrew Filardo** Head of Economics for Asia and the Pacific **Aaron Mehrotra** Senior Economist

Programme

Day 1, 18 June 2012

09:00–09:15 ***Welcome remarks***

Andrew Filardo, Head of Economics for Asia and the Pacific, Bank for International Settlements

Session 1 ***Measuring economic slack in emerging Asian economies***

Chair: **He Dong**, Executive Director, Research Department, Hong Kong Monetary Authority

09:15–10:45 Presenter: **Shaun Vahey**, Professor, Australian National University

Presenter: **Kenji Nishizaki**, Director, Research and Statistics Department, Bank of Japan

10:45–11:00 Coffee break

Session 2 ***How important are inflation expectations in driving Asian inflation?***

Chair: **Diwa Guinigundo**, Deputy Governor, Bangko Sentral ng Pilipinas

11:00–12:30 Presenter: **Pierre Siklos**, Professor, Wilfrid Laurier University

Presenter: **Jun Il Kim**, Deputy Governor, Bank of Korea

12:30–13:30 Lunch

Session 3 ***Understanding commodity price cycles in emerging Asia and their implications for monetary policy***

Chair: **Rhys Mendes**, Director, International Department, Bank of Canada

13:30–15:00 Presenter: **Changyong Rhee**, Chief Economist, Asian Development Bank

Presenter: **Paolo Pesenti**, Vice President, International Research Function, Federal Reserve Bank of New York

Session 4 ***Globalisation and inflation in Asia and the Pacific (I)***

Chair: **Adam Cagliarini**, Head, Asian Economies Research Unit, Reserve Bank of Australia

15:00–16:30 Presenter: **Mark Wynne**, Vice President and Director, Globalization & Monetary Policy Institute, Federal Reserve Bank of Dallas

Presenter: **Charles Engel**, Professor, University of Wisconsin

16:30–16:45 Coffee break

Session 5 ***Globalisation and inflation in Asia and the Pacific (II)***

Chair: **Sukhdave Singh**, Assistant Governor, Central Bank of Malaysia

16:45–18:15 Presenter: **Raphael Auer**, Deputy Head, International Trade and Capital Flows Unit, Swiss National Bank

Presenter: **Michael Devereux**, Professor, University of British Columbia

19:00 Dinner

Dinner address: European crisis and its implications for global inflation dynamics

Speaker: **Athanasios Orphanides**, former Governor, Central Bank of Cyprus

Day 2, 19 June 2012

08:45–09:45 **BIS research proposals**

Chair: **John McDermott**, Assistant Governor, Reserve Bank of New Zealand

Short presentations and general discussion

09:45–11:00 ***Panel discussion: Conduct of monetary policy in Asia-Pacific in a volatile external environment***

Chair: **Athanasios Orphanides** (former Governor, Central Bank of Cyprus)

Panellists: **Adam Cagliarini**, Head, Asian Economies Research Unit, Reserve Bank of Australia

Wang Yu, Advisor, Research Bureau, People's Bank of China

Perry Warjiyo, Director, Directorate of Economic Research and Monetary Policy, Bank Indonesia

Doris Ritzberger-Grünwald, Head, Foreign Research Division, Central Bank of the Austrian Republic

11:00–11:15 Coffee break

11:15–12:15 ***Panel discussion: Monetary policy frameworks in Asia-Pacific – beyond inflation targeting?***

Chair: **Diwa Guinigundo**, Deputy Governor, Bangko Sentral ng Pilipinas

Panellists: **John McDermott**, Assistant Governor, Reserve Bank of New Zealand

He Dong, Executive Director, Research Department, Hong Kong Monetary Authority

Sukhdave Singh, Assistant Governor, Bank Negara Malaysia

12:15–12:30 ***Closing remarks***

12:30–14:00 Farewell lunch

Session 1

Measuring economic slack in emerging Asian economies

Measuring economic slack in emerging Asian economies

Dong He[1]

At a recent central bank chief economists workshop at the Bank of England, there was much discussion about inflation persistence, or why core inflation was quite stable during the Great Recession and did not drop as much as one would have thought despite the very large negative output gaps. Two main hypotheses were offered. First, potential output, which is unobservable, was adversely affected by the international financial crisis. Second, inflation expectations were well anchored at the (implicit and explicit) medium-term inflation targets. So inflation persistence during the Great Recession was a hallmark of central banks' success in anchoring inflation expectations.

Both issues are obviously of relevance for our topic, the measurement of economic slack in emerging Asian economies. And while the empirical challenges in the measurement of slack are often formidable, the related theoretical issues are no less important. First, pertaining to inflation dynamics themselves, what are the determinants of inflation inertia? In models of the New Keynesian type, inflation inertia is limited, but empirical evidence suggests that there is substantial inertia in inflation, with inflation reacting to external shocks only in a gradual and sometimes delayed manner. Theoretically, backward-looking price setting behaviour is a plausible factor contributing to the gradual adjustment of prices, but may not explain all of the observed inflation inertia.

Second, what are the implications of flexible inflation targeting and how should we think of the flexible price output as a benchmark? In dynamic stochastic general equilibrium models, potential output is defined as the output level that would obtain if there were no nominal rigidities in the economy; in particular, wages and prices would be fully flexible. But potential output is affected by real shocks and is therefore not smooth over time, creating challenges for its empirical measurement.

This brings me to the third question: how should trends in output data, to the extent that they are used to capture potential output, be estimated? Should we use econometric methods to extract the trends, or should the computation of trends be model-based? If model-based methods remain robust to structural changes in the economy – something that is impossible to determine *ex ante* – those may be the preferred approach.

Of course, the accuracy of the measure of potential output directly affects the usefulness of output gaps for evaluating inflation pressures in the economy. But their usefulness is not only affected by difficulties in the measurement of potential output. Actual output data are often subject to large revisions, causing real-time output gap data sometimes to differ significantly from later estimates, with obvious implications for policymakers trying to obtain information about current economic conditions.

Finally, from an open economy perspective, how should we think of domestic and global output gaps? The underlying idea is that for open economies, global measures of economic slack are relevant for the determination of "true" capacity constraints and therefore possible inflation pressures. For the Asia-Pacific region in particular, given increased real and financial integration, global and regional output gaps may have become more important over time for domestic inflation determination. But given the challenges involved in measuring

[1] Executive Director, Hong Kong Monetary Authority.

potential output for individual economies, the uncertainties inherent in regional or global measures of economic slack are even greater.

At the Hong Kong Monetary Authority, as I think is the case for most central banks, measures of the output gap serve as useful indicators of economic slack. But they have to be used together with other indicators, and the limitations and characteristics of the various measures need to be borne in mind when using them to obtain inference about possible inflation pressures. This is even more pressing for the case of emerging economies, where the growth rate of potential output may have experienced large fluctuations over time.

To address these and related issues this morning, we have two paper presentations. The first presentation will be given by Shaun Vahey, Professor at Australian National University. His talk will focus on the issue of probability forecasting, in particular how the probability of extreme events that may have large macroeconomic consequences needs to be taken into account at policy institutions when formulating forecasts. This could be especially significant for output gaps, where large shocks hitting the real economy could bring about a negative output gap and increase the probability of a deflationary spiral.

In the second presentation, Kenji Nishizaki from the Bank of Japan talks about “chronic deflation” in Japan, mentioning negative output gaps as one of the possible factors behind Japan’s deflation. In addition to presenting various estimates of potential output, his talk will discuss various channels through which the negative output gaps could have arisen in the Japanese context.

Moving towards probability forecasting

Shaun P Vahey and Elizabeth C Wakerly[1]

Abstract

This paper proposes an international collaboration between researchers in academia and policymaking institutions to stimulate and coordinate research on probability forecasting in macroeconomics, developing a toolbox for short-term prediction. The toolbox should include time series models, methods for forecast combination, and techniques for probabilistic forecast evaluation in order to reduce the setup costs and risks to both individual researchers and policymaking organizations. A particular emphasis should be placed on replication studies with the toolbox so that central bankers can be sure that they are utilizing best practice techniques to produce probabilistic forecasts of events of interest.

Keywords: probability forecasting

JEL classifications: C87, E17

[1] Australian National University.

Introduction

Macroeconomic forecasts are imperfect. If a forecaster provides information about inflation next month, there is considerable inaccuracy implied. The inaccuracy stems (in part) from imprecise real-time measurements, latent variables, model uncertainty, parameter uncertainty, and the inherently unpredictable nature of the macroeconomy. Nevertheless, most central banks provide little information on forecast imprecision. Furthermore, the probabilities of outcomes that are economically substantive, although not the most likely, receive little attention. Put differently, conventional macroeconomic forecasting neglects the assessment of risk, and the probability of extreme events.

The neglect of formal probabilistic forecasts for macroeconomic decision-making before the Global Financial Crisis (GFC) parallels the experience in another applied statistics field in the late 1990s. In December 1999, a storm called Lothar caused extensive damage across Europe; see MacKenzie (2003). Key meteorological institutes failed to offer timely storm warnings. The incident sparked the research and development of systems for producing probability forecasts. Ex post analysis using modern methods has shown that Lothar was highly likely to miss land. Contemporary forecasters were correct, from the perspective of the most likely outcome. There was, however, a significant probability that the storm would strike land, which the forecasters missed. That is, the state-of-the-art weather forecasting systems in the late 1990s—like those used by most macroeconomic policymakers today—did not generate accurate probabilities for extreme events. Even though the meteorological practitioners worked with (highly) non-linear specifications, insufficient attention was paid to probabilistic forecast verification. Moving beyond Gaussian predictive densities enhanced considerably the probability forecasting performance, without compromising point forecasting accuracy, or the theoretical structure of the models.

The 2007 vintage workhorse macroeconomic policy models had little to say about the probability of extreme events. Even today, hardly any institutions produce forecasts for the probability of a recession, or the probability of deflation. Most policymakers limit their analysis to (near) linear Gaussian specifications, and communicate only the "most likely" scenario to the public. This approach masks quantifiable information of use to policymakers for both the formulation and communication of the policy stance from a risk management perspective.

Related literature

The academic work concerned with macroeconomic probability forecasting can be grouped into two distinct programs. The first concerns methods for probabilistic forecast evaluation; the second focuses on techniques for improving the accuracy of probabilistic forecasts.

Although evaluations of probabilistic forecasts are common in applied statistics fields, forecast evaluation exercises published by central banks and other policymaking institutions restrict attention to point forecasting accuracy. Some recent papers considering probabilistic forecast evaluation include Garratt, Lee, Pesaran and Shin (2003), Adolfson, Andersson, Lindé, Villani and Vredin (2007), Lahiri and Wang (2007), Garratt, Koop, Mise and Vahey (2009), Kryshko, Schorfheide and Sill (2010), Berge and Jorda (2011), Clark (2011), Diks, Panchenko and van Dijk (2011), Galbraith and van Norden (2011, 2012), Gneiting and Ranjan (2011), and Mitchell and Wallis (2011). These papers typically use the forecast density relative to the outturn, or gauge performance in terms of predicting discrete events, such as a recession. In meteorology and other applied statistics fields, it is common to link forecast evaluation explicitly to the relevant economic decision. Berrocal, Raftery, Gneiting and Steed (2010) provide a recent example for a road maintenance problem. Granger and Pesaran (2000) propose applications in economics.

The second program focuses on improving forecast accuracy. Most policymaking macroeconomic models are (approximately) linear Gaussian—with features that are difficult to reconcile with the theory and data; see, for example, the discussion by Robertson, Tallman and Whiteman (2005). A long tradition in macro-econometrics has emphasized the importance of non-linearities in macroeconomics. Morley (2009) provides a review of the literature; and recent examples include Paap, Segers and van Dijk (2009), Hamilton (2011), Arora, Little and McSharry (2012), De Livera, Hyndman and Snyder (2011) and Koop, Léon-González and Strachan (2011). Methods for handling fat and asymmetric tails are common in financial econometrics; see, for example, Patton (2006). Copula models are widely exploited in other applied statistics fields as flexible tools to allow for non-linear dependence and non-Gaussian error distributions. Examples include Clayton (1978), Li (2000), Lambert and Vandenhende (2002), and Danaher and Smith (2011).

A number of recent papers in macroeconomics have proposed using mixtures or forecast density combinations to enhance performance by approximating non-linear and non-Gaussian processes. Key contributions with forecast density combinations include (among others) Geweke and Amisano (2011), Jore, Mitchell and Vahey (2010), Gneiting and Thorarinsdottir (2010), Waggoner and Zha (2010), Billio, Casarin, Ravazzolo and van Dijk (2011), Bjørnland, Gerdrup, Jore, Smith and Thorsrud (2011), and Garratt, Mitchell, Vahey and Wakerly (2011). These papers build on earlier macroeconomic research on forecast combinations by, for example, Hendry and Clements (2004), Wallis (2005), Mitchell and Hall (2005) and Kapetanios, Labhard and Price (2008). Timmermann (2006) provides a review of forecast combination; and Clements and Harvey (2011) discuss combining probabilistic forecasts. Aastveit, Gerdrup, Jore and Thorsrud (2011) consider intra-month probability forecasts, generalizing the more traditional point forecasting approach of, for example, Giannone, Reichlin and Small (2008), Lombadi and Maier (2011) and Kuzin, Marcellino and Schumacher (2011). Faust and Wright (2011) and Kozicki and Tinsley (2012) discuss the scope for survey evidence to improve timely forecasting. Giordani, Kohn and van Dijk (2007) and Maheu and Gordon (2008) provide examples based on mixtures.

Probabilistic forecasting in practice at central banks

Despite the extant body of literature devoted to probability macroeconomic forecasting, only a handful of central banks have pursued the approach, including the Bank of England. Norges Bank has a short-term forecasting system based on probability forecasting; see Bjørnland, Gerdrup, Jore, Smith and Thorsrud (2011). Furthermore, finance ministries, independent fiscal watchdogs and data agencies pay little attention to probabilities (with the UK's Office for Budget Responsibility a notable exception).

Uptake has been slow for three main reasons. First, given the techniques for probability forecasting and evaluation are relatively new to economists, very little exposure occurs at the graduate or undergraduate level. This leaves practitioners to learn unfamiliar techniques on-the-job by replicating papers after they appear in journals. Inefficiencies arise because the methods are computationally burdensome, with the code sometimes idiosyncratic or unobtainable.

Second, with the research frontier of macroeconomic forecasting constantly shifting, it is risky for a policy-oriented organization to invest in the new technology. Recently developed techniques for probability forecasting and evaluation are often based on long runs of US data, and in some cases, performance is less impressive with other datasets.

Third, the existing macroeconomic literature says little about extreme event predictability, despite the recent financial crisis. The default policymakers' modeling framework, grounded on assumptions of linear dependence and Gaussian errors, hinders progress in this regard.

A proposal

These challenges slowing the uptake by central banks and other policymaking institutions could be considerably eased by the existence of a probability forecasting toolbox. Such a toolbox might include macro-econometric models, data, methods for forecast combination and probabilistic forecast evaluation tools suitable for short-term macroeconomic prediction. International collaboration between researchers in academia and central banks could stimulate and coordinate research on probability forecasting around such a toolbox. The toolbox itself could substantially reduce the setup costs and risks faced by both individual researchers and central banks in adopting probability forecasting techniques, not least by greatly facilitating replication analysis.

Conclusion

In this short paper, we have argued that central bankers should switch to probability forecasting. The recent financial crisis has changed the nature of macroeconomic forecasting. It no longer suffices to claim that a forecasting system is adequate if it matches the point forecasting accuracy of a simple autoregressive benchmark. To close the gap between the extant academic literature and policymaking practice, and to foster further research in probability forecasting, requires a bold collaborative step. Our proposal to accelerate research into probability forecasting methods and practice involves pooling knowledge and resources across central banks and academia through the construction of a toolbox for short-term macroeconomic prediction. Such a step would spread the cost and risk of developing the new technology amongst many.

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Chronic deflation in Japan[1]

Kenji Nishizaki, Toshitaka Sekine, Yuichi Ueno and Yuko Kawai[2]

Abstract

This short paper is an abbreviated version of Nishizaki et al (2012). Japan has suffered from long-lasting but mild deflation since the latter half of the 1990s. Estimates of a standard Phillips curve indicate that a decline in inflation expectations, the negative output gap, and other factors such as a decline in import prices and a higher exchange rate, all account for some of this development. These factors, in turn, reflect various underlying structural features of the economy. This paper examines a long list of these structural features that may explain Japan's chronic deflation.

Keywords: deflation, Japan

JEL classifications: E31, E58, O53

[1] This short paper is an abbreviated version of Nishizaki et al (2012). Please see Nishizaki et al (2012) for further discussion.

[2] Bank of Japan.

Introduction

Why have price developments in Japan been so weak for so long? What can current economics tell us about the possible causes for these developments? Despite the obvious importance of the practical and academic implications and somewhat to our surprise, few serious academic attempts had been made to research these questions. To shed light on these issues, the Bank of Japan's Research and Statistics Department and the Center for Advanced Research in Finance (CARF) of the University of Tokyo invited prominent Japanese economists to a joint conference on 24 November 2011. This short paper seeks to document the event's main findings, together with our interpretation. We first summarise certain data sets to outline the development of deflation in Japan. Then, we list and examine the hypotheses discussed in the above-mentioned conference. In the concluding section, we provide our own thinking as to the most prominent variables and lessons to be learned from our experience.

Deflation in Japan

Figure 1 shows the major inflation indicators for Japan. Both of them show that Japan has faced declining prices since the mid-1990s. The CPI less fresh food first turned negative in or around 1995 and, since 1998, it has remained almost always slightly negative, except for the period of the commodity price surge before the global financial crisis. The GDP deflator declined more rapidly since the middle of the 1990s. In this paper, we call this post-mid-1990s period of deflation the "chronic deflation".

The charts in Figure 2 compare price developments in G3 economies. All of them show that Japan's price increases have historically been weaker, even before the Chronic Deflation era. Japan's headline inflation had usually been two to three percentage points lower than in the United States and the euro area. A decomposed analysis into goods and services prices inflation tells the same story. Other nominal variables, such as nominal ULC and nominal interest rate, are also weaker in Japan than in the United States and the euro area.

These data indicate that Japan has, in a genuine sense, experienced a mild but long-lasting deflation: that is, all nominal values have been weak. Also the international comparison may suggest that there is a structural cause for Japan to be deflationary.

Possible causes

At the conference, several variables were suggested as responsible for the prolonged deflation. To begin with, we estimated a New Keynesian Phillips curve to confirm the basic data (Table 1). The CPI increased by about 1.5% up to the middle of the 1990s, but after that it became zero or negative. Trend inflation, which is a proxy for long-run inflation used to push up the inflation rate by more than one percentage point, but the effect diminished after that point. The output gap has continued to push down the inflation rate since the middle of the decade. And other factors, which include the effects of all other off-model variables such as the impact of exchange rates or the change in margins, have also helped to push down the inflation rate by a slightly larger degree since 2000.

From this exercise, we conclude that we cannot single out any prime suspect as the cause of deflation. In the rest of our paper, we analyse the major candidate variables and the underlying driving factors behind them, and the associated hypotheses suggested in the conference.

Inflation expectations

The first candidate is inflation expectations, under which heading we ask "How far have inflation expectations declined?" and "Why have inflation expectations declined?".

Figure 3 shows various measures of expected inflation. They all indicate that long-run inflation expectations had declined but had not fallen into negative territory. Therefore, the answer to the first question is that the expectations for long-run inflation had fallen but did not go below zero. Hence we may tentatively conclude that expectations certainly helped to drag the inflation rate down but not as far as to bring it into the negative regime, ie deflation.

Although long-run inflation expectations remained positive, it might be useful to identify the reasons why inflation expectations declined, as these could be the drivers that led to the deflationary environment. Three hypotheses were discussed at the conference. The first was that the central bank's lowering of the inflation target had the effect of bringing down the public's inflation expectations. The second was that the central bank's inefficient communications strategy sent a deflationary signal to the public. And the third was that the public perceived that Japan's prices were in general too high in comparison with those of other countries. Figure 4 shows relative prices against the US and major trading partners based on the PPP exchange rate. This indicates that Japan's prices were more than 1.8 times higher than those of the United States around the middle of the 1990s. Since then, the price gaps have narrowed as Japan's prices have remained weaker than those of other countries.

The negative output gap

As Figure 5 showing various measures of the output gap indicates, the output gap in Japan has been largely negative since the 1990s. This is a natural suspect as a cause of deflation, given that oversupply should bring down the price of goods and services. But why should the output gap be negative? Although Japan encountered a series of mishaps at key inflection points, such as the collapse of domestic asset price bubble, the domestic banking and the Asian crisis, the bursting of the dotcom bubble and the global financial crisis, we also have hypotheses that address more fundamental causes.

The first hypothesis is the negative natural rate of interest. At the conference, Watanabe (2012) estimated that the natural rate of interest in Japan, using the technique of Laubach and Williams (2003), fell into negative territory. If this were the case, just as Krugman (1998) argues, Japan may also have fallen into a liquidity trap. In order to cross-check Watanabe's estimate, we gathered various measures of potential growth or long-run growth expectations that should correlate with the natural rate of interest (Figure 6). All of them seem to suggest that potential growth had declined but not into negative territory except for a short period of time. Therefore, this hypothesis is neither proven nor disproved.

The second hypothesis is a negative permanent productivity shock. When potential growth declines, this normally leads to a narrowing of the negative output gap. However, this thought process ignores how the demand side would respond to a shock that delivers a decline in potential growth. If it were due to a temporary shock, demand would not respond that much because of consumption smoothing, and the output gap would improve leading to an increase in the inflation rate. On the other hand, if a decline in the potential growth were delivered by a negative permanent shock in productivity, demand would react more in anticipation of a future decline in income growth, leading to deflation. These hypotheses can be confirmed by the impulse response of a DSGE model (Figure 7). The above panel is a temporary shock where inflation goes up, whereas the bottom panel is a permanent shock. Inflation goes down.

The third hypothesis is risk aversion on the part of banks. If banks become more risk averse for some reason, then they would pile up JGB assets instead of extending loans to private business sectors. This would widen the output gap and lead to lower inflation. This hypothesis can be confirmed by impulse responses of another DSGE model where cautiousness on the part of banks is represented by Adrian-Shin's (2010) type of value-at-

risk constraint (Figure 8). In the upper panels, a shock to banks' net worth would dampen both output and inflation. Moreover, the DSGE model confirms that if there is negative permanent productivity shock, that shock would tighten the VaR constraint and thus widen the output gap and encourage deflation.

Other factors

In addition to the above two categories, other off-model factors might be considered. Indeed, several external factors were suggested at the conference.

The first was the exchange rate. The yen's nominal effective exchange rate has tended to appreciate. At the conference, it was suggested that, if there had been a strong expectation for the yen to appreciate, it could have formed a liquidity trap. In other words, if uncovered interest parity holds, the short-term nominal interest rate may be subject to the zero lower bound and the economy may hence fall into a liquidity trap when the yen appreciates.

The second external factor discussed was a supply shock from the emerging economies. In the context of the Great Moderation, some researchers claim that supply shocks of emerging economies are one of the sources. At the conference, a three-country DSGE model showed that a positive productivity shock in China's final goods sector would lower Japan's inflation more than that of the United States (Figure 9).

Conclusion

As noted above, a number of hypotheses exist as to why Japan has suffered from chronic deflation. At the conference, however, no one factor could be singled out as the primary cause. Table 2 lists the hypotheses raised and we tentatively evaluate the contribution of each candidate variable as follows.

As shown in the estimation results of the New Keynesian Phillips curve, we believe that Japan's chronic deflation is a consequence of multiple causes rather than of a single factor. However, on a detailed view, some factors may have had a stronger effect than others. For example, inflation expectations were generally stable except during the financial crisis of the 1990s. Expectations for the appreciation of the yen in the foreign exchange market were not persistent. By eliminating seemingly weak contributors, we tentatively conclude that we were left with the long-lasting negative output gap.

If such is the case, what measures to prevent prolonged deflation could be suggested from our experience? As many countries may be moving in the same direction as Japan, it might be worthwhile to highlight some lessons that arise from our experience. Behind the widening of the output gap, we identified two major causes – one is the prolonged clean-up process for banks' balance sheets, which is only now being completed 15 years after the bubble burst in the 1990s. This process is closely related to the hypothesis based on banks' risk aversion. The other is the demographic deterioration, which has lowered the natural rate of interest and expectations for future income growth.

The lessons are relatively simple; to avoid impairing bank balance sheets, try to prevent asset bubbles. If, nonetheless, a bubble does blow up, combat it at an early stage. In the long run, make adequate preparations for the ageing of the population.

These conclusions are easy enough to list but rather more difficult to implement, as they require both political action and public assent. However, given that we now have more tools and knowledge to hand than Japan did in the 1990s, we could employ macroprudential policies involving a coordinated approach of both the prudential and macro policy wings, observe cross-border money flows, and use the information and experience to plan effective contingency procedures and promote the construction of a sound social security system.

All the hypotheses listed in this paper require further examination and research. As involuntary pioneers in this field, we intend to continue investigating the causes of Japan's prolonged deflation and possible countermeasures.

Figure 1

Inflation indicators

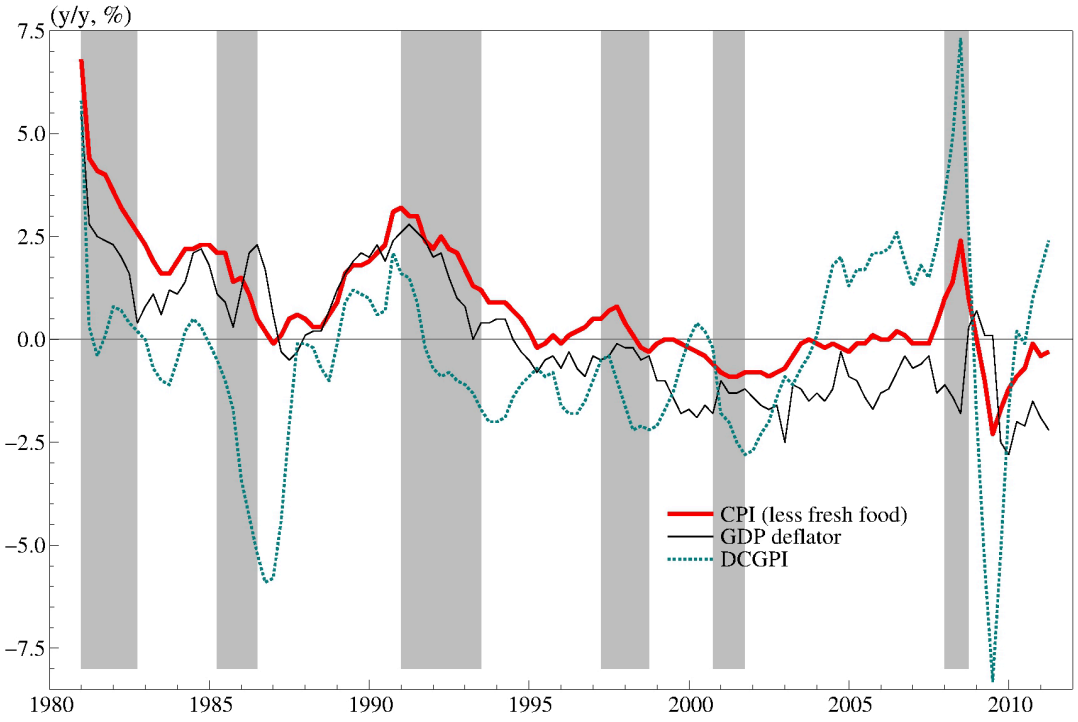

Figure 2

G3 comparison

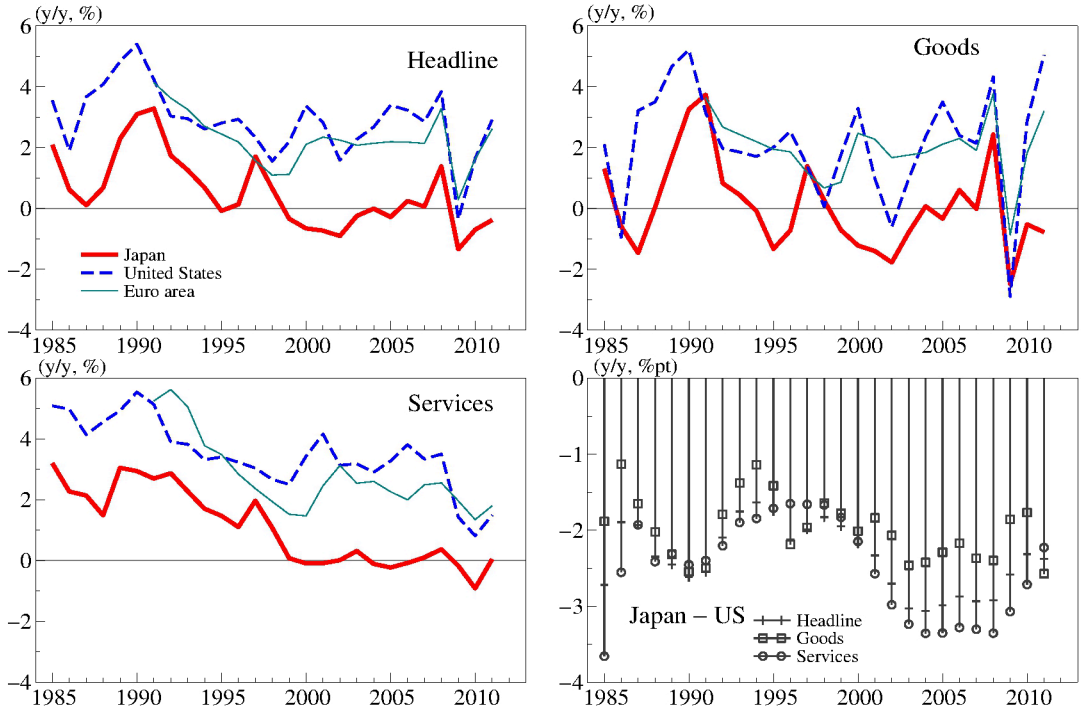

Figure 3

Expected inflation

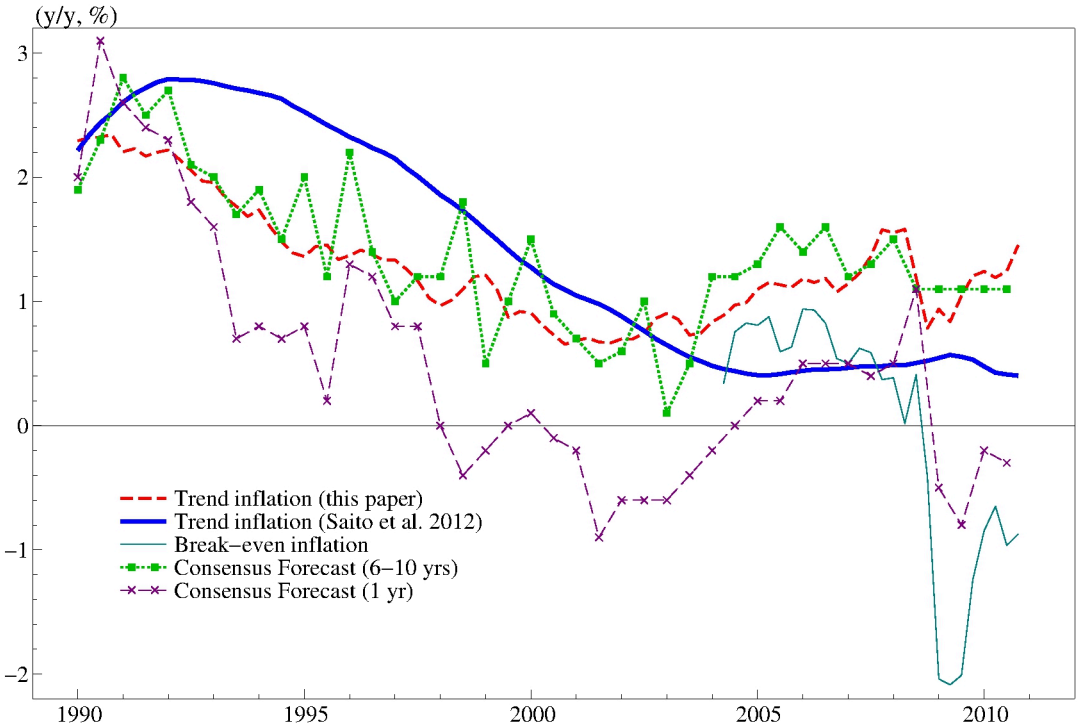

Figure 4

Domestic-foreign price gap

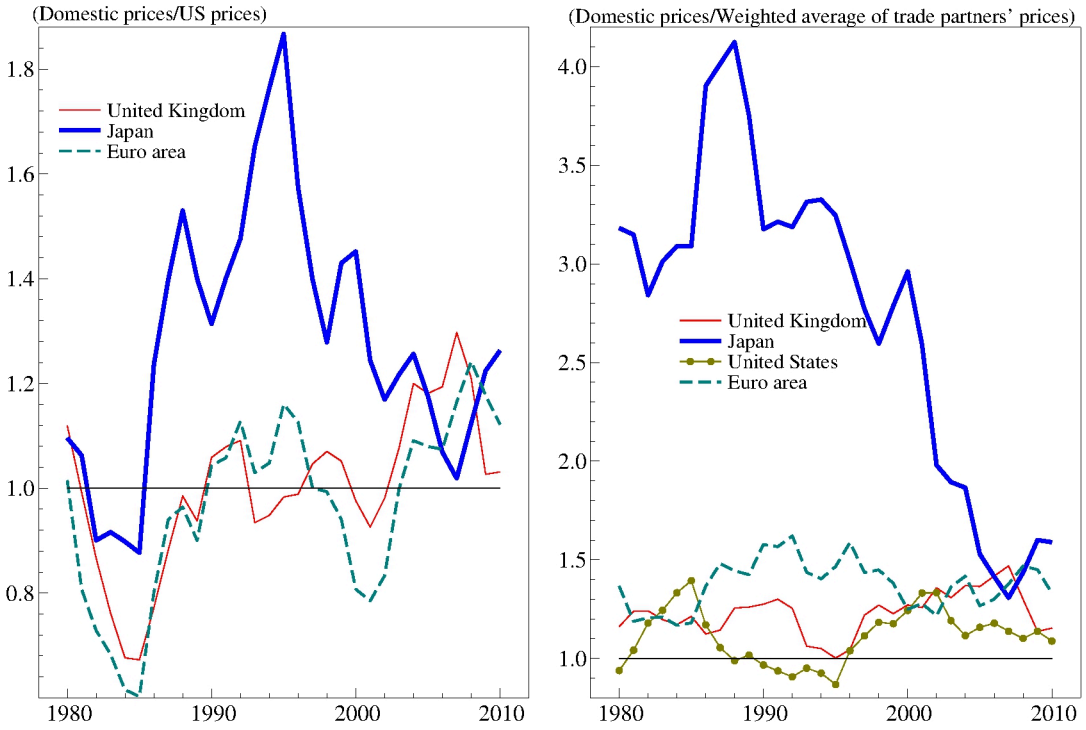

Figure 5

The output gap

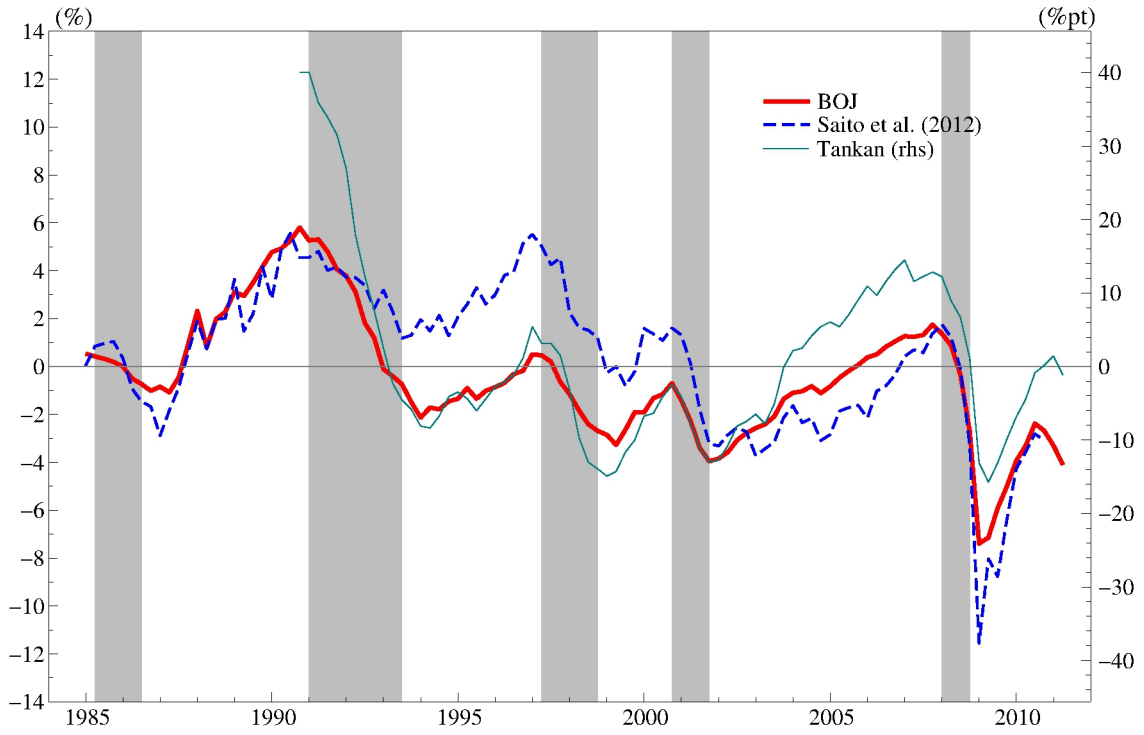

Figure 6

Potential growth

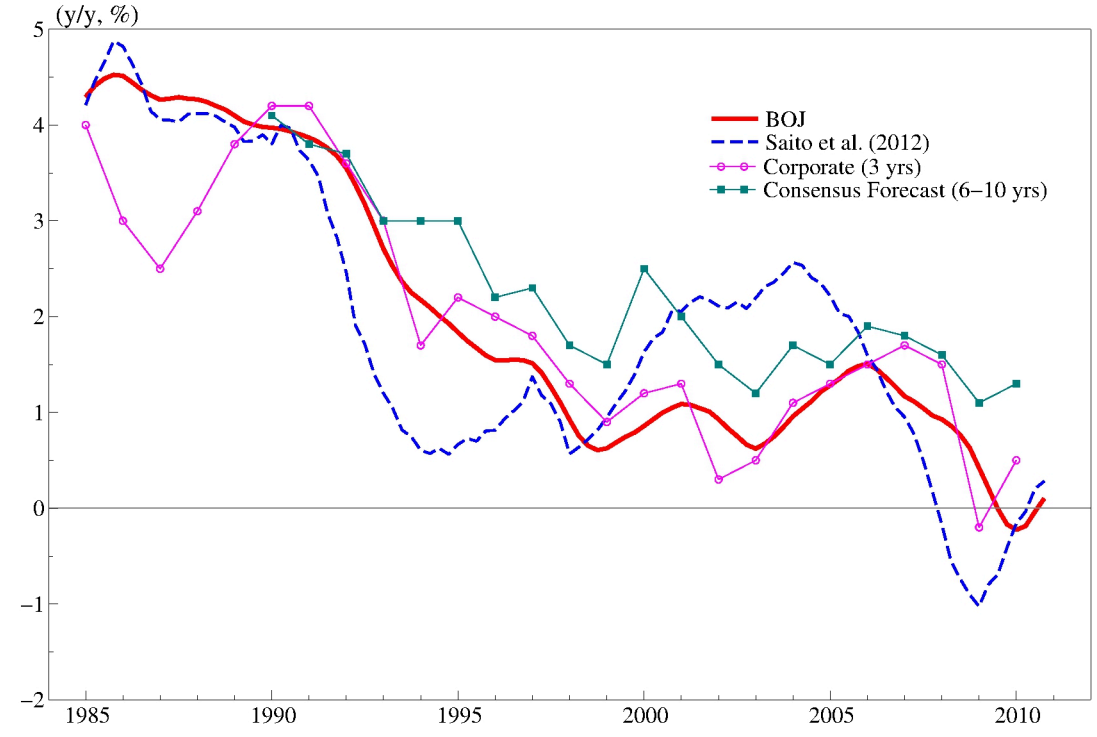

Figure 7

Effect of temporary and permanent productivity shocks

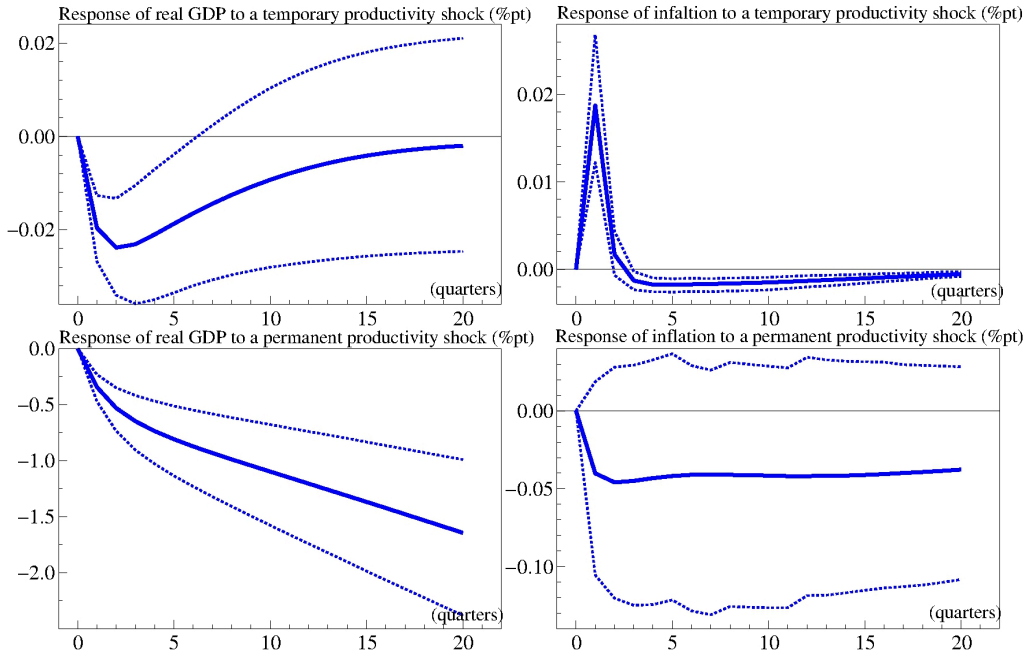

Figure 8

Effect of VaR constraint

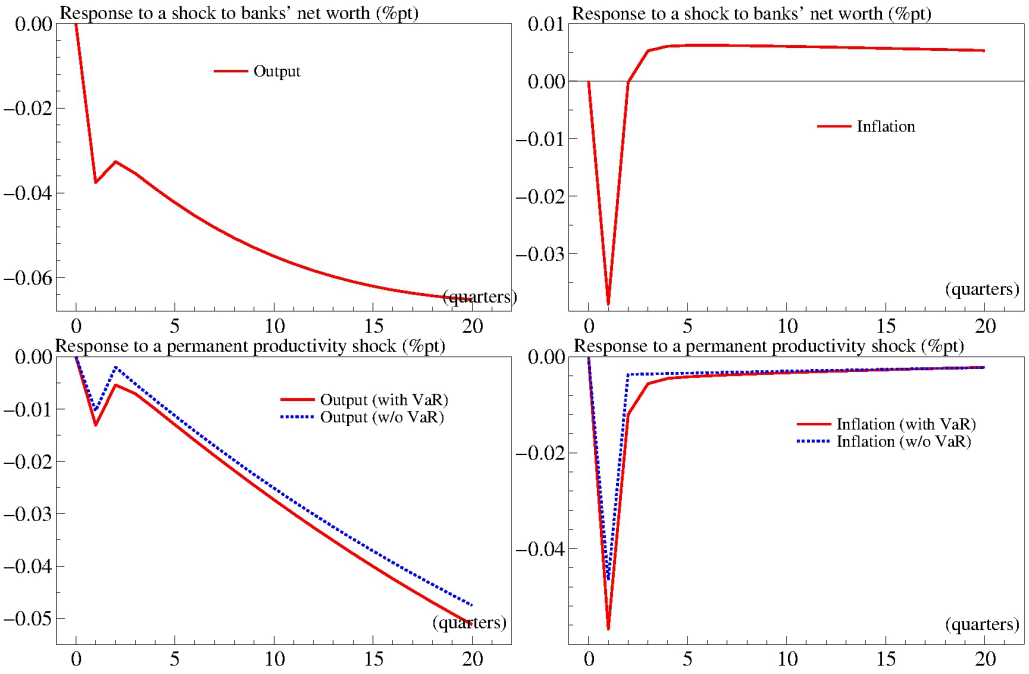

Figure 9

Effect of supply shock from China

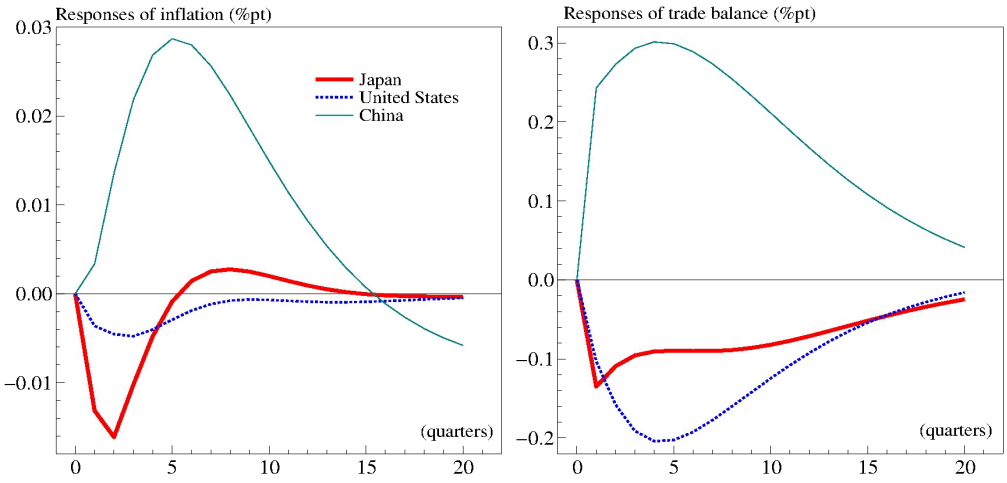

Table 1

Contribution of New Keynesian Phillips Curve variables (annual average, %)

	1987-1990	1990-1995	1996-2000	2001-2005	2006-2009
CPI (less fresh food)	1.4	1.3	0.0	-0.4	0.0
Contributions to CPI					
Own lag	0.5	0.4	0.0	-0.1	0.0
Trend inflation	1.5	1.2	0.7	0.6	0.9
The output gap	0.6	0.1	-0.3	-0.4	-0.3
Others	-1.2	-0.4	-0.4	-0.6	-0.6

Table 2

List of hypotheses

Inflation expectations	• Liquidity trap due to negative inflation expectations. • CB lowered the target. • CB communication problem. • Perception by the public that the prices in Japan were in general too high.
The output gap	• Bad luck. • Liquidity trap due to negative growth expectations. • Permanent negative productivity shock. • Banks' risk aversion.
Other factors	• Expectations for yen's appreciation. • Productivity shock in EMEs.

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Session 2

How important are inflation expectations in driving Asian inflation?

How important are inflation expectations in driving Asian inflation?

Diwa Guinigundo[1]

We cannot overemphasize that inflation expectations play an important role in the conduct of modern monetary policy. A wide range of agents' decisions on saving, spending, and investing are influenced by expectations about future inflation. Central banks (CBs) track and compare them to internal forecasts and to the inflation target to check whether monetary authorities are able to influence them successfully. However, to be able to influence them with any degree of certainty, it is important to understand how expectations are formed.

The public's inflation expectations, I submit, are determined to a large extent by the way central banks conduct and communicate their monetary policy. Under inflation targeting, inflation expectations are linked strongly with the announced monetary policy objective, i.e. the inflation target. There is in fact some evidence that private sector inflation expectations have converged increasingly around the inflation target in many emerging economies (including the Czech Republic, Colombia, Mexico, and South Africa)[2] as the inflation target provided considerable information on the expected disinflation path while serving as an important commitment device. This helps shape inflation expectations.

In the Philippines, we have attempted to quantify the expectations channel.[3] Using a reduced-form equation model of survey-based inflation expectations, we found that the current actual inflation and the inflation target appeared to be significant in driving expectations. This implies that private agents assess the credibility of the Bangko Sentral and form their expectations based on what they have learned during the current period, and are similarly interested in the declining medium-term path of the inflation target as announced by the Bangko Sentral. At the same time, the significant impact of the real policy rate on inflation expectations reinforces the view that current monetary policy actions are effective tools for sending a clear signal on the central bank's future actions, thus influencing inflation expectations. However, results also indicated that inflation expectations in the Philippines remain backward-looking.[4]

We believe that imperfect information on the Bangko Sentral's policy intentions has been a source of inertia in the formation of inflation expectations. At the same time, imperfect knowledge of the market's inflation expectations can impart inertia to monetary policy responses.[5] Thus, it is important to factor into the monetary policy process an accurate measure of how inflation expectations are formed in the market. This is quite tricky because there are various measures of inflation expectations, including forecasts of professional economists, results from surveys of consumers, and information extracted from financial markets, which can provide different views about future outcomes. Likewise, these views can

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[1] Deputy Governor, Bangko Sentral ng Pilipinas.

[2] Madhusudan Mohanty and Philip Turner: "Monetary policy transmission in emerging market economies: what is new?" BIS background paper to Transmission mechanisms for monetary policy in emerging market economies (BIS paper no 35), January 2008.

[3] Veronica Bayangos, Joselito Basilio, Danvee Floro and Eloisa Glindro, "Quantifying the inflation expectations channel in the Philippines: some preliminary results", Bangko Sentral ng Pilipinas (unpublished), 2010.

[4] Current inflation Granger causes inflation expectations up to six months, while the opposite does not hold true.

[5] Bayangos, et al., 2010.

reflect not only differences in economic agents' knowledge of the economy, but also errors due to information set construction and depth of financial markets. In economies with relatively sophisticated financial markets, inflation-indexed bonds are a key source of information on inflation expectations. By contrast, CBs in emerging markets have tended to rely more on survey-based measures of inflation. However, little is known about how respondents interpret survey questions, how their backgrounds affect their interpretations, and how their interpretations eventually influence their responses.[6] That various measures can provide different views on future inflation and that these divergent views could be due to factors other than the structure of the economy suggests that the anchoring of inflation expectations could be a challenge for monetary authorities.

These forecast disagreements will be the subject of Professor Pierre Siklos' presentation. In particular, his paper will explore the behavior of inflation forecasts from a variety of sources with the aim of measuring the size and evolution of forecast disagreements and their proximate sources. Prof. Siklos also looks at the role played by domestic and international shocks on changes in inflation forecasts, and whether developments since the global financial crisis have resulted in noticeable changes in the behavior of inflation expectations.

Like most modern CBs, the Bangko Sentral closely tracks inflation expectations and monitors their consistency with our policy objectives. One indicator we look at is the yield curve, which provides information on expected inflation based on the price of financial market assets. Likewise, we utilize survey-based measures of inflation expectations, which include results from our quarterly consumer and business expectations surveys, our monthly survey of private forecasters, which is presented in our report to the Monetary Board on the stance of monetary policy in the country, and other surveys conducted on a monthly basis by private organizations such as the Asia Pacific (AP) Consensus and Bloomberg. However, there has been considerable debate on the reliability of these survey results in providing information on inflation expectations and inflation uncertainty. Deputy Governor Jun Il Kim joins our panel to discuss the Bank of Korea's (BOK) recent work on inflation expectations based on consumer surveys. He will share with us BOK experience on how to make use of information from such surveys for monetary policy formulation and how to deal with potential biases arising from survey methodology and design.

It is with great honor that I open this session on the importance of inflation expectations in driving Asian inflation. Let me now invite Prof. Pierre Siklos from Wilfrid Laurier University and Deputy Governor Jun Il Kim from the Bank of Korea to deliver their presentations.

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[6] Bruine de Bruin W., Potter S., Rich R., Topa G. and W. van der Klaauw (2010a): "Improving Survey Measures of Household Inflation Expectations," Current Issues in Economics and Finance, Vol. 16(7), Aug/Sept. 2010.

Forecast disagreement and the anchoring of inflation expectations in the Asia-Pacific Region

Pierre L Siklos[1]

Abstract

This paper explores the behaviour of inflation forecasts from a variety of sources (ie Consensus and other professional forecasters, international and domestic financial institutions, central banks) with the aim of measuring the size and evolution of forecast disagreements and their proximate sources (ie economic versus institutional determinants). An additional objective is to ascertain the extent to which inflationary expectations are anchored, the role played by domestic versus international shocks on changes in inflation forecasts, and whether developments since the global financial crisis have resulted in noticeable changes in the behaviour of inflationary expectations.

Keywords: Forecast disagreement, inflation expectations

JEL classification: E52, E58, C53

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Introduction

Central banks in the Asia-Pacific region are concerned that rising inflation might be an unintended consequence of attempts by some of the major central banks around the world, notably the US Federal Reserve and the ECB, to maintain historically low policy rates while permitting their balance sheets to swell to unheard of proportions.[2] The worry, of course, is that the build-up of liquidity by the major central banks will eventually spill over into the world economy, once normal levels of real economic growth resume, with an eventual run-up in inflation. Promises by central bankers to reign in the excess liquidity once crisis conditions are passed have not prevented some from worrying about the blurring of fiscal and monetary policies and about the temptation to resort to inflation as a way out of the current economic crisis. As Charles Plosser, President of the Federal Reserve Bank of Philadelphia, recently remarked: "…unless governments are constrained..., they often resort to the printing press...this can often lead to high inflation" (Plosser (2012)).

Even if these worries appear misplaced for the time being, there may be unpredictable consequences as central banks increasingly replace the private sector as a source of credit. As the BIS's General Manager has recently pointed out "These emergency measures could have undesirable side effects if continued for too long. A worry is that monetary policy would be pressured to do still more because not enough action has been taken in other areas. While central bank actions can buy time, they cannot substitute for balance sheet repair or reforms to raise productivity and growth" (Caruana 2012).[3]

Central banks around the world understandably take pride in their record at maintaining low and stable inflation over the past decade or so. Indeed, the independence and accountability of central banks may well have helped prevent a worse economic outcome in the wake of the so-called global financial crisis which began in 2007, which has since shifted from the United States to the euro zone. Even if it is now widely acknowledged that price stability is no longer enough, the challenge remains of maintaining low and stable inflation while the private sector and sovereigns in some parts of the world repair their balance sheets.

Therefore, it is essential for central banks in the region to ascertain how households and professionals, to name just two groups, view the short-term outlook for inflation. In this paper I suggest that policymakers need to move away from reliance on point forecasts of inflation and examine why forecasters disagree. This requires thinking in terms of the degree of forecast disagreement and its evolution over time.[4] In addition, and especially in the Asia-Pacific region, there needs to be more data collected from households and businesses concerning their views about future inflation. It is only by considering the distribution of views about the outlook for inflation that policymakers in the region will be able to determine the conditions under which inflation expectations may become unanchored.

The rest of the paper is organised as follows. After a brief overview of the concept of forecast disagreement in the next section, I then describe the data and provide a few stylised facts

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[2] The phenomenon of the "exploding" central bank balance sheet is now well known. A visualisation of this phenomenon for the United States is regularly updated by the Federal Reserve Bank of Cleveland (http://www.clevelandfed.org/research/data/credit_easing/index.cfm).

[3] Academics have also suggested that the usual textbook device for inflating the economy may be counterproductive. "…there is a good case to be made for monetary expansion, given the current low rate of inflation and high rate of unemployment. But if fear of inflation puts off the American public, such a policy will again underperform, relative to what we have learned in textbooks. There won't be a credible commitment to see the monetary stimulus through, as people panic that resulting inflation will be used to redistribute wealth." (Cowen (2012))

[4] While the focus, in what follows, is on inflation, all of the arguments made here extend to the outlook of other major macroeconomic variables such as real GDP growth.

prior to discussing the behaviour of forecast disagreement in the Asia-Pacific. The paper concludes with a short summary and some suggestions for further research.

Methodology and related literature

When examining the inflation outlook it is common to rely on point forecasts, ordinarily prepared by professionals such as the well known forecasts published by Consensus Economics. However, it has also been known for some time that such an approach is problematic for a variety of reasons. Kahneman and Tversky (1979, p 316) forcefully argued that "…..disregard of distributional information ...is perhaps the major source of error in forecasting..." Forecasters "...should therefore make every effort to frame the forecasting problem so as to facilitate utilizing all of the distributional information that is available". This notion was also understood by central bankers. For example, Greenspan (2004) noted that "…a central bank needs to consider the distribution of possible outcomes...decision-makers need to reach a judgment about the probabilities...of the various outcomes under alternative choices for policy". Further reinforcing the argument that forecasts from a single source are inadequate is the finding that econometric models used to generate inflation forecasts are unstable (Stock and Watson (2010)), that the behaviour of inflation is asymmetric thereby complicating the ability of conventional models to successfully predict inflation over the business cycle (eg Filardo and Gordon (1998), Dotsey, Fujita, and Stark (2011)), as well as the growing body of evidence suggesting that "subjective"' forecasts (eg Survey of Professional Forecasters, Blue Chip) outperform forecasts from econometric models, often by a wide margin (Faust and Wright (2011)). Consequently, it would appear desirable to measure the degree to which forecasters disagree or consider a metric that provides clues about how forecasts are distributed across forecasters. While several approaches along these lines have been developed the focus below is on the concept of forecast disagreement.

There is no universally agreed upon measure of forecast disagreement. A popular indicator is the squared deviations among individual forecasts (eg Lahiri and Sheng (2008)). Alternatively, one can ask whether the distribution of views about future inflation may have shifted over time. Filardo and Guinigundo (2008) apply the so-called Kulback-Liebler (K-L) divergence metric to examine how professional forecasters' views about future inflation in the Asia-Pacific region have moved as inflation targeting was adopted by some countries in the region. Each existing measure has advantages and disadvantages but space constraints prevent a fuller discussion here. Readers are asked to consult Siklos (2012), and references therein, for additional details. In what follows, forecast disagreement in 12 Asia-Pacific economies is examined based on the (modified) squared deviation measure.[5]

Briefly, forecast disagreement at time *t*, over a forecast of horizon *h*, for economy *j* is evaluated as follows. Define,

$$d_{th}^{j} = \frac{1}{N_j - 1} \sum_{i=1}^{N_j} (F_{ith}^{j} - \overline{F}_{\bullet th}^{j})^2 \tag{1}$$

where F is the inflation forecast, N_j is the number of forecasts, i identifies the forecast, while $\overline{F}^{j}$ represents the mean forecast value across forecasters in economy j. Forecast disagreement can be aggregated according to the source of the forecast. Central bank forecasts, survey-based forecasts conducted among households and businesses, a set of

[5] Measures based on the K-L metric are relegated to an Appendix.

widely followed or core forecasts (ie OECD, IMF, Consensus), as well as a group consisting of all non-survey-based forecasts, represent the principal group of forecasters. The mean value of *d* is then calculated for each economy *j* in the dataset. Grouping of forecasts can be useful. For example, some of the data used in this study are projections, others are actual forecasts. Moreover, the assumptions and models (whether of the implicit or explicit variety) used to generate inflation forecasts are also likely to differ across the available sources. Space constraints prevent additional discussion of relevant technical issues. Readers are asked to consult Siklos (2012) for all the details.

Prior to discussing the results, it is worth asking briefly: is greater forecast disagreement desirable? Unfortunately, there is no consensus about the answer to this question. To the extent that greater forecast disagreement is due to a loss of credibility, or poor central bank communication, the answer is no. If, on the other hand, more central bank transparency encourages attentiveness to monetary policy decisions and fosters a greater diversity of opinion about the economic outlook, then higher levels of forecast disagreement can be desirable.[6]

Stylised facts and empirical results[7]

The evidence presented below consists of data from 12 Asia-Pacific economies. They are: Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. The economies in this region examined here are a diverse group in terms of the monetary policy regimes in place over the past several years. Half of the economies in the sample considered possess a numerical inflation target (IT). They are: Australia, Indonesia, Korea, New Zealand, the Philippines and Thailand. The remaining economies cover the range of policy regimes from Hong Kong SAR's pegged exchange rate to China's managed floating regime. Indeed, at least according to Ilzetzki, Reinhart and Rogoff's (2008) classification of exchange rate regimes, not all of the IT regimes can be said to adhere to the textbook's pure floating variety. Finally, the economies considered here also differ in terms of the degree to which their central banks are transparent. Figure 1 plots the index of central bank transparency due to Dincer and Eichengreen (2008), subsequently updated by Siklos (2011), and the data reveal that a wide range exists in the amount of information the region's central banks publicly disclose. For example, there is still a wide gap between the transparency of the US Federal Reserve (Fed), or the European Central Bank (ECB), and the People's Bank of China (PBOC). Overall, however, transparency has either remained stable or has shown marked improvement over time.

The analysis of inflation forecast disagreement is based on current year and one year ahead inflation forecasts from a variety of sources.[8] These include: Consensus forecasts, survey-based forecasts, and central bank forecasts. The number of forecasters surveyed from Consensus Economics ranges from 11 to 20, while the number of non-Consensus forecasts considered ranges from three to 10 separate forecasts. Included in the non-Consensus forecasts are those published by central banks. Eight of the 12 central banks

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[6] The theoretical debate over the consequences of more publicly available information is germane but remains unsettled. See Morris and Shin (2002), and Svensson (2006).

[7] Space constraints prevent an extensive description of the institutional background of each economy. Accordingly, some details are relegated to an Appendix.

[8] Forecasts are either of the fixed event (ie a forecast for inflation for a particular calendar year) or fixed horizon (eg one quarter or one year ahead) variety. It is common in the literature to convert fixed event data into a fixed horizon using an admittedly *ad hoc* procedure. See Siklos (2012) for the conversion details.

surveyed here publish inflation forecasts. They are: Australia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. In most cases, but not all (eg Japan, Thailand), these are staff forecasts. Finally, in the results presented below, the sampling frequency is quarterly, usually from the mid-1990s to Q1 2012.[9]

Figure 2 plots inflation for several groupings of the economies in the sample. The groupings are somewhat arbitrary. Nevertheless, there is an attempt to separate the emerging Asia-Pacific economies (ie India, Indonesia, Malaysia, Philippines, and Thailand) from their more industrialised counterparts in the region (ie, Australia, New Zealand, Hong Kong SAR, Korea, and Singapore). Finally, by way of illustration, one of the figures plots inflation in the large economies in the dataset (ie China and Japan) vis-à-vis the US and the euro area. Generally speaking, inflation has tended to fall worldwide and has remained stable. Moreover, the newly industrialised countries (NICs: ie Hong Kong SAR, Korea, and Singapore), together with their so-called emerging market counterparts, have tended to experience similar inflation rates in recent years. The only exception is India which, more recently, has seen a surge in inflation. Japan continues to be an outlier of sorts, persistently mired in a low-level deflation, while China's inflation rate is persistently higher than that of the United States and the euro zone economies.

An indication of how well inflation expectations are anchored is provided in Table 1 which shows the degree of inflation persistence as estimated by fitting a first-order autoregressive model to realised inflation for two samples. The first column displays the persistence parameter for the full sample, generally from 1990 to early 2012, while the second column estimates the same parameter for a sample that begins in 2001. The latter sample approximates the period when low and stable inflation became the norm in much of the region. The final column asks whether, in a statistical sense, inflation persistence changed significantly over the two samples. The first thing to note about the results is that persistence is high although it has shown signs of falling in the lower and more stable inflation subsample. While the fall in persistence is very much a feature of inflation targeting regimes (eg see Siklos (1999)), the same phenomenon is repeated in most non-IT economies. Nevertheless, only four economies (ie China, Japan, Korea and the Philippines) is the change statistically significant. Since only two of the four economies in question adhere to a numerical inflation target the reduction in inflation persistence is not exclusive to IT-type regimes.

Prior to a discussion of forecast disagreement it is worthwhile briefly examining forecast performance across economies and over time. Table 2 provides some summary statistics about forecast errors as well as highlighting the cases where non-Consensus forecasts over or under-perform the Consensus forecasts. In seven of the 12 economies in the region, non-Consensus forecasts (these also include central bank forecasts) outperform Consensus forecasts, at least based on the mean forecast error metric. Indeed, much the same conclusion is reached even if we examine forecast errors when inflation is rising or falling. As previously noted, the literature finds that forecast performance is highly asymmetric. Finally, if we subdivide the sample according to periods when there are inflation or deflation scares it is found that Consensus forecasters often *under*estimate inflation (ie realised inflation tends to exceed the one year ahead inflation forecast) while virtually all non-Consensus forecasts *over*estimate future inflation. Clearly, forecasters not only disagree substantially according to the group they belong to but also across inflation cycles. Finally, Figure 3 plots the forecasting record for the eight central banks for which we have data. Generally speaking, central bank forecast errors are just as persistent as the other forecasts considered and there seems to be little to distinguish the IT central banks' forecasting record from the performance of the non-IT monetary authorities. It is also interesting to note that the Bank of

[9] This necessitates some conversion of the data. See Siklos (2012) for the relevant issues.

Japan's Monetary Policy Committee's forecasting record reveals a persistent under-estimation of realised inflation. Forecasting inflation may well be different, or more difficult, in a deflationary environment.

The analysis concludes with a discussion of forecast disagreement. Figure 4 gives the estimates of forecast disagreement. The most obvious result is that forecast disagreement rises during times of economic uncertainty or stress, as is plainly evident from an examination of the behaviour of the series during the 2007–10 period. Even if the US-euro area crisis did not immediately affect the Asia-Pacific region there was an impact on forecast disagreement. However, it is also the case that the rise in forecast disagreement is far less noticeable during the latest financial crisis than during the Asian financial crisis of 1997-98, in certain cases such as Hong Kong SAR. Next, it appears that forecast disagreement rises before a particular financial crisis peaks. This implies that measures of forecast disagreement can possibly be useful as a kind of leading indicator of the severity of a crisis on inflationary expectations. Finally, while inflation has been relatively subdued throughout the region, in spite of the global events since 2007, the data for India do capture a sharp and sustained rise in forecast disagreement. Finally, it is equally important is to consider the source of forecasts. If policymakers are worried about the possibility of expectations becoming unanchored then non-Consensus forecasts may well be a good source to look at. For example, notice the differences in forecast disagreement as between Consensus and non-Consensus forecasts for Indonesia, Malaysia and Thailand, shown in Figure 5. If Faust and Wright's (2011) conclusion is correct, and "subjective" type forecasts outperform model-based forecasts (eg as in ones used in central banks), then it is important not only to examine forecast disagreement but, where possible, to disaggregate the data by groups of forecasters.

Conclusions

This paper has examined the performance of one year ahead inflation forecasts in the Asia-Pacific region with a threefold aim. First, to examine the performance of these forecasts over time and determine the extent to which inflation expectations remain anchored. Second, the paper argues that point forecasts will not provide sufficient clues to policymakers about the fragility of markets and the public's belief about the inflation outlook unless these decision-makers consider how much forecast disagreement exists across economic agents. Finally, forecast disagreement can vary considerably according to the group examined. Hence, forecast disagreement between central banks and professional forecasters may well differ from the public's view about the future outlook. As other research has shown (eg Siklos (2012)), the public may respond to a different information set than do professional forecasters. Hence, institutional devices such as inflation targeting and central bank transparency may matter more to some groups than to others.

Table 1

Inflation persistence in the Asia-Pacific region

Economy	Full sample	Post-2001	Are they different?
AU	.81	.66	Yes
CN	.97	.88	Yes
HK	.97	.95	No
ID	.97	.82	No
IN	.88	.93	No
JP	.87	.79	Yes
KR	.88	.72	Yes
MY	.81	.74	No
NZ	.82	.74	No
PH	.87	.72	Yes
SG	.91	.92	No
TH	.85	.76	No

Note: The full sample usually consists of quarterly data from 1995. The last observation is Q1 2012. Estimates shown are based on the following regression: $\pi_t = \beta_0 + \beta_1 \pi_{t-1} + \varepsilon_t$ where β_1 is the estimate of inflation persistence and π_t is (annualised) inflation at time t. No special adjustment was made for the adoption of inflation targeting. As shown in the Appendix, Indonesia, Philippines and Thailand adopted inflation targeting after 2000. Only Australia, Korea, and New Zealand adopted IT before 2000 and IT was in place for the full sample in Australia and New Zealand.

Table 2

Analysis of forecast errors: Consensus versus non-Consensus forecasts

Consensus forecasts

Economy	Rising inflation	OBS	Falling inflation	OBS	Inflation scare	OBS	Deflation scare	OBS	Median
AU	-0.26 (1.48)	40	-0.43 (1.20)	41	0.02 (0.05)	40	0.01 (0.02)	12	-0.28 (1.22)
CN	-0.28 (1.99)	35	-3.00 (2.60)	31	0.14 (0.05)	28	0.12 (0.08)	12	-1.37 (2.67)
HK	-1.00 (1.71)	33	-1.44 (1.92)	32	0.12 (0.07)	28	0.13 (0.21)	12	-1.36 (1.34)
ID	0.22 (2.31)	30	1.69 (6.83)	36	0.24 (0.34)	28	0.38 (5.46)	12	-0.63 (7.62)
IN	-0.35 (2.58)	41	-1.46 (2.11)	35	0.20 (0.10)	28	0.09 (0.07)	12	-0.65 (2.78)
JP	-0.06 (0.68)	33	-0.35 (0.65)	43	0.02 (0.01)	43	0.01 (0.01)	12	-0.22 (0.67)
KR	-0.17 (1.26)	33	-0.36 (1.31)	33	0.05 (0.03)	28	0.02 (0.10)	12	-0.29 (1.30)
MY	-0.62 (1.2)	33	-0.86 (1.27)	32	0.05 (0.03)	28	0.04 (0.04)	12	-0.70 (1.25)
NZ	0.24 (0.80)	32	-0.46 (1.03)	32	0.03 (0.01)	28	0.03 (0.01)	12	-0.02 (0.98)
PH	-0.46 (0.47)	4	-0.93 (0.36)	3	INS		INS		-0.75 (0.58)
SG	-0.39 (1.52)	38	-1.14 (1.51)	27	0.07 (0.07)	28	0.03 (0.02)	12	-0.60 (1.04)
TH	0.06 (1.90)	31	-0.83 (1.83)	35	0.08 (0.04)	28	0.08 (0.18)	12	-0.35 (1.92)

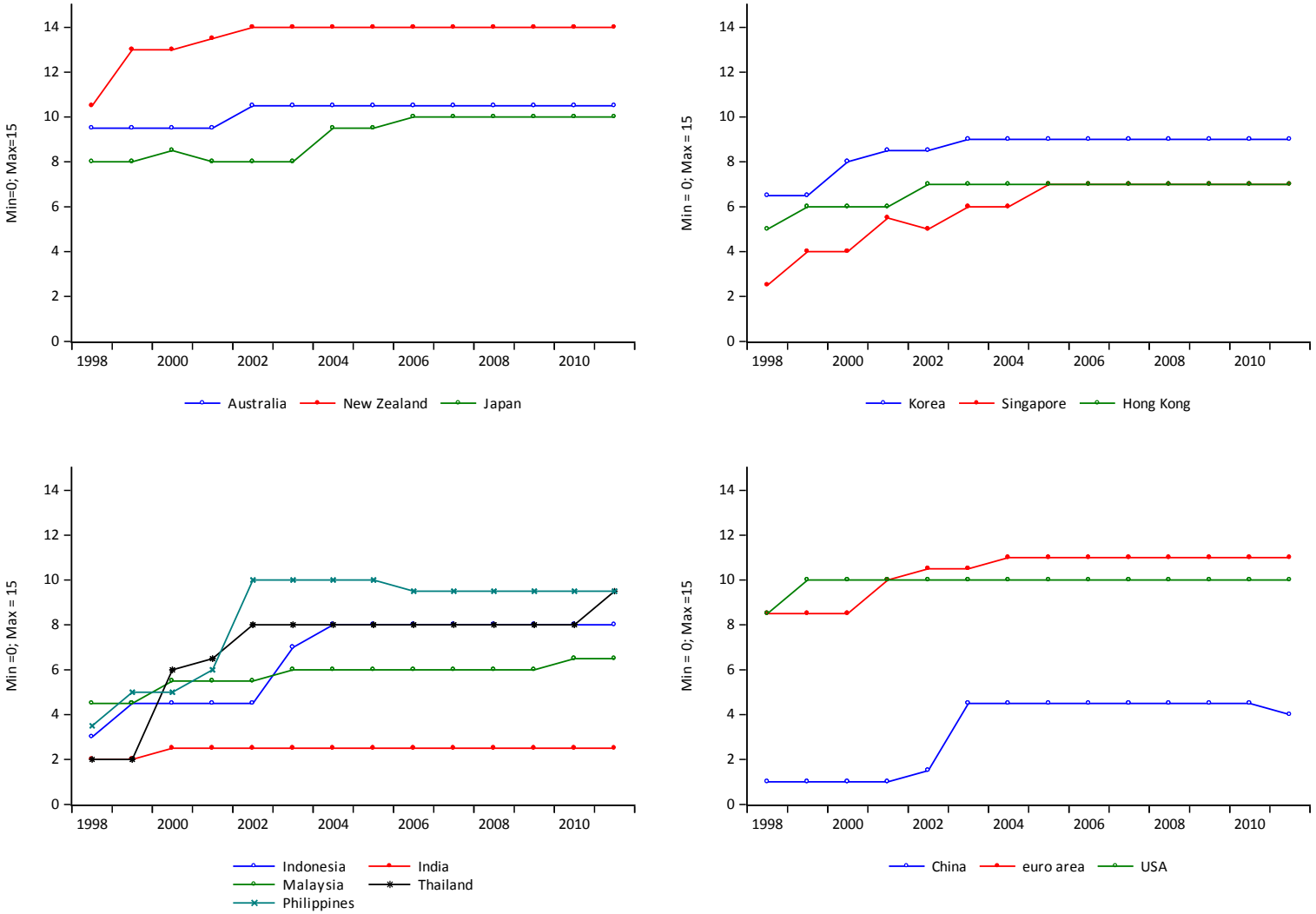
Non-Consensus forecasts

Economy	Rising Inflation	OBS	Falling inflation	OBS	Inflation scare	OBS	Deflation Scare	OBS	Median
AU	-0.04 (1.31)	15	-0.40 (1.09)	30	-0.53 (1.22)	44	-0.15 (1.11)	12	-0.26 (1.16)
CN	0.68 (1.74)	9	-1.97(1.95)	11	-0.18 (2.28)	29	-0.89 (1.75)	12	-0.71 (2.25)
HK	-0.68 (2.25)	9	-0.82 (2.50)	20	-0.81 (1.47)	29	-1.44 (2.28)	12	-0.72 (2.41)
ID	-0.46 (3.66)	7	-1.99 (3.86)	15	-0.65 (2.08)	29	-1.56 (5.65)	12	-0.64 (3,55)
IN	0.48 (1.61)	10	-1.10 (3.04)	12	-0.13 (2.43)	29	-0.04 (2.04)	12	-1.02 (2.40)
JP	0.27 (0.67)	23	-0.13 (0.38)	22	-0.14 (0.63)	44	-0.56 (0.32)	12	0.04 (0.60)
KR	-0.18 (2.53)	7	-0.34 (1.66)	23	-0.02 (0.81)	29	-0.85 (0.71)	12	-0.27 (1.85)
MY	-0.40 (1.83)	10	-0.93 (1.21)	14	-0.66 (1.52)	29	-0.90 (1.17)	12	-0.67 (1.98)
NZ	-0.24 (1.31)	16	-0.92 (1.33)	28	-0.02 (1.07)	28	-0.02 (0.70)	12	-0.39 (1.38)
PH	-0.25 (2.59)	8	-2.46 (2.40)	14	-0.75 (0.52)	8	INS		-0.74 (2.67)
SG	-0.60 (1.57)	13	-0.97 (1.95)	16	-0.05 (2.05)	29	-0.43 (0.81)	12	-0.82 (1.81)
TH	INS	0	-1.43 (1.93)	23	0.04 (2.02)	29	-0.90 (1.48)	12	-1.43 (1,33)

Note: Forecast errors are defined as $\pi_t - \pi^f$ where π_t, π^f are, respectively, (annualised) inflation less the one year ahead inflation forecast. Periods of rising inflation are defined by the condition $\Delta\pi_t \geq 0$ while periods of falling inflation represent cases where $\Delta\pi_t < 0$. Inflation scares follow the US definition (1992–95, 2002–04, 2008–11). Deflation scares are 2000, 2006–07. OBS are the number of observations. INS means insufficient data. The highlighted parts indicate cases where non-Consensus forecasts outperform Consensus forecasts.

Figure 1

Central bank transparency



Sources: Dincer & Einchengreen (2007), Siklos (2011), and http://www.central-bank-communication.net/links/.

Figure 2

Inflation performance

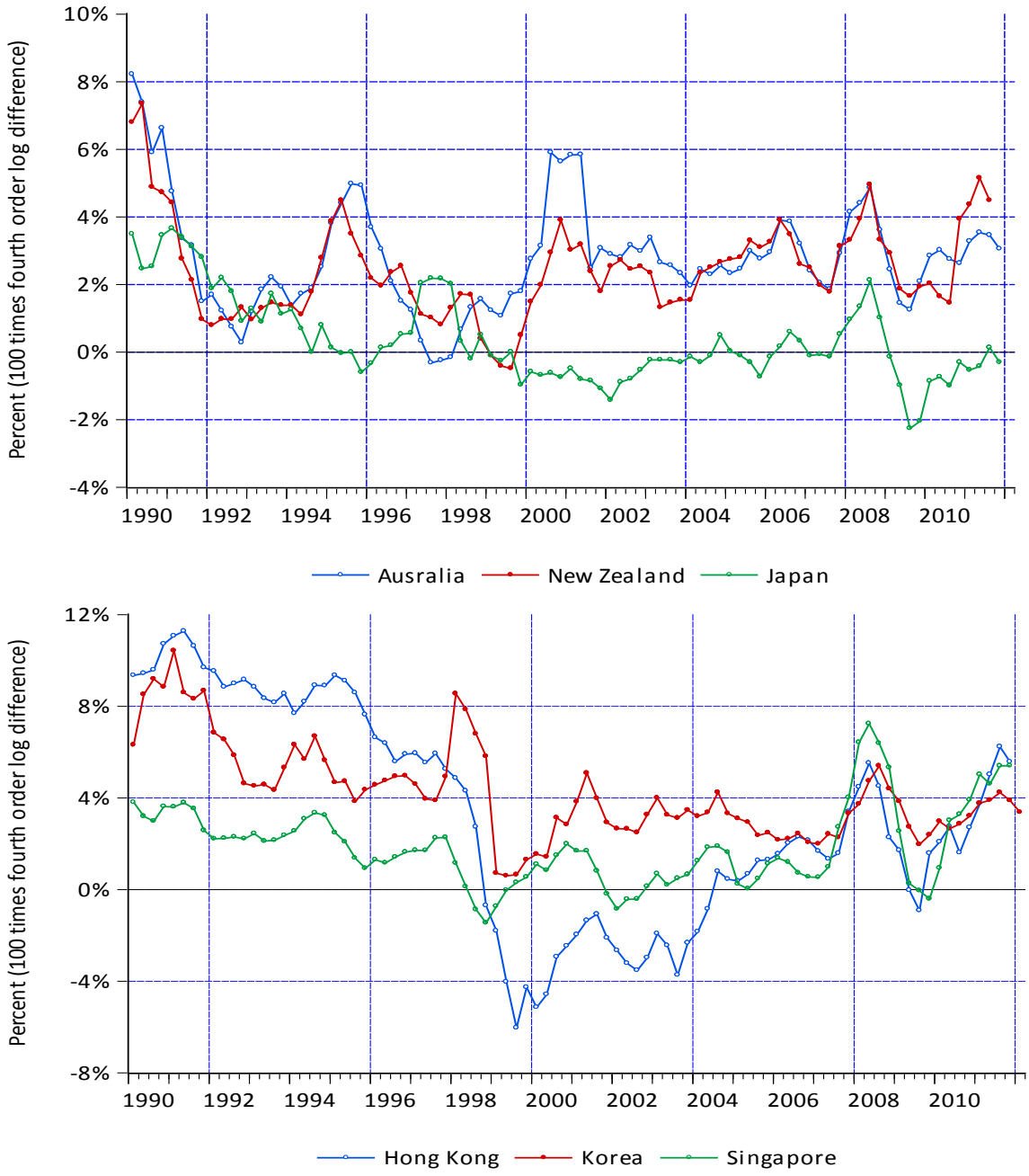
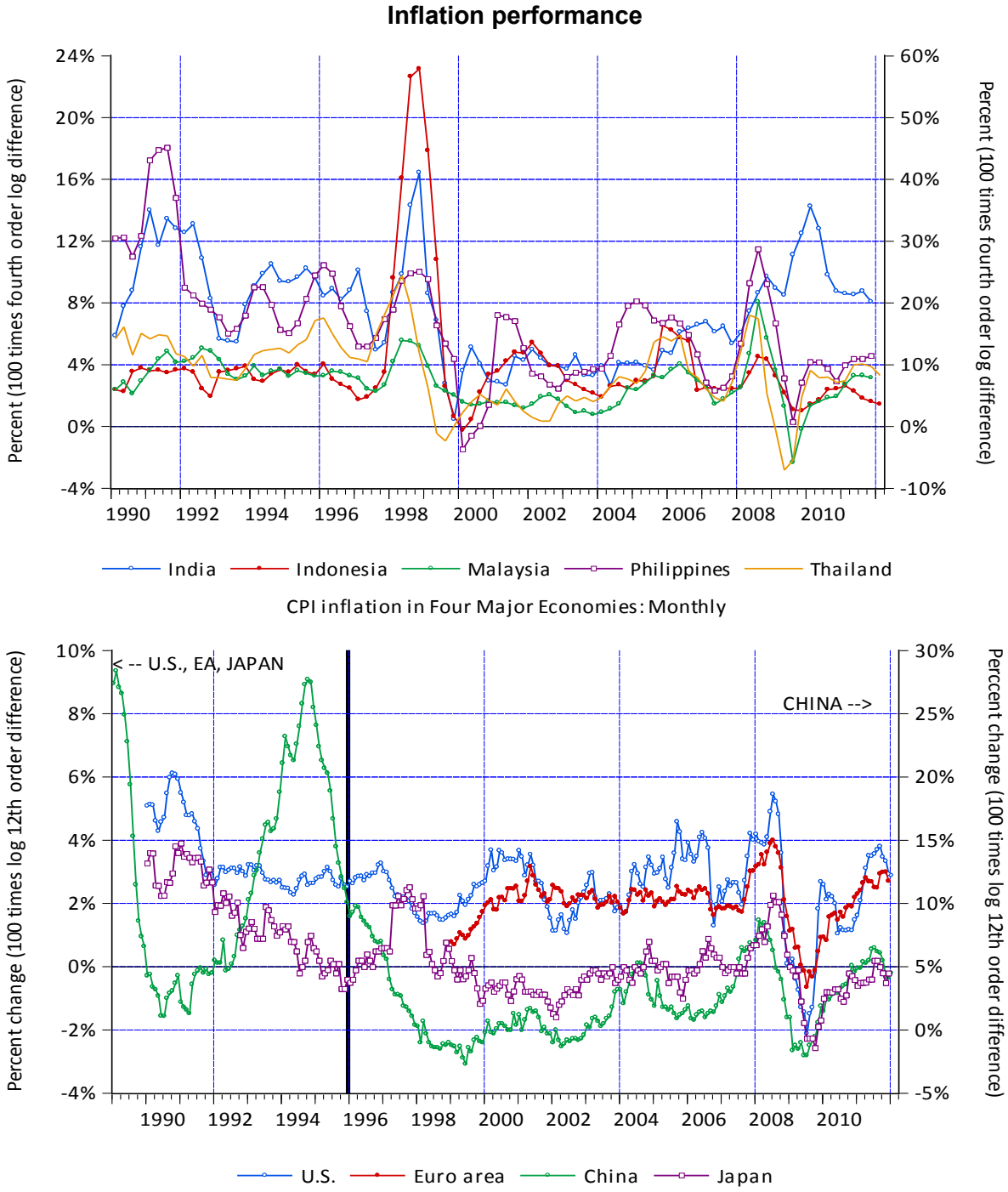


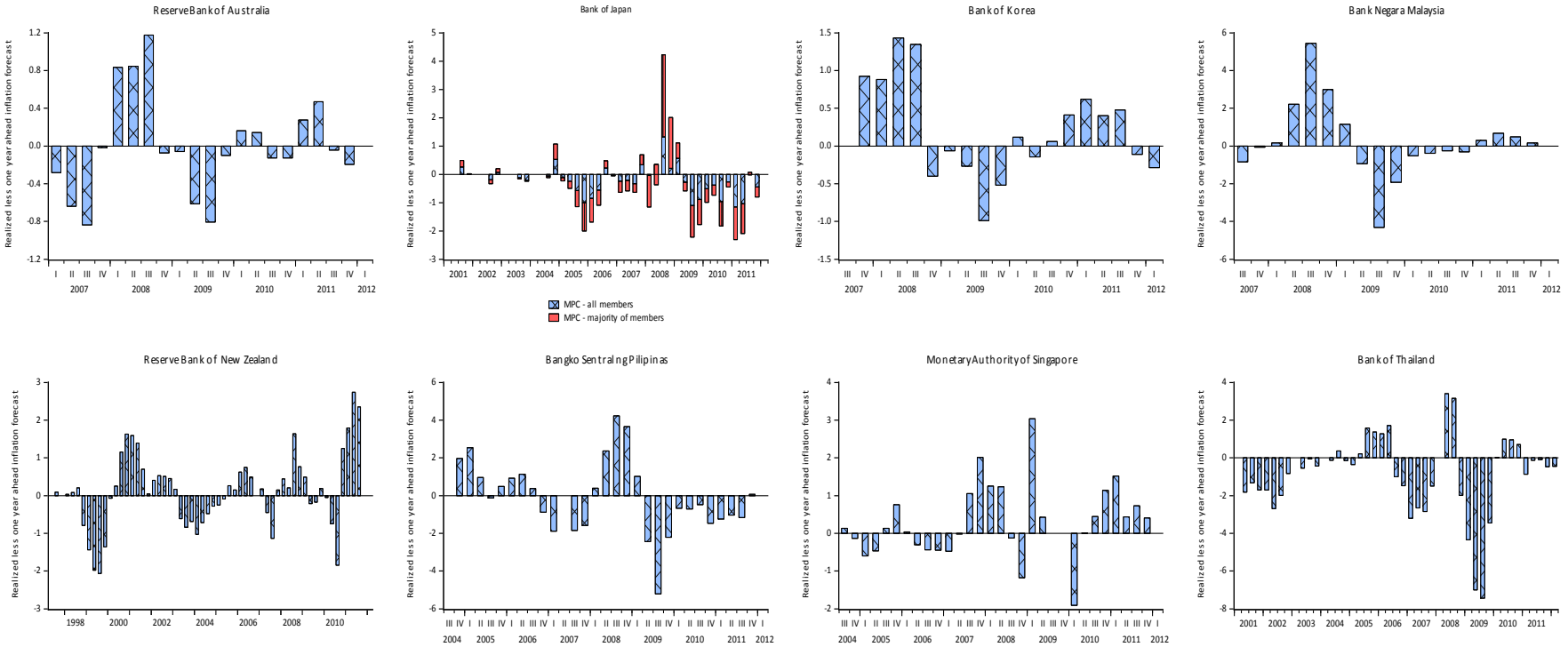
Figure 2 (cont)



Note: Except for the euro area (harmonised index of consumer prices), CPI is used. Inflation is annualised inflation based on quarterly data. Data are from International Monetary Fund International Financial Statistics CD-ROM (May 2012 edition).

Figure 3

The forecasting record of central banks in the Asia-Pacific region



Note: errors are defined as $\pi_t - \pi^f$ where π_t, π^f are, respectively, (annualised) inflation less the one year ahead inflation forecast. Source: Author's calculations.

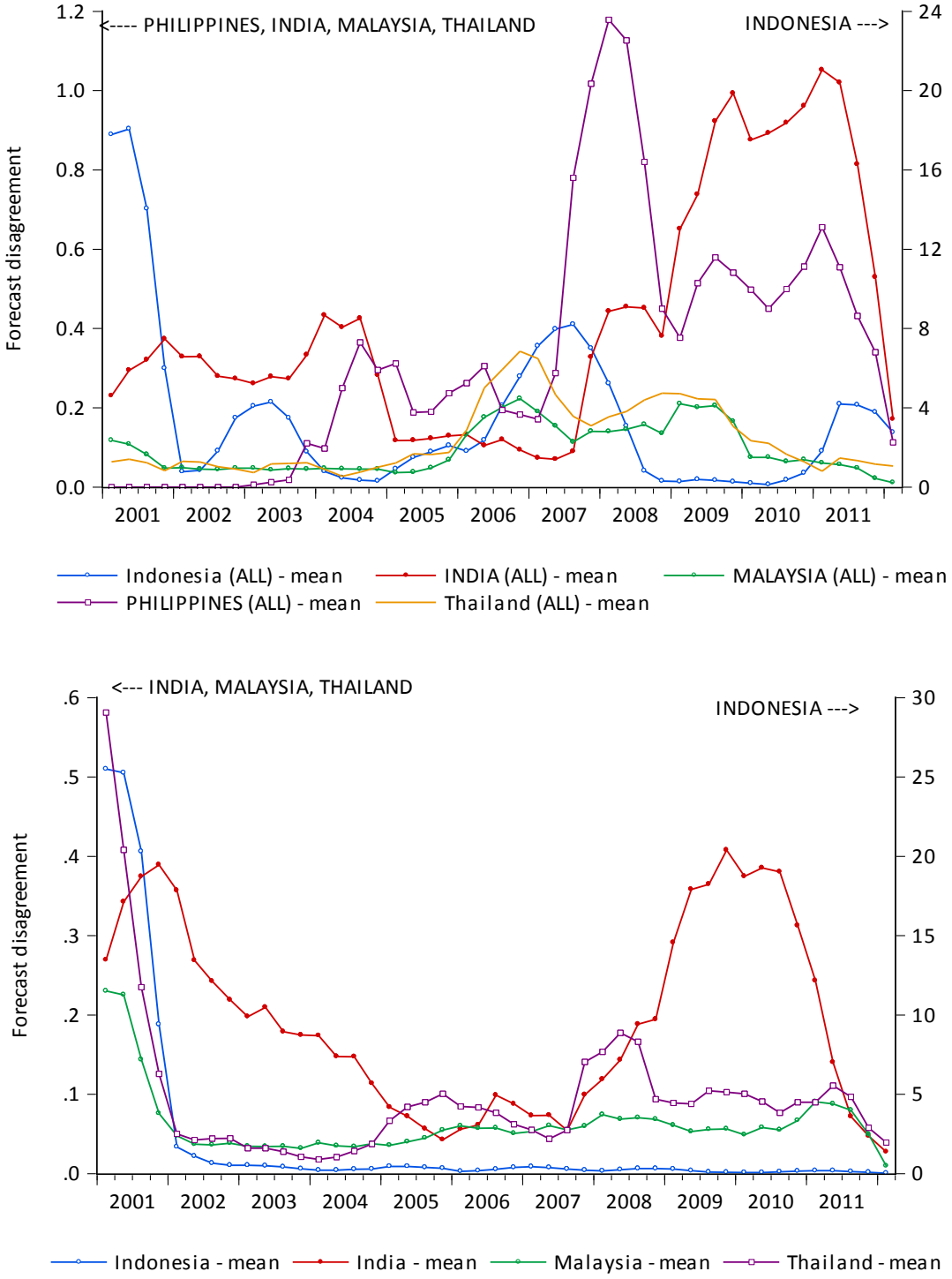
Figure 4

Forecast disagreement since 2001

Note: Forecast disagreement among Consensus forecasters, evaluated according to equation (1). There were too few observations for the Philippines. See, however, Figure 5.

Figure 5

Forecast disagreement: Consensus and non-Consensus forecasts, selected economies



Note: See note to Figure 4.

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How important are inflation expectations in driving Asian inflation?[1]

Jun Il Kim[2] and Jungick Lee[3]

Abstract

Using simple statistical methods, this note examines the relationship between expected and actual inflation and the importance of inflation expectations in driving actual inflation in Asia. We find that, in Asia, short-term inflation expectations tend to co-move among economies while international energy and food price inflation seems to be an important driver of inflation expectations. The analysis of impulse responses also suggests that inflation expectations appear to play an important role in driving actual inflation, with expectation shocks having significant dynamic effects on actual inflation in many Asian economies.

Keywords: expected inflation, co-movement, energy/food price, impulse response analysis

JEL classification: E31

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1. Introduction

Inflation expectations are of great importance to policymakers. The main purpose of inflation targeting (IT) is to shape and guide inflation expectations around the established inflation target. Well-anchored inflation expectations reflect the credibility of the central bank, help enhance the effectiveness of monetary policy, and create ample space for flexible monetary policy in the short run.

Consumers and firms often comprehend the future path of inflation implicitly or explicitly. The reason is that they ought to consider real prices (inflation accounted for) when they negotiate wages with employers, open saving accounts at the bank, or set product prices. Economic agents' decision making is affected by their expectations of future inflation and they later face the consequences of actual inflation. In this regard, it is argued that expected inflation is a key driver of inflation dynamics (Mishkin, 2007).

This note examines the relationship between expected and actual inflation. Also, by using survey measures of inflation expectations obtained from *Asia Pacific Consensus Forecasts*, it explores the significance of inflation expectations in driving actual inflation. The rest of this note is organized as follows. After providing a brief overview of the properties of inflation expectations in Korea in Section 2, we explain the developments and co-movements in actual and expected inflation, explore a possible driver of inflation expectations, and examine the role of inflation expectations in driving actual inflation in Asia in Section 3. Section 4 summarizes with concluding remarks.

2. Properties of inflation expectations in Korea

To gauge inflation expectations, economists refer to a number of sources, such as surveys of the general public or professional forecasters, the breakeven inflation rate obtained from financial markets, and econometric forecast reports. Survey measures seem most popular in Asia, including Korea, where financial markets are less developed than in advanced economies.

The most widely referred-to measure of inflation expectations in Korea is obtained from a monthly survey of households conducted by the Bank of Korea (BOK). It provides the average expected inflation rate over the following twelve months. BOK also conducts a survey of professional forecasters in the first month of each quarter and provides the expected inflation over the following two quarters and twelve months, and the average inflation rate over the following five years as well. There is another monthly survey measure by Consensus Economics Inc., a London-based macroeconomic survey firm.

We briefly review the properties of inflation expectations in Korea based on both BOK's household survey and Consensus Economics' survey. Inflation expectations in Korea appear highly persistent and remain far from being rational in the sense that not all useful information available is fully taken into account when expectations are formed. In fact, the public's expectations of inflation are backward-looking and not well anchored to the inflation target. For instance, we observe that the public's inflation expectation is highly positively correlated with previous inflation rates while exhibiting low or insignificant correlations with future inflation rates.

Conversely, the inflation expectations by professional forecasters as measured by Consensus forecasts tend to lead actual inflation to some extent, and are fairly well anchored to the inflation target. They also appear to have predictive power for the future path of inflation. To be specific, Consensus forecasts have stronger statistical properties of rational forecasts of inflation (such as unbiasedness and efficiency) than those based on BOK's household survey. Of course, however, the fact that Consensus forecasts are a better predictor of future inflation than household survey measures does not necessarily mean that

the former are economically more important than the latter. In this light, BOK monitors both measures of inflation expectations in its conduct of monetary policy.

3. Inflation expectations and realized inflation in Asia

3.1 Data

We examine the relationship between expected and actual inflation and the importance of inflation expectations in driving (actual) inflation in Asia using data on inflation expectations and realized CPI inflation from 13 Asian economies from December 2005 to May 2012. The economies covered in our study include China (CN), Hong Kong SAR (HK), Korea (KR) and Taiwan, China (Hereinafter referred to as Taiwan) (TW) from East Asia; India (IN), Bangladesh (BD) and Sri Lanka (LK) from South Asia; Indonesia (ID), Malaysia (MY), Philippines (PH), Singapore (SG), Thailand (TH) and Vietnam (VN) from South East Asia. Here note that KR, ID, PH and TH are countries that adopt IT as a monetary policy framework.

The data for inflation expectations are obtained from *Asia Pacific Consensus Forecasts* (APCF) published by Consensus Economics Inc., which provides forecasts for the current calendar year and the following year on a monthly basis. Since the data are for the annual expected inflation rate but measured on a monthly frequency, they include multiple and time-varying sample points (observed at different dates) for the expected inflation of the same year. A monthly sample of twelve-month ahead expected inflation is then constructed by taking the weighted average of the multiple forecasts in the original sample data. For instance, the twelve-month ahead expected inflation at May 2012 is computed as a weighted average of the Consensus 2012 and 2013 forecasts—both observed at May 2012—with the former assigned a weight of 7/12 and the latter 5/12.

The data also provide long-term expected inflation for the following 5 to 10 years on a semi-annual frequency (observed in April and October, respectively). Out of these data, a semi-annual sample of long-term expected inflation is constructed by using a similar weighting method to that used for the construction of twelve-month ahead expected inflation. Finally, the data for annual CPI inflation and energy and food price inflation are obtained from the IMF's International Financial Statistics, CEIC database, and national sources, and the World Bank.

3.2 Developments in actual and expected inflation

Figure A1 shows the developments in short- and long-term inflation expectations along with realized (average) annual CPI inflation for the above mentioned 13 Asian economies since the end of 2005. In each country, actual and 1-year ahead expected inflation exhibits substantial variation over time. In most countries except India, short-term inflation expectations tend to lead actual inflation to some extent as is manifest in the cross-correlation between expected inflation and actual inflation—$corr(\pi_t^e, \pi_{t+j})$—as shown in Figure A3. Meanwhile, long-term expected inflation over the following 5 or 10 years where available appears to remain stable compared to short-term expectations and lies within the target range in the case of IT-adopting countries, suggesting that central banks in the region have been successful in building up policy credibility in the 2000s.

3.3 Co-movements in actual and expected inflation

Table 1 shows that actual inflation tends to co-move among countries in the same region, especially economies grouped as East Asia (CN, HK, KR, TW) and those in the advanced economy group (US, EU, Japan). Actual inflation at the regional level—measured by the first principal component of inflation at the national level—also appears to move together

between East Asia, South Asia, and advanced economies as shown in Table 2. South East Asia is an exception to such co-movements, suggesting a possibility that these economies are less well integrated with other regions in Asia or advanced countries.

Table 3 and Figure A2 show fairly strong co-movements in short-term expected inflation within/across regions, which together with strong co-movements in actual inflation within/across regions suggests a common influence. Interestingly, for East Asia, co-movements appear stronger for expected inflation than actual inflation.

3.4 Possible drivers of short-term inflation expectations

Energy and food prices appear to be one of the main drivers of short-term inflation expectations in most Asian countries, particularly in East Asia as shown in Figure 1. Also, note from Figure A4, which displays cross-correlograms—$corr(\pi_t^e, \pi_{t+j})$—between expected inflation and energy and food price inflation, that short-term inflation expectations are strongly associated with energy and food price inflation in the previous quarter. This finding is broadly consistent with the finding of Gerlach et al. (2011) that food prices seem to affect inflation expectations in emerging market economies more strongly than in advanced economies. Food prices in the CPI have generally risen by more in emerging economies than in advanced economies. Moreover, food accounts for a higher proportion of the total household consumption expenditure basket in economies with lower income per capita.

3.5 Impulse response analysis

To examine if short-term inflation expectations are driving Asian inflation, a simple bivariate VAR of expected and actual inflation is estimated. The impulse responses obtained from the estimated VAR model would then offer some guidance on the issue. In the estimation, the lag orders of the VAR are selected based on the Schwarz criterion. In many (though not all) Asian economies, expectation shocks seem to have significant dynamic effects on actual inflation. The impulse response functions in Figure A5 show that, in response to expectation shocks, actual inflation tends to peak in 3 to 4 quarters in most countries. Among others, the strong response of actual inflation in Indonesia and Vietnam is noteworthy.

4. Conclusion

This note examines the relationship between expected and actual inflation and the importance of inflation expectations in driving (actual) inflation in Asia. It should be noted as a caveat that the analysis is based on very simple statistical methods using a limited sample with a short time span from December 2005 to May 2012.

Both short-term expected inflation and actual inflation exhibit substantial variation over time. However, long-term expected inflation remains relatively stable and lies within target ranges in IT-adopting countries. This will offer some policy space for Asian central banks to deal with adverse shocks in the short run. Short-term inflation expectations in Asian countries tend to co-move while international energy and food price inflation seems to be an important driver of inflation expectations in Asia. The analysis of impulse responses also suggests that inflation expectations appear to play an important role in driving actual inflation, with expectation shocks having significant dynamic effects on actual inflation in many Asian economies.

Table 1

Correlation matrix for actual inflation

(a) East Asia

	Hong Kong	Korea	Taiwan
China	71	57	75
Hong Kong		56	46
Korea			56

(b) South Asia

	Bangladesh	Sri Lanka
India	03	-.45
Bangladesh		.36

(c) South East Asia

	Malaysia	Philippines	Singapore	Thailand	Vietnam
Indonesia	67	64	-.14	63	02
Malaysia		79	.53	66	71
Philippines			.21	58	47
Singapore				30	92
Thailand					32

(d) Advanced economies

	EU	Japan
United States	91	71
EU		84

Table 2

Correlation matrix for the first principal components in inflation

	South Asia	South East Asia	Advanced economies
East Asia	64	-.69	.74
South Asia		-.63	.88
South East Asia			-.79

Note: The first principal component explains 79%, 52%, 59%, and 88% of total variation in inflation in East Asia, South Asia, South East Asia, and advanced economies, respectively.

Table 3

Correlation matrix for short-term inflation expectations

(a) East Asia

	Hong Kong	Korea	Taiwan
China	.90	.78	.87
Hong Kong		.79	.79
Korea			.77

(b) South Asia

	Bangladesh	Sri Lanka
India	.55	-.15
Bangladesh		.40

(c) South East Asia

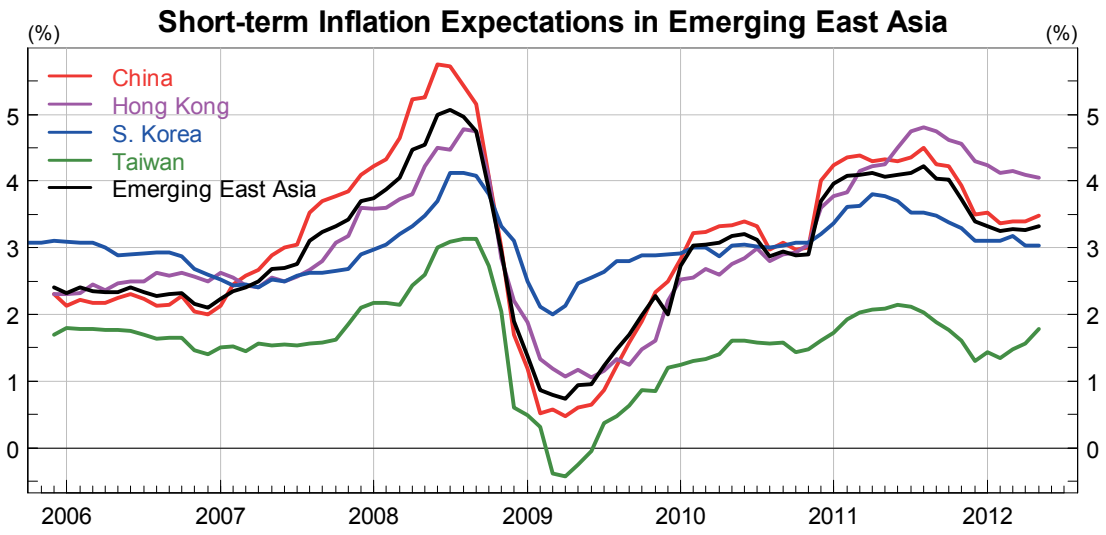
	Malaysia	Philippines	Singapore	Thailand	Vietnam
Indonesia	.54	.80	-.06	.50	-.02
Malaysia		.71	.59	.84	.62
Philippines			.12	.62	.32
Singapore				.64	.86
Thailand					.55

(d) Across regions

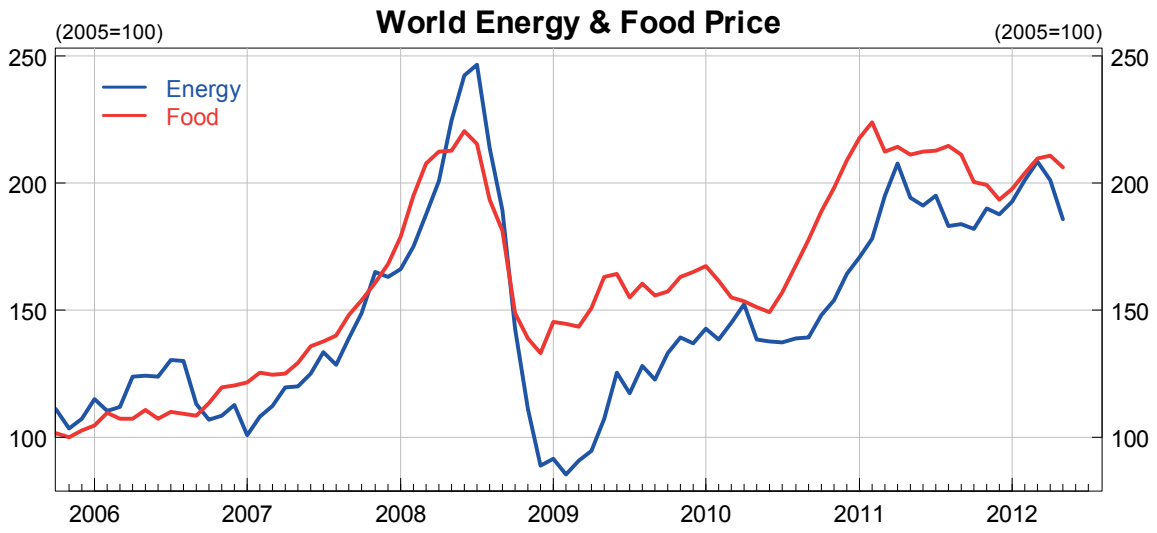
	South East Asia	United States	EU
East Asia	.55	.69	.82
South East Asia		.61	.73
United States			.83

Figure 1

World energy/food price and inflation expectations in Asia



Source: Asia Pacific Consensus Forecasts



Source: World Bank

Appendix

Figure A1

Developments in actual and expected inflation by economies

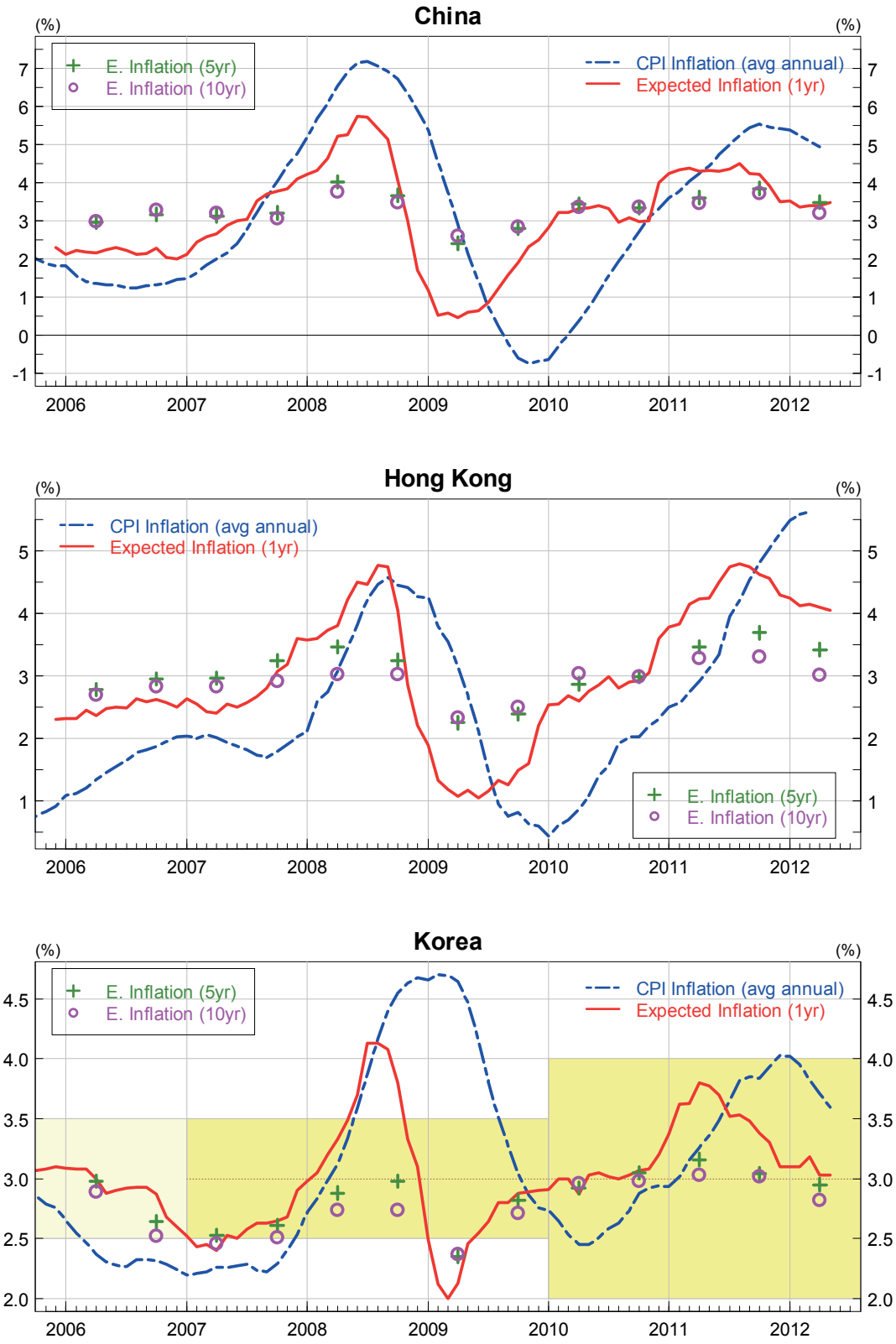


Figure A1

Developments in actual and expected inflation by economies (cont)

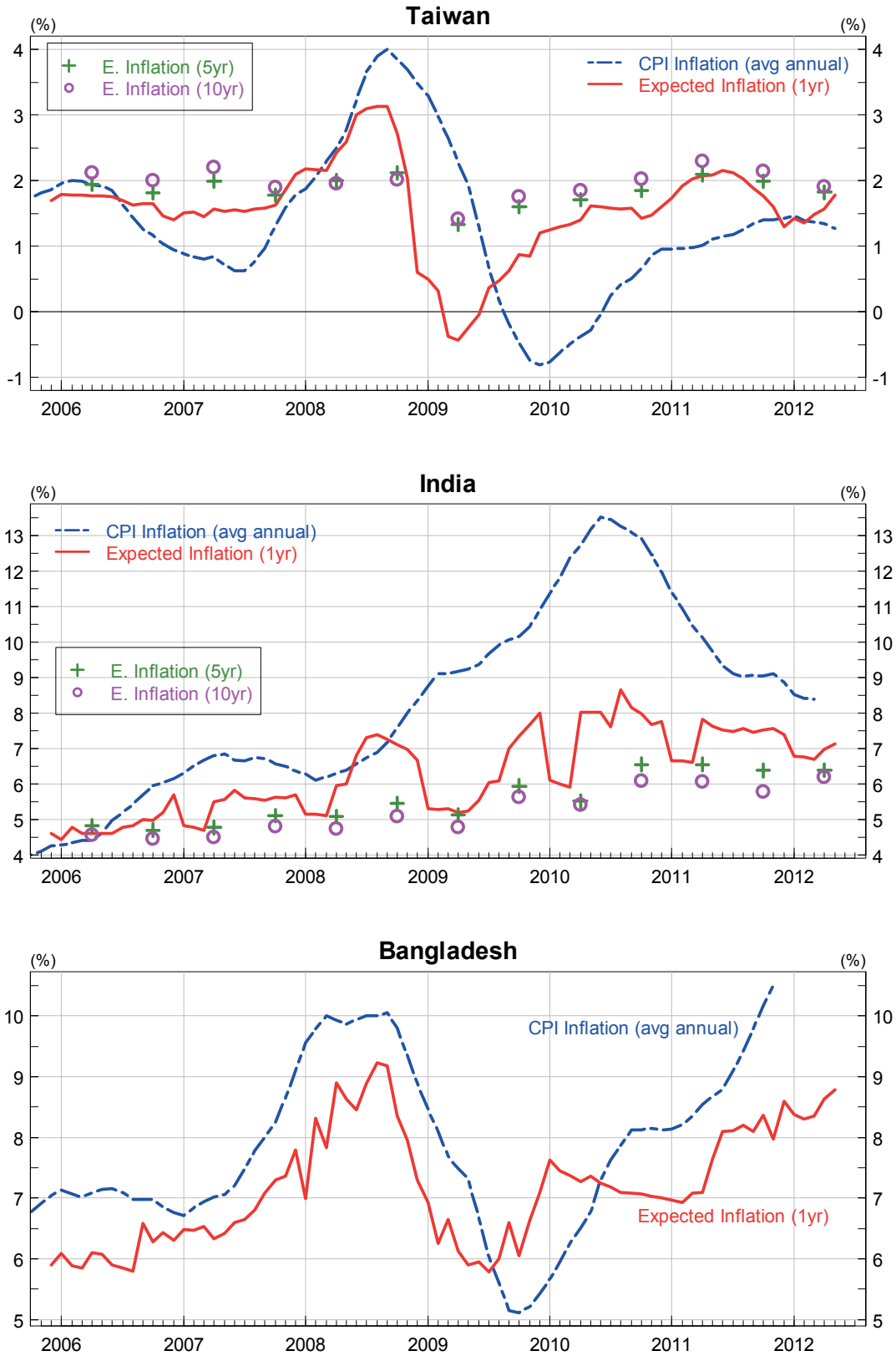


Figure A1

Developments in actual and expected inflation by economies (cont)

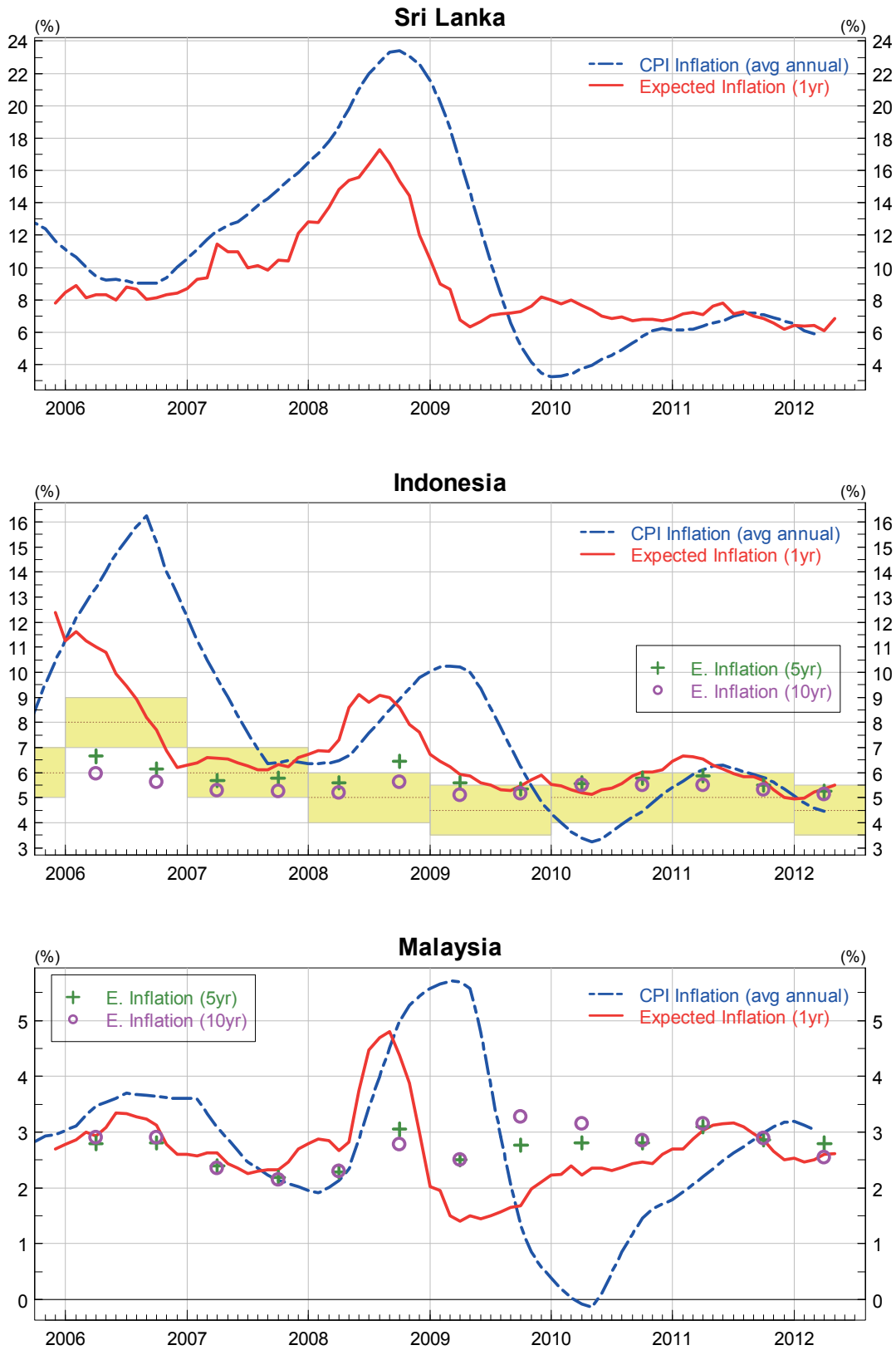


Figure A1

Developments in actual and expected inflation by economies (cont)

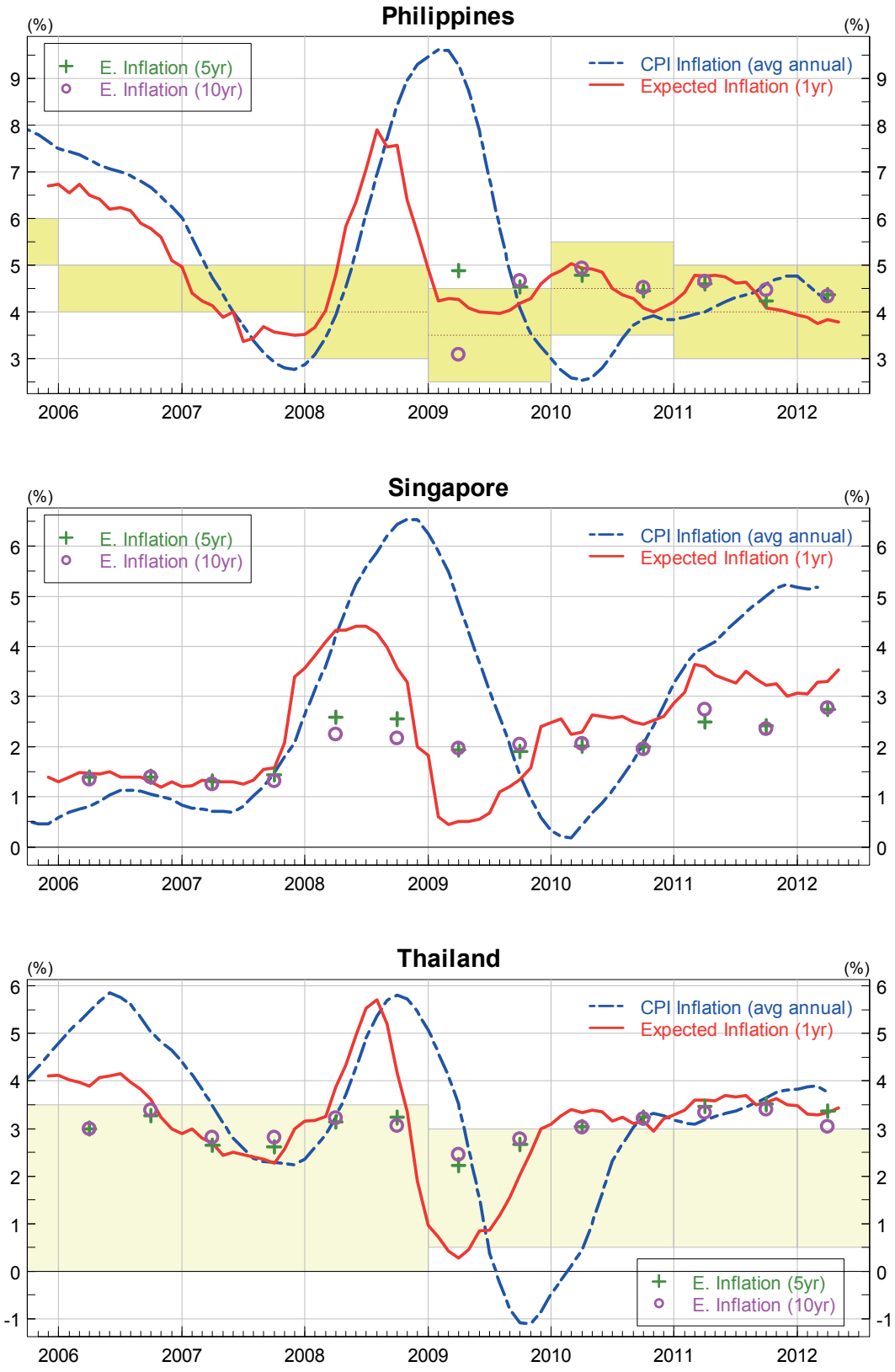
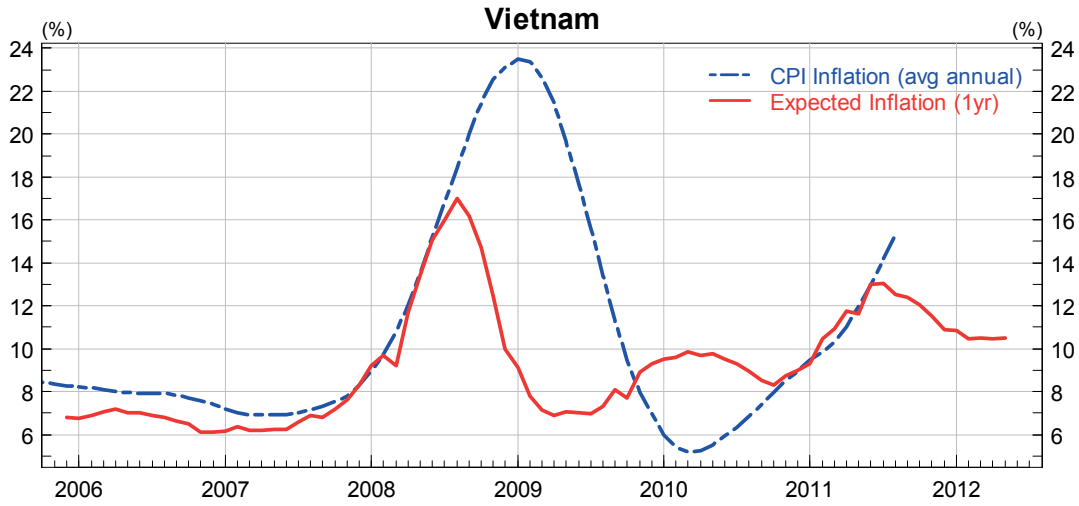


Figure A1

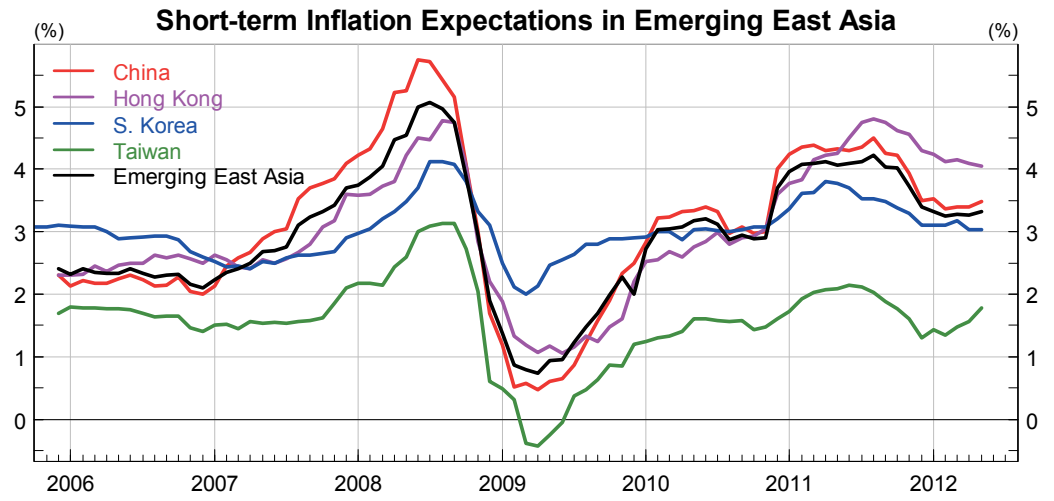
Developments in actual and expected inflation by economies (cont)



Note: The shaded areas represent inflation target ranges for inflation targeting-adopting countries.

Figure A2

Co-movements in expected inflation within regions



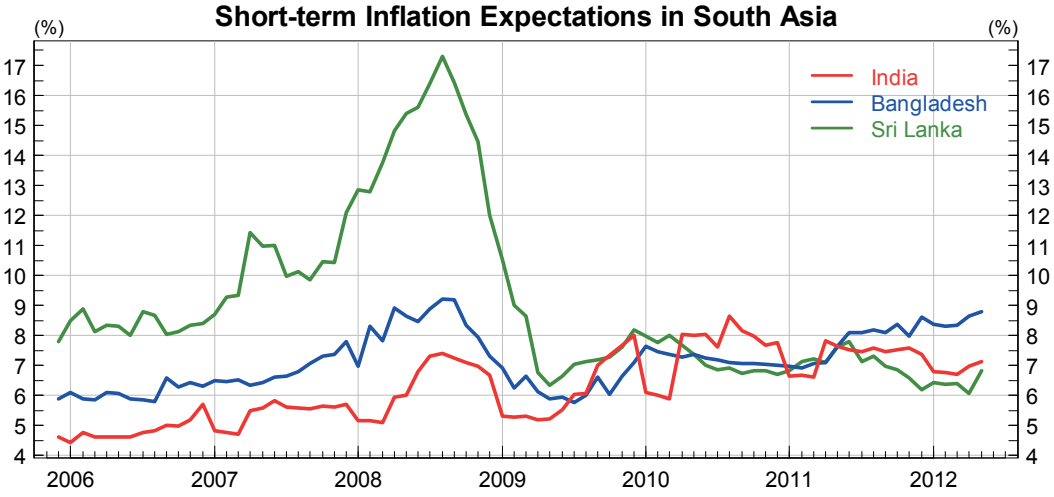
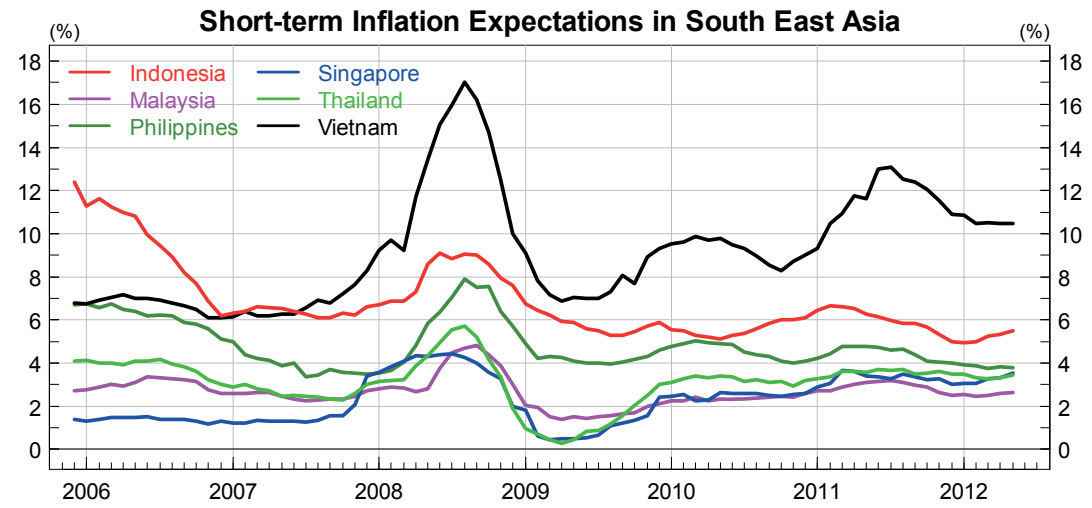


Figure A2

Co-movements in expected inflation within regions (cont)



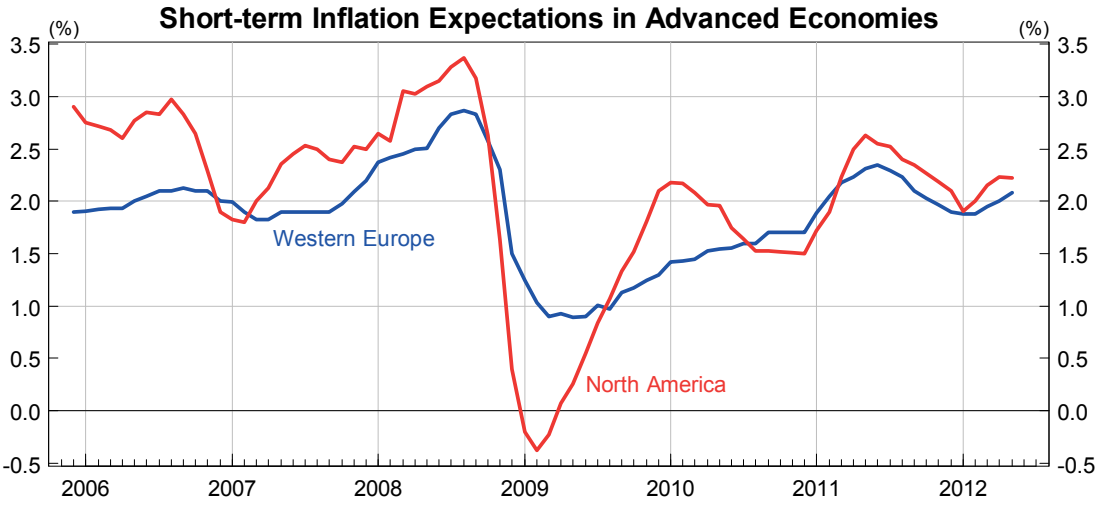


Figure A3

Cross-correlation between expected inflation and actual inflation

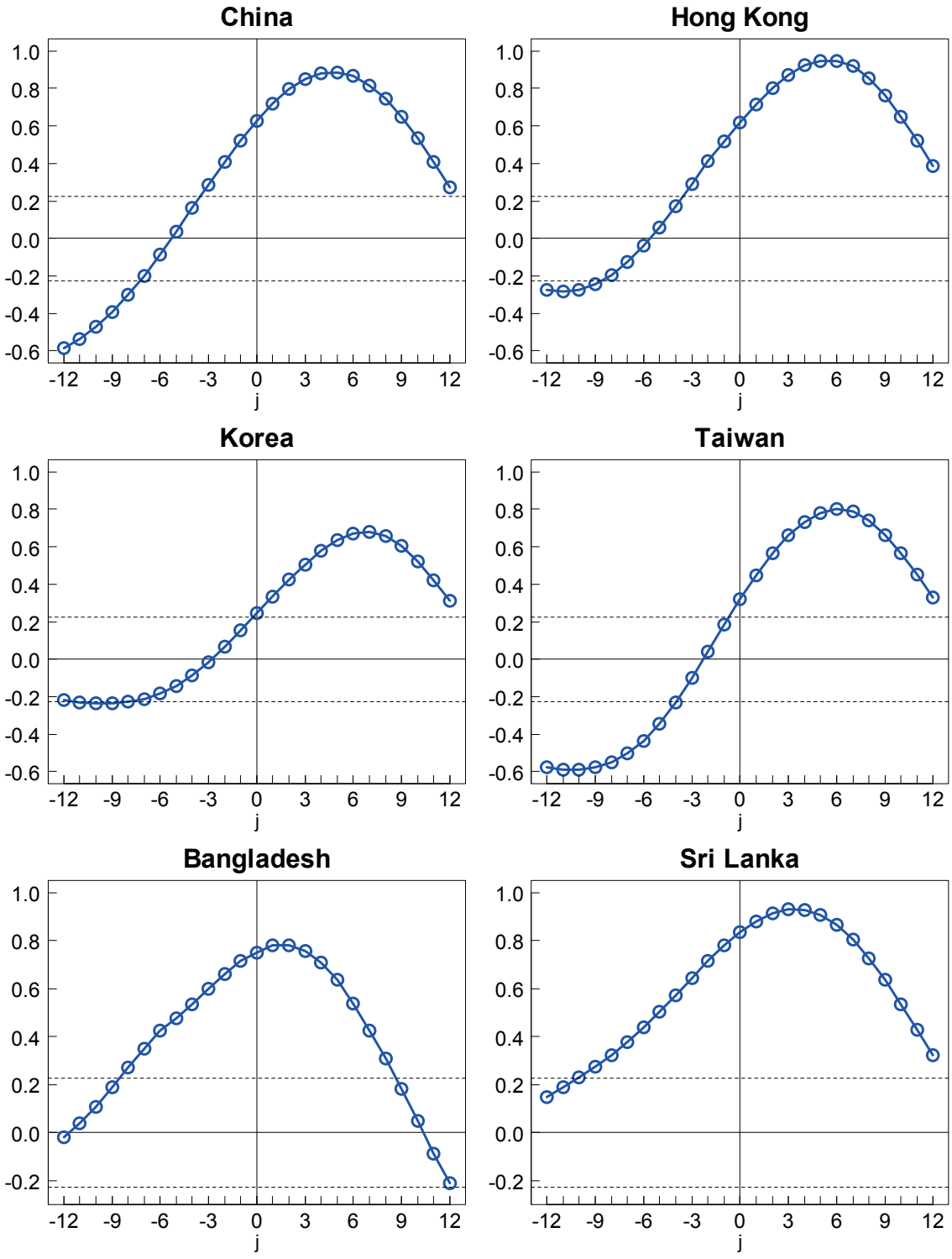
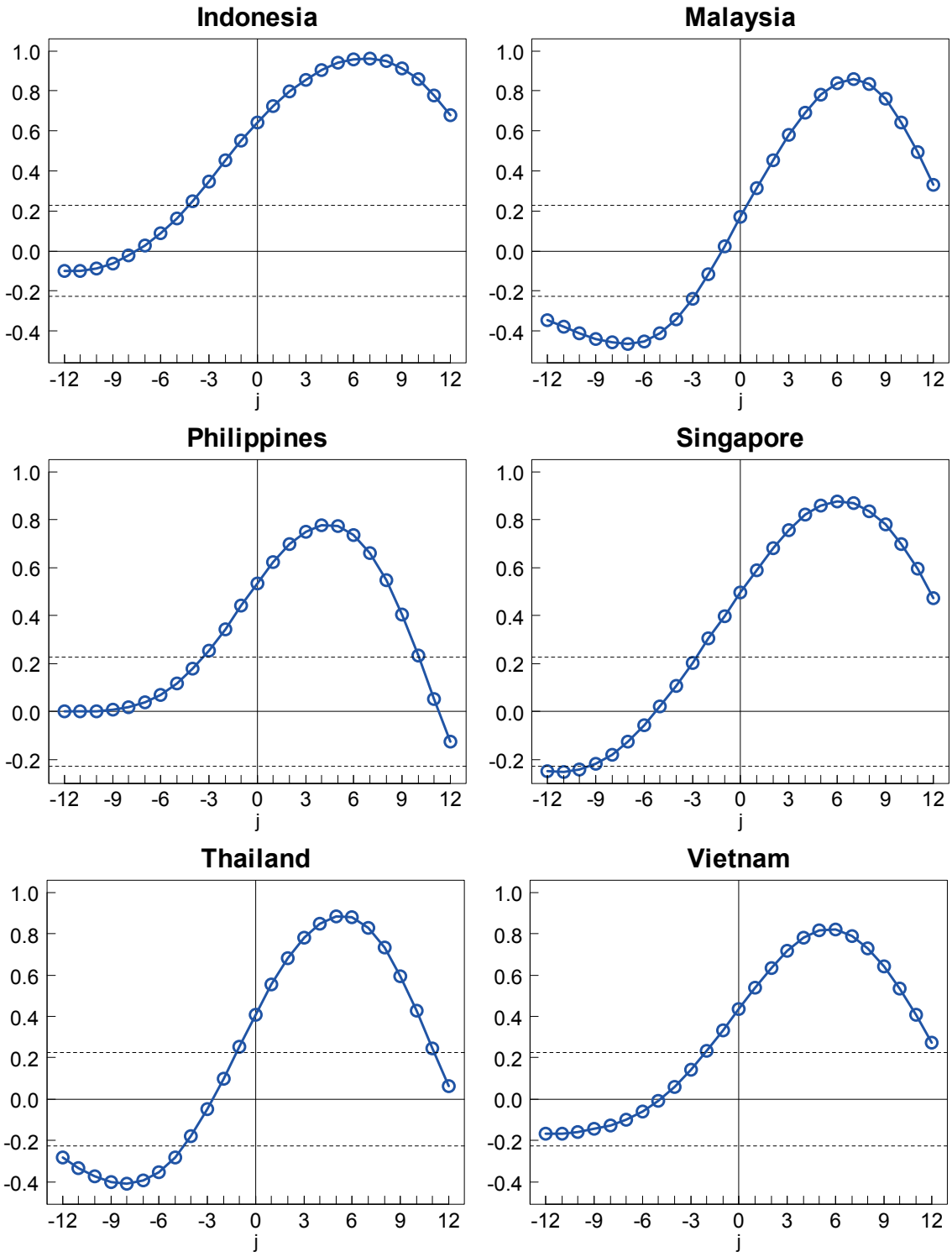


Figure A3

Cross-correlation between expected inflation and actual inflation (cont)



Note: Cross correlation between expected inflation, π_t^e, and realized inflation, π_{t+j}.

Figure A4

Cross-correlation between expected inflation and energy & food price inflation

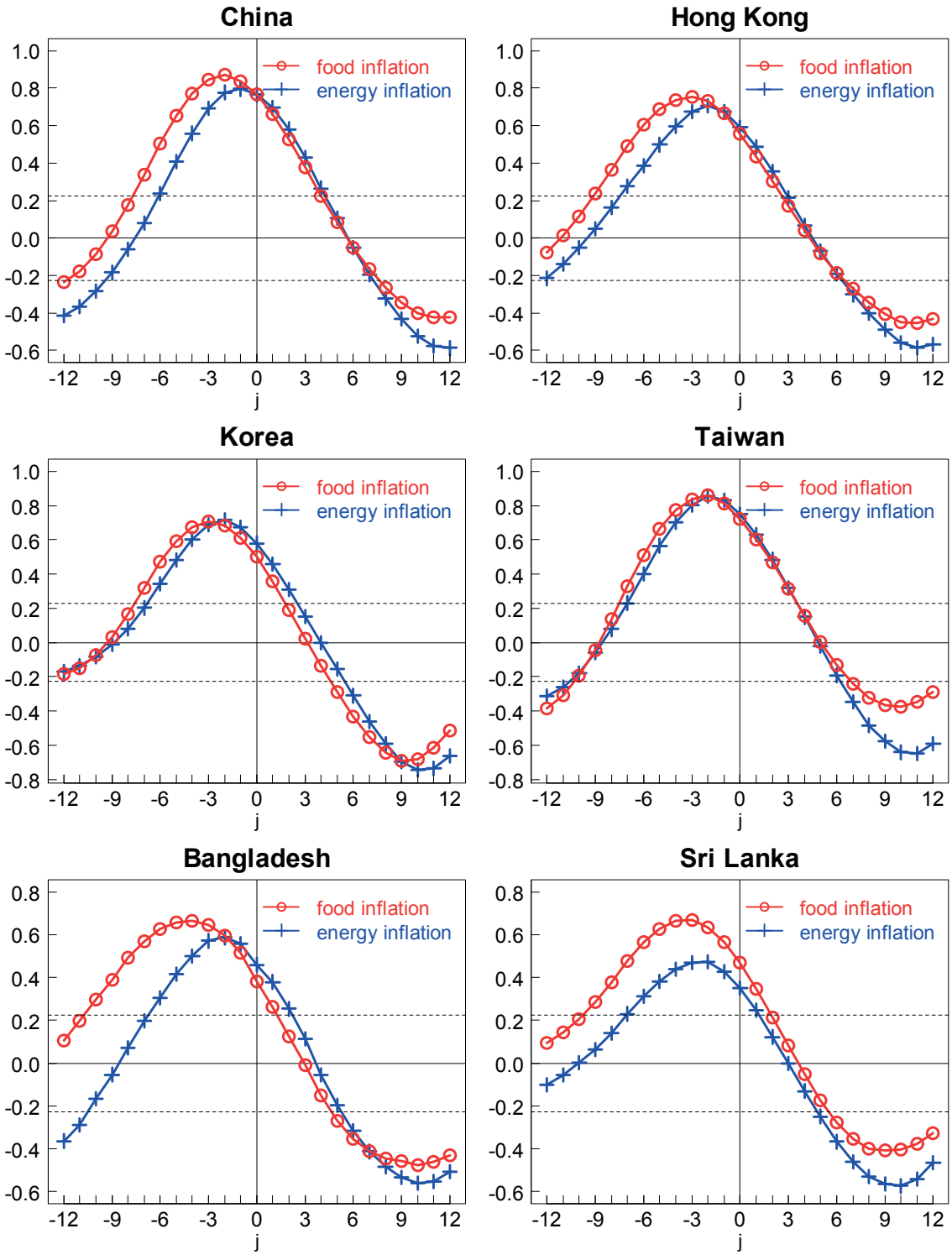
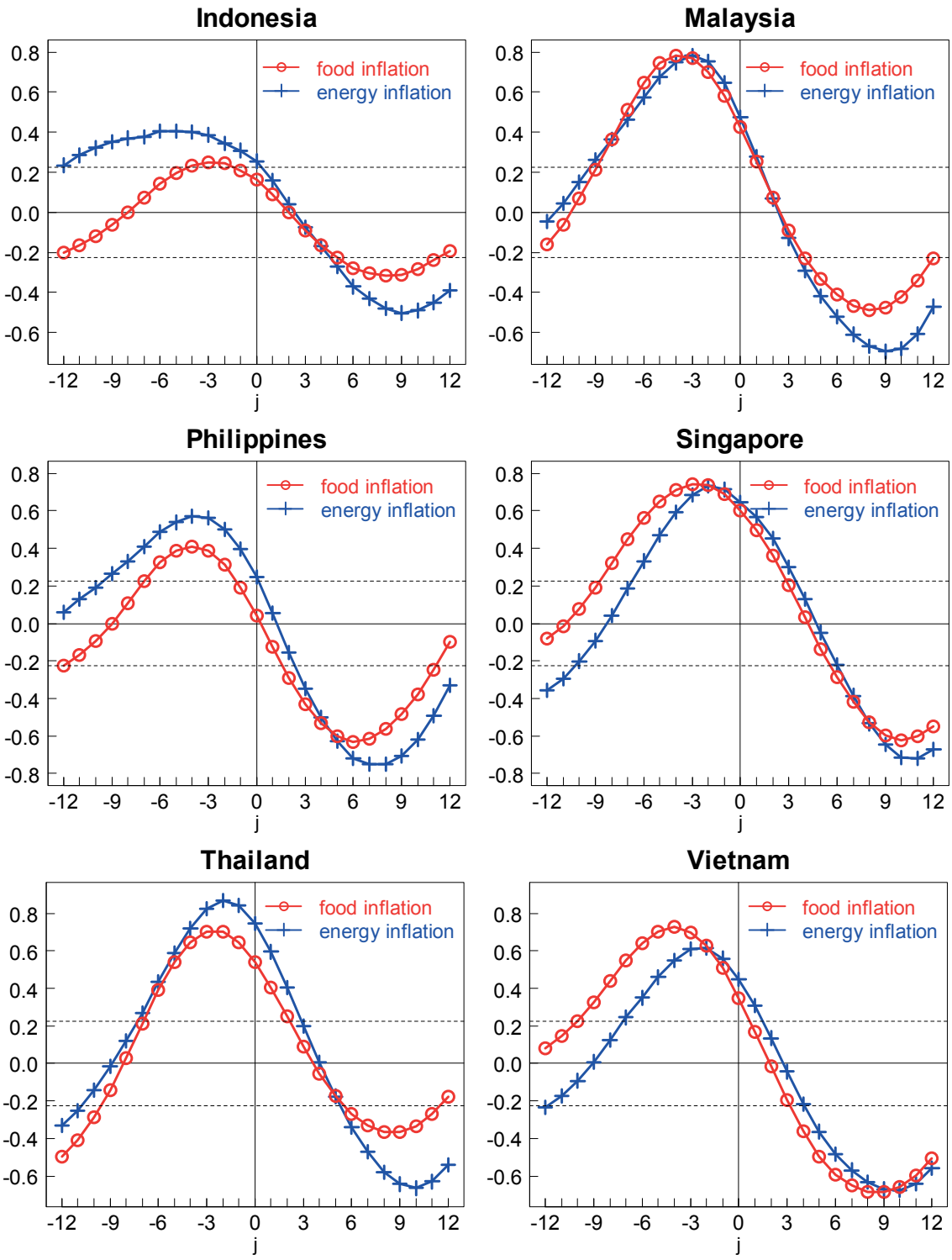


Figure A4

Cross-correlation between expected inflation and energy & food price inflation (cont)



Note: Cross correlation between expected inflation, π_t^e, and food or energy price inflation, π_{t+j}.

Figure A5

Impulse responses

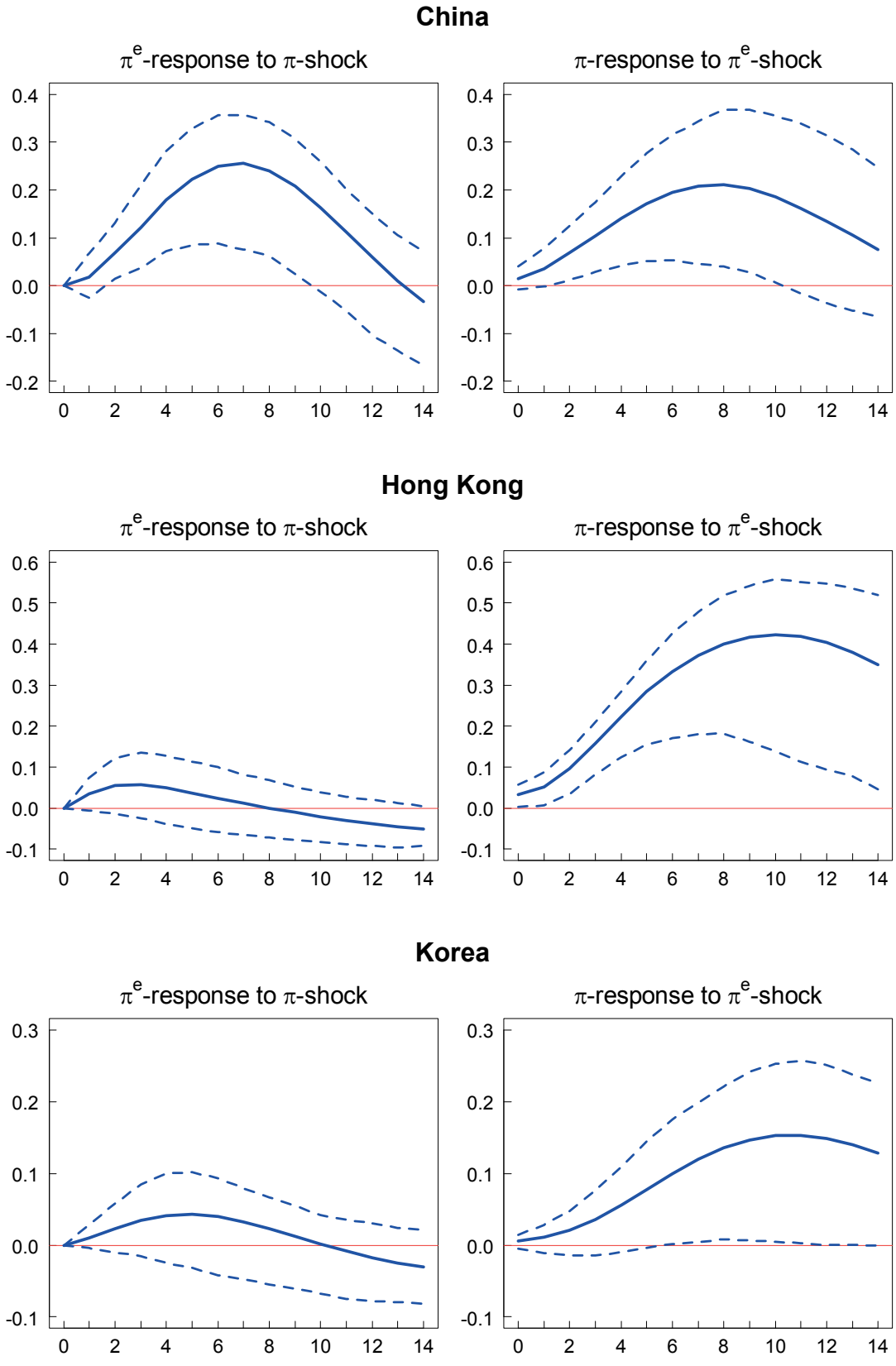
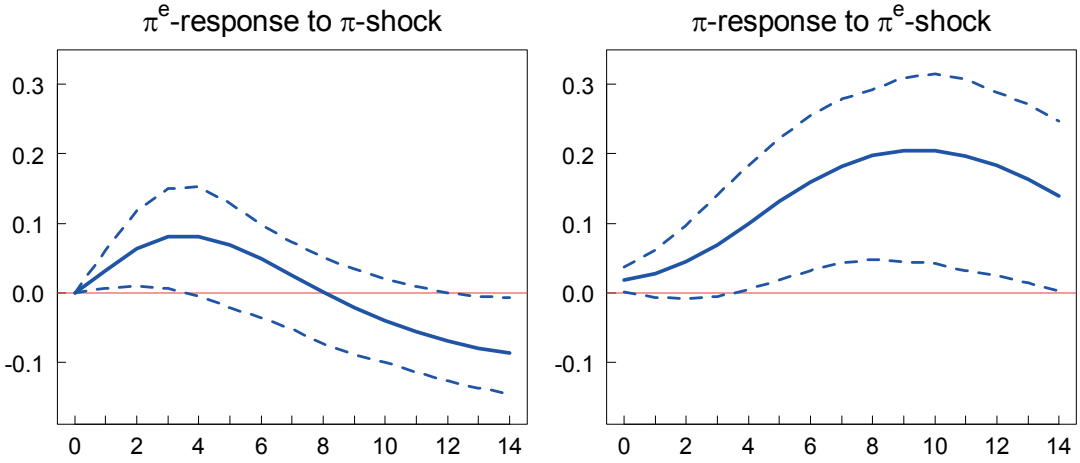


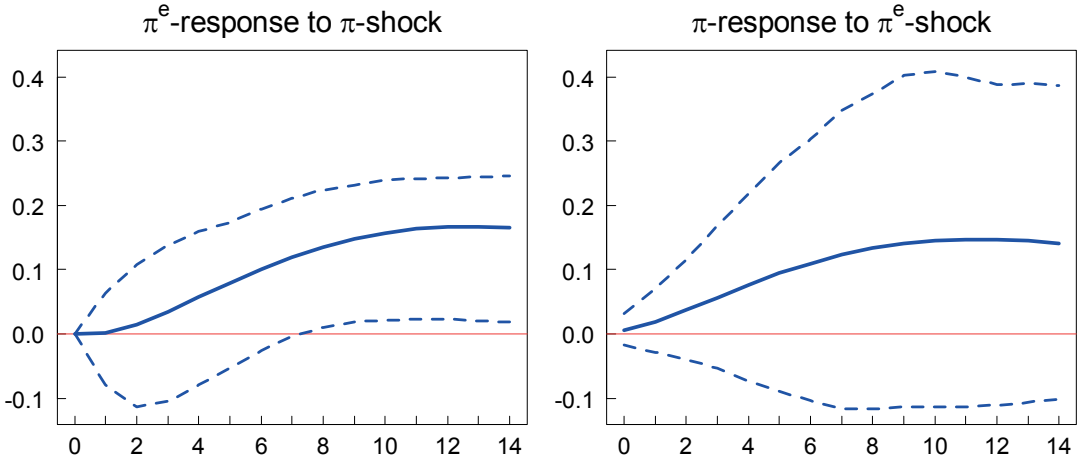
Figure A5

Impulse responses (cont)

Taiwan



India



Bangladesh

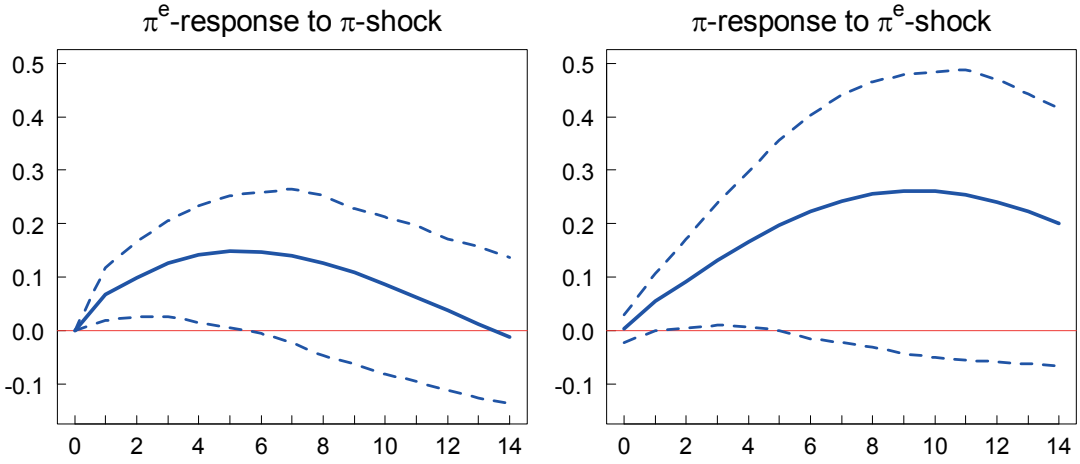
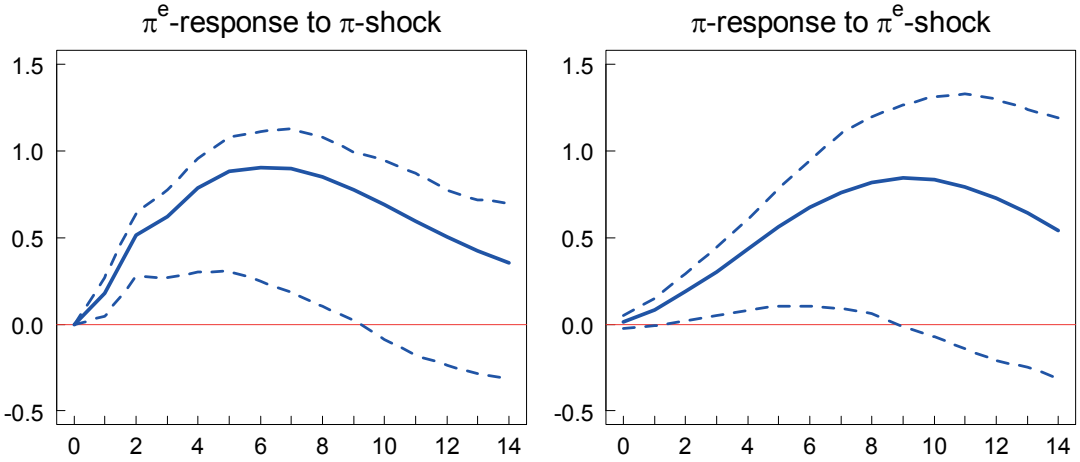


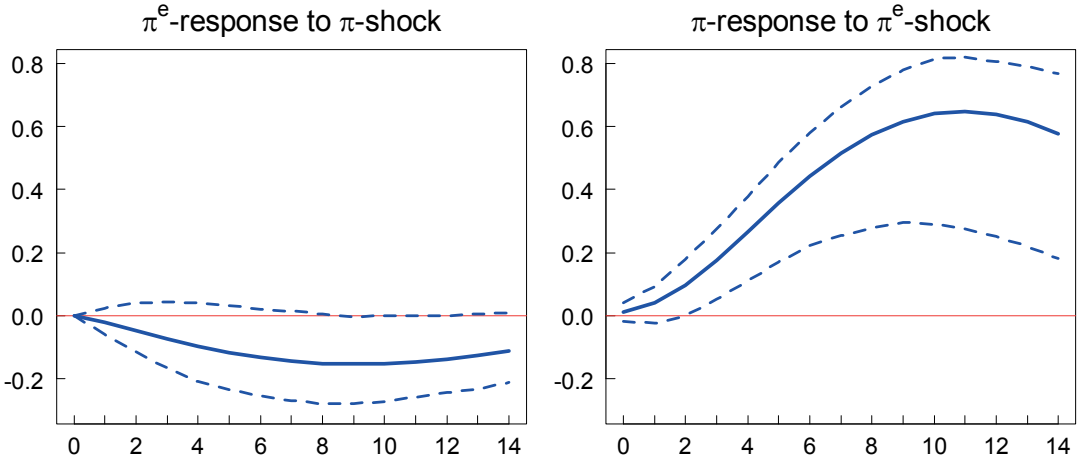
Figure A5

Impulse responses (cont)

Sri Lanka



Indonesia



Malaysia

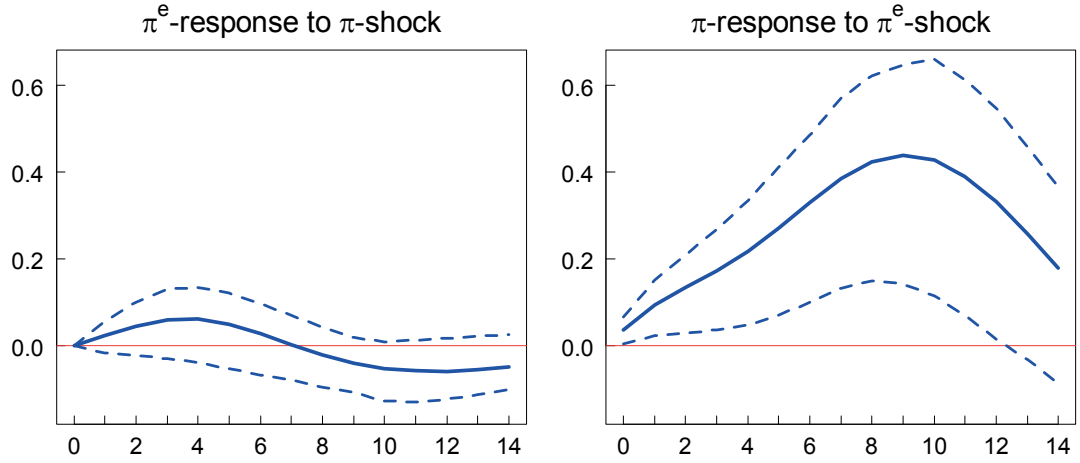
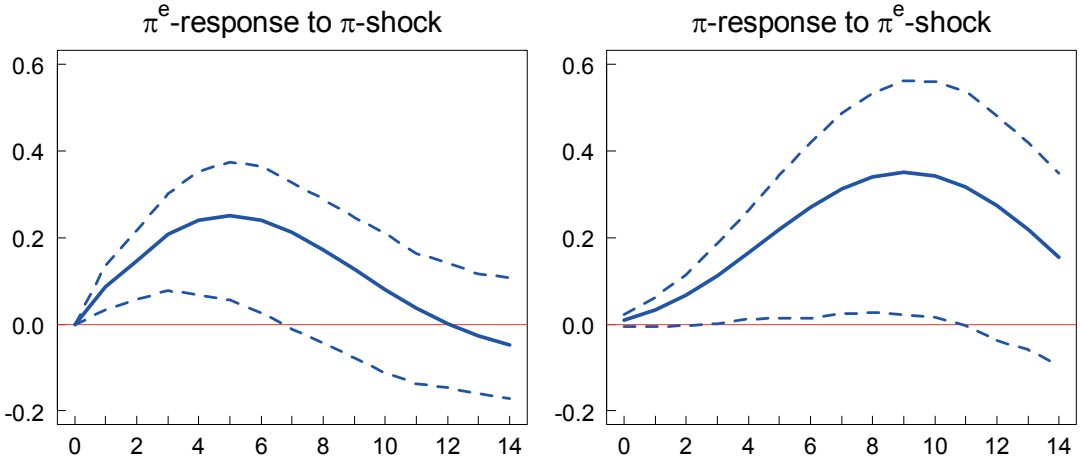


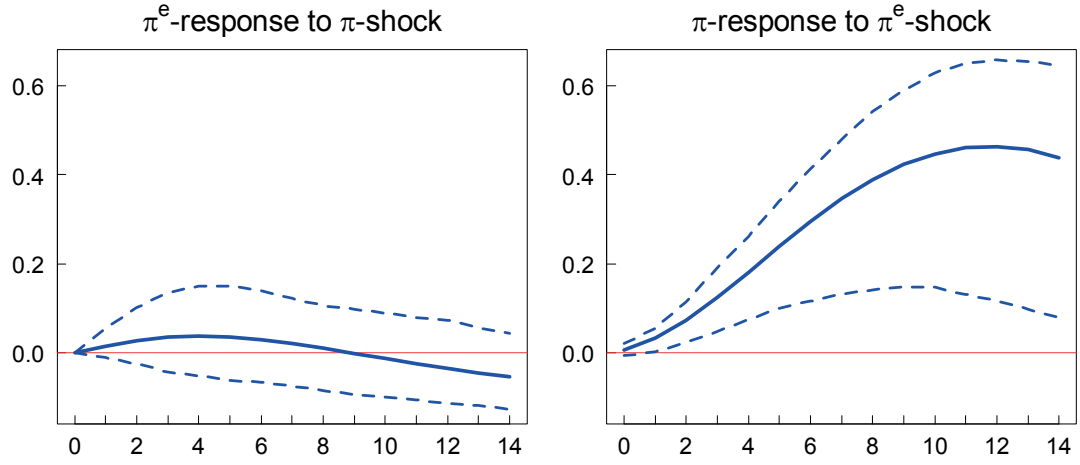
Figure A5

Impulse responses (cont)

Philippines



Singapore



Thailand

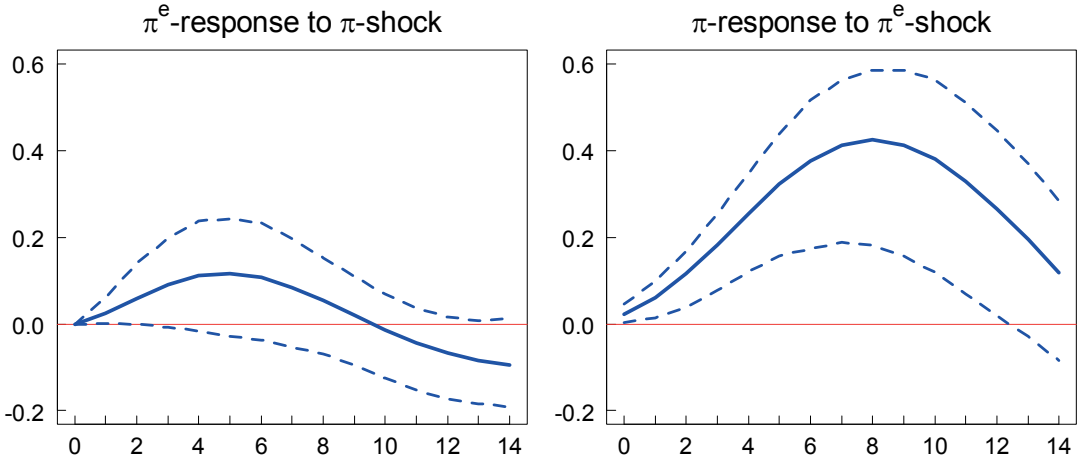
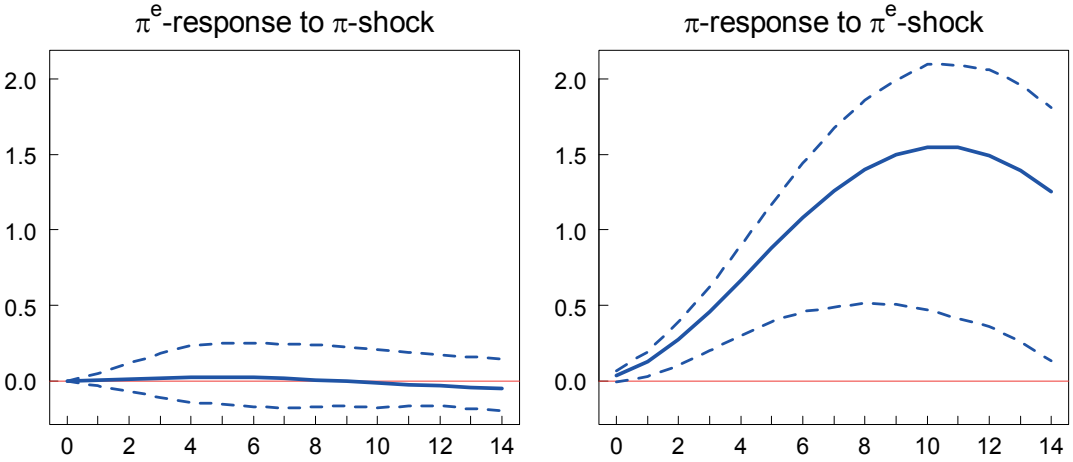


Figure A5

Impulse responses (cont)

Vietnam



Note: The dotted lines represent 95% bootstrap confidence intervals for the orthogonal impulse response function.

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Session 3

Understanding commodity price cycles in emerging Asia and their implications for monetary policy

Understanding commodity price cycles in emerging Asia and their implications for monetary policy

Rhys Mendes[1]

Many of the old-guard inflation targeting (IT) central banks benefitted from being able to build credibility in the relatively tranquil environment of the Great Moderation. That is not to say it was easy. But, all else equal, the relative stability of the global economy and commodity prices in the 1990s was advantageous. Newer members of the IT club – many of them emerging market economies (EMEs) in Asia and the Pacific region – do not have that luxury.

In recent years, commodity prices have increased rapidly and persistently. Since 2002, prices for metals and grains have more than doubled, while crude oil prices have almost quadrupled. Volatility has also been elevated, reaching IT-era, though not historic, highs (Group of Twenty, 2011). This has provoked a debate about the design of monetary policy frameworks: should central banks target core or headline CPI inflation rates?

Some have argued that central banks should target what they can hit. That is, central banks should target measures of core inflation. For example, the IMF (2011) has suggested that focusing on core inflation may ease the process of building monetary policy credibility in economies with high food shares in their consumption baskets and low initial credibility. Others have argued that persistent shifts in commodity prices have undermined the usefulness of core measures as indicators of underlying inflation (McCauley, 2007).

The papers in this session make both theoretical and empirical contributions to this debate. Both papers conclude that headline inflation targeting is more likely to be optimal in emerging market economies than in advanced economies.

Changyong Rhee and Hangyong Lee argue that inflation expectations are likely to be more sensitive to headline inflation in economies with high food shares and low monetary policy credibility. Their paper attempts to draw lessons from the behaviour of inflation. Among other things, they examine pass-through from commodity prices to core inflation and the extent to which headline inflation reverts to core. Rhee and Lee conclude that their results favour headline inflation targeting in Asian EMEs. Their conclusion, however, is based on reduced-form evidence on inflation dynamics. While this is a useful starting point, it can be a misleading guide to policy design. In particular, the conduct of monetary policy can have a profound impact on inflation dynamics.

For example, measured exchange rate pass-through has declined in many countries. These changes coincided with changes to the conduct of monetary policy which led to both lower inflation rates and more aggressive policy responses to deviations of inflation from target. As Devereux and Yetman (2010) have pointed out, lower inflation rates naturally lead to longer price contracts and thus slower pass-through. In a similar vein, Murchison (2009) notes that more aggressive policy reduces the persistence of the impact of shocks on marginal cost, thus reducing pass-through to prices. Similar considerations may also affect pass-through from commodity prices to core inflation.

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[1] Director of Policy Analysis, International Economic Analysis Department, Bank of Canada. The views expressed herein are those of the author. No responsibility for them should be attributed to the Bank of Canada.

Evidence also suggests that the policy regime can influence measured inflation persistence. In Canada, quarter-over-quarter inflation went from being highly persistent in the 1980s to exhibiting virtually no persistence at all in the IT era (Mendes and Murchison, 2010). Other countries have also experienced significant declines in inflation persistence. One reason for the apparent declines is that inflation persistence is not always measured under a stable regime with a clearly defined nominal anchor – when it is, it appears to be lower (Benati, 2008). Another reason is that as IT regimes acquire credibility, price-setters' forecasts of inflation rely less on lagged inflation and more on the target itself. Amano, Mendes and Murchison (2009) show that this type of behaviour can be optimal and it can have a significant impact on inflation dynamics. Such considerations complicate the headline versus core debate by diluting the information value of reduced-form empirical results.

This suggests that the burden of proof must be borne, to a greater extent, by theory and structural models. Paolo Pesenti's paper shows that the theoretical case for core targeting is weaker for EMEs than it is for advanced economies. In particular, headline targeting may be superior in economies with sufficiently high exchange rate pass-through to import prices – a condition more likely to be met in EMEs.

However, even in cases in which headline targeting is optimal in principle, it is difficult to completely abandon core in practice. Inflation targeting is inherently forward-looking. Most central banks have a target horizon of about two years. There are two main reasons for this: (i) monetary policy impacts the real economy and inflation with a lag, and (ii) looking through high-frequency variations in inflation reduces the volatility of the policy instrument and the real economy.

Thus, in order to target headline inflation, it is necessary to forecast headline inflation – both the core and non-core components. But it is notoriously difficult to forecast the commodity prices that dominate the non-core component. For example, futures markets have been forecasting fairly stable oil prices for 10 years – and they have been wrong for 10 years. This poor forecasting record does not reflect any shortcomings on the part of market participants; rather, it is merely a symptom of how difficult it is to beat a random walk forecast of oil prices at horizons of more than a few quarters (Alquist, Kilian and Vigfusson, forthcoming).

Given the inherent difficulty of forecasting the non-core component of inflation, even a committed headline targeter must concede some role for core inflation. Specifically, a measure of core inflation that captures underlying inflation pressures is likely to be useful as an operational guide to help a central bank achieve its headline target.

As a practical matter, this type of approach to targeting headline inflation is often not all that different from targeting core. A difference emerges only in the event that a divergence between core and headline is *expected* to persist beyond the normal monetary policy horizon. That is, that the central bank believes *ex ante* that headline will not converge to core over the normal horizon. But, given the difficulty of beating random walk forecasts for commodity prices, such situations are very rare. Indeed, even at the height of the pre-crisis commodity boom, headline inflation expectations in IT countries remained largely in check (Lavigne, Mendes and Sarker, 2012). So, while the debate rages on, best practice inflation targeting will likely continue to involve the co-existence of headline and core measures of inflation.

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Commodity price movements and monetary policy in Asia

Changyong Rhee[1] and Hangyong Lee[2]

Abstract

Emerging Asian economies typically have high shares of food in their consumption baskets, relatively low monetary policy credibility, and aggressive fiscal interventions in response to rises in international food and energy prices. Under these circumstances, we argue that targeting headline rather than core inflation would be better in the conduct of monetary policy in these economies. We also examine the inflation dynamics associated with commodity price changes in Asian countries.

Keywords: headline inflation, core inflation, monetary policy

JEL classification: E31, E52, E58

[1] Asian Development Bank.

The views expressed in this document are those of the authors and do not necessarily reflect the views and policies of the Asian Development Bank, or its Board of Governors, or the governments they represent.

[2] Hanyang University.

International commodity prices rose substantially during the 2003–08 period, fell briefly during the Great Recession, and surged again in 2010 and 2011 to the level of the mid-2008 peak. Rapid increases in commodity prices have created tremendous adverse social and economic impacts in emerging market economies in Asia. In particular, the surge in food and energy prices has posed a significant challenge to central banks in stabilising inflation. This challenge may be more critical in emerging market Asian countries where the share of food in consumption baskets is higher and monetary policy credibility is lower.

From the standpoint of the central banks in these countries, therefore, one of the most important policy issues is how to adjust monetary policy in response to changes in food and energy prices. In this respect, we revisit the issue of which inflation measure (core inflation or headline inflation) a central bank should target in emerging market Asian countries. Against the standard view which advocates core inflation targeting, we attempt to point out several factors that may lead to the conclusion that headline inflation targeting is more useful. We also examine the inflation dynamics associated with commodity price changes in Asian countries.

1. Should monetary policy target core inflation in Asia?

1.1 Standard view

Standard advice is to allow for the first-round effects of commodity price increases on headline inflation, but not the second-round effects (ie through wages and core prices). Because the headline measure of inflation includes temporary and volatile food and energy items, it does not necessarily reflect underlying inflation. Consistent with the standard advice, IMF (2011) states that, because shocks to commodity price inflation are typically beyond the control of policy makers, are hard to predict, and often not sustained, central bankers are generally better off setting and communicating their monetary policy in terms of underlying inflation (core inflation) rather than headline inflation.

If central banks are concerned with the underlying inflation and core inflation is a reliable proxy for underlying inflation, targeting core inflation can help prevent central banks from overreacting to temporary fluctuations in inflation. In this sense, at least in advanced countries, targeting core inflation seems to be appropriate in the conduct of monetary policy.

The standard view is also confirmed in several theoretical studies. In a two-sector dynamic general equilibrium model, Aoki (2001) shows that the optimal monetary policy is to target sticky-price inflation (core inflation) rather than a broad inflation measure in order to achieve the socially optimal allocation of resources. Bodenstein, Erceg, and Guerrieri (2008) also set up a DSGE model with an energy sector to find that a policy of stabilising core inflation rather than headline inflation more closely resembles the optimal policy.

1.2 Modifications

Although the standard view is plausible in advanced countries, it is not clear that a central bank should target core inflation in emerging Asian country. In emerging Asian countries, the share of food in consumption baskets is high, reaching 50% or more in some countries.[3] Thus, food price inflation may have a larger direct effect on headline inflation. In addition, monetary policy credibility is, in general, low in these countries. Under these circumstances,

[3] The share of food in the consumption basket is 58.84% in Bangladesh, 46.71% in Sri Lanka, 44.78% in Cambodia, 39.93% in Vietnam, 39.0% in the Philippines.

higher food price inflation and the resulting higher headline inflation are more likely to lead to an increase in inflation expectations, which may further increase the inflation rate.

First, in many developing countries, core and headline inflation are not differentiated. In fact, headline inflation numbers are more commonly watched. Because the general public is aware of headline inflation, their inflation expectations are adjusted based on these numbers. Any upward movement in food prices raises headline inflation, even though core inflation remains unchanged. Such may be seen by the general public as an inability by the central bank to anchor inflation expectations, and may further contribute to lowering the credibility of the central bank in implementing monetary policy. These circumstances raise the question of whether targeting core inflation is desirable in emerging Asian countries.[4]

Second, rapidly rising food prices are not just a macroeconomic problem but, by influencing poverty levels, are also a political challenge for developing countries. As the poor spend large fractions of their income on food, recent surges in food prices have pushed more people into poverty. According to ADB estimates based on the $1.25 a day poverty line, a 10% increase in domestic food prices will increase the number of poor in developing Asia by more than 60 million and by close to 200 million if the prices were to shoot up by 30%. High prices thus weaken poverty reduction, exacerbate income inequality and weaken social cohesion (Jha and Rhee (2012)).

Meanwhile, an interesting finding from the recent food price inflation in Asian countries is that the effect of international food price changes on domestic food price inflation is relatively muted, suggesting a limited pass-through.[5] Figure 1 shows that the changes in domestic rice and wheat prices are much lower than the changes in international prices. Local food prices would have been higher in the absence of aggressive fiscal interventions such as higher subsidies and lower taxes and tariffs on food that Asian governments implemented in the wake of the food price spikes.

This means that, in emerging countries, policy responses to rising prices involve a combination of fiscal and monetary policy. Fiscal policy measures, in effect, have implications for monetary policy. Consider a country that provides subsidies to keep domestic grains prices at a certain level. If that country's central bank uses core inflation targeting, a large hike in headline inflation due to rising grains prices will require a significant amount of subsidy to stay within the core inflation target. However, if the central bank policy is headline inflation targeting, then movements in headline inflation due to food price increases will require smaller fiscal costs. Alternatively, in case food prices fall, missing the inflation target will not affect the central bank's reputation. So it does not really matter whether core or headline inflation is targeted.

These observations underscore the fact that the situation in developing countries is not very well captured by traditional models, in terms of both monetary policy credibility and the optimal mix of fiscal and monetary policy.

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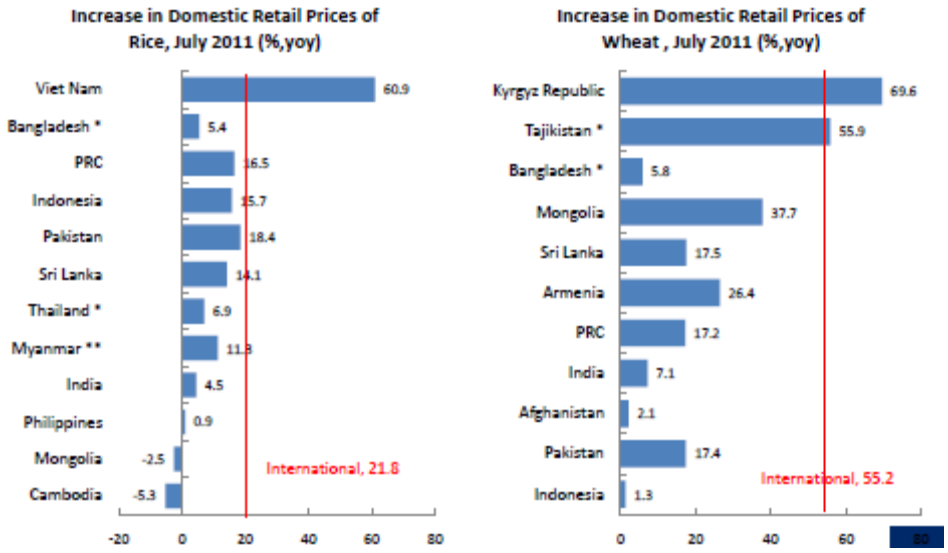
[4] Anand and Prasad (2010) argue that headline inflation targeting is better in a New Keynesian model with an incomplete financial market. As they point out, households are more likely to be credit-constrained in emerging Asian countries.

[5] Domestic production of food can also partially explain the incomplete pass-through.

Figure 1

Changes in domestic retail food prices



Note: * June 2011; ** May 2011.

Source: ADB staff calculations.

2. Inflation dynamics and food price in Asia

In this section, we test the premise of the traditional argument for core inflation targeting. We assume that food price increases are temporary, and do not permanently affect core inflation. As a test for pre-conditions for core inflation targeting, we compare the impacts of commodity price swings on inflation dynamics across Asian countries. Specifically, we address the following two questions: (i) to what extent the international commodity price changes spilled over into domestic food price changes? and, how the changes in domestic food prices affect core inflation over time? (ii) is headline inflation reverting to core inflation or vice versa?

To analyse these aspects of inflation dynamics in Asian countries, we define core inflation as headline CPI inflation net of food and energy components.[6] The sample period is maximally from January 2000 to December 2011, but shorter for some countries due to lack of data. We present our preliminary results below.

2.1 Pass-through

First, we estimate the degree of pass-through from international food price changes to domestic price changes (pass-through I).[7] Then, we examine the pass-through from domestic food price changes to core inflation (pass-through II). The regression equation is as follows:

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[6] Following the Classification of Individual Consumption by Purpose (COICOP) by the UN Statistics Division, we use COICOP 01 for food prices and COICOP 04.5 plus COICOP 07.2.2 for energy prices. However, because data for energy prices are not consistent for most of the Asian countries, we use the closest available data for these countries.

[7] We report the estimation results only for food prices because energy prices are not consistently compiled in some countries.

$$\pi(t) = \alpha + \sum_{K=0}^{S} \beta_K \pi^*(t-k) + \sum_{K=1}^{S} \beta_K \pi(t-k) + e(t),$$

Where $\pi(t)$ is the domestic food price inflation rate for pass-through I or the core inflation rate for pass-through II. $\pi^*(t)$ denotes the changes in international food price index (in domestic currency) compiled by IMF for pass-through I or the domestic food price inflation rate for pass-through II, respectively. To control for the seasonal fluctuations in food prices, we include monthly seasonal dummies in the regressions. Controlling for the lagged dependent variables, if the sum of the coefficient estimates on current and lagged π^* is significantly different from zero, we may conclude that international food prices have spilled over into domestic food prices (pass-through I) and domestic food prices have affected core inflation (pass-through II).

Table 1

Pass-through (S=12months)

	Pass-through I	**Pass-through II**
Japan	0.059 (0.171)	0.129 (0.577)
Korea	0.154 (0.082)	0.068 (0.286)
Hong Kong SAR	0.129 (0.065)	0.770 (0.055)
Singapore	0.051 (0.295)	-0.233 (0.305)
Philippines	0.049 (0.325)	0.444 (0.001)
Thailand	0.174 (0.034)	0.143 (0.019)
Malaysia	0.155 (0.011)	0.388 (0.052)
India	-0.024 (0.834)	0.177 (0.408)
Pakistan	0.431 (0.014)	0.316 (0.019)
Bangladesh	0.132 (0.314)	0.156 (0.292)
Sri Lanka	0.236 (0.089)	0.634 (0.048)

Note: Numbers in parentheses are p-values for Chi-square tests.

The estimation results in Table 1 shows that the degree of pass-through from international food prices to domestic food prices are low in Asia, consistent with Figure 1 and IMF (2011). The size of the pass-through from domestic food prices to core inflation varies across countries, as Sri Lanka and Philippines show larger effects while Japan and Korea exhibit smaller effects. Notably, a country with statistically significant pass-through I also tends to have statistically significant pass-through II.

2.2 Is headline inflation reverting to core inflation or vice versa?

Next, we attempt to test whether the headline inflation tends to revert to core inflation in the medium run. The reversion of headline towards core inflation implies that changes in food and energy prices are temporary and do not lead to persistent changes in core inflation, justifying core targeting in the conduct of monetary policy. We estimate the following equation:

$$\pi^{headline}(t+k) - \pi^{headline}(t) = \alpha + \beta\left[\pi^{headline}(t) - \pi^{core}(t)\right] + e(t+k)$$

In contrast, following Cecchetti and Moessner (2008), we also test whether core inflation is reverting to headline inflation by estimation of the following equation.[8]

$$\pi^{core}(t+k) - \pi^{core}(t) = \gamma + \delta\left[\pi^{headline}(t) - \pi^{core}(t)\right] + e(t+k)$$

The convergence of core inflation towards headline inflation is consistent with second-round effect as higher food and energy prices cause higher inflation expectation and thus higher core inflation.

Table 2 shows that headline inflation is not reverting to core inflation in some countries, yet core inflation tends to converge to headline inflation. This finding suggests that, in some countries, second-round effects through inflation expectations prevail in inflation dynamics and thus targeting core inflation may not be appropriate in the conduct of monetary policy.[9]

Table 2

Reversion of headline (core) towards core (headline) inflation (k=12 months)

	Reversion of headline towards core		**Reversion of core towards headline**	
	α	β	γ	δ
Japan	-0.018 (-0.23)	-0.908 (-4.94)***	-0.005 (-0.07)	0.285 (1.44)
Korea	0.025 (0.43)	-1.329 (-9.91)***	0.005 (0.09)	-0.189 (-1.82)*
Hong Kong SAR	0.011 (0.05)	0.679 (1.06)	-0.096 (-0.50)	1.940 (3.05)***
Singapore	0.038 (0.22)	-0.341 (-1.94)*	-0.101 (-0.45)	0.586 (2.95)***
Philippines	-0.050 (-0.31)	-0.436 (-1.46)	-0.134 (-0.92)	0.650 (2.35)**
Thailand	-0.306 (-1.97)*	-1.208 (-5.56)***	-0.059 (-0.94)	-0.268 (-1.94)*
Malaysia	0.236 (1.21)	-2.214 (-8.18)***	0.152 (1.13)	-0.939 (-7.23)***
India	-0.247 (-0.56)	-0.897 (-2.84)***	0.201 (0.67)	0.262 (0.90)
Pakistan	-0.829 (-3.70)***	-1.158 (-8.28)***	0.142 (1.09)	0.115 (0.96)
Bangladesh	-0.390 (-1.91)*	-0.692 (-4.77)***	0.109 (0.84)	0.146 (1.35)
Sri Lanka	0.121 (0.29)	-0.129 (-0.56)	-0.969 (-2.00)**	1.059 (3.99)***

Note: Numbers in parentheses are *t*-values. ***, **, * denote that the coefficient estimate is statistically significant at 1%, 5%, 10% level.

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[8] If β=-1, headline inflation is fully reverting to core inflation and if δ=0, core inflation is not reverting to headline inflation.

[9] We also find that food price inflation is more persistent than core inflation in Philippines, Malaysia, Indonesia, Bangladesh and Sri Lanka, suggesting that food price inflation is not temporary. In these countries, therefore, persistent changes in food prices are more likely to affect inflation expectations over the longer horizon and to create second-round-effects, thus complicating the task of core inflation targeting.

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Theoretical notes on commodity prices and monetary policy[1]

Paolo Pesenti[2]

Abstract

These notes provide a non-technical introduction to recent models of monetary policy response to commodity price shocks, with emphasis on the choice between targeting the headline consumer price index vs. a measure of core prices, and the reaction to global sources of inflation when inflexible exchange rate regimes represent a source of distortion in world commodity markets.

Keywords: commodity prices, core and headline inflation, monetary policy

JEL classifications: F42, E52

[1] Thanks to Bianca De Paoli for helpful comments and suggestions. The views expressed here are those of the author, and do not necessarily reflect the position of the Federal Reserve Bank of New York, the Federal Reserve System, or any other institution with which the author is affiliated.

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The purpose of these notes is to provide a non-technical introduction to recent models of monetary policy response to commodity price shocks. The emphasis in what follows is on the choice between targeting the headline consumer price index or rather a measure of "core" prices that excludes specific products like food and energy.

In this regard, the conventional wisdom is well summarised in a recent chapter of the IMF's World Economic Outlook that is revealingly entitled "Target what you can hit: Commodity price swings and monetary policy".[3]

Quoting directly from the report: "Because shocks to commodity price inflation are typically beyond the control of policymakers, hard to predict, and often not sustained, central banks seeking to establish credibility are generally better off setting and communicating their monetary policy in terms of underlying inflation rather than headline inflation. A headline framework may be preferred, however, if economic agents place a much higher value on the stability of headline inflation than on the stability of output."

The case for targeting core (or "underlying") inflation typically emphasises the low predictability of commodity price swings (thus the difficulty of controlling overall inflation); the long and variable monetary policy lags (such that, by the time the monetary stance is transmitted to the economy, the original shocks may have already dissipated); the nominal inertia characteristic of core prices dynamics (because of which monetary policy responses to transitory commodity price shocks have long-lasting distortionary effects on the rest of the economy, even after the original disturbances have retracted). In the simplest possible terms, the rationale for core targeting may be articulated in terms of the macroeconomic impact of this policy strategy on the national product and labour markets. In what follows we revisit the foundations of the choice-theoretic canonical model with the help of an extremely stylised, yet surprisingly insightful, algebraic and graphical apparatus.[4]

Consider the vantage point of a monetary authority unable (or unwilling) to commit to a policy rule in a commodity-importing country facing inflationary shocks. There are two kinds of consumption goods, "core" and "commodities". C is the aggregate consumption of both core goods and commodities. P is the headline price index, defined as an average of core prices, denoted P_H, and commodity prices, denoted P_F. Assuming unit elasticity of substitution between core goods and commodities[5], and defining as γ the share of core goods in consumption, we can write the consumer price index P as:

$$P = P_H^{\gamma} P_F^{1-\gamma}$$

Core goods are produced domestically with labour effort ℓ. They are either consumed locally or exported abroad in exchange for imported commodities. So in equilibrium ℓ can be "transformed" into consumption C according to the formula:

$$C = Z\ell$$

where Z is an index of relative import prices, that is, a measure of the country's terms of trade (TOT for short):

$$Z = (P_H / P_F)^{1-\gamma}$$

[3] International Monetary Fund (2011), Chapter 3.

[4] The model builds on Corsetti and Pesenti (2008), to which the reader is referred for details.

[5] This particular parameterisation is analytically convenient, even though a more realistic value for this elasticity would be well below one.

Graphically, Figure 1 summarises the macroeconomic equilibrium relations of the model as drawn in the consumption-labour (or consumption-output) space. In the figure, expression $C = Z\ell$ is a ray from the origin with slope Z. A deterioration of TOT tilts the ray downward: households need to work more to get the real income that finances the same level of consumption. From this point of view, a deterioration of TOT is isomorphic to a productivity shock.

Define now μ as the monetary stance of the country, a function of current and expected future short-term interest rates. The monetary authority controls nominal spending, so that:

$$\mu = PC$$

In Figure 1, the equation above is a horizontal line with intercept μ / P. Consumption increases when either nominal spending increases or prices fall.

Households like consumption C and dislike labour effort ℓ. The representative household's utility is:

$$U = \ln C - \ell$$

Accordingly, in Figure 1, there is a map of (negatively sloped) indifference curves. Welfare increases when we move North-West.

The initial equilibrium is represented in Figure 1 at point O. The starting allocation is characterised by full employment, and output is at its potential level $\overline{\ell}$.

As mentioned above P_F is the price of imports in terms of domestic currency. By assumption, there are no nominal rigidities in the imports (commodities) sector. Upward shocks to P_F, reflecting hikes in the prices of oil, energy, food, and other commodities, increase the price level P thus reduce the purchasing power of any given level of nominal wealth or income, and worsen the terms of trade Z.

Different from import prices, domestic prices are subject to nominal rigidities. P_H is partially sticky (with coefficient $1-\alpha$) and partially flexible (with coefficient $\alpha < 1$). The sticky component is predetermined, as it reflects past pricing decisions. The flexible component responds instead to current monetary policy, say:

$$\ln P_H \propto \alpha \log \mu + (1-\alpha) \log P_{H,-1}$$

We can summarise the above model by denoting $\widehat{X}$ as the log-deviation of any variable X from its initial equilibrium. For small shocks over the short run, the model is:

$$\hat{C} = \hat{\mu} - \hat{P}$$

$$\hat{\ell} = \hat{C} - \hat{Z}$$

$$\hat{P} = \gamma \widehat{P_H} + (1-\gamma)\widehat{P_F}$$

$$\hat{Z} = (1-\gamma)(\widehat{P_H} - \widehat{P_F})$$

$$\widehat{P_H} = \alpha \hat{\mu}$$

$$\widehat{P_F} > 0$$

Consider now the behaviour of the monetary authorities, focusing on *discretionary responses* to temporary commodity price hikes. The domestic policymakers can choose among two different monetary strategies: target core prices and stabilise P_H or target headline prices and stabilise P. As an important caveat, the policy strategies considered here are not policy rules under commitment, and the shocks under consideration are always inflationary

(positive innovations $\widehat{P_F} > 0$). Many features of this policy evaluation exercise can be extended to ex ante rules in response to commodity price volatility, but such extension is not automatic.

Under core targeting the monetary authorities choose $\hat{\mu}$ such that $\widehat{P_H} = 0$. Of course, this implies $\widehat{P_H} = \alpha\hat{\mu} = 0$: the monetary stance is unchanged, and there is no reaction to a commodity price shock. The headline CPI increases as the monetary authority tolerates (temporarily) higher headline inflation $\hat{P} = (1-\gamma)\widehat{P_F} > 0$. Consumption and real spending fall due to higher prices: $\hat{C} = -\hat{P} = -(1-\gamma)\widehat{P_F} < 0$. The terms of trade deteriorate as households pay more for their imports: $\hat{Z} = (1-\gamma)(\widehat{P_H} - \widehat{P_F}) = -(1-\gamma)\widehat{P_F} < 0$. Crucially, there is no change in domestic labour market conditions: output remains at its potential, full employment level: $\hat{\ell} = \hat{C} - \hat{Z} = -(1-\gamma)\widehat{P_F} + (1-\gamma)\widehat{P_F} = 0$. The new equilibrium is plotted in Figure 2, as the economy moves downward from O to C.

Under headline targeting the monetary authority does not tolerate higher CPI inflation, so core prices need to fall and offset the increase in commodity prices leaving $\hat{P} = \gamma\widehat{P_H} + (1-\gamma)\widehat{P_F} = 0$. Thus, the monetary stance contracts to bring down core prices. The more sticky are core prices (the lower is α), the more contractionary is the monetary stance:

$$0 = \gamma\alpha\hat{\mu} + (1-\gamma)\widehat{P_F} \Rightarrow \hat{\mu} = -\frac{1-\gamma}{\gamma\alpha}\widehat{P_F} < 0$$

Consumption and real spending fall due to lower nominal spending. Note that they fall by more than under core targeting: $\hat{C} = -(1-\gamma)\widehat{P_F} / (\gamma\alpha) = \hat{\mu} - \hat{P} < 0$. The terms of trade deteriorate because both import prices increase and core (and export) prices fall. As a result, TOT deterioration is worse than under core targeting: $\hat{Z} = (1-\gamma)(P_H - P_F) = -(1-\gamma)\widehat{P_F} / \gamma < 0$. The fall in consumption leads to a fall in demand for labour effort. Also, as terms of trade deteriorate, households need to work more to maintain the same level of consumption. With sticky prices ($\alpha < 1$) the first effect prevails upon the second, and labour effort falls below full employment level:

$$\hat{\ell} = \hat{C} - \hat{Z} = -\frac{1-\gamma}{\gamma}\left(\frac{1}{\alpha} - 1\right)\widehat{P_F} < 0$$

In Figure 2 the economy moves from O to H. Point H lies below and to the left of C.

To recapitulate: under core targeting, consumption falls a bit, headline inflation increases a bit, but output remains at potential; under headline targeting, consumption falls a lot, headline inflation does not change, output falls below potential.

Which policy response provides a better outcome?

There is an obvious welfare metrics, ie the utility of the representative household. Normalising full-employment output $\bar{\ell}$ to one, we can write:

$$dU = \frac{dC}{C} - \bar{\ell}\frac{d\ell}{\ell} = \hat{C} - \hat{\ell} = \hat{Z}$$

so that the deterioration of the terms of trade provides an appropriate measure of social welfare loss. The caveat here is that the focus in this analysis is on an *ex-post* measure of welfare, assessed after the inflationary shock has materialised, and taking previous pricing decisions (reflecting market expectations) as given.

In this case, under core targeting the terms of trade worsen by:

$$\hat{Z} = -(1-\gamma)\widehat{P_F}$$

and under headline targeting the terms of trade worsen by:

$$\hat{Z} = -\frac{(1-\gamma)}{\gamma}\widehat{P_F}$$

Unambiguously, TOT fall more under headline than core targeting. In welfare terms, households are better off under core targeting (as some increase in leisure under headline targeting does not compensate for the larger fall in consumption).

Is there a case for headline targeting at all? The analysis above, focused on the role of the terms of trade as a synthetic measure of social welfare, suggests that headline targeting may be the appropriate discretionary response to unexpected *reductions* in commodity prices, opening the intriguing possibility that the appropriate monetary strategy may be an asymmetric response to commodity price hikes and falls.

For a different approach, in the Appendix below we consider a variant of the previous model. The main result of this variant, in a nutshell, is that when exchange rate pass-through to import prices is sufficiently high relative to domestic price (wage) rigidities, there may be a case for responding (discretionally) to commodity price hikes by stabilising headline rather than core prices. To the extent that open emerging market (EM) economies are more likely to meet these requirements, headline targeting may end up providing a more appropriate policy response in these countries than in advanced economies.

In the recent literature, this line of thought is the analytical underpinning of more sophisticated refinements and model extensions that use a theoretical framework whose kernel is similar to our previous model. Two papers are worth mentioning in particular.

Anand and Prasad (2010) consider a model with financial frictions: consumers are credit-constrained, demand is insensitive to interest rate fluctuations, and determined by real wages which depend on prices in the flexible price sector (commodities). The central bank finds it appropriate to stabilise price movements in the flexible price sector, by adopting a flexible headline inflation targeting regime. According to the authors, these results are "particularly relevant for emerging markets, where the share of food expenditures in total consumption expenditures is high and a large proportion of consumers are credit-constrained".

Catão and Chang (2010) argue that a broad CPI targeting strategy is welfare-superior to alternative policy rules once the variance of food price shocks is appropriately accounted for. This is because TOT and real exchange rate move in opposite directions: food price shocks reduce TOT but, different from the canonical model, increase the cost of home consumption relative to abroad.

A more complex variant of the core versus headline targeting dilemma emerges in a multi-country setting. Let's return to the original vantage point of an advanced economy facing commodity price shocks. Underlying the model above was the implicit notion that commodity price shocks reflect fundamental factors, say growing commodity-intensive consumption of EM populations facing supply bottlenecks as the existing investment in infrastructure to supply commodities is inadequate to keep pace with growth in demand. In this case there are frequent commodity price spikes as demand must be rationed given constrained supply. Also, the underlying demand/supply factors abroad are independent of the monetary policy undertaken in the advanced economy.

But what would happen if excess demand in commodity markets reflected an excessively expansionary global policy stance, under the assumption that the commodity-exporter countries are unable or unwilling to adjust exchange rates and tackle inflation?

Consider the following thought experiment. Assume the world economy consists of two countries, US and THEM. US (not necessarily the United States) exhibits relatively slow growth, sluggish demand, a sizable output gap, low capacity utilisation, and is a net importer of commodities. In contrast, THEM (Truly Hot Emerging Markets...) is characterised by no labour market slack and a zero output gap. Most crucially, THEM produces and exports commodities, under a regime of limited exchange rate flexibility against US.

Under these assumptions, if US adopts an expansionary monetary policy to strengthen domestic growth, THEM mimics its policy stance to avoid currency appreciation. In other words, THEM maintains stable exchange rates but imports overheating from US and exports higher food and fuel prices. The resulting global inflation loop may systematically amplify the effects of US monetary policy on US headline inflation.

A policy conflict emerges. The favourite US scenario is one in which exchange rate appreciation in THEM in response to US stimulus reduces global overheating (but THEM bears all adjustment costs in terms of lower export growth and loss of market share). The favourite THEM scenario is such that the removal of monetary accommodation in US – without exchange rate adjustment – reduces global overheating (but US bears all adjustment costs in terms of a higher output gap). The prisoner's dilemma outcome is global overheating with no exchange rate flexibility. A cooperative outcome instead is one in which THEM's exchange rate appreciates and US adopts a less stimulative stance. The increase in THEM net imports generates demand for US goods without overheating the global economy and without upward pressures on commodity prices.

A quantitative illustration of the above scenarios is provided, *mutatis mutandis*, in a set of model-based simulations conducted at the IMF.[6] These simulations abstract from zero bound considerations (so that the "nominal interest rate" is an index of the effective monetary stance), there are no capital controls or trade barriers, and no sterilisation of capital inflows. The highlights from these simulations can be summarised as follows.

In a baseline scenario of transmission under fixed exchange rates, US lowers interest rate by 2.5% in response to a persistent contractionary shock to consumption and investment. This dampens the fall in US output, which goes 1.2% below potential in the year following the shock. THEM maintains a peg against US. Its interest rate falls in tandem with US, and output expands 4.5% above potential. Fast growth in the commodity-intensive THEM country exerts upward pressure on global oil and food prices (up 14% and 5.3% respectively). In the short run, US headline inflation is up 0.4% despite the US slowdown and the fall in US core inflation.

An alternative scenario considers transmission under flexible exchange rates. Now THEM follows an inflation targeting regime and increases its interest rate in response to the US cut in order to avoid overheating.

Relative to the baseline scenario, THEM output expansion is halved, and headline inflation rises by only half as much as under a peg, as oil prices increase by 9% rather than 14%. The effects on US output through reduced demand for exports are small. The effects on core inflation (through dollar depreciation) are also small. In sum, flexible exchange rates are good for US and good for THEM.

Suppose instead that THEM maintains a regime of limited exchange rate flexibility but US responds to both core and non-core price inflation, internalising THEM's lack of policy

[6] IMF (2008), Chapter 3, Box 3.3. The simulations use a five-region version of the IMF-BoC DSGE Global Economy Model, where their analog of the US country represents 21% of the world economy, their analog of the THEM country represents 25% of the world economy, and other three regional blocs make up for the rest of global output.

response and taking account of the effects of its monetary policy on the rest of the world. The US stance is now less accommodative, its interest rate falls 1.5% instead of 2.5% and rapidly goes 0.3% above neutral. The US output gap deteriorates 1.2% more than baseline. But the peak oil price falls to 4% from 14%. Inflation in THEM is much more stable than under the baseline scenario. The drawback is that, according to the simulations, core inflation falls a lot in US. Paradoxically, targeting headline rather than core prices makes headline inflation under headline targeting more volatile than headline inflation under the baseline scenario (as the entire US economy becomes more volatile)!

All these results can be summarised by suggesting that there is a case for core price targeting as best response to swings in commodity prices, although the case for core targeting is stronger in advanced economies than in emerging markets. There is also a (strong) case in favour of global exchange rate flexibility, and the jury is still out on whether there may be a second-best case for reacting to world inflation when inflexible exchange rate regimes represent a source of distortion in global commodity markets.

Appendix

In the model above, commodity price shocks were equivalent to shocks to the domestic price of imports. In contrast, suppose now that monetary policy may affect the domestic price of commodities through its effects on the exchange rate. Recalling the law of one price, we can think of P_F as the product of two components: the price of foreign exports in foreign currency, P_F^*, multiplied by the nominal exchange rate, $\mathcal{E}$.

Assume the equilibrium exchange rate $\mathcal{E}$ is function of the relative (domestic vs. ROW) monetary stance:

$$\mathcal{E} \propto \mu / \mu^*$$

and take the foreign monetary stance as given, so $\widehat{\mu^*} = 0$. Also, assume that in the short run, exchange rate pass-through to import prices may be less than full. Putting all these elements together, we can revisit our model under the new pricing behaviour:

$$\widehat{P_F} = \alpha^* \hat{\mu} + \widehat{P_F^*}$$

Now when μ falls the exchange rate appreciates, reducing the inflationary effects of commodity price hikes. A domestic monetary contraction directly reduces import prices in domestic currency terms and improves TOT.

Under core targeting we have:

$$\widehat{P_H} = \alpha\hat{\mu} = 0$$

$$\widehat{P_F^*} > 0$$

$$\hat{P} = (1-\gamma)\widehat{P_F^*} > 0$$

$$\hat{C} = -\hat{P} = -(1-\gamma)\widehat{P_F^*} < 0$$

$$\hat{Z} = (1-\gamma)(\widehat{P_H} - \widehat{P_F}) = -(1-\gamma)\widehat{P_F^*} < 0$$

$$\hat{\ell} = \hat{C} - \hat{Z} = -(1-\gamma)\widehat{P_F^*} + (1-\gamma)\widehat{P_F^*} = 0$$

In Figure 3, the economy moves from O to C.

Under headline targeting we have instead:

$$\hat{P} = \gamma\widehat{P_H} + (1-\gamma)\widehat{P_F} = 0$$

$$0 = \gamma\alpha\hat{\mu} + (1-\gamma)\left(\alpha^*\hat{\mu} + \widehat{P_F^*}\right) \Rightarrow$$

$$\hat{\mu} = -\frac{1-\gamma}{(1-\gamma)\alpha^* + \gamma\alpha}\widehat{P_F^*} < 0$$

$$\hat{C} = \hat{\mu} - \hat{P} = -\frac{1-\gamma}{(1-\gamma)\alpha^* + \gamma\alpha}\widehat{P_F^*} < 0$$

$$\hat{Z} = (1-\gamma)(\widehat{P_H} - \widehat{P_F}) = -\left[\frac{(1-\gamma)\alpha}{(1-\gamma)\alpha^* + \gamma\alpha}\right]\widehat{P_F^*} < 0$$

$$\hat{\ell} = \hat{C} - \hat{Z} = -\frac{(1-\gamma)(1-\alpha)}{(1-\gamma)\alpha^* + \gamma\alpha}\widehat{P_F^*} < 0$$

From a positive point of view, Figure 3 resembles Figure 2. The economy moves from O to H, consumption falls more under headline targeting than under core targeting, labour effort falls below full employment. But now it is no longer true that the terms of trade fall more under headline targeting than under core targeting. In fact, this depends on whether α is greater than α^* or not. If $\alpha^* < \alpha$ core targeting prevails in welfare terms (as before, when $\alpha^* = 0$). But if $\alpha^* > \alpha$, welfare is higher under headline targeting! In Figure 3, Z falls less under headline targeting than under core targeting. Even though consumption falls more under headline targeting than under core targeting, the terms of trade fall by less: workers in the exportable sector provide less labour effort and enjoy more leisure, more than compensating for the loss of consumption.

Figure 1

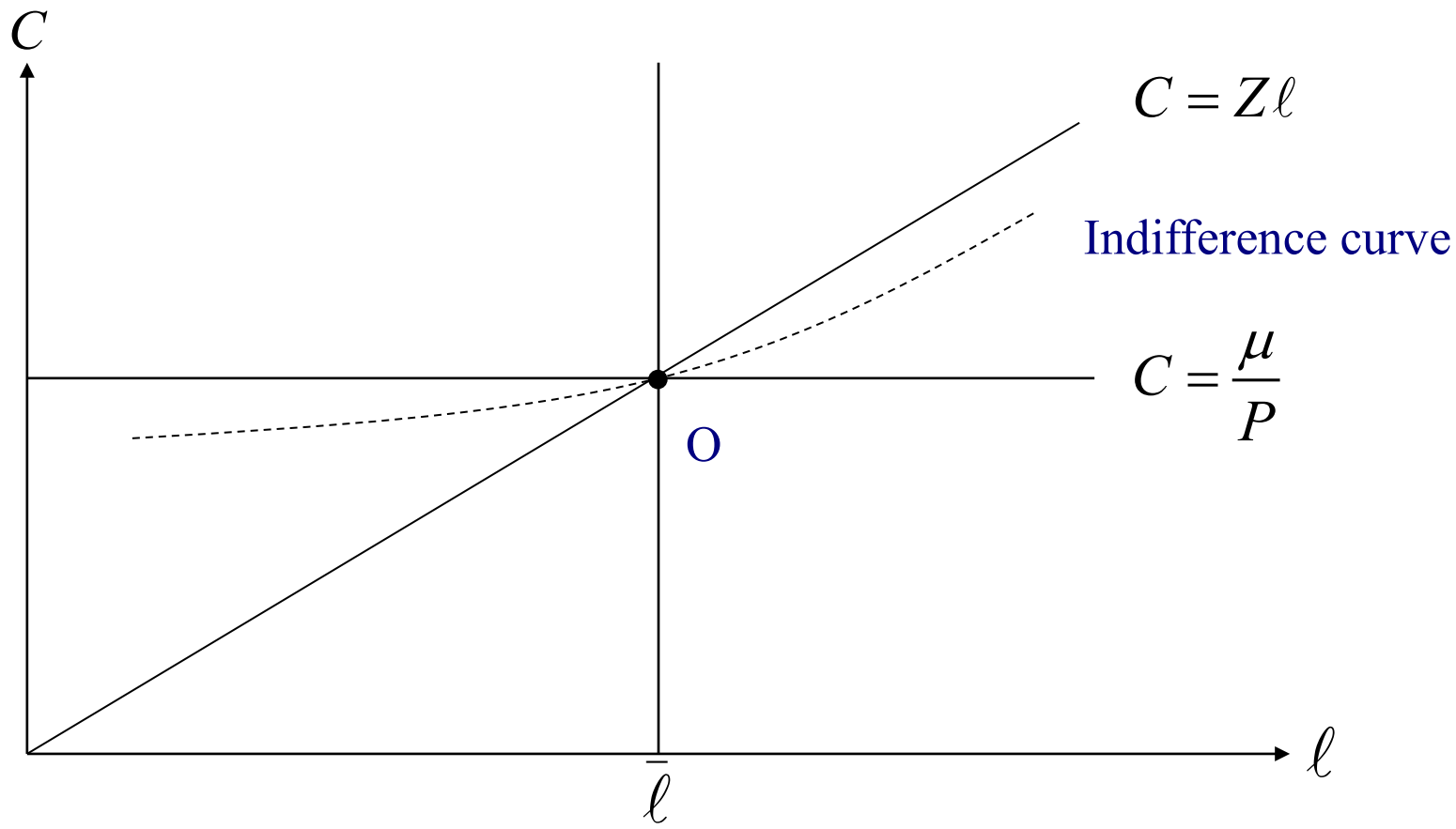


Figure 2

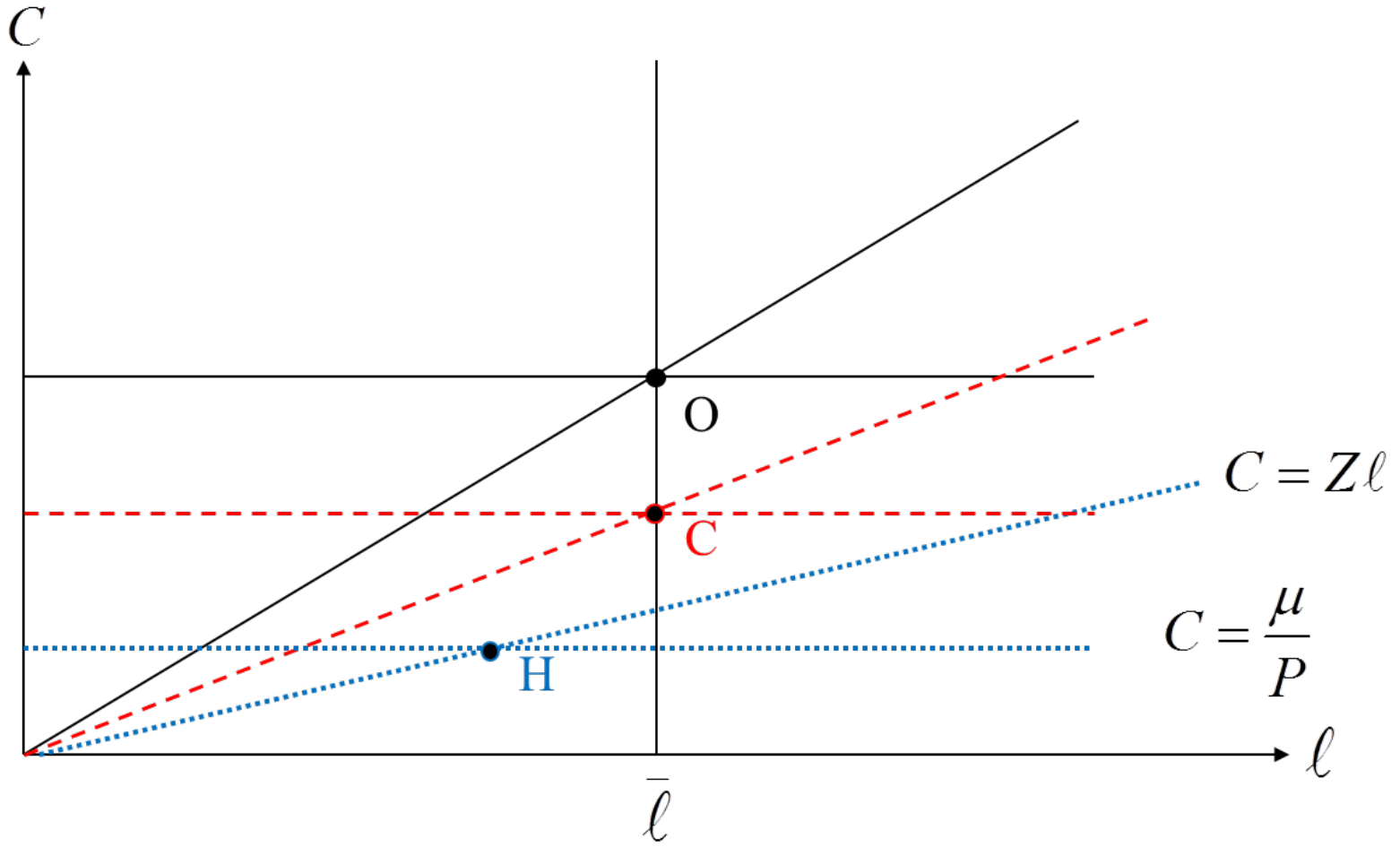
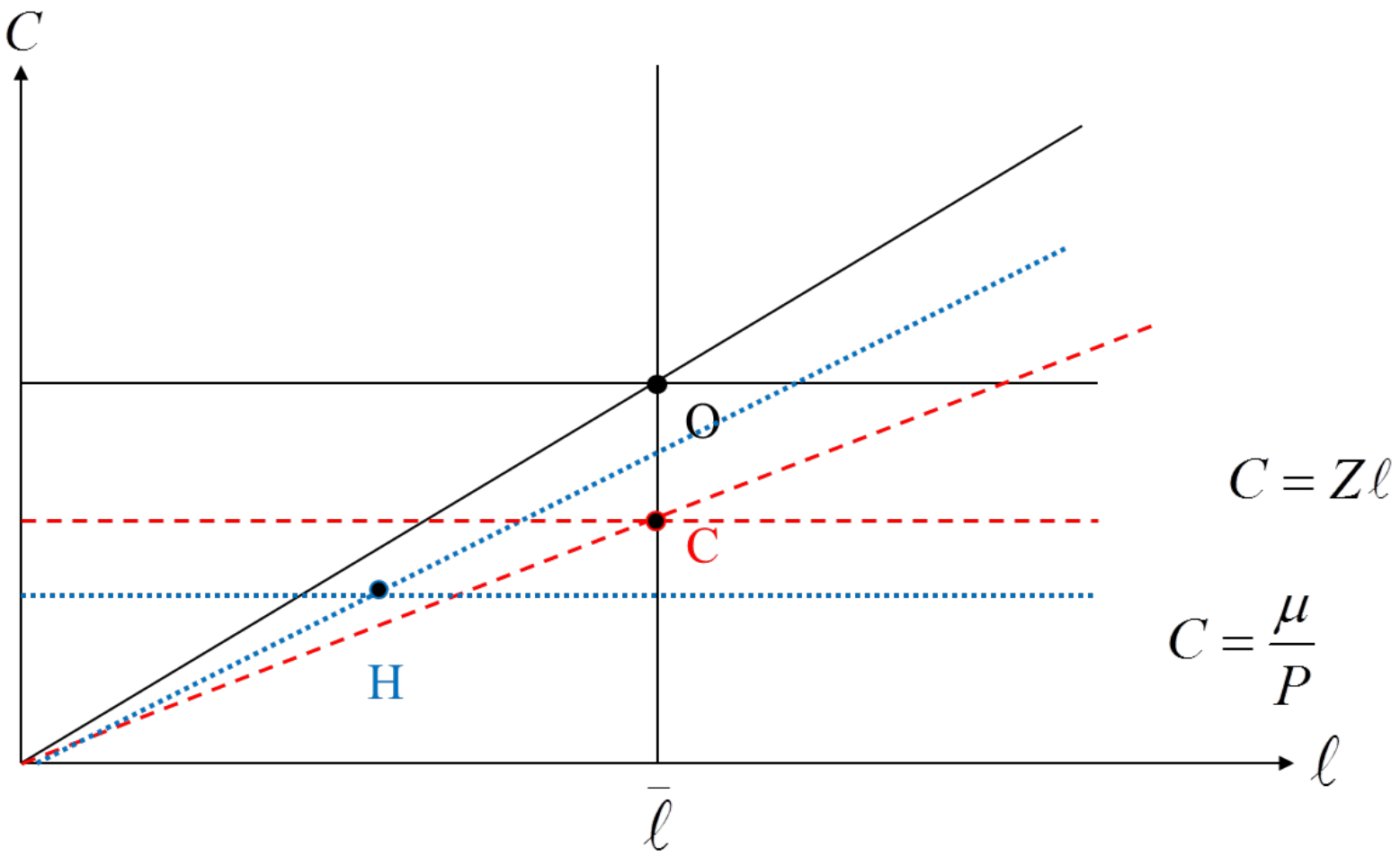


Figure 3



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Session 4

Globalisation and inflation in Asia and the Pacific (I)

Global slack as a determinant of US inflation[1]

Enrique Martínez-García[2] and Mark A Wynne[3]

Abstract

Resource utilisation, or "slack", is widely held to be an important determinant of inflation dynamics. As the world has become more globalised in recent decades, some have argued that the relevant concept of slack should be global rather than domestic (the "global slack hypothesis"). This line of argument is consistent with standard New Keynesian theory. However, the empirical evidence is, at best, fragile possibly because of a disconnect between empirical and theory-consistent measures of output gaps.

Keywords: Global slack, open-economy Phillips curve, inflation

JEL classification: E3, F4

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Introduction

The idea that resource utilisation or slack plays an important role as a determinant of inflation has a long and disputed history in economics. The empirical relationship was first documented by Phillips (1958) (although Irving Fisher (1926) has some claim to priority) and has been a staple of macroeconomic analysis for the better part of the last half-century. Mankiw (2001) includes the short-run relationship between inflation and unemployment as one of the 10 basic principles of economics. The stability of the relationship has been called into question for a number of reasons, and so in recent years there has been a major attempt to put the relationship on a firmer theoretical footing.

Traditionally the Phillips Curve relationship has been specified as a relationship between some measure of domestic resource utilisation and domestic inflation. However a number of researchers have argued that with greater integration of the global economy ("globalisation") the concept of resource utilisation that is relevant for short run inflation dynamics is some measure of global resource utilisation rather than domestic. Borio and Filardo (2007) is a widely cited early contribution to the empirical literature exploring this idea. See also the works of Orr (1994), Tootell (1998) and Gamber and Hung (2001), and the more sceptical findings of Ihrig, Kamin, Lindner and Marquez (2007). In an earlier paper (Martínez-García and Wynne (2010)), we sketched out the analytical content of the global slack hypothesis in a simple open-economy extension of a standard New Keynesian model.

In what follows we provide some illustrative evidence on how well the global slack hypothesis holds for the United States, and then discuss the puzzle posed by the evidence. We then highlight four important results from our earlier paper that have important implications for empirical tests of the global slack hypothesis. First, as long as the consumption basket that is priced to derive the consumer price index includes foreign goods, then foreign output gaps should have a direct effect on domestic inflation. An indirect effect is also to be expected as foreign demand of domestically-produced goods affects the marginal cost and prices of the domestic goods too. The extent to which these effects matter will depend on the importance of foreign goods in the domestic consumption basket and domestic goods in the foreign consumption basket. Second, the effects of foreign output gaps on domestic inflation can be captured by the information contained in terms of trade (or, to be more precise, on the deviations of terms of trade from their relative abundance given the potential of the domestic and foreign economies). Third, these results hold under alternative assumptions on international price-setting behaviour—both producer and local currency pricing—although the exact form of the Phillips Curve will differ somewhat. And fourth, the concept of the output gap that is consistent with this particular theory of output and inflation determination in an open economy could bear little relationship to the output gap as conventionally measured. We conclude with some suggestions for further research.

Aggregate US data

Let's start with the aggregate data for the United States. Table 1 reports estimates of simple Phillips Curves using annual data over the past three decades, as well as over two sub-samples. We choose 1990 as the year in which to break the sample, as it is around this time that the process of globalisation kicked into high gear. The output gap $\widehat{y_t}$ is measured as the cyclical component of real GDP, where the cyclical component is obtained using a Hodrick-Prescott filter with smoothing parameter equal to 100. Inflation $\widehat{\pi_t}$ is measured as the cyclical (also Hodrick-Prescott filtered with smoothing parameter equal to 100) component of the annual change in the GDP deflator. The main point to note here is that the coefficient on the US output gap declines between the first and second samples—the estimated coefficient on the domestic output gap declines from 0.35 to just 0.10. This is a

fairly robust finding and there is a significant literature seeking to understand the causes of the decline (see, for example, Roberts (2006)).

Table 1

US Phillips Curves

Sample period	Estimated Phillips Curve
1979–2010	$\hat{\pi}_t = \underset{(0.14)^{***}}{0.65}\ \hat{\pi}_{t-1} + \underset{(0.06)^{***}}{0.17}\ \hat{y}_t$
1979–1990	$\hat{\pi}_t = \underset{(0.27)^{***}}{0.87}\ \hat{\pi}_{t-1} + \underset{(0.16)^{**}}{0.35}\ \hat{y}_t$
1990–2010	$\hat{\pi}_t = \underset{(0.16)^{***}}{0.59}\ \hat{\pi}_{t-1} + \underset{(0.05)^{*}}{0.10}\ \hat{y}_t$

Table 1: Standard errors in parentheses. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

The global slack hypothesis holds that the decline in the coefficient on the domestic output gap could be a manifestation of the increased openness of the US economy. Over this period imports as a share of GDP increased from just under 10% in 1978 to a peak of 17.8% in 2008. The US economy became more open along a number of other dimensions as well during this period. To the extent that we believe that slack is an important driver of inflation at business cycle frequencies, this suggests that we might want to augment the measure of slack in these simple Phillips Curve regressions with a measure of foreign slack as well. We define the foreign output gap, $\widehat{y_t^*}$ as a trade-weighted average of the output gaps in the main US trade partners. That is, $\hat{y}_t^* = \sum_{j=\text{US tradepartners}} w_t^j \hat{y}_t^j$ where $\hat{y}_t^j$ is the estimated output gap in country j and w_t^j is the time-varying weight of imports from country j in US imports. We use HP-filtered annual data on real GDP from the IMF publication *International Financial Statistics* to compute output gaps in each trade partner. The time-varying weights w_t^j are the ones used by the Federal Reserve Board of Governors to compute the trade-weighted value of the dollar.

Table 2

US Phillips Curves

Sample Period	Estimated Phillips Curve
1979–2010	$\hat{\pi}_t = \underset{(0.15)^{***}}{0.47}\ \hat{\pi}_{t-1} + \underset{(0.08)}{0.03}\ \hat{y}_t + \underset{(0.12)^{**}}{0.31}\ \hat{y}_t^*$
1979–1990	$\hat{\pi}_t = \underset{(0.29)}{0.44}\ \hat{\pi}_{t-1} - \underset{(0.24)}{0.11}\hat{y}_t + \underset{(0.12)^{**}}{0.63}\ \hat{y}_t^*$
1990–2010	$\hat{\pi}_t = \underset{(0.20)^{**}}{0.46}\ \widehat{\pi}_{t-1} + \underset{(0.06)}{0.06}\ \hat{y}_t + \underset{(0.12)}{0.12}\ \hat{y}_t^*$

Table 2: Standard errors in parentheses. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

When we estimate a simple Phillips Curve relationship over the full sample, we see that the estimated coefficient on the foreign slack measure exceeds the one on the domestic slack

measure (indeed, it is 10 times larger) and furthermore is the only one that is statistically significant. The estimated coefficient on the US output gap is small and statistically insignificant. However, when we split the sample in 1990, we find that the estimated effects of foreign slack are *greater* in the pre-1990 period than in the post-1990 period, which would seem to contradict the idea that the changing magnitude of the response to domestic slack is being driven by globalisation.

On the face of it, then, these simple reduced-form econometric exercises seem to pose a challenge to the idea that broader, global, measures of slack or resource utilisation should matter more for inflation over time. This leaves us with a number of possibilities. One is that the global slack hypothesis is simply wrong, and that, to the extent that inflation is driven by slack, domestic slack is all that matters. Another is that the data are not terribly informative about the relative importance of domestic and foreign slack as drivers of inflation, or simply that time series are too short. Measures of domestic and foreign output gaps tend to move together. The pairwise correlation between the US output gap and the foreign output gap is 0.59. There are other possibilities as well, including explanations having to do with changes in the conduct of monetary policy altering the slope of the Phillips Curve and the possibility that the concept of the output gap that is relevant for inflation determination is different from what we have measured.

Theory: the global slack hypothesis

For the purpose of thinking about inflation dynamics in an open economy framework, the basic two-country New Open Economy Macro model of Clarida, Galí and Gertler (2002) has proven to be quite useful. In Martínez-García and Wynne (2010), we worked with a straightforward variant of that workhorse model, and here we highlight a number of key points from that earlier paper.

First, in an open economy, when firms engage in producer-currency pricing, both the domestic and foreign output gaps matter for short-run inflation dynamics. That is, the open-economy Phillips Curve can be written as,

$$\hat{\pi}_t \approx \beta \mathbb{E}_t\left(\hat{\pi}_{t+1}\right) + \Phi\left[\Psi_{\pi,x}\hat{x}_t + \Psi_{\pi,x^*}\hat{x}_t^*\right], \tag{1}$$

where Φ, $\Psi_{\pi,x}$ and Ψ_{π,x^*} are composites of underlying structural parameters, and $\widehat{x_t}$ and $\widehat{x_t^*}$ denote the theory-consistent domestic and foreign output gaps.

Second, in theory, the effects of foreign activity on domestic inflation can be fully captured by information contained in terms of trade, ie the open-economy Phillips Curve can also be written as

$$\hat{\pi}_t \approx \beta \mathbb{E}_t\left(\hat{\pi}_{t+1}\right) + \Phi\left[(\varphi+\gamma)\hat{x}_t + \Psi_{\pi,z}\hat{z}_t\right], \tag{2}$$

where $\widehat{z_t}$ denotes the deviation of the terms of trade from its frictionless level.

Third, these results continue to hold if instead firms engage in local currency pricing, but the open-economy Phillips Curve now takes the form,

$$\hat{\pi}_t \approx \beta \mathbb{E}_t\left(\hat{\pi}_{t+1}\right) + \Phi[\Psi_{\pi,x}\hat{x}_t + \Psi_{\pi,x^*}\hat{x}_t^* - \Psi_{\pi,rp}(\widehat{rs}_t - \left(\xi - \xi^*\right)\widehat{tot}_t)], \tag{3}$$

where $\widehat{rs}_t$ denotes the real exchange rate, $\widehat{tot}_t$ the terms of trade, the coefficients on the Home and Foreign output gaps $\Psi_{\pi,x}$ and Ψ_{π,x^*} are the same as before, while the new coefficient, $\Psi_{\pi,rp}$, is again a composite of underlying structural parameters.

Fourth, there is essentially no robust relationship between the theory-consistent measure of the output gaps $\hat{x}_t$ or $\widehat{x_t^*}$ and the measures commonly used in econometric exercises to evaluate the global slack hypothesis such as the ones used in our estimations above. In Martínez-García and Wynne (2010) we calibrate a fuller version of a two-country model, simulate it and measure the output gap in a theory-consistent manner and using traditional econometric techniques. The correlation between the two measures is only 0.08.

Conclusion

There are strong empirical and theoretical reasons for believing that globalisation has fundamentally altered short-run inflation dynamics. However quantifying the effect has proven challenging, and the mixed results found in the empirical literature are a good illustration of that. Still, it is too early to dismiss the global slack hypothesis on those grounds. After all, the lack of robust evidence may be due to the short sample of data that is available to evaluate the global slack hypothesis, to shortcomings in commonly used measures of resource utilisation, to the high correlation between some slack measures for the United States and the rest of the world, or to the weak relation between theory-consistent and statistical measures of slack. In on-going work, we are pursuing a number of different avenues to shed light on the role of globalisation in inflation dynamics. First, noting the data problems that arise in evaluating the hypothesis using international data, we are looking at whether *intra*national data from the United States might be used to shed some light on it. The idea here is that we can think of the economic relationship between the individual cities and states within the United States as approximating what we might see in a fully globalised world with complete freedom of movement of goods, services and factors of production. One might then argue that, because of its integration with the rest of the state of Texas and the rest of the United States, inflation pressures in Dallas should be less responsive to resource utilisation in Dallas, somewhat more responsive to resource utilisation in the rest of the state of Texas and most responsive to resource utilisation in the United States as a whole. We find some evidence of this, but it is at best inconclusive as we rely on estimates of slack that correspond to the cyclical component of output derived with statistical techniques without imposing any theoretical constraints. Second, we are pursuing a more pragmatic statistical approach to the measurement of domestic and global output gaps using unobserved components models but incorporating some of the key theoretical constraints that the open-economy Phillips Curve prescribes in order to also derive more consistent measures of slack. And third, we are examining ways to take a fully structural approach to modelling global inflation dynamics. Some of our preliminary work along this dimension centred on structural identification and the interpretation of the open-economy Phillips curve is reported in Martínez-García, Vilán and Wynne (2012).

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Inflation and globalisation: a modelling perspective

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Abstract

This paper examines some standard open-economy New Keynesian models to address the question of how globalisation affects the inflation process. Specifically, it investigates how the Phillips curve for consumer price inflation in a country is affected by openness, and how the optimal choice of monetary policy is influenced by openness. The paper compares models that assume producer currency pricing with ones that assume local currency pricing. It also considers the role of financial market completeness.

Keywords: open-economy Phillips curve; monetary policy; exchange rate policy

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In the past decade there has been much discussion among policymakers and policy-oriented economists on the role of globalisation in inflation. Inflation is a monetary phenomenon, and a general equilibrium phenomenon. The effects of globalisation on inflation depend on the structure of the macroeconomy and on monetary policies. For example, suppose a country has its own currency, and it successfully and rigidly targets its inflation rate – for example, at a 2% annual rate. Globalisation will not affect the inflation rate at all under this scenario. Inflation is 2% no matter how globalized it becomes. In this note, in the context of a simple open-economy New Keynesian macroeconomic model, we suggest three different ways of thinking about the effects of an economy's openness on inflation: (1) How openness might affect the policymaker's assessments of the relative costs of inflation, output gaps and possibly exchange rate misalignments (that is, how the policymaker's objectives are influenced by openness). (2) How the Phillips curve is affected by openness (that is, how the constraints facing the policymaker are influenced by globalisation). (3) How the equilibrium inflation rate, which depends on the policy choices and the Phillips curve, is influenced by globalisation.

One way to assess the potential effects of globalisation is to build a full and empirically plausible general equilibrium macroeconomic model, and then assess how the stochastic process for inflation would change under the hypothetical experiment of the economy becoming more open. For a given set of exogenous shocks, one could predict how the unconditional mean of inflation changes, and how the dynamics of inflation changes in response to various shocks.

While that approach is certainly useful, this note examines the *tradeoffs* – in the policymaker's loss function and in the Phillips curve – in the simple two-country open economy New Keynesian model of Engel (2011). There are two direct channels through which the world economy influences local inflation – through the foreign output gap, and through exchange rate changes. We propose a logical framework for assessing the question and to clarify some of the discussion in the literature, but not necessarily to provide a realistic answer.

To illustrate the point of this note, consider Ball (2006), who inveighs against much of the literature on this topic, which he views as having committed many logical fallacies. Ball concludes that globalisation does not play much, if any, role in inflation determination. In some contexts, that conclusion is certainly correct. For example, the central bank that always rigidly targets 2% inflation presumably does not consider there to be a tradeoff among objectives concerning the output gap, inflation and exchange rate misalignment – its only objective is to minimize deviations from its target inflation rate. In this case, as noted already, there is no influence of globalisation on inflation. However, real world central banks must make tradeoffs, and globalisation influences these tradeoffs.

Ball does not examine the question in the context of a model. Consider Ball's criticism of Borio and Filardo (2007), who estimate a Phillips curve that includes the foreign as well as the domestic output gap: "This story is dubious on both theoretical and empirical grounds. In mainstream theories, output affects inflation because it affects firms' marginal costs. Rises in marginal cost are passed through into higher prices. Marginal costs for a country's firms depend on their own output levels, not foreign output." However, in mainstream theory, such as the model in Engel (2011), the foreign output gap does matter for home inflation precisely because the foreign output gap influences domestic marginal cost. Ceteris paribus, an increase in the foreign output gap will generally raise domestic inflation by increasing demand for home goods, which drives up the home real wage.

While this note does not strive to build a realistic model, the model of Engel (2011) seems to have some quite implausible channels through which exchange rates affect inflation, arising from its assumption of complete markets. So, we also consider two simple versions of the model in which financial markets are not complete – indeed, one in which trade is balanced

period by period. These help to illuminate channels through which globalisation might affect inflation in real world economies.

1. The Model and the Phillips Curve Equations

The model is from Engel (2011), which in turn is based heavily on Clarida et al. (2002) and Benigno (2004). The model assumes two countries, each inhabited with a continuum of households, normalized to a total of one in each country. Households have utility over consumption of goods and disutility from provision of labour services. In each country, there is a continuum of goods produced, each by a monopolist. Households supply labour to firms located within their own country, and get utility from all goods produced in both countries. Each household is a monopolistic supplier of a unique type of labour to firms within its country. We assume at this point that there is trade in a complete set of nominally-denominated contingent claims.

Monopolistic firms produce output using only labour, subject to technology shocks. Each firm uses labour inputs from every household within its country. Nominal wages are flexible, but nominal prices are sticky and set according to a Calvo pricing mechanism.

We allow for different preferences in the two countries. Home agents may put a higher weight in utility on goods produced in the Home country. Home households put a weight of $\nu/2$ on Home goods and $1-(\nu/2)$ on Foreign goods (and vice-versa for Foreign households). This is a popular assumption in the open-economy macroeconomics literature, and can be considered as a short-cut way of modelling "openness". A less open country puts less weight on consumption of imported goods, and in the limit the economy becomes closed if it imports no goods.

We will focus on Home consumer price inflation, which is a weighted average of inflation in the Home country of Home-produced goods and imported (Foreign-produced) goods:

(1) $\pi_t = (\nu/2)\pi_{Ht} + [1-(\nu/2)]\pi_{Ft}$.

Engel (2011) considers two types of price-setting behaviour. Producer-currency pricing (PCP) entails each firm setting one price for its goods, in its own currency. Alternatively, under local-currency pricing (LCP) each firm sets two prices: one in the Home currency for sale to Home consumers and one in the Foreign currency for sale to Foreign consumers.

1.1 PCP

Under PCP, the dynamics of inflation for Home goods prices are given by:

(2) $\pi_{Ht} = \delta(w_t - p_{Ht} - a_t) + \beta \mathrm{E}_t \pi_{Ht+1}$.

Here, w_t is the log of the wage in the Home country, p_{Ht} is the log of the price of Home goods in Home currency, and a_t is the log of the marginal and average product of labour. Thus inflation depends on the real wage, $w_t - p_{Ht}$, relative to the marginal product of labour, a_t, and expectations of future inflation. δ is smaller the less frequent is price adjustment.

Home currency inflation of imported goods, π_{Ft}, is equal to the Foreign inflation rate of those goods, π^*_{Ft}, plus the change in the exchange rate, $e_t - e_{t-1}$, by the law of one price. That is,

(3) $\pi_{Ft} = \pi^*_{Ft} + e_t - e_{t-1}$,

where:

(4) $\pi^*_{Ft} = \delta(w^*_t - p^*_{Ft} - a^*_t) + \beta E_t \pi^*_{Ft+1}$,

for Foreign currency inflation of Foreign goods, with variables defined analogously to those in (2).

1.2 LCP

Under LCP, equation (2) still determines the Home consumer price inflation of Home goods. The consumer prices of Foreign goods are set in Home currency by Foreign firms under LCP, and we have:

(5) $\pi_{Ft} = \delta(w^*_t - p_{Ft} + e_t - a^*_t) + \beta \mathrm{E}_t \pi_{Ft+1}$.

2. Openness and Inflation in Complete Markets Model

Clearly, Home consumer price inflation depends on the global economy through imported goods inflation. However, global factors also influence the Home real wage, which from equation (2) determines Home CPI inflation of Home-produced goods.

In all cases, the rate of inflation ultimately depends on the excess of the real wage over the marginal product of labour. If all prices are flexible and the economy achieves efficient allocations, real wages should equal the marginal product of labour. But in Keynesian models, prices are sticky and output is demand-determined, which means that the equilibrium real wage may either exceed or fall short of the marginal product of labour.

2.1 PCP

Under PCP, we have:

(6) $\pi_{Ht} = \delta\left[\left((\sigma / D) + \phi\right)\tilde{y}^R_t + (\sigma + \phi)\tilde{y}^W_t\right] + \beta \mathrm{E}_t \pi_{Ht+1} + u_t$.

Here, $\tilde{y}^W_t$ is equal to the average of the Home and Foreign output gaps, $(\tilde{y}_t + \tilde{y}^*_t)/2$, while $\tilde{y}^R_t \equiv (\tilde{y}_t - \tilde{y}^*_t)/2$. The parameter σ is the inverse of the intertemporal elasticity of substitution, while ϕ is the inverse of the Frisch elasticity of labour supply. Also, $D \equiv \sigma\nu(2-\nu) + (\nu-1)^2$. The term u_t refers to a "cost-push" shock, as in Clarida et al., that arises from time-varying labour-market conditions.

From this equation, we can see the effect of the foreign output gap on inflation of Home-produced goods (holding the Home output gap and expected future inflation constant):

(7) $\partial \pi_{Ht} / \partial \tilde{y}^*_t = \delta\sigma(1 - (1/D))/2 = \delta\sigma(\sigma - 1)\nu(2-\nu)/2D$.

In the empirically plausible case of $\sigma > 1$, we find that inflation of Home-produced goods increases with a rise in the Foreign output gap. Intuitively, an increase in Foreign demand raises demand for Home goods, which increases demand for Home labour. This pushes up the real wage above the marginal product of labour leading to inflationary pressure.

A well-known result in Clarida et al. (2002) is that the Foreign output gap does not influence inflation of Home-produced goods, precisely in this model. Clarida et al. (2002) define output gaps in a way that is useful for their analysis but does not correspond to the usual definition for empirical work. Under Engel's (2011) definition, the Home and Foreign output gaps are the differences between actual and the output potential of each country when resources are used efficiently in the global economy. Under Clarida et al.'s definition, the Home potential

output takes the actual level of Foreign output as given. Hence, an increase in Foreign output, perhaps caused by a monetary expansion, lowers Home potential output. (The mechanism is that the increase in Foreign output improves Home's terms of trade. The increase in Home wealth reduces Home labour supply, thus reducing Home's potential output under this definition.) The key point is that no matter how the term "output gap" is defined, an increase in Foreign demand raises inflation of Home-produced goods. Under Engel's definition of output gap, this is reflected as the effect of the Foreign output gap on Home inflation. Under Clarida et al.'s definition, the increase in Foreign demand lowers Home potential output, thus raising the Home output gap and increasing Home inflation.

Economies are more open when ν is close to 1 (and most closed when $\nu = 2$). From equation (7), we can see that the effect of the Foreign output gap on inflation of Home goods is maximized when the economies are most open.

Home CPI inflation is also influenced by inflation of imported goods, $\pi_{Ft} = \pi^*_{Ft} + e_t - e_{t-1}$. Of course, these receive a greater weight in Home CPI inflation the more open the economy. We have:

(8) $$\pi^*_{Ft} = \delta\left[-\left((\sigma / D) + \phi\right)\tilde{y}^R_t + (\sigma + \phi)\tilde{y}^W_t\right] + \beta \mathrm{E}_t \pi^*_{Ft+1} + u^*_t .$$

The effect of the Foreign output gap on Foreign inflation is given by

(9) $$\partial \pi^*_{Ft} / \partial \tilde{y}^*_t = \delta[\phi + \sigma(1 + (1/D))/2] .$$

When $\sigma > 1$, the effect of the Foreign output gap on Foreign inflation is smaller the more open the economy, as we would expect. However, the rate of inflation of Foreign goods plays a larger role in determining Home inflation when the economy is more open. Recall that Foreign inflation receives a weight of $1-(\nu/2)$. We find $[1-(\nu/2)](\partial \pi^*_{Ft} / \partial \tilde{y}^*_t)$ is maximized the more open the economy, and of course is zero when the economy is closed.

Combining the effects of the Foreign output gap on inflation of Home-produced goods and imported goods, and holding the exchange rate constant, we find:

(10) $$\partial \pi_t / \partial \tilde{y}^*_t = (\nu/2)\partial \pi_{Ht} / \partial \tilde{y}^*_t + [1-(\nu/2)]\partial \pi^*_{Ft} / \partial \tilde{y}^*_t = \delta[[1-(\nu/2)]\phi + \sigma(1 + (1-\nu)(1/D))/2] .$$

The Foreign output gap has its maximal impact on Home CPI inflation when the economy is most open, $\nu = 1$.

Finally, under PCP, exchange rate changes are passed one-for-one into import prices. These, of course, have a larger role in Home inflation the more open the economy.

2.2 LCP

Under local-currency pricing, we have

(11) $$\pi_{Ht} = \delta\left[\left((\sigma / D) + \phi\right)\tilde{y}^R_t + (\sigma + \phi)\tilde{y}^W_t + \left((D - (\nu - 1))/2D\right)m_t\right] + \beta \mathrm{E}_t \pi_{Ht+1} + u_t$$

(12) $$\pi_{Ft} = \delta\left[-\left((\sigma / D) + \phi\right)\tilde{y}^R_t + (\sigma + \phi)\tilde{y}^W_t + \left((D + \nu - 1)/2D\right)m_t\right] + \beta \mathrm{E}_t \pi_{Ft+1} + u^*_t .$$

Here, m_t represents the currency misalignment – the undervaluation of the domestic currency. It is a measure of the ratio of Foreign to Home prices of identical goods: $m_t \equiv e_t + p^*_{Ht} - p_{Ht} = e_t + p^*_{Ft} - p_{Ft}$. Under symmetric Calvo pricing, the price differential paid by Foreign versus Home consumers is equal for both Home- and Foreign-produced goods.

It is apparent from comparison of (11) and (12) to (6) and (8) that the Foreign output gap's influence on Home inflation is the same under LCP as under PCP.

Under PCP, a change in the exchange rate, $e_t - e_{t-1}$, is passed directly into Home inflation of imported Foreign goods. But under LCP, Home consumer prices of Foreign-produced goods are set in the Home currency, so there is no direct effect of the exchange rate change on Home inflation.

However, currency misalignments affect Home inflation. We have:

(13) $\partial \pi_{Ht} / \partial m_t = \delta((\sigma - 1)\nu + 1)(2 - \nu) / 2D$

(14) $\partial \pi_{Ft} / \partial m_t = \delta((\sigma - 1)(2 - \nu) + 1)\nu / 2D$

(15) $\partial \pi_t / \partial m_t = (\nu / 2)\partial \pi_{Ht} / \partial m_t + [1 - (\nu / 2)]\partial \pi_{Ft} / \partial m_t = \delta\sigma\nu(2 - \nu) / 2D$.

Not surprisingly, the impact of currency misalignment on Home CPI inflation is largest when the country is most open ($\nu = 1$), and the effect is zero when the economy is closed ($\nu = 2$).

But why do currency misalignments have an effect on inflation? That is, from equations (11) and (12), it is apparent that these exchange rate effects work through some channel other than output gaps. Even when the Home and Foreign output gaps are zero, a currency misalignment influences exchange rates. This channel arises because of the influence of asset markets. Under the well-known equilibrium condition when markets are complete, we have:

(16) $\sigma c_t - \sigma c_t^* = m_t + (\nu - 1)s_t$,

where $s_t = p_{Ft} - p_{Ht} = p_{Ft}^* - p_{Ht}^*$, so that $m_t + (\nu - 1)s_t$ is equal to the real exchange rate. Under complete markets, a Home depreciation that increases m_t redistributes resources toward Home consumers. This wealth redistribution reduces the incentive for Home households to work, thus increasing the Home real wage. From equation (2), this increase in the Home real wage leads to an increase in inflation. The same redistribution will tend to lower the Foreign real wage, but less than one-for-one with the depreciation. Hence, the Home currency cost of Foreign goods also rises, which from equation (5) leads to an increase in π_{Ft}.

How realistic is this channel? Of course, in the real world, markets are not complete. However, even with a small number of assets traded, the distributional effects of complete markets can be replicated. Engel and Matsumoto (2009) show how a Home depreciation can have identical wealth effects as in equation (16) if each country holds a portfolio of nominal bonds in which they hold no net debt, but are debtors in their own currency and creditors in the other country's currency. A Home depreciation then redistributes wealth to Home consumers.

This may not be a plausible channel through which exchange rates influence inflation for a variety of reasons. It is worthwhile examining how the Phillips curves are affected when this channel is cut off. So we turn next to models in which trade is continuously balanced and there is no trade in financial assets. Henceforth, we will consider only models with LCP, since we are primarily concerned here about the influence of exchange rate misalignments on inflation.

3. Openness and Inflation in Balanced Trade Models

Under balanced trade and local-currency pricing, we find:

(17) $\pi_{Ht} = \delta\left[\left(\sigma(\nu - 1) + 2 - \nu + \phi\right)\tilde{y}_t^R + (\sigma + \phi)\tilde{y}_t^W + \left((D - (\nu - 1)) / 2\right)m_t\right] + \beta \mathrm{E}_t \pi_{Ht+1} + u_t$

(18) $$\pi_{Ft} = \delta\left[-\left(\sigma(\nu-1)+2-\nu+\phi\right)\tilde{y}_t^R + (\sigma+\phi)\tilde{y}_t^W + \left(1+\nu-D\right)/2\right)m_t\Big] + \beta \mathrm{E}_t\pi_{Ft+1} + u_t^*.$$

We find that the influence of the Foreign output gap on Home inflation is slightly different under this formulation compared to the complete markets case:

(19) $$\partial\pi_{Ht} / \partial\tilde{y}_t^* = \delta(\sigma-1)(2-\nu)/2$$

(20) $$\partial\pi_{Ft} / \partial\tilde{y}_t^* = \delta[(\sigma\nu+2-\nu)/2+\phi]$$

(21) $$\partial\pi_t / \partial\tilde{y}_t^* = (\nu/2)\partial\pi_{Ht} / \partial\tilde{y}_t^* + [1-(\nu/2)]\partial\pi_{Ft} / \partial\tilde{y}_t^* = \delta\left[(2-\nu)(\sigma\nu+1-\nu)/2+\phi\right].$$

The wealth distribution is different under balanced trade than under complete markets, but the qualitative conclusions on the influence of the Foreign output gap on inflation is the same: Assuming $\sigma > 1$, a higher Foreign output gap raises π_{Ht}, and this effect is larger the more open the economy. A higher Foreign output gap also increases π_{Ft}, but this effect is smaller the more open the economy. But overall, the effect of the Foreign output gap on Home CPI inflation is larger the more open the economy when $\sigma > 1$.

Notice from equations (17) and (18) that currency misalignments still influence inflation, even when output gaps are zero. That is because there is still a wealth redistribution effect of an undervalued Home currency, and it works in the same direction as in the complete markets model. Here the effect comes through the influence of exchange rates on profits of exporters. A Home depreciation increases the revenue for Home firms that are selling in the Foreign country and have priced in Foreign currency, while it reduces the revenues for Foreign firms. This wealth redistribution from Foreign to Home works through the same channels as in the complete markets model to influence inflation. We find:

(22) $$\partial\pi_{Ht} / \partial m_t = \delta((\sigma-1)\nu+1)(2-\nu)/2$$

(23) $$\partial\pi_{Ft} / \partial m_t = \delta(\nu-(\sigma-1)\nu(2-\nu))/2$$

(24) $$\partial\pi_t / \partial m_t = (\nu/2)\partial\pi_{Ht} / \partial m_t + [1-(\nu/2)]\partial\pi_{Ft} / \partial m_t = \delta\nu(2-\nu)\left[(\sigma-1)(\nu-1)+1\right]/2.$$

In this formulation, the effect on wages of a currency misalignment may be greater than the misalignment – that is, a 1% misalignment may lead to a greater than 1% increase in Home real product wages and a greater than 1% decline in Foreign real product wages. The overall effect is still at its maximum when the economy is most open.

Even with balanced trade, exchange rates still influence inflation rates through wealth effects. However, we might inquire about the effects of openness on inflation if these wealth effects were not present at all. Devereux and Engel (2002) consider a global economy in which some goods are sold by distributors. These distributors purchase goods directly from exporters, who set the price in the exporter's currency. They sell them to domestic consumers, but price in the domestic consumer's currency. The distributor is taking on exchange rate risk, because when the exporter's currency appreciates unexpectedly, the distributor pays more for the goods but does not pass along that increase to the consumer.

In this symmetric model with the two countries of equal size, when exactly half of all exports are sold to distributors and the other half are sold directly to consumers (and priced LCP), exchange rate fluctuations have no wealth effect. A home depreciation, for example, increases the value of sales from Home firms that export directly to the Foreign consumer. But Home distributors of imported Foreign goods lose when the Home currency depreciates – they must pay more for the imports but do not pass along that cost increase to the Home consumers. Under balanced trade, the net wealth effect for the Home country is zero – the gain in wealth by the exporters is balanced off by the loss of wealth by the distributors.

In this case, we find:

(25) $$\pi_{Ht} = \delta\left[\left(\sigma(\nu-1)+2-\nu+\phi\right)\tilde{y}_t^R + (\sigma+\phi)\tilde{y}_t^W\right] + \beta \mathrm{E}_t \pi_{Ht+1} + u_t$$

(26) $$\pi_{Ft} = \delta\left[-\left(\sigma(\nu-1)+2-\nu+\phi\right)\tilde{y}_t^R + (\sigma+\phi)\tilde{y}_t^W + m_t\right] + \beta \mathrm{E}_t \pi_{Ft+1} + u_t^* .$$

Comparing these Phillips curves to equations (17) and (18) with no distributors, we find that the effects of output gaps are the same in both cases, but the currency misalignment no longer affects real product wages. Instead, the only effect of a larger m_t is to increase the Home currency cost of Foreign output, thus putting upward pressure on π_{Ft}. So we find simply:

(27) $$\partial\pi_{Ht} / \partial m_t = 0 \qquad \partial\pi_{Ft} / \partial m_t = \delta \qquad \partial\pi_t / \partial m_t = \delta[1-(\nu/2)] .$$

In this case, we can conclude that openness affects domestic inflation in three ways. First, when an economy is more open, the Foreign output gap has a greater effect on Home inflation by pushing up domestic wages and therefore inflation of Home-produced goods. Second, the Foreign output gap influences the price of imported goods. While the Foreign output gap has a smaller effect on Foreign inflation the more open the economies, the effect on Home inflation is nonetheless larger because greater openness implies a larger import share. Finally, currency misalignments affect inflation by increasing the Home currency cost of imports, which pushes up inflation of those goods. That effect increases with openness again simply because imports are a larger share of consumption.

4. The Effects of Openness on Loss Functions

The Phillips curves can be thought of as the constraints facing policymakers. Openness might also affect the objectives of policymakers that aim to maximize welfare of households. Here we follow Engel (2011) and consider policymaking under cooperation. We examine how openness affects the weight policymakers put on inflation relative to other objectives (output gaps and currency misalignments).

In the model of Engel (2011), under PCP, the loss function for the policymaker can be expressed as the expected present discounted value of Ψ_t, where

(28) $$\Psi_t \propto \left[(\sigma / D)+\phi\right](\tilde{y}_t^R)^2 + (\sigma+\phi)(\tilde{y}_t^W)^2 + (\xi/2\delta)\left((\pi_{Ht})^2 + (\pi_{Ft}^*)^2\right).$$

Here, ξ is the elasticity of substitution for consumers among different varieties of goods produced within a country. Openness does not influence $\xi / 2\delta$. The only role that openness plays in this loss function is in the parameter $D \equiv \sigma\nu(2-\nu)+(\nu-1)^2$. Assuming $\sigma > 1$, D is larger the more open the economies are. This increased openness reduces the influence of $(\tilde{y}_t^R)^2$ in the loss function.

First, consider why relative output gaps matter at all. Suppose the world output gap were zero, but one country's output gap was positive and the other's was negative. One country is producing excessive output, and the other's is insufficient. This production arrangement is clearly inefficient, but in terms of its impact on welfare, the effect is smallest when economies are most open. In the extreme case of complete openness, the inefficient production structure does not have an allocative effect across households in the two countries. Households in each country have the same consumption basket, and will consume more of the goods from the country that overproduces and fewer from the country that underproduces. As the economies become less open, the relative output gap causes further distortions not only to the production structure but to optimal consumption distribution. High Home output and low Foreign output, for example, hurts Foreign households more than Home households when there is home bias in consumption.

Hence, from a global perspective, openness reduces policymakers' concerns about output gaps relative to the weight put on inflation.

Under LCP, Engel (2011) finds

(29)

$$\Psi_t \propto \left[\frac{\sigma}{D}+\phi\right](\tilde{y}_t^R)^2+(\sigma+\phi)(\tilde{y}_t^W)^2+\frac{\nu(2-\nu)}{4D}m_t^2+\frac{\xi}{2\delta}\left(\frac{\nu}{2}(\pi_{Ht})^2+\frac{2-\nu}{2}(\pi_{Ft})^2+\frac{\nu}{2}(\pi_{Ft}^*)^2+\frac{2-\nu}{2}(\pi_{Ht}^*)^2\right)$$

The influence of openness on the tradeoff between output gaps and inflation is the same under LCP as under PCP. Now, as Engel (2011) emphasizes, in addition to output gaps and inflation, policymakers must also be concerned about the losses from currency misalignments. Those are maximized when the economies are most open.

As Engel (2011) notes, currency misalignments cause a loss through their effects on consumption allocation. When Home and Foreign output gaps are zero, then aggregate output in each economy is at an efficient level. Moreover, if all inflation rates are zero, then there is no output misallocation within each country. Even in this case, currency misalignments cause misallocation because the complete markets equilibrium condition (16) shows that when $m_t \neq 0$, there will be incomplete consumption risk sharing, so $c_t \neq c_t^*$. In this symmetric model, equal Home and Foreign consumption is optimal for the global policymaker, so they would like to drive currency misalignments to zero.

When trade is balanced, under LCP, we find

(30)

$$\Psi_t \propto \left[(\sigma-1)(\nu-1)^2+\phi\right](\tilde{y}_t^R)^2+(\sigma+\phi)(\tilde{y}_t^W)^2+\frac{\nu(2-\nu)D}{4}m_t^2+(\sigma-1)\nu(2-\nu)(\nu-1)m_t y_t^R + \frac{\xi}{2\delta}\left(\frac{\nu}{2}(\pi_{Ht})^2+\frac{2-\nu}{2}(\pi_{Ft})^2+\frac{\nu}{2}(\pi_{Ft}^*)^2+\frac{2-\nu}{2}(\pi_{Ht}^*)^2\right).$$

Although the magnitudes are somewhat different, the qualitative role of openness on the tradeoffs between output gaps and inflation, and currency misalignments and inflation are similar to the complete markets case. As economies become more open, the weight policymakers put on $(\tilde{y}_t^R)^2$ declines. Also, as economies become more open, the weight put on m_t^2 increases, as we would expect.

Interestingly, there is another term in the loss function that involves $m_t y_t^R$. Notice that this term has $y_t^R = (y_t - y_t^*)/2$, which is the average of the actual output difference, not the output gap difference. This is another channel through which currency misalignment leads to consumption misallocation, in the case when trade is balanced. Recall that under balanced trade, there was a wealth effect from a Home depreciation, as Home firms gain revenue from foreign sales. This tends to benefit Home consumers, and the benefit is larger the greater is Home output relative to Foreign output. That is because, unless the economies are perfectly open, Home consumers benefit more from an increase in Home output than Foreign consumers. But note that when economies are perfectly open, $\nu = 1$, this effect disappears. Under complete openness, an increase in Home output does not benefit Home consumers under balanced trade. So this component of the loss function is zero either when economies are completely closed $\nu = 2$, or completely open, $\nu = 1$.

Finally, in the model with distributors, the wealth effects of currency misalignments disappear. In this case, the loss function is simply

$$(31)\quad \Psi_t \propto \left[(\sigma-1)(\nu-1)^2+\phi\right](\tilde{y}_t^R)^2+(\sigma+\phi)(\tilde{y}_t^W)^2+\frac{\xi}{2\delta}\left(\frac{\nu}{2}(\pi_{Ht})^2+\frac{2-\nu}{2}(\pi_{Ft})^2+\frac{\nu}{2}(\pi_{Ft}^*)^2+\frac{2-\nu}{2}(\pi_{Ht}^*)^2\right)$$

This is the same as in the balanced trade model, except that currency misalignments have no welfare effect.

Conclusions

In each of these models, we could go further. We could determine a monetary policy for the central bank. As in many models, we might set an ad hoc interest-rate rule, or we might instead determine the optimal policy by minimizing the loss subject to the constraints presented by the Phillips curves. In either case, with a monetary policy rule in hand, we can then take the Phillips curves, the goods market equilibrium conditions and the financial market equilibrium conditions and solve for the endogenous variables. We can solve for equilibrium inflation, and then perform the comparative static exercise of asking how greater openness affects steady-state inflation. We could also see the influence of openness on the dynamic response of inflation to shocks – productivity shocks, cost-push shocks, and possibly monetary policy shocks.

The model examined here is not a realistic model, so we cannot easily draw real world conclusions about the effects of openness on inflation from this study. Instead, the objective here is to suggest a blueprint for analysis of the influence of openness on inflation. We can go beyond asking how openness influences inflation in equilibrium, which depends both on the structure of the economy and the monetary policy rule. We can look at the influence of inflation on the Phillips curve, which shows role of the economic structure; and, we can see how openness influences the objectives of policymakers, which demonstrates the role of monetary policy. Here we have found that openness matters for inflation because the foreign output gap influences domestic inflation, and potentially also because exchange rates affect aggregate demand through wealth effects.

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Session 5

Globalisation and inflation in Asia and the Pacific (II)

Globalisation of inflation and its implications for monetary policy

Sukhdave Singh[1]

Globalisation, whether real or financial, has more significant implications for small open economies than it does for larger and more closed economies. For monetary policy, globalisation and the structural changes it has created in the global economy have influenced inflation dynamics in important ways, and perhaps in ways that we still do not fully understand. A noteworthy example of this is the role played by global developments in explaining the "great moderation" during the period before the financial crisis. A lot has been written about how the better conduct of monetary policy led to this era of price stability. I believe that factors related to globalisation played an equal, if not more important, role. Let me mention just four global developments that in my view have had, and are continuing to have, an important impact on inflation globally.

1. ***Structural changes in the global economy.*** These include the reduced energy intensity of economic activity in the advanced economies, reduced volatility in global oil prices, improved management of business inventories and the productivity boost from increased usage of information and communication technology. All these factors contributed to the period of lower inflation. However, developments such as the emergence of new energy-intensive economies, the emergence of a sizeable middle class in emerging economies and the consequent changes in consumption patterns, the growing use of food for fuel, and the financialisation of commodity markets have had the reverse effect on inflation globally.

2. ***Economic integration, trade liberalisation and global competition.*** The focus has generally been on the role of China, especially following its accession to the WTO in December 2001. China's emergence in the global trading system has had a negative impact on global prices for manufactured goods but a positive impact on input and commodity prices. But China is not the only manifestation of how globalisation is affecting inflation dynamics. The emergence of vertical production chains in Asia has raised the possibility that the disruption of production in any country could lead to regional, and even global, price shocks. The flood in Thailand in 2011 affected global prices of everything from rice to hard disk drives. Similarly, the tsunami in Japan affected car production across the world as the supply of critical car parts ran short.

3. ***Globalisation of labour.*** This is generally thought of in terms of the global supply of labour. Again, much attention justifiably has been on China and its abundant supply of rural workers. However, there is also India and Eastern Europe. This phenomenon of shifts in the global labour supply is not new. What is new this time is the sheer magnitude, with a doubling of global labour supply on some estimates. From the global economy perspective, it is a new reality. A related issue is the flow of labour across national borders. In ASEAN, a number of the more economically advanced regional countries have attracted large number of migrant workers from other regional economies. This has helped to keep labour costs low in the industries where such migrant workers are employed. This phenomenon is global. In the mid-1980s, when I was a student at the University of Texas, Spanish was heard largely in the southern states of the United States. Now, you hear Spanish spoken almost anywhere you go in the United States.

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4. ***Globalisation of monetary policy frameworks.*** Of course, inflation targeting had taken the limelight, especially prior to the crisis, when the trend in many advanced economies was to adopt more narrowly defined policy goals. However, the more important development was that, irrespective of framework, central banks had generally adopted good practices in the conduct of monetary policy including: acceptance of price stability as a primary objective of monetary policy, committee-based decision-making, transparency and communication, and in many emerging economies, fiscal dominance had been greatly reduced. In fact, monetary frameworks of many regional central banks differ more in form than substance. A potential downside to the globalisation of monetary policy frameworks, especially as it pertains to narrowly defined mandates, is whether the exclusive focus on inflation reduced the peripheral vision of central bankers to other risks associated with monetary policy.

The point here is that factors beyond those under the control of central banks, particularly those related to globalisation, played a key role in not only realising the "great moderation" but also in the changes to inflation since. In the recent period, financial globalisation has become a key development affecting not just financial, but also macroeconomic conditions. A number of regional economies had a nasty encounter with this form of globalisation some 15 years ago during the Asian financial crisis. More recently, since the onset of the crisis in the advanced economies, we have seen some of the negative implications of financial globalisation including: financial contagion and large capital flows, volatile asset prices and the financialisation of commodity markets. However, financial globalisation, if properly managed, can also promote growth and macroeconomic stability. Within Southeast Asia, policymakers are trying to promote regional financial globalisation, for example, through mechanisms to channel savings between regional economies. Growing regional trade and investment are facilitating financial linkages among regional economies and as these financial linkages grow, they will facilitate regional economic integration.

The globalisation of the sources of inflation does raise some questions about the conduct of monetary policy and its role in ensuring macroeconomic stability. Let me just mention three points before I introduce our speakers for this session.

POINT 1: Monetary frameworks have remained largely national even as the sources of inflation have increasingly become global. If global factors are playing an increasing role in determining domestic inflation, what role does a domestically oriented monetary policy have? Increased openness of developed and developing economies has increased the sensitivity of domestic inflation to global supply and demand developments.

POINT 2: Not fully comprehending such changes could potentially lead to policy mistakes. For instance, was the "great moderation" misdiagnosed? More specifically, did central banks claim too much credit for something in which they may only have had a minor role? For the emerging economies in Asia, structural changes in these economies are exacerbated by structural changes in the global economy. This raises the risks of potential blind spots in the policymakers' knowledge of inflation dynamics in their economies.

POINT 3: Has globalisation, particularly globalisation of financial markets, increased the risk of policy contagion? More specifically, has the globalisation of financial markets made monetary policy leaky, in terms of reducing its effectiveness as a national policy tool? Conversely, has it made our national economic and financial well-being more vulnerable to the monetary policy of other economies, especially if they are big economies? This is an important question given the sustained large-scale financial repression in the advanced economies and the potential for this to create large negative spillovers into regional economies.

To address these and other issues related to the impact of globalisation on inflation in Asia and the Pacific we have two speakers this evening. They complement each other rather nicely in the sense that Raphael Auer of the Swiss National Bank will talk about "real" globalisation," while Michael Devereux of the University of British Columbia will discuss "financial" globalisation.

The globalisation of inflation: a view from the cross section

Raphael A Auer and Philip Sauré[1]

Abstract

We examine whether a higher degree of trade integration is associated with a higher rate of price spillovers. More specifically, we examine how bilateral sector-specific trade integration affects the bilateral co-movements of sectoral prices. Our findings suggest that increasing trade integration was associated with a significant increase in the rate of price spillovers, which is consistent with the hypothesis that increasing real integration has made the inflation process a more global one. We conclude with describing our current work in this research field.

JEL Classifications: E31, F41, F61, F62

Keywords: Globalisation, Inflation, International Supply Chain, Exchange Rate Pass Through, Price Complementarities

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Introduction

Measured as a percentage of world GDP, global trade in goods and services increased from 12.1% in 1960 to 27.9% in 2010. Given this substantial increase in international transactions, the average country is much more exposed and susceptible to international shocks today than it was half a century ago. This observation has led many observers to argue that the increased real integration has also caused the increased co-movement of international prices (as documented by Monacelli and Sala (2009), Ciccarelli and Mojon (2010), Surico and Mumtaz (forthcoming), and Andrade and Zachariadis (2012)), ie many observers subscribe to the view that trade globalisation has also caused a "globalisation of inflation".

Despite this argument's intuitive appeal, the economic profession is split on whether trade globalisation has indeed *caused* a more globalised inflation process. On the one hand, Borio and Filardo (2007), building on Tootell (1998) and Gamber and Hung (2001), pioneered research that documented the importance of trade integration for the spillover of inflation. The first step of their empirical strategy is to construct a "global output gap" in the baseline specification equal to the trade-weighted average of the output gap prevailing abroad. In a second step, they then document that the global output gap has gained increasing importance as a determinant of domestic inflation, a development that was mirrored by the decreasing importance of the domestic output gap.

On the other hand, Ihrig et al (2010) challenge Borio and Filardo, claiming that their results depend on the particular specification of the estimated regressions. In the alternative specifications of Ihrig et al, the global output gap does not matter significantly for domestic inflation and neither do they find any evidence that it has gained importance in recent years.

As argued by Bianchi and Civelli (2010), a major difference between the approaches of these two contrasting views concerns how inflation expectations are modelled. This argument is related to a fundamental critique of any study on how global forces affect local equilibrium inflation, with monetary policy endogenously reacting to price shocks. If, for example, a national central bank adjusts its monetary policy such that it exactly counteracts any imported inflationary pressure, the observed relation between the global measures and domestic inflation is absent even if sizeable international price spillovers exist.[2]

While we believe that sophisticated time series estimation techniques may improve upon on this endogeneity issue (see, for example, the work of Mark A Wynne in this conference volume), we also believe that a look at a dimension other than time can more directly shed light on this issue. We therefore take a closer look at the cross section, ie sectoral data.

Identifying price spillovers from sectoral data has two advantages over the study of price spillovers in the aggregate. The first concerns the endogenous response of central bank policy to inflation spillovers. In each country and at each point in time, the exposure to global shocks varies across sectors. Thus, one can identify the importance of price spillovers by examining how the relative exposure to global shocks translates into relative sectoral price developments. Because the latter comparison is relative, one can identify the coefficients of interest abstracting from the aggregate over-time variation (technically, this is done by adding time fixed effects for each country).

[2] Another contentious issue is how policy should react to imported inflation. Corsetti and Pesenti (2005) analyse optimal monetary policy among interdependent economies and find that monetary policy should react to the exchange rate. Gali and Monacelli (2008), however, find that, under the assumption that preferences are such that expenditure shares of home and foreign goods are constant and there is no intertemporal optimisation, the optimal policy regime only targets the domestic inflation rate so that the consumer price inflation rate varies with fluctuations of the terms of trade.

The second advantage of using sectoral data is that it allows us to discern the effect of real integration from other forms of integration. For example, it is true that Germany and the Netherlands are well integrated in real terms and their inflation rates also co-move closely, but much of the degree of inflation co-movement can probably be attributed to factors other than trade integration – most notably a common monetary policy. The wealth of sectoral data allows us to link real integration and price spillovers in a more causal sense as the degree of real integration varies across sectors. We can thus examine whether bilateral price spillovers play a more important role in more integrated sectors.

While the cross section thus offers a much clearer link between price spillovers, it also has an obvious limitation, namely the fact that relative price shocks by no means necessarily translate into aggregate inflation.[3]

In this note, we thus present some evidence derived from an ongoing project (see Auer and Sauré (2012)) documenting that international spillovers of producer prices can be related to trade linkages at the sectoral level: we assess the rate at which shocks to producer prices in exporter countries spill over to producer prices in importer countries. We then examine how the rate of spillover is affected by the degree of real integration.

For our estimation, we utilise the dataset compiled by Auer and Sauré (2012) that covers the following three dimensions. First, our data cover 21 OECD countries, including the major world economies.[4] Second, our data cover the years 1975 to 2010 on a monthly frequency (1998–2010 and 1996–2011 for the United States and Canada, respectively). Third, the data is disaggregated and covers 21 sectors classified by the Classification of Economic Activities in the European Community (NACE) at the two-digit level of disaggregation.

Some estimation results

According to our conjecture, the degree of bilateral import penetration should be an important determinant of the spillover rate of producer prices from exporter to importer countries. To account for this effect, we augment a standard dynamic panel regression by adding an interaction term between the change in producer price index $\Delta ppi_{j,s,t}$ and a measure of bilateral import penetration, $w_{j,i,t}$, which yields the specification

$$\Delta ppi_{i,s,t} = \alpha_{i,j,s} + \sum_{k=0}^{L} \beta_k \Delta ppi_{j,s,t-k} + \sum_{k=0}^{L} \theta_k w_{j,i,s,t-k} \Delta ppi_{j,s,t-k} + \varepsilon_{i,j,s,t} \qquad (1)$$

The variable Δppi stands for the change of the sectoral producer price index on a monthly frequency. This index is specific to the sector-country pair, indicated by the subscripts *i* for the country and *s* for the sector. Periods are indicated by *t*, the data are on a monthly frequency. The spillover rate is defined as the sum of the estimated coefficients $\beta = \sum \beta_k$. Sector-importer-exporter specific fixed effects are accounted for as well as the corresponding time trends (not reported in (1)). These latter capture, among others, trends in sector-specific

[3] Ball and Mankiw (1995) note that relative price shocks affect equilibrium inflation if they have an impact on the distribution of sectoral price changes (see also Balke and Wynne (2000)). In the presence of menu costs, the skewness of relative shocks has an effect on equilibrium inflation owing to the asymmetric price responses of firms to small and large shocks. Auer and Fischer (2010) document that, in the United States, the increase in import competition from low-wage countries has induced such a shift in the distribution of price changes.

[4] The 21 different countries are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Romania, Slovenia, Spain, Sweden, the United Kingdom and the United States.

technological change and country-pair relations. Finally, $\varepsilon_{i,j,s,t}$ is an error term that depends on importer, exporter, sector and the month.

The measure of import penetration $w_{j,i,s,t}$ is defined as the value of shipments from the exporter country *j* to the importer country *i* in sector *s* over the value of output of the importer country *i* in sector *s* plus the value of total imports by country *i* , ie

$$w_{j,i,s,t} = \frac{X_{j,i,s,t-12}}{X_{i,s,t-12} + \sum_{m \in M} X_{i,m,s,t-12}} \tag{2}$$

where $X_{i,j,s,t}$ are bilateral export volumes from *j* to *i*, $Y_{i,s,t}$ is national output of sector *s* at time *t.* To mitigate endogeneity problems in the measure of import penetration with prices, we lag the import penetration in our estimation by one year.

We run regressions of specification (1) for time-lags up to 24 months. Figure 3 plots the cumulative effect of the plain spillover rate, ie the estimated sum of the coefficients ($\sum \beta_k$) for each lag length (blue line). The spillover rate peaks around four to five months after impact at levels above but close to 25%. In the longer run, it then falls back to levels below but close to 20%.

We note that there is no clear interpretation of the main effect in (1), ie the expression $\beta = \sum \beta_k$, which is represented by the blue line in Figure 1, suffers an obvious endogeneity problem since, by construction, for each country pair *i* and *j*, a shock to *i* is treated as a dependent and as an independent observation at the same time. Thus, if a shock originates in one country, it appears in the dependent variable for part of the observations. Similarly, if shocks to global supply or to global demand hit a specific sector uniformly across all countries, the resulting common price change will induce an upward bias of the estimated coefficient β from specification (1). Overall, problems of endogeneity and omitted variables preclude a clean interpretation of the respective coefficient.

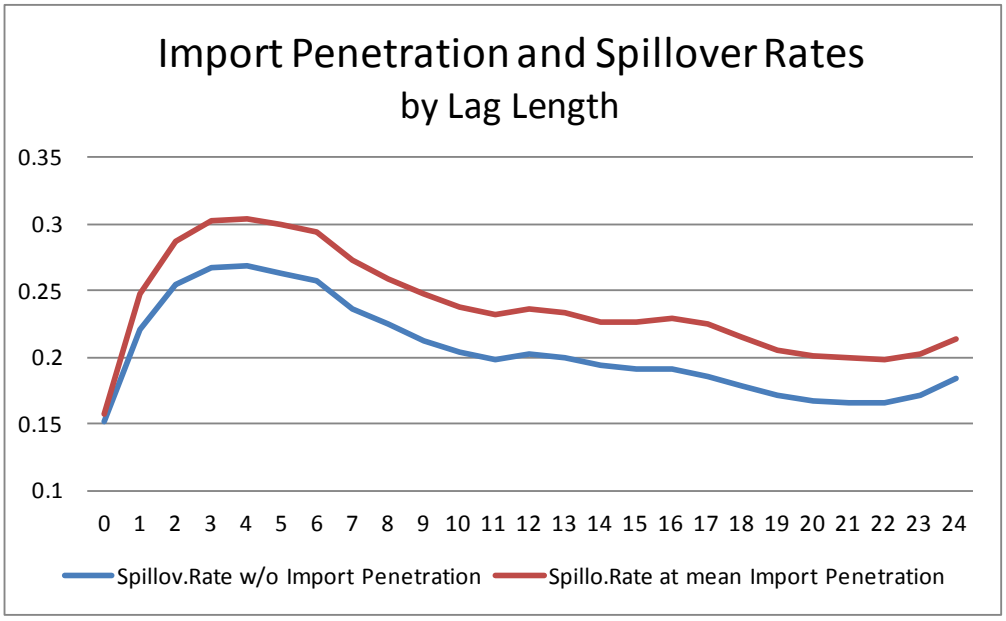
The main insight derived from these results is that price spillovers are larger in more integrated country sector pairs. To represent the average effect that comes in addition to the plains spillover effect, the red line in Figure 3 represents the spillover at the mean import penetration, defined in (2). The mean import penetration is 2.05%. Thus, the red line plots the expression $\sum(\beta_k + 0.0205 \cdot \theta_k)$ as a function of the lag-length *k*. As expected, the additional effect is positive, ie a higher import penetration results in a higher spillover rate.

A change in the producer prices in country *j* does not affect producer prices in country *i* very much if country *j* exports virtually nothing to country *i*. Instead, if country *j* is the dominant supplier for country *i*, its price changes strongly impact producer prices in country *i*.

A typical specification of (1) with 12 lags suggests that for each additional percentage point of import penetration the spillover rate increases by about 1.6 percentage points. The estimates also suggest that a very substantial increase in the average spillover rate was brought about by the increase in globalisation mentioned in the introduction that raised trade shares from 12.1% of world GDP in 1960 to 27.9% in 2010.

Figure 1

Estimated general cumulative spillover rate and spillover at mean import penetration from exporter country to importer country based on equation (1)



Conclusion

In this note, we present evidence that a higher degree of trade integration is associated with a higher rate of price spillovers. The key novelty of our analysis is its focus on sectoral prices, which allows us to quantify the importance of price spillovers even if the central bank reacts to imported inflation. We examine how bilateral sector-specific trade integration affects the bilateral co-movements of sectoral prices conditional on sector, country-pair and time characteristics. Our findings suggest that increasing trade integration has caused a significant increase in the rate of price spillovers.

In Auer and Sauré (2012), we examine whether these results also hold conditional on sector, country-pair and time characteristics. We also extend these results, decompose the precise channels by which real integrations foster the spillover of price shocks, and develop a theoretical model of the international supply chain, price complementarities (based on an extension of Auer and Schoenle (2012), and price spillovers in an integrated world to guide our analysis. Among other things, we utilise input-output tables to show the importance of the international supply chain for international price spillovers.

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Inflation and financial globalisation

Michael B Devereux[1]

Abstract

The size of gross external portfolio holdings has among many countries increased substantially over the recent past. Over the same period the volatility of inflation has declined in most countries. Many previous papers argue that financial globalisation has led to improved policy-making and lower inflation. This paper makes the case that there could be causation running in the other direction. We present theory and empirical evidence indicating that more stable inflation leads to a substantial rise in the size of gross international financial positions, and an increase in financial globalisation.

Keywords: Inflation, Financial Globalisation

JEL classification: E4, E5

[1] NBER, CEPR and University of British Columbia. This is a write-up of my presentation at the BIS Conference on "Globalisation and inflation dynamics in Asia and the Pacific", 18–19 June 2012 in Hong Kong. It is based on joint research with Ozge Senay and Alan Sutherland.

1. Introduction

Data on external asset positions shows that the gross size of country portfolios has increased substantially over the past four decades. Over the same period the volatility of inflation has declined in most countries as monetary authorities have shifted the focus of monetary policy towards inflation stabilisation and away from output stabilisation. Are these two phenomena related? Has the increased monetary policy focus on nominal stability resulted in greater financial globalisation?

There has been a substantial literature on the relationship between financial globalisation and inflation. But the literature for the most part has focused on the causation going in the other direction. As an example, many authors have suggested that increasing globalisation in goods and financial markets has led to a decline in national inflation rates, either through direct market mechanisms or by influencing the behavior of monetary authorities. Rogoff (2004, 2006) suggests that increasing economic openness may steepen the trade-off between inflation and output, and reduce the equilibrium inflation rate chosen by monetary authorities. Chen et al. (2009) find empirical evidence that increasing openness, by reducing non-competitive distortions in domestic markets, reduces the inflation bias in monetary policy. In addition, it has been suggested that there are direct disinflationary forces imparted by international trade (Pain et al. 2006, Borio and Filardo 2007). Alternatively, financial globalisation could affect inflation indirectly by imposing a 'disciplining effect' on domestic monetary policy.

This link is explicitly tested in Tytell and Wei (2004). They find evidence that financial globalisation has led to lower inflation rates. Related research by Kose et al. (2007) suggest that there are 'collateral' benefits of financial globalisation coming from its effect on the quality of domestic economic policy. Stark (2011) also conjectures that financial globalisation was a contributing factor in improved monetary policy performance in OECD countries.

These hypotheses are quite plausible. Through these or other mechanisms, it is quite likely that financial globalisation would influence the level or variability of inflation. But the link may also go the other way. That is the subject of the paper that is summarized in the present discussion (Devereux, Senay and Sutherland, 2012 - hereafter DSS). The paper argues that there is a strong theoretical case for the hypothesis that more stable inflation leads to a substantial rise in the size of gross international financial positions, and as a result, an increase in financial globalisation.

In DSS we find that monetary policy which reduces the variability of domestic inflation leads to an increase in the diversification of international portfolios, generating higher gross external assets and liabilities. We show that this result is highly robust across a wide variety of modeling specifications and parameter assumptions. In addition, we provide some preliminary empirical evidence for this link.

Our approach is to provide a theoretical investigation of the impact of monetary policy and nominal stability on the size of external asset positions in a general theoretical model in which gross external financial positions are endogenous.

The theoretical model is a two-country DSGE structure with Calvo-style sticky prices. The benchmark model with a standard Taylor rule displays home bias in equity holdings while each country holds a long position in bonds denominated in their own currency. By varying the feedback coefficient on inflation in the Taylor rule it is possible to analyze the relationship between the anti-inflation stance of monetary policy, the variance of inflation and equilibrium portfolio positions. In the baseline parameterization of the model, as the policy feedback coefficient on inflation is increased, the variance of inflation falls and the absolute size of equilibrium gross positions in both equities and bonds increase. So the model predicts a negative relationship between the variance of inflation and the size of equity and bond portfolio positions. This negative relationship appears to be very robust across a wide range of parameter variations.

The underlying cause of this negative relationship can be explained in terms of simple expressions for equilibrium portfolios which show that the equilibrium gross portfolio position in any asset is proportional to the variability of home income relative to foreign income and inversely related to the variability of the asset return. Lower variability of asset returns compared to the variability of relative income implies that gross portfolios have to be larger in order to provide adequate hedging of income shocks. We show that the model implies that, as the feedback coefficient on inflation in the Taylor rule is increased, the variability of asset returns decreases compared to the variability of relative income. This leads to an increase in gross asset positions. We further show that the size of gross positions depends on the correlation between asset returns and cross-country income shocks. The more asset returns are correlated with income shocks the larger are equilibrium gross holdings. Our model shows that, when asset markets are incomplete (meaning there are fewer independent assets than there are sources of uncertainty) a reduction in inflation variability increases the correlation between asset returns and income shocks. In effect, inflation stabilisation moves equilibrium closer to the complete markets outcome. This tends to raise the size of equilibrium gross holdings. There are thus two effects which link a reduction in inflation variability to an increase in the size of gross portfolio positions, a return variability effect and a return-income correlation effect. The model shows that both effects contribute to an expansion of gross positions the more monetary policy focuses on inflation stabilisation.

The relationship between gross positions and inflation volatility can be investigated empirically using the Lane and Milesi-Ferretti (2001, 2007) data on gross external portfolio positions. In order to put our theoretical results in context, we first report panel regression estimates for advanced economies for the period 1970-2007 which show a statistically significant negative relationship between inflation variability and the size of gross portfolio positions. This empirical result appears to be quite robust to different specifications of the regression equation and different definitions of the variables. In particular the results are robust for overall gross positions and also the gross positions in bonds and equities separately.

DES represents part of a large literature on the theoretical and empirical underpinnings of international capital flows. On the theory side, Devereux and Sutherland (2010, 2011) and Tille and Van Wincoop (2010) develop techniques for computing equilibrium portfolios in DSGE models. Applications to the 'home bias' puzzle include Coeurdacier et al. (2010), Engel and Matsumoto (2009), Heathcote and Perri (2007), and Benigno and Nistico (2009). Empirically, Lane and Milesi-Ferretti (2008a,b) and Lane and Shambaugh (2010) have explored the determinants of international portfolio positions.

2. Empirical Evidence

Here we take some empirical evidence from DSS. That paper does some basic panel regression estimates of the relationship between gross positions and inflation variability.We estimated a panel regression of the following form

$$100\ln(GP_{i,t} / GDP_{i,t}) = \beta_0 + \beta_1 \sigma_{i,t}(\pi) + \beta_2 Open_{i,t} \quad (1)$$

where $GP_{i,t}$ is a measure of the size of the gross portfolio position of country i in period t and $\sigma_{i,t}(\pi)$ is a measure of inflation variability for country i in period t.

We control for capital market frictions by including $Open_{i,t}$ as a measure of financial openness in the above regression equation.

We focus on the total gross position, GP, which we define as

$$GP = \frac{\left(Total\ External\ Assets + Total\ External\ Liabilities\right)}{2}$$

We define $\sigma_{i,t}(\pi)$ to be the standard deviation of the CPI inflation rate of country i for the period $t-k$ to t where inflation is measured as the annual percentage change in the CPI measured at quarterly intervals. In the main results we report below we choose k to be six years, so $\sigma_{i,t}(\pi)$ is the standard deviation of annual inflation based on the 24 quarterly observations of the CPI up to and including the final quarter of year t. Data on gross asset and liability positions is taken from Lane and Milesi-Ferretti (2007).

Column 1 of Table 1 reports the estimated coefficients for the case where country dummies and a time trend are included in the list of regressors. For this version of the estimation equation the estimated coefficient on the variability of inflation is negative and the coefficient on the Chinn-Ito index is positive.

The magnitude of the coefficient on inflation variability suggests that inflation variability has quite a large effect on the size of gross positions. For instance, a coefficient of –5.1 implies that a fall in the standard deviation of annual inflation by 1 percentage point raises the size of gross portfolio positions by approximately 5% of GDP. The average range of the standard deviation of inflation over the sample period is approximately 5 percentage points, so these estimates suggest that changes in inflation variability might account for a change in the size of gross positions of approximately 25% of GDP, which is quite a large effect.

The coefficient on the Chinn-Ito index is also quite large. The Chinn-Ito index varies between –1 and +2.5 over the sample period, so a coefficient of 7.2 implies a change in gross portfolio positions of approximately 25% of GDP. Again this is a large effect.

Column 2 of Table 1 reports the results for a variant of the model where we correct for auto-correlation. The estimated coefficient on inflation variability continues to be negative and significant, but is somewhat smaller than the coefficient reported in Column 1. The coefficient on the Chinn-Ito index continues to be positive but is no longer significant.

Columns 3 and 4 repeat the AR(1) corrected regression for cases where the dependent variable is respectively equity-type assets and debt-type assets. The general message of these results, in terms of the coefficient signs, is similar to the results already reported for the total gross position, ie the coefficient on inflation variability is negative and the coefficient on the Chinn-Ito index is positive. Columns 5 to 7 report results for an extended sample of countries which includes a wider set of developed economies.

3. A model of monetary policy and gross portfolio positions

We analyse a model of two countries with multiple types of shocks. The full description of the model is given in the working paper by Devereux, Senay and Sutherland (2012). Here we simply state some of the main results which are used to construct international portfolio positions. We follow Devereux and Sutherland (2011) in computing the characteristics of the portfolios using a second-order approximation to the portfolio selection equations for the home and foreign country.

Define Δc as relative (log) consumption between a home and foreign country, q as the real exchange rate, Δy as relative (log) income, f as initial net foreign assets of home, and r_x as a vector of excess returns on the home portfolio. We allow for a portfolio of equities and bonds to be traded across countries.

Following Devereux and Sutherland (2011), we may write the orthogonality condition which determines the optimal bond and equity portfolio as follows:

$$E_t\left(\Delta c_{t+1} - \frac{1}{\rho} q_{t+1}\right) r_{x,t+1} = 0 \tag{2}$$

From each country's budget constraint, and optimal intertemporal consumption smoothing, we can obtain an expression for real exchange rate adjusted relative consumption in period $t+1$ as

$$\Delta c_{t+1} - \frac{1}{\rho} q_{t+1} = (1-\beta)\left[\Gamma_{y,t+1} + \beta^{-1} 2 f_t + 2\tilde{\alpha}' r_{x,t+1}\right] \tag{3}$$

where

$$\Gamma_{y,t+1} = E_{t+1} \sum_{j=0}^{\infty} \beta^j \left(\Delta y_{t+1+j} + \% \frac{(\rho - 1)}{\rho} q_{t+1+j}\right)$$

represents the present value of expected innovations to relative income, plus the present value of expected innovations to the real exchange rate. Here β is the time discount factor and ρ is the inverse elasticity of intertemporal substitution. Note that in the case of $\rho = 1$, the second term drops out, and innovations in current and expected future real exchange rates do not directly affect the value of $\Delta c_{t+1} - \frac{1}{\rho} q_{t+1}$.

Putting (3) together with the orthogonality condition (2), we may compute the expressions characterising the equilibrium portfolio as

$$\tilde{\alpha} = -\frac{1}{2} \Sigma_r^{-1} \text{cov}_t(r_{x,t+1}, \zeta_{y,t+1}) \tag{4}$$

Where $\zeta_{y,t+1} = \Gamma_{y,t+1} - E_t \Gamma_{y,t+1}$ and where Σ_r is the co-variance matrix of $r_{x,t+1} - E_t r_{x,t+1}$. Thus, the optimal portfolio position is determined by the way in which innovations in the excess return vector co-vary with innovations in the expected present discounted value of relative income (adjusted by the real exchange rate).

DES show that equation (4) is equivalent to the following expressions for equilibrium asset holdings

$$\tilde{\alpha}_e = -\frac{1}{2} \text{corr}\left(\zeta_{y,t}, r^e_{x,t} \mid r^b_{x,t}\right) \frac{\text{StDev}\left(\zeta_{y,t} \mid r^b_{x,t}\right)}{\text{StDev}\left(r^e_{x,t} \mid r^b_{x,t}\right)} \tag{5}$$

$$\tilde{\alpha}_b = -\frac{1}{2} \text{corr}\left(\zeta_{y,t}, r^b_{x,t} \mid r^e_{x,t}\right) \frac{\text{StDev}\left(\zeta_{y,t} \mid r^e_{x,t}\right)}{\text{StDev}\left(r^b_{x,t} \mid r^e_{x,t}\right)} \tag{6}$$

These expressions show that the size of the gross position in asset *i* depends on two factors:

(1) $corr\left(\zeta_{y,t}, r^i_{x,t} \mid r^j_{x,t}\right)$,, the correlation of the return differential of asset *i* with innovations in the present value of relative income (conditional on the return differential of asset *j*)

(2) $StDev\left(\zeta_{y,t} \mid r^j_{x,t}\right) / StDev\left(r^i_{x,t} \mid r^j_{x,t}\right)$,, the standard deviation of innovations in the present value of relative income (conditional on the return differential of asset *j*)

relative to the standard deviations of returns on asset i (conditional on the return differential of asset j)

These expressions have a very intuitive explanation. Agents wish to hold a portfolio of assets which hedge against shocks to relative income, ζ_y. The extent to which asset i provides a good hedge against relative income shocks depends on the correlation between the return on asset i and relative income shocks, ie $corr\left(\zeta_{y,t}, r^i_{x,t} \mid r^j_{x,t}\right)$. An asset which is (negatively) correlated with income shocks is a good hedging instrument and so will be held in the equilibrium portfolio with a positive gross position. The stronger the correlation the more of that asset will be held. But the amount of the asset that needs to be held to hedge income shocks also depends on the size of fluctuations in income relative to the size of fluctuations in the return on asset i, ie $StDev\left(\zeta_{y,t} \mid r^j_{x,t}\right) / StDev\left(r^i_{x,t} \mid r^j_{x,t}\right)$. The larger are fluctuations in income relative to fluctuations in the return on asset i the larger must be the gross position in asset i in order to provide the desired degree of hedging.

These two effects, (ie *the correlation effect* measured by $corr\left(\zeta_{y,t}, r^i_{x,t} \mid r^j_{x,t}\right)$, and *the variability effect* measured by $StDev\left(\zeta_{y,t} \mid r^j_{x,t}\right) / StDev\left(r^i_{x,t} \mid r^j_{x,t}\right)$)), are key to the interpretation of the link between inflation variability and the size of gross positions.

4. Inflation and globalisation: main results

In DSS, this model is solved numerically, and then optimal portfolios are constructed as described above. That paper shows in detail how the portfolios depend on the correlation and variability terms as identified in (5) and (6). Rather than an extensive analysis of the calibration, computation methods and quantitative implications of the model, here we simply summarize the main results in words.

The key to the results lies in the impact of a 'tighter' monetary policy on both inflation variability and gross external portfolios simultaneously. By 'tight', we mean a monetary policy rule where the Central Bank adjusts interest rates in response to inflation and output gaps, and the parameter governing the response to inflation rises. In accord with realistic descriptions of policy, we assume that policy responds to CPI inflation.

What happens when monetary policy becomes tighter? The first and most direct effect is that the response of CPI inflation to various shocks in the model is dampened. This means that the volatility of inflation is reduced, in accord with what we see in the historical pattern of inflation over the last few decades for most countries. But the tighter monetary policy also affects equilibrium portfolios and therefore the size of gross external asset holdings.

The intuitive linkage between inflation stabilisation and external asset holdings can be related to the 'correlation effect' and the 'variability effect' defined above. The model in DSS includes both equity and nominal bond holdings for each of the two countries. A tighter monetary policy tends to reduce the standard deviation of relative equity returns, as it makes dividend payments more stable. It also reduces the standard deviation of relative bond returns, since relative nominal bond returns depend on relative CPI inflation directly. As a result, through the variability channel defined above, the absolute size of both external equity and external bond holdings rise. It also turns out that a tighter monetary policy in most cases increases the standard deviation of relative income, therefore giving a further boost to the size of gross external asset holdings (both in equity and debt).

At the same time, if a tight monetary policy improves the efficiency of asset prices in responding to fundamental shocks governing asset returns, then it can also be shown that the policy increases gross external asset holdings through the correlation effect. Thus,

through all the channels described in equations (5) and (6), a policy of inflation stabilisation will lead to an increase in financial globalisation.

5. Discussion

This research agenda suggests that a more aggressive monetary policy which reduces the variability of inflation in almost all cases leads to an increase in gross external assets and liabilities. Previous researchers have argued that the causation may go in the other direction. Econometric evidence such as Tytell and Wei (2004) finds that measures of financial globalisation have significantly negative coefficient estimates in cross country inflation (level) equations. By contrast, our empirical evidence finds that inflation variability is significant in panel regressions of financial globalisation. Sorting out the full set of causal links between the level of inflation, the variability of inflation, and financial globalisation is beyond the scope of this paper. Both inflation and international portfolio positions are endogenous and affected by all aspects of the macroeconomy, and it is difficult to obtain robust instruments for either variable. Moreover, our theory by no means precludes the possibility that there may be additional forces leading from international financial globalisation to inflation either directly or indirectly through endogenous monetary policy. Our main point is that evidence suggesting that increased capital market openness has been associated with reductions in average inflation rates does not necessarily establish the direction of causation, since we have shown that there are strong theoretical reasons to think that there may also be a link between inflation stability and the size of gross external financial positions.

The effect of inflation variability on gross external assets depends on the correlation and variability channels defined above. Are these channels empirically relevant? Our model predict that a fall in the variance of the relative returns on bonds and equity will lead to a rise in gross external positions. The relative return on nominal bonds is represented by the variance of expected exchange rate changes. In fact, over the major period of financial globalisation discussed in this paper, as noted by Rogoff (2006), there was a decline in variability in nominal exchange rates between the major economies. Likewise, there is evidence of an increase in the co-movement of major world stock markets since the mid-1990s (see e.g. Kizys and Pierdzioch 2009). This should be associated with a fall in the variability of relative equity returns.

The second component of the variability effect is determined by the conditional variance of relative income across countries. One way to measure this would be to look at business cycle co-movement across countries. Here, the results of the literature are quite ambiguous. Heathcote and Perri (2002) and Stock and Watson (2003) find that business cycle co-movement among the major economies fell in the 1990's relative to earlier periods. In principle, this should lead to an increase in the conditional variance of relative income across countries. However, using a wider sample of countries, Kose, Prasad and Terrones (2003) find that correlations tended to increase over time during the 1960-99 period.

In the case of demand shocks, our model predicts that a fall in inflation variability will still lead to a rise in financial globalisation, even though it will cause a decline in the conditional variance of relative income. This is because the rise in gross holdings coming from the fall in the conditional variance of asset returns dominates the effect of the fall in the conditional variance of relative income. Thus, to establish to importance of inflation variability in gross external assets does not necessarily require a fall in business cycle co-movements.

Table 1 Panel regression results

	(1) G7 Total portfolio	(2) G7 Total portfolio	(3) G7 Equities	(4) G7 Debt	(5) G22 Total portfolio	(6) G22 Equities	(7) G22 Debt
Constant	-194.2***	-219.4***	-400.0***	-217.6***	-262.2***	-486.2***	-269.0***
	(30.45)	(8.71)	(14.33)	(7.62)	(12.02)	(15.10)	(10.56)
StDev	-5.12***	-3.20***	-2.06*	-3.45***	-1.11*	-0.72	-1.10*
Inflation	(4.36)	(3.94)	(1.65)	(3.92)	(1.85)	(0.83)	(1.74)
Chinn-Ito	7.20***	2.38	6.18**	1.87	2.77**	2.47	3.17**
Index	(4.18)	(1.36)	(2.32)	(0.98)	(2.14)	(1.33)	(2.33)
Trend	4.41***	6.16***	8.75***	4.42***	7.46***	11.66***	5.82***
	(24.35)	(10.02)	(12.13)	(6.39)	(18.13)	(19.25)	(12.31)
AR coeff		0.92	0.89	0.92	0.91	0.91	0.92
R^2	0.94	0.99	0.99	0.99	0.99	0.99	0.98
St Err Est	20.62	7.73	11.77	8.38	10.07	14.51	10.58
F-stat	411.35	28.59	68.30	20.95	29.14	36.90	18.03
DW-stat	0.17	1.74	1.76	1.74	1.84	1.89	1.78

Column (1): simple OLS. Columns (2)-(7): OLS corrected for AR(1) residuals.

*** indicates significant at 1% level

** indicates significant at 5% level

* indicates significant at 10% level

t-stats in brackets

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Dinner address

European crisis and its implications for global inflation dynamics

Athanasios Orphanides[1]

It is a pleasure to participate at this conference on "Globalisation and inflation dynamics in Asia and the Pacific", and I appreciate the opportunity to share some thoughts with you about the implications of the ongoing European crisis for global inflation dynamics.

Let me begin with a few words on the broader topic of the conference. Over the long term, inflation is always and everywhere a monetary phenomenon. But over shorter horizons, inflation dynamics are driven by the interaction of an economy's productive capacity with demand, and the influence of macroeconomic policy on both.

Globalisation has influenced the inflation process through a number of channels. First, by allowing the gains from trade to show with greater force, it has facilitated more efficient production on a worldwide scale, which could be seen as a positive supply shock to each economy benefiting from it. This was an important factor that provided a benign backdrop for monetary policy during long stretches over the past 20 years. Against this backdrop, central banks around the world consolidated disinflation gains that brought us to an environment of relative price stability worldwide.

Second, globalisation may have influenced the response of inflation to any difference between domestic demand and domestic potential supply. The global balance between demand and supply becomes a greater force in determining inflation dynamics in an economy with greater links to the rest of the world. By linking the economies around the world more closely, globalisation has facilitated a potentially more forceful transmission of shocks from one part of the world to others.

Which brings us to our specific topic for this evening, the implications of the ongoing European crisis for global inflation dynamics.

The key word, I believe, is uncertainty. When looked at as a single economy, the euro area, the collection of the 17 economies that have adopted the euro, is the second largest economy in the world, with the US still being the largest. At the moment, the euro area is at the centre of a financial crisis with global dimensions. The risk of disintegration is not negligible, with global contagion effects that are as difficult to assess as what we experienced only a few years ago with the collapse of Lehman. But the situation is far more dangerous as the starting conditions are more precarious. The repair from the global recession of 2009 is far from completed, indeed balance sheets are weak. In many economies, there is much less fiscal space to deal with additional weakness. In this setting, we can envision three different scenarios in Europe with vastly different implications for global inflation.

A catastrophic scenario in Europe, a full blown crisis in the euro area, could impart deflationary pressures to the global economy. We have recently been through such a close call, following the collapse of Lehman. A vast monetary policy expansion at a global level averted the worst in 2008–09. But monetary policy at the moment is still overextended. In many economies, policy rates are near zero and we are operating in unconventional territory where the effectiveness of additional easing is much more uncertain. So the risk that

[1] Former Governor, Central Bank of Cyprus.

monetary policy may be less effective in containing the deflation concerns is higher than it was three years ago.

A muddling-through scenario in Europe, where the current environment of instability remains but with just sufficient action on the part of governments to avert deterioration, should be neutral on the expected inflation developments around the world. But such a scenario would come with continued high risks, perhaps increasing risks of trouble. Even with the best intentions of avoiding one, an accident can occur due to a miscalculation.

A good scenario in Europe is one that restores the euro area to a sustainably stable path. This would certainly be welcome. But in that case, central banks around the world should be ready to face an inflationary dynamic. With global liquidity currently at exceptionally high levels, restoring confidence and solid growth in Europe could quickly move the global economy to a phase of excess credit growth and exuberance, feeding into inflation.

So the implications of the European crisis for global inflation depend crucially on how it evolves in Europe, that is, how it is handled going forward. To assess the likelihood of the different scenarios, it may be instructive to review how we got to the current stage of the crisis and some of the options ahead regarding its resolution.

The ongoing global crisis did not start in Europe. The beginnings can be traced to the United States, where, starting in the summer of 2007, we saw the first serious cracks in financial markets. The crisis had still not reached the euro area in a major way until after the collapse of Lehman in September 2008. The global recession and financial crisis that engulfed virtually all developed countries at the end of 2008 and 2009 also proved painful to Europe. But unlike most of the rest of the world, in the euro area the recession also brought to light weaknesses in the construction of the euro that thrust the crisis into a new phase, the one we are still experiencing today.

The euro area is an economic and monetary union. A monetary union enforces monetary policy coordination and a common lender of last resort to the banking system for the union as a whole. For a monetary union to function properly, however, additional coordination and cooperation are necessary. Some minimal policy coordination and control are needed on fiscal policy. The protection of the integrated financial sector is also necessary. One way to achieve these is with a complete political union, a solution that was ruled out in the construction of the European Union. Rather, the idea for the European Union was to form a single economy, an integrated financial system, in the euro area a single currency and single monetary policy, but still leave sovereign states to handle their own fiscal affairs and retain all risks with fiscal implications. The European Union treaty prohibits member states from assuming the debts of other member states and prohibits monetary financing by any central bank in all member states.

On the fiscal side, the minimal coordination that was adopted rested on member states respecting strict limits on debts and deficits. This was the objective of the Stability and Growth Pact. Tight control of fiscal policy in each individual member state would ensure that no member state would run into trouble with its fiscal finances. In order to avoid any moral hazard issues, no crisis management mechanism was set up at the beginning. It was assumed that the strict fiscal rules and the absence of any crisis management mechanism would be sufficient to avoid any country getting into trouble.

The global recession and financial crisis revealed two flaws in this construction. First, the crisis revealed that the fiscal framework was lacking. It was not respected by all member states and could not be properly enforced. In the case of Greece, towards the end of 2009 it became clear that the country was running fiscal deficits that had been and were projected to stay too large, raising questions of debt sustainability.

Second, the crisis revealed that the financial integration construction was fragile. Before the crisis, EU directives and regulations promoted a single unified banking sector. Banks based in one member state could easily operate everywhere in the Union, take deposits, take risks

in lending. But supervision, deposit protection, resolution, all remained nationally based. The crisis showed that this nationally-based banking system embedded in a monetary union was not robust to large shocks. Paraphrasing Mervyn King, large banks were European in life but local in death. More than anything else, in the euro area this element has been at the centre of the negative feedback loop between sovereigns, banks and real economies in member states. This has been a source of trouble in the euro area in particular because the lender of last resort to the banking system is a European institution – the central bank of the euro area, that is the ECB – while no similar euro area resolution authority exists.

The resulting mismatch has created and continues to create severe problems. In the case of Ireland, the banking crisis in late 2008 created large demands for the resolution and restructuring of the banking system. Although the cost of a collapse would have created severe contagion for the euro area as a whole, the member state was called to incur all of the cost of cleaning up. Despite having a very good fiscal position before the crisis, Ireland was forced to take up the implicit liabilities associated with supporting its banking sector that generated concerns about the sustainability of its debt going forward.

The euro area construction was incomplete and did not have a crisis response mechanism in place to handle such developments. Bold political leadership was necessary to control the problem effectively. Unfortunately, the political response proved inadequate and added to the problem rather than alleviating it.

Let me be clear. In both cases mentioned above, Greece and Ireland, the initial shocks were very small for the euro area as a whole but very large for the country in isolation. A European solution from the very beginning could have easily contained the consequences of these shocks. In the event, the policy response magnified the cost and transmitted it also to other economies in the euro area, and the world. By the end of 2010, both countries had to resort to the IMF and their euro area partners for assistance.

In terms of GDP, Greece and Ireland make up around 2% of the euro area. For the euro area as a whole, the shock uncovered in Greece due to fiscal imbalances and the shock to Ireland due to the banking collapse could be contained if euro area governments were willing to tackle them collectively. But to do this properly would have required some degree of coinsurance, mutual help. The problem with this was concern about the moral hazard such a solution could have created for the future. For some governments in the euro area, this was anathema.

Perhaps the most important casualty of the crisis in Europe is that of trust among governments of the member states and their people.

In the face of the crisis, European leaders decided to provide loans to countries faced with shocks that brought their debt dynamics into question. But they also decided to rule out the mutual help framework that could have ensured stability in each state going forward. Rather, European governments decided to magnify the credit risk in sovereign paper as a means to avoid the future moral hazard.

In October 2010, following first a meeting in Deauville between the leaders of France and Germany and then confirmed in a European Union Summit in Brussels, a fatal error was committed by the governments. They decided to introduce the concept of private sector involvement (PSI) in euro area debt. The idea was that an investor buying euro area sovereign debt should no longer assume he would be repaid in full. Rather, any investor would have to worry that if the country faced the prospect of high debt, then a haircut on the debt would be implied, even if there was no issue regarding the sustainability of the debt.

In 2011, with decisions on 21 July and 26 October, European leaders went further and forced a selective haircut on Greek debt. By creating the precedent that a member of the euro area would be forced to impose a haircut on the holders of its debt, they reinforced to investors how the PSI concept would be applied in any other member of the euro area.

Introducing the prospect of sovereign default was bad enough, but it got worse. As a consequence of the forced and highly selective default of Greek debt, combined with an adjustment programme that was seen as too harsh on the Greek population, questions about the prospect of Greece leaving the euro started appearing. It did not help that some analysts and academics were arguing that Greece would be better off if it unilaterally left the euro area. Whether Greece should remain in the euro or not was arguably the main question faced by voters in yesterday's election in Greece. Of course, what is a prospect for one member state could later be a possibility for another. The irreversibility of joining the euro area was brought into question.

This phase of the management (or rather, mismanagement) of the crisis by European governments introduced currency risk into the mix on top of sovereign risk. The idea of leaving the euro, for Greece or anyone else, is to allow for a devaluation that might ease the immediate pressures of economic adjustments. You can imagine the incentives this created for private depositors to maintain deposits in accounts in euros in Greece.

In a short two years, the crisis response to a small problem by euro area governments introduced credit risk in sovereigns and currency risk in deposits in member states perceived as weak, threatening the whole construction of the euro area.

At the moment, the system is extremely unstable. It is essential to understand this to comprehend the global risks of something going wrong and the adverse scenarios it could create. Let's focus on Italy and Spain, the third and fourth largest economies in the euro area. At the moment, because of the credit risk embedded in euro area sovereigns, the financing costs for the governments of these countries are a few percentage points higher than some other countries in the euro area, including Germany and France, the largest two. Such differences cannot be sustained for long.

Suppose someone is concerned that the deterioration of the recession might cause additional losses in the banking sector in the countries perceived to be weak. In the current setup, if banks in these countries require future support from their governments, the responsibility falls squarely with these governments.

In this setting, would it be unreasonable for private depositors to be concerned that with some small probability these countries too might be engulfed in a debate about whether they should leave the euro in the future? Would it then be unreasonable for businesses and households to wonder whether it may make sense to have euro accounts with any extra euro deposits held as savings in banks in member states that are perceived as stronger?

The same destabilising dynamic that has shifted demand for sovereign debt from the weak to the strong states inside the euro area is creating incentives for deposits to flee from the states perceived to be weak to the states perceived to be stronger. A worsening of the crisis should not come as a surprise unless some fundamental aspect of the design of the euro is changed. How things evolve depends on whether European governments move towards adopting a solution that removes the destabilising forces inherent in the euro construction or choose to limp along, risking a collapse on the way.

Solutions do exist, if the political will can be found to adopt them: Let me briefly mention two possible solutions, both with different pros and cons. One solution is moving towards a more complete political and fiscal union – find a mechanism to reduce the credit spreads introduced by the earlier decisions. Ideas like eurobonds with mutualisation of risks associated with government borrowing are on the table. If adopted, these ideas can diffuse the immediate pressures. But without a mechanism to control spending by sovereign governments, these solutions could create more severe tensions in the long run. Without a stronger political union, one that reduced the sovereignty of state governments to control their spending decisions, this may not be feasible to design properly.

Another solution is to move towards a more integrated financial sector – a banking union. The idea here would be to break the loop between sovereigns and banks so that even if a

sovereign is considered weak, banks based in that country and the real economy are not unduly penalised for this. Banks must not be penalised depending on where their head office happens to be, which is currently the case. We must delink banks from sovereigns. As in other areas, we need to work backwards to solve this problem. Banks, their customers and their shareholders must face the same responsibilities and same opportunities everywhere in the union – at least in the common currency area.

In the euro area, at the moment, we observe that the sovereign crisis has increased the heterogeneity of the member states, has increased the segmentation in banking and is threatening the functioning of the currency union and the common market. To reverse this dynamic, Europe needs a truly European solution on bank stability, resolution and deposit insurance. There are frameworks elsewhere that could serve as examples. In the United States, for example, the supervisory environment and operation of the FDIC implies that depositors need not worry about the safety of their deposits depending on the finances of the state where their bank is headquartered. And resolution is the responsibility of this federal institution.

We need to work towards establishment of an FDIC-style entity for Europe. That entity could offer insurance to depositors and also have broad early intervention and resolution authority on cross-national European banks. At least for the euro area, where we share a common currency and, consequently, a common lender of last resort for the banking system, I believe that this is essential to pool together the management of the banking sector to deepen the common market. When this is achieved we will have insulated the real economy from troubles that a sovereign may run into.

Many practical elements need to be worked out. For example, how should a pan-European resolution mechanism be funded? An FDIC insurance fee, common across all banks, could provide the seeds of a resolution fund that could be used for early intervention and resolution. The main issue is to create the political will to make progress in this domain.

In the aftermath of yesterday's elections in Greece, where with their vote the Greek people reaffirmed their determination to stay in the euro area, one may feel that the immediate tensions about a possible breakup of the euro have diminished. But the result merely reduced the risk of an immediate collapse. The European summit at the end of the month offers another opportunity to make progress.

Time is running out for Europe. Limping along may buy more time but is not a solution. A muddling-through scenario in Europe may seem well intended and may avoid the worst for a while, but in no way reduces the risk of an accidental meltdown.

Returning to the rest of the world I will emphasise just one word. In the current environment, the key word on the implications of the European crisis for global inflation dynamics is uncertainty.

Panel Discussion 1

Conduct of monetary policy in Asia-Pacific in a volatile external environment

East Asia and Australian monetary policy

Adam Cagliarini[1]

Over the past few decades, Australia's economy has increasingly been transformed by the effects of economic developments in East Asia. Australia's economic relationships with economies in the region have been deepening over a number of decades. The most profound effects on the Australian economy have been experienced over the past 10 years or so with the emergence of China as a major economy and trading partner.

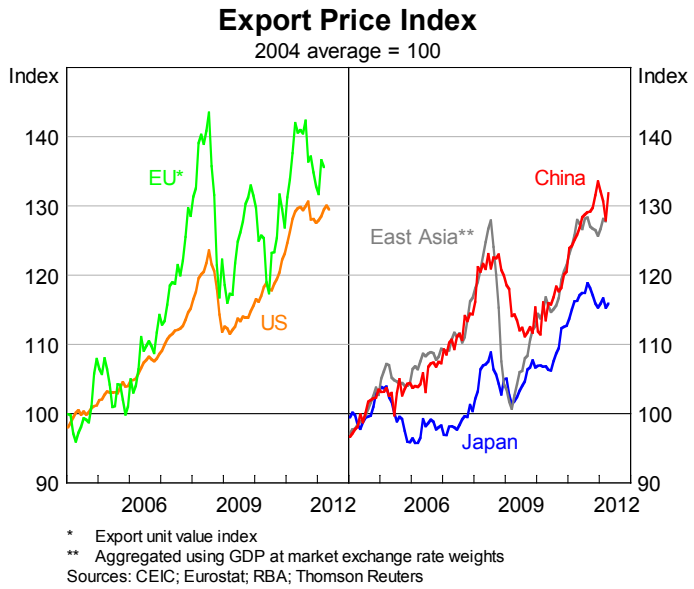
My comments today will focus on the effect of emerging Asia on inflation in Australia, and I will then briefly discuss how external developments are affecting the conduct of monetary policy in Australia.

The Effect of Emerging Asia on Australian Inflation

Given the limited time I have, I will focus on the main direct channels by which developments in East Asia have affected Australian inflation.

There has been a great deal of discussion about the effect that East Asia, and especially China, has had on inflation in developed economies. Prior to the global financial crisis, there was much talk about East Asia "exporting deflation" to the rest of the world. However, export prices for these economies were not deflating; the rate of increase in export prices (in US dollar terms) has been consistent with the rate of increase in export prices in more developed economies (with the exception of Japan) since 2004 (Graph 1).

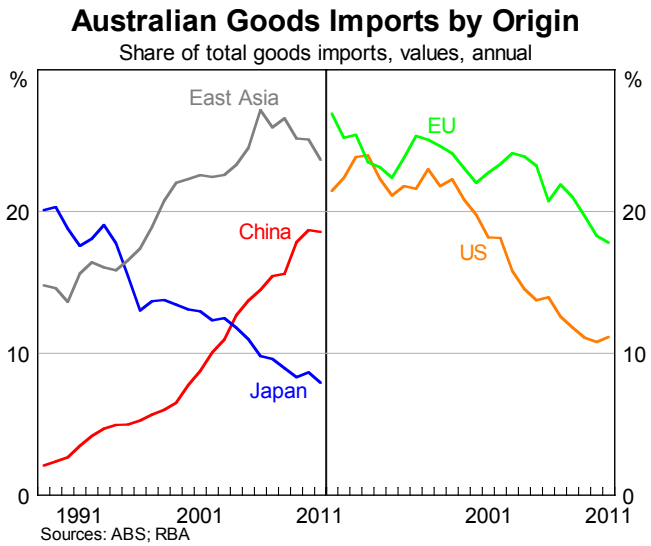
Graph 1



[1] Head of Asian Economies Research Unit, Reserve Bank of Australia.

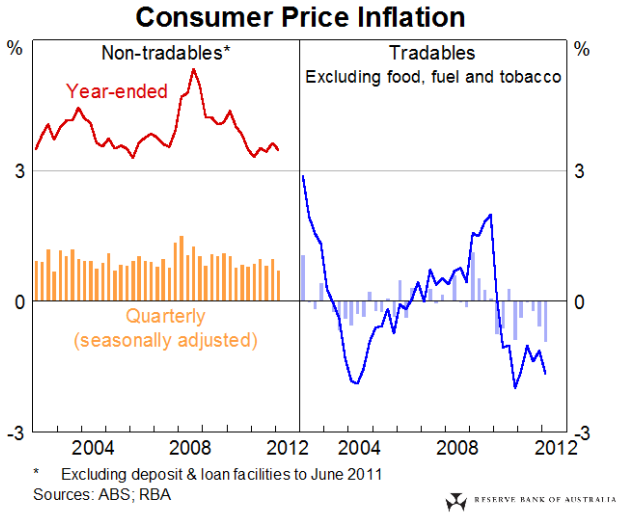
What has been happening is that East Asia has accounted for an increasing share of global manufacturing production, and the level of prices at which it sells these goods is generally lower. In Australia, an increasing share of merchandise imports has been sourced from East Asia and China (Graph 2). This switch to lower-priced goods has helped exert some downward pressure on the general level of prices faced by consumers and businesses.

Graph 2



As the development of East Asian economies accelerated through the 2000s, commodity prices rose strongly and the terms of trade for commodity exporters, including Australia, increased to around historic highs. Australia's currency appreciated significantly over that period, which helped to offset some of the inflationary effects of the increase in commodity prices. However, in the period prior to the global financial crisis, the appreciation of the exchange rate was not enough to offset the inflation in landed import prices in Australia; tradables inflation in Australia had been rising even as the exchange rate appreciated from 2006 to 2008 (Graph 3).

Graph 3



This has not been the case more recently. During the crisis, the Australian dollar depreciated significantly but briefly. With stimulatory policies put in place in response to the crisis, particularly in China, commodity prices began to rise again, and Australia's currency began to appreciate. However, this time around, notwithstanding the increase in commodity prices, the appreciation of the Australian dollar has been rapid enough to exert some downward pressure on tradables prices, and consequently the CPI.

Monetary Policy in Australia and External Developments

Given Australia's status as a small and open economy, it is not surprising that developments in the global economy have an important bearing on the decisions made by the RBA Board. The RBA Board has repeatedly referred to developments overseas in its minutes as being important considerations for policy in Australia. In the period leading up to this conference, the Board recognized the headwinds that the Australian economy was confronting. Conditions in Europe were playing a particularly important part in the discussions of global economic conditions, and in its minutes the Board noted that conditions in Europe, and to some extent those in China, had the potential to slow the Australian economy. The Board has noted at a number of meetings that "The financial problems in Europe continued to be a potential source of adverse shocks to the world economy…" and that "sentiment remained somewhat fragile".

The deepening economic relationship with a large and growing Chinese economy has meant that the RBA Board has increasingly turned more of its attention to developments in China (as well as the rest of East Asia). In recent months, the Board has been considering the effect of a slowing Chinese economy and its implications for Australia. Not only would a slowing in China have a direct real effect through a slowing in exports, but lower growth in the Chinese economy would precipitate a fall in commodity prices, thereby lowering Australia's terms of trade and potentially the value of the Australian dollar. The nature of the slowing in the Chinese economy would also matter, for example the extent to which it might affect steel consumption, and so the degree to which lower growth in China will affect the Australian economy remains uncertain.

The adjustment of China's monetary policy stance in the face of global volatility

Wang Yu[1]

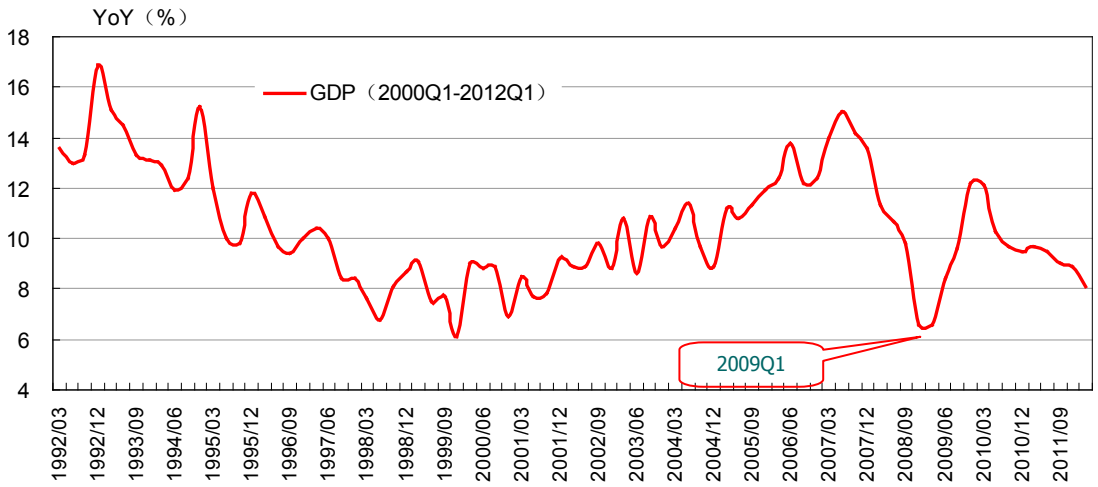
Since 2007, the US subprime crisis, the global financial crisis and the European sovereign debt crisis have stoked volatility in global markets with varying degrees of impact on the world's economies. To ensure the sustainable and steady development of the nation's economy and maintain a stable price level, the People's Bank of China (PBC) has adjusted its monetary policy stance three times to good effect.

The first adjustment: responding to the crisis

Due to the global financial crisis, China's GDP growth rate fell to 6.1% in the first quarter of 2009. Meanwhile, the consumer price index (CPI) dropped continuously, sagging to –1.8% in July 2009.

Chart 1

China GDP growth rate



Source: PBC.

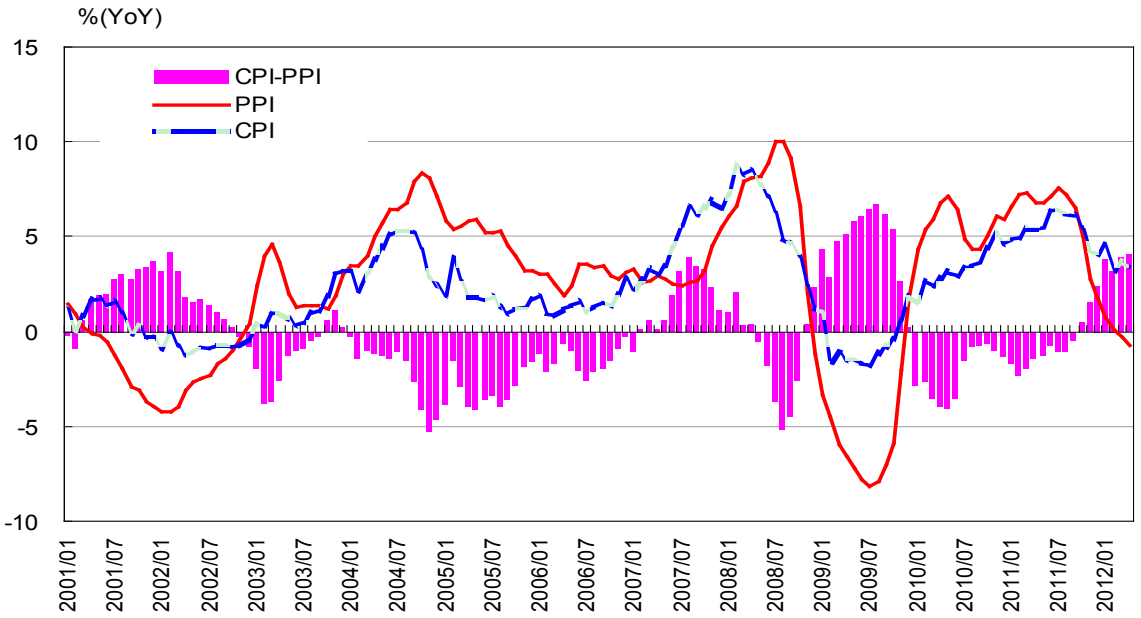
In response, the PBC adopted a moderately loose monetary policy stance and launched a series of measures to ensure economic growth and financial market stability. In the second half of 2008, the PBC strengthened its support for economic development, lowering the benchmark deposit and loan rates on five occasions and reducing the reserve requirement

[1] Research Bureau, The People's Bank of China.

ratio (RRR) four times. In 2009, China reported GDP growth of 8.7% and was the first country to recover from the crisis.

Chart 2

China's CPI and PPI movements



Source: PBC.

Table 1

Adjustments of RMB benchmark one-year deposit and loan interest rates (Q3 2008–Q4 2008)

	Deposit rate (After adjustment)	Adjustment	Loan rate (After adjustment)	Adjustment
2008-12-23	2.25	0.27	5.31	0.27
2008-11-27	2.52	1.08	5.58	1.08
2008-10-30	3.60	0.27	6.66	0.27
2008-10-9	3.87	0.27	6.93	0.27
2008-9-16	4.14		7.20	0.27

Source: PBC.

Table 2

RRR adjustments (Q3 2008–Q4 2008)

	RRR for large depositary financial institutions (After adjustment)	Adjustment	RRR for other financial institutions (After adjustment)	Adjustment
2008-12-25	15.5	0.5	13.5	0.5
2008-12-5	16.0	1.0	14.0	2.0
2008-10-15	17.0	0.5	16.0	0.5
2008-9-25	17.5		16.5	1.0

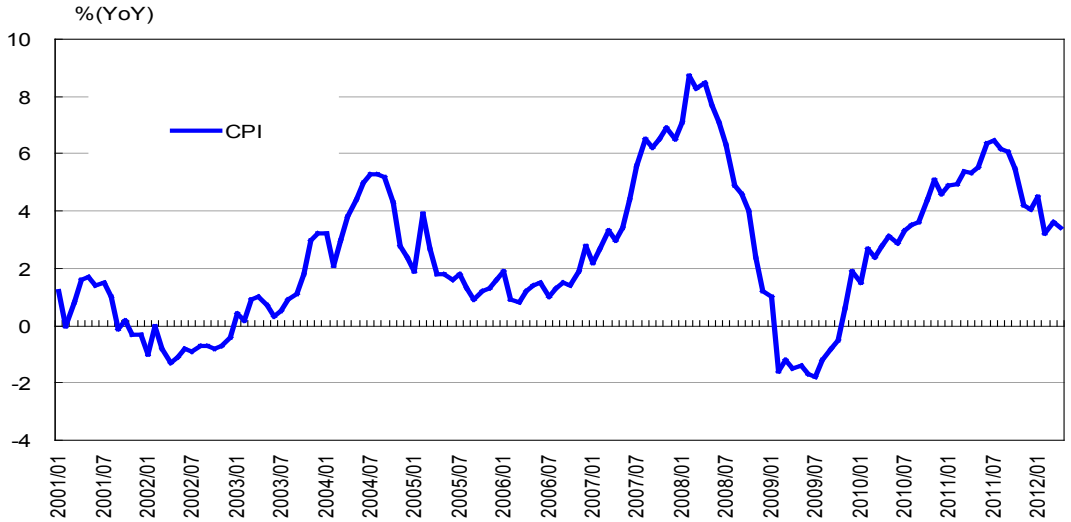
Source: PBC.

The second adjustment: to combat inflation

As the world economy recovered, inflation in different countries began to rise from the second half of 2010. Due to soaring global commodity prices and a continuous rise in domestic labour costs and resource prices, China's inflation pressure increased in the second half of 2011. In July 2011, China's CPI growth reached 6.5%.

Chart 3

China's CPI movements



Source: PBC.

In the face of upward inflationary pressure, the PBC took immediate action: it shifted its monetary policy stance from *moderately loose* to *prudent* at the end of 2010 and changed its

monetary policy goal from fighting against the crisis to combating inflation. From 2010 to the third quarter of 2011, the PBC lifted its benchmark deposit and loan rates on five occasions and increased the reserve requirement ratio 12 times to 21.5%. By the end of December 2011, the rising trend of China's price level had been contained with CPI inflation dropping to 4.1%. Meanwhile, China's economy continued to grow rapidly and registered GDP growth of 9.2% in 2011.

Table 3

Adjustments of RMB benchmark one-year deposit and loan interest rates (2010–11)

	Deposit rate (After adjustment)	Adjustment	Loan rate (After adjustment)	Adjustment
2011-7-7	3.50	0.25	6.56	0.25
2011-4-6	3.25	0.25	6.31	0.25
2011-2-9	3.00	0.25	6.06	0.25
2010-12-26	2.75	0.25	5.81	0.25
2010-10-20	2.50	0.25	5.56	0.25

Source: PBC.

Table 4

RRR adjustments (2010–11)

	RRR for large depositary financial institutions (After adjustment)	Adjustment	RRR for other financial institutions (After adjustment)	Adjustment
2011-6-20	21.5	0.5	19.5	0.5
2011-5-18	21.0	0.5	19.0	0.5
2011-4-21	20.5	0.5	18.5	0.5
2011-3-25	20.0	0.5	18.0	0.5
2011-2-24	19.5	0.5	17.5	0.5
2011-1-20	19.0	0.5	17.0	0.5
2010-12-20	18.5	0.5	16.5	0.5
2010-11-29	18.0	0.5	16.0	0.5
2010-11-16	17.5	0.5	15.5	0.5
2010-5-10	17.0	0.5	15.0	0.5
2010-2-25	16.5	0.5	14.5	0.5
2010-1-18	16.0	0.5	14.0	0.5

Source: PBC.

The third adjustment: to stabilise economic growth

As the European sovereign debt crisis continues to worsen, China's economy has also changed. Economic growth has slowed and the inflation rate has dropped. In particular, the downside risks to economic growth have increased.

Since early 2012, inflation has fallen rapidly in China. The CPI reading posted 3.4% and 3% in April and May respectively.

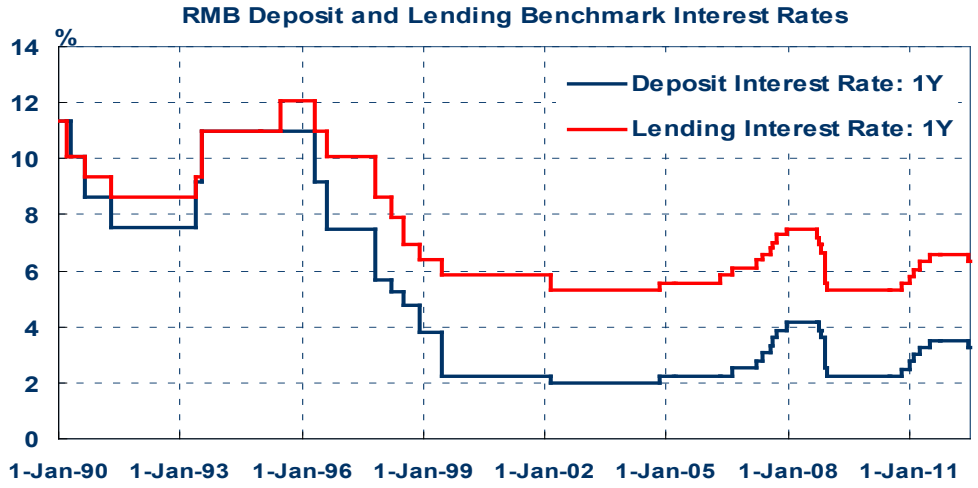
Faced with these new challenges, the Chinese government decided to stick to the principle of seeking progress amidst stability, appropriately balancing the relationship between maintaining steady and rapid economic development, restructuring the economy and managing inflation expectations. The priority was now to stabilise economic growth. Accordingly, the PBC has gradually changed its monetary policy stance, lowering its reserve requirement ratio on three occasions in December 2011, February and May 2012. After these adjustments, the reserve requirement ratio had come down 1.5 percentage points to 20%. Meanwhile, the PBC reduced its benchmark deposit and loan rates in June 2012. In addition, the PBC has also used a mix of monetary policy instruments to appropriately increase market liquidity. These monetary policy measures have been effective: in the first quarter of 2011, China's GDP grew by 8.1% year on year while, in May 2012, China's CPI inflation dropped to 3%.

Table 5

Adjustments of RRR and RMB benchmark one-year deposit and loan interest rates (Q4 2011–Q2 2012)

	RRR for large depositary financial institutions (After adjustment)	**Adjustment**	**RRR for other financial institutions (After adjustment)**	**Adjustment**
2012-5-18	20.0	0.5	18.0	0.5
2012-2-24	20.5	0.5	18.5	0.5
2011-12-5	21.0	0.5	19.0	0.5
	Deposit rate (After adjustment)	Adjustment	Loan rate (After adjustment)	Adjustment
2012-6-8	3.25	0.25	6.31	0.25

Source: PBC.



Monetary policy stance for the next period

In future, the PBC will further improve its macro adjustment mechanism and make China's monetary policy more forward-looking, more anticipatory, better targeted and more flexible. Above all, the PBC will appropriately strike a balance between maintaining rapid economic growth, restructuring the economy and managing inflation expectations, so as to achieve sound and rapid economic growth with stable price inflation. Meanwhile, the PBC will improve credit allocation, increase support to economic restructuring, and guide financial institutions and financial market in better serving the real economy. In addition, the PBC will steadily push forward reforms to liberalise interest rates, allowing markets to play a larger role in the formation and movement of RMB interest rates. Finally, the PBC will further promote reforms of the exchange rate regime in a gradual and coordinated manner, with a view to enhancing exchange rate flexibility, and to keeping the RMB exchange rate basically stable at an appropriate and balanced level.

Indonesia's monetary policy: coping with volatile commodity prices and capital inflows

Perry Warjiyo[1]

Introduction

Global commodity prices and volatile capital flows are among the key challenges facing Indonesian monetary policy over the past three years. Global commodity prices increased dramatically between mid-2010 and mid-2011 but then decelerated, as concerns over the global economic slowdown mounted. For Indonesia as a commodity exporter country, volatile global commodity prices have impacted not only domestic inflation but also the performance of the economy's external sectors. Effective monetary policy responses are needed to mitigate these impacts.

Volatile capital flows have also complicated the conduct of monetary policy. Capital continued to pour into Indonesia in the period up to August 2011, but capital flows then reversed abruptly as the global crisis deepened, especially in Europe. As a result, the rupiah exchange rate, which had previously appreciated strongly, came under downward pressure. In such a volatile environment, it is the task of monetary policy to mitigate the spillover impacts of global economic and financial turbulences to safeguard Indonesia's macroeconomic performance, and to maintain the stability of the exchange rate, inflation, and growth as well as of the overall financial system.

This paper reviews the Indonesian experience in designing and implementing monetary policy responses to volatile global commodity prices and capital flows. We find that an interest rate response alone would not have been sufficient to cope with these challenges. A mix of monetary and macroprudential measures is needed that complements interest rate policy with exchange rate policy, capital flow management, and macroprudential measures on bank lending and other banking activities. Active policy communication is also necessary. The following section will review Indonesia's macroeconomic performance, and then focus on the country's experience in implementing the monetary and macroprudential policy mix over the past three years.

Indonesia: the macroeconomic context

The Indonesian economy has been resilient against the global crisis and continues to combine robust growth with macroeconomic stability. Growth accelerated from 6.2% in 2010 to 6.5% in 2011, and is forecast to stay at about 6.4% in 2012 before accelerating again to 6.7% in 2013 (Table 1).[2] This performance is driven by strong domestic consumption and

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[1] Executive Director, Economic Research and Monetary Policy Department.

[2] With the continuing downward revisions of global growth forecasts and those of Indonesia's major trading partners, especially China and India, recent indicators show some downward revisions to Indonesian growth to 6.4% and 6.2% in Q2 and Q3 2012, respectively. Bank Indonesia's recent forecasts indicated that growth will come in at about 6.1–6.5% for 2012 and 6.3–6.7% for 2013. The downward revisions were driven mainly by export performance, while domestic consumption and investment continue to be robust, reflecting the economy's resilience. For instance, while export growth is forecast to slow to 3.1–3.5% in 2012, private consumption and investment growth is estimated to have accelerated to 4.7–5.1% and 10.4–10.8% in in Q2 and Q3 2012, respectively.

investment, which grew by about 5% and 10%, respectively, in 2010 and 2011. Exports put up a strong performance in 2010 and 2011, with growth of 15.3% and 13.6%, respectively, but they have come under pressure in 2012 from the slowdown in China and India. Overall, strong domestic consumption and investment have offset declining export performance.

Table 1

Indonesia: selected macroeconomic indicators, 2010–13

	2010	2011					2012*		2013**
		Q1	Q2	Q3	Q4	2011	Q1	2012*	
Real GDP (%)	6.2	6.4	6.4	6.5	6.5	6.5	6.3	6.4	6.7
• Consumption (%)	4.1	4.3	4.6	4.6	4.6	4.6	5.0	5.2	5.1
• Investment (%)	8.7	7.2	9.3	7.1	11.5	8.8	9.9	10.0	10.5
• Exports (%)	15.3	12.2	17.2	17.8	7.9	13.6	7.8	8.8	11.4
• Imports (%)	17.3	14.4	15.3	14.0	10.1	13.3	8.2	10.0	12.4
CPI Inflation (%)	6.9	6.6	5.5	4.6	3.8	3.8	4.0	4.5	4.6
• Core (%)	4.3	4.5	4.6	4.9	4.3	4.3	4.2	4.2	4.6
• Volatile Foods (%)	17.7	15.2	8.6	5.1	3.4	3.4	4.5	6.9	6.2
• Administered Prices (%)	5.4	5.5	5.6	2.8	2.8	2.8	2.9	3.1	3.0
Balance of Payments (US$ B)	31,765	7,666	11,876	-3,960	-3,726	11,857	-1,034	6,984	10,958
• Current Account (US$ B)	5,144	2,657	136	504	-1,577	1,719	-2,894	-7,275	-6,950
• FDI Inflows (US$ B)	13,771	4,990	6,321	3,300	4,294	18,906	4,576	19,467	20,700
• Portfolio (US$ B)	15,713	4,109	6,259	-4,804	-85	5,479	3,177	5,391	4,216
• FX Reserves (US$ B)	96,207	105,709	119,655	114,502	110,123	110,123	110,493	..	..
• Exchange Rate (Rp/US$)	9,023	8,761	8,564	8,766	9,088	9,088	9,155	..	..
Monetary & Financial									
• Policy Rate (%)	6,50	6.75	6.75	6.75	6,00	6,00	5.75	..	..
• Lending Rate (%)	13.3	13.2	13.1	13.0	12.9	12.9	12.5	..	..
• M2 Growth (%)	15.4	16.1	13.1	16.2	16.4	16.4	18.8	..	..
• Lending Growth (%)	22.4	23.4	22.9	25.3	25.3	25.3	26.3		
•Stock Price Index	3,704	3,679	4,131	3.549	3.822	3.822	4.122		

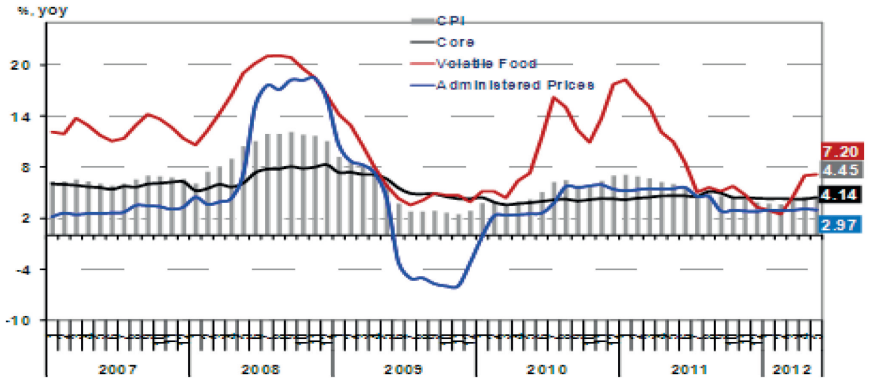
Indonesia's strong economic performance has been underpinned by macroeconomic and financial system stability. CPI inflation has declined from 6.9% at the end of 2010 to 3.8% in 2011, and is forecast to fall within its target range of 4.5±1% in 2012 and 2013. Core inflation has been kept below 4.5%, with a contribution to lower inflation from the government's abandonment of a planned increase in energy prices. The upward pressure on food inflation stemming from high global commodity prices has eased, especially since the second half of 2011.

Nonetheless, high global commodity prices have complicated the monetary policy response. In particular, they have put upward pressure on inflation stemming from the volatile food prices, which rose steeply between mid-2010 and mid-2011 (see charts below). For Indonesia, the increase in rice prices was particularly significant, as this cereal is a major component in the basket. But other staple foods such as cooking oil, onions, and chili peppers also saw price increases. Food price inflation drove up overall inflation expectations but the impact of global commodity prices on inflation, and especially on core inflation, was somewhat mitigated by Bank Indonesia's policy of allowing the rupiah to appreciate on the back of large capital inflows, as a means of dampening imported inflation.

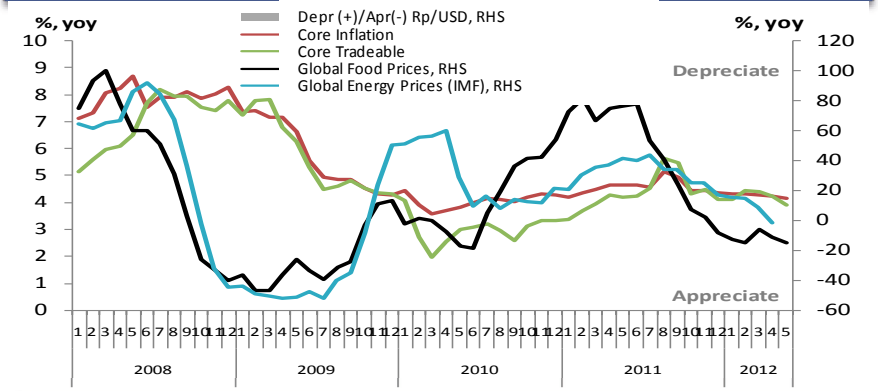
Graph 1

Inflation developments

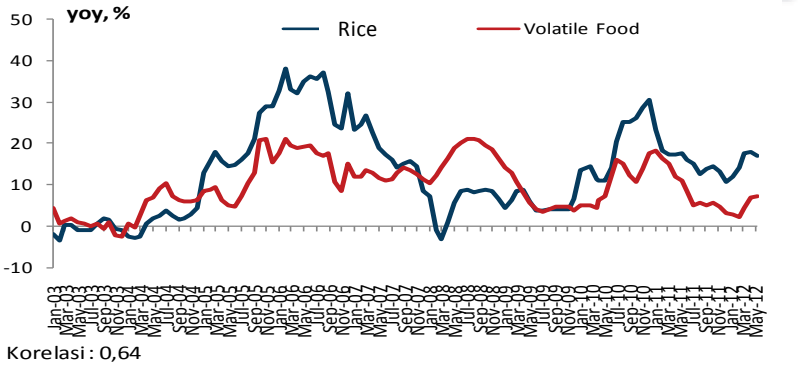
CPI Inflation Disaggregation



Core Inflation and Exchange Rate



Rice & VF Inflation



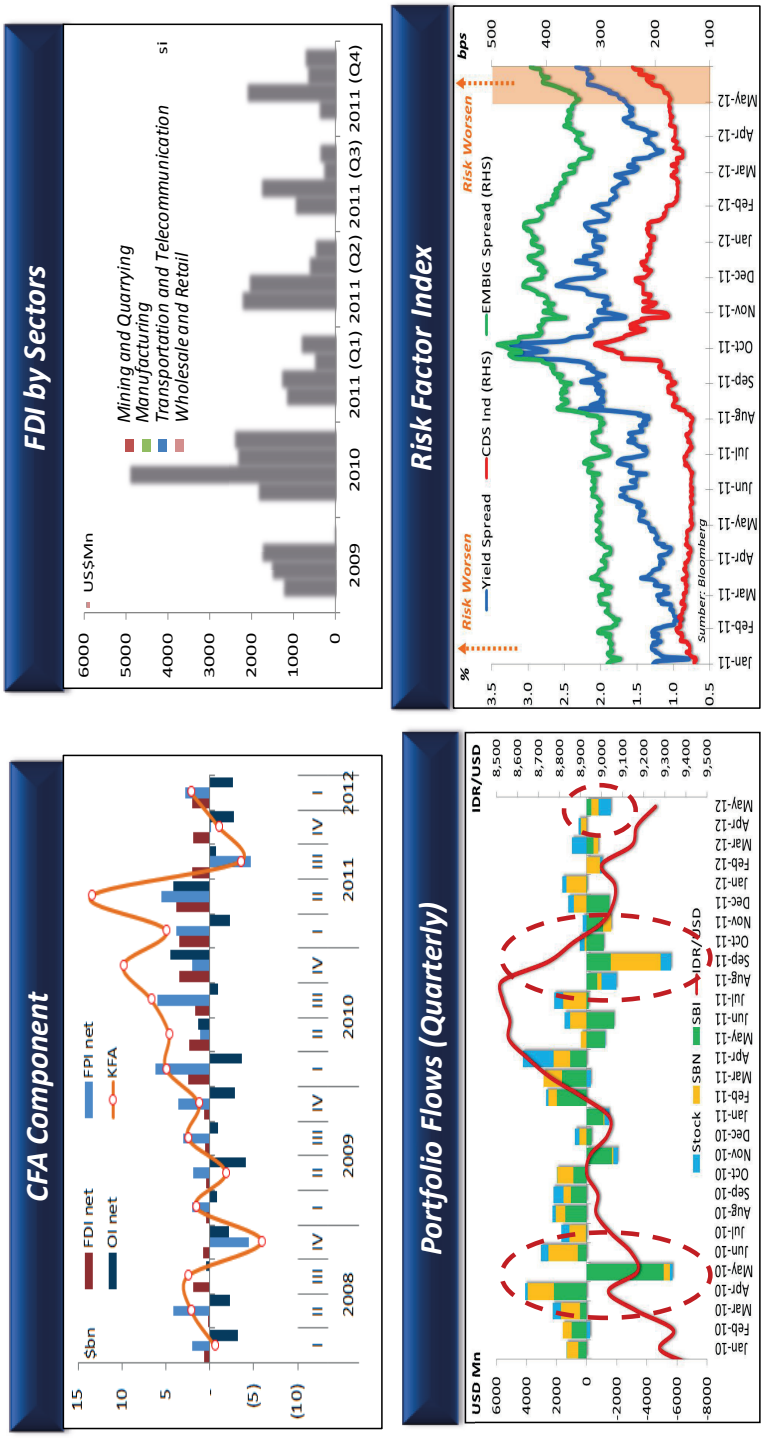
Korelasi : 0,64

Inflation Expectation: Consensus Forecast

Volatile global commodity prices and capital flows have also affected the performance of Indonesia's external sector (Graph 2). As a commodity exporter, Indonesia benefited from both strong external demand and high commodity prices during the period up to mid-2011. As a result, the country enjoyed a sizeable balance of payments surplus, thanks to surpluses in both the current account and the capital account during this period. From then onwards, the current account posted diminishing surpluses, and fell into deficit from Q4 2011. Deficits have since continued to widen on falling exports as well as strong domestic demand for imports.

Graph 2

Capital flows



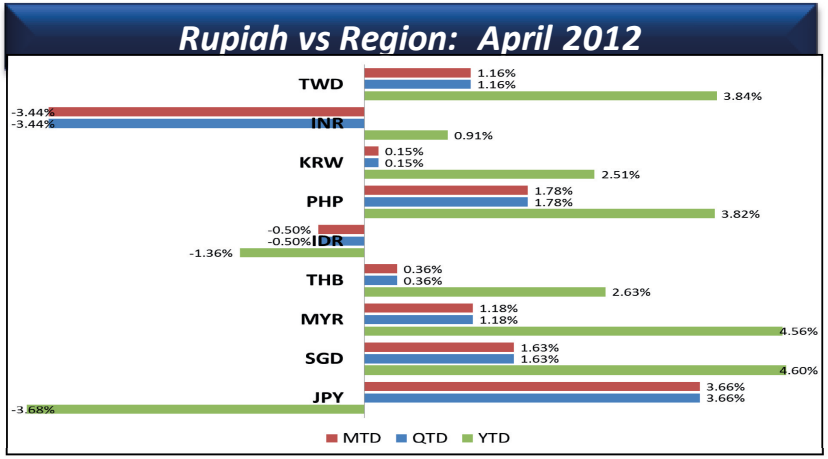
With the declining current account performance, the balance of payments and its implications for the exchange rate depend on the capital account surplus. Thus, capital flows are highly significant for the design of macroeconomic and monetary policy responses. Despite the global crisis, FDI inflows to Indonesia continue to be strong, driven by solid domestic demand for investment in mining, transport and communications, manufacturing and trade. FDI amounted to US$19 billion in 2011 and an estimated US$20 billion in 2012. But portfolio inflows have been volatile, driven by risk perceptions in the global financial markets. They reached US$10.3 billion in the first half of 2011, but outflows of US$4.9 billion were seen in the second half of 2011. Inflows of US$3.2 billion followed in Q1 2012 and funds have since continued to flow in strongly thanks to the strength of Indonesia's domestic economy.

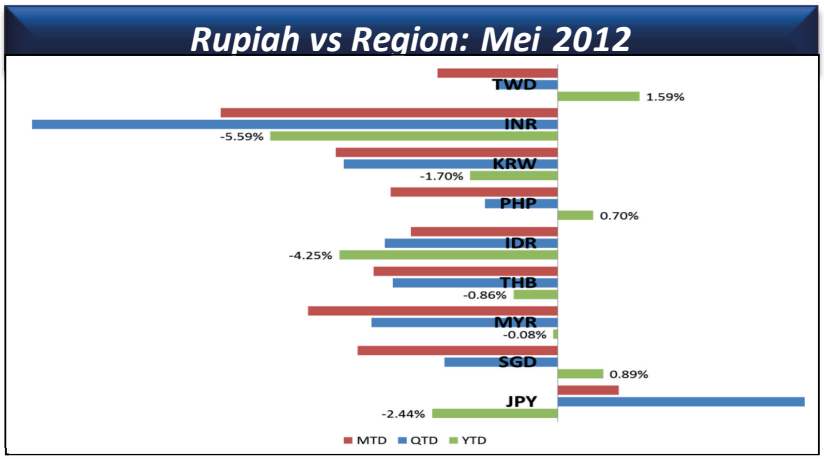
These balance of payments dynamics, including the volatile capital flows, have strongly affected the exchange rate over the past three years (Graph 3). Thus, the rupiah appreciated strongly up to August 2011, reflecting the surpluses in both the current and capital accounts, but it has come under pressure since then owing to the capital flow reversals driven by the worsening of the European crisis. In this regard, Bank Indonesia continues to adopt a flexible policy with the aim of stabilising the exchange rate at its fundamental level. This is nonetheless a daunting challenge in such a volatile global environment. FX interventions supported by ample FX reserves are one option open to Bank Indonesia but this instrument needs to be complemented by the management of capital flows, especially the short-term and volatile capital flows that often cause the exchange rate to overshoot.

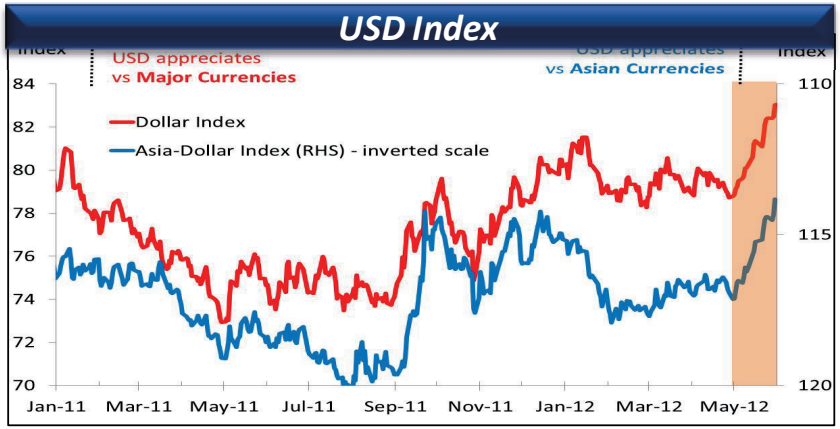
Volatile capital flows, together with the current account deficit, have also affected the functioning of the monetary policy transmission mechanism, particularly via the impact on domestic excess liquidity in the financial markets. Hence, interest rate policy alone would not be sufficient for effective monetary policy transmission. Although the deposit rate moves in line with the Bank Indonesia (policy) rate, the lending rate is less sensitive owing to, eg, high overhead costs, risk premia and interest rate margins in the banking system (Graph 4). At the same time, growth in the monetary aggregates and bank lending is strong. Bank Indonesia believes it is important to complement interest rate policy with macroprudential measures that aim at managing excess liquidity as well as credit growth.

Graph 3

Exchange rates and foreign reserves







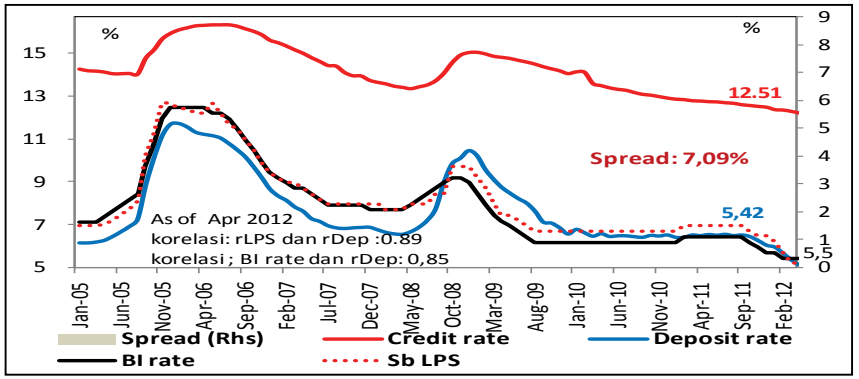
Foreign Reserve Position

	Indicator	
1	**International Reserve as of 31 Mei 2012 (USD Mn)**	**111,528**
	Months of Goods and Services Import Ratio	6.43
	Months of Goods Imports Ratio	7.67
	Months of Import and Debt Repayment Ratio	6.14
	Reserve Adequacy (average of peer group rating)	
	Months of Goods Import Ratio	6.7
2	Equal to International Reserve position (USD Mn)	97,423.9
	Difference of intl reserve position(1 - 2)	**14,104.2**
	IMF Reserve adequacy Ratio (3 - 4 months of import)	
3	Equal to 3 month of Goods and Services Import	52,024
4	Equal to 4 month of Goods and Services Import	69,365
	Difference (1 - 3)	**59,504**
	Difference (1 - 4)	**42,163**

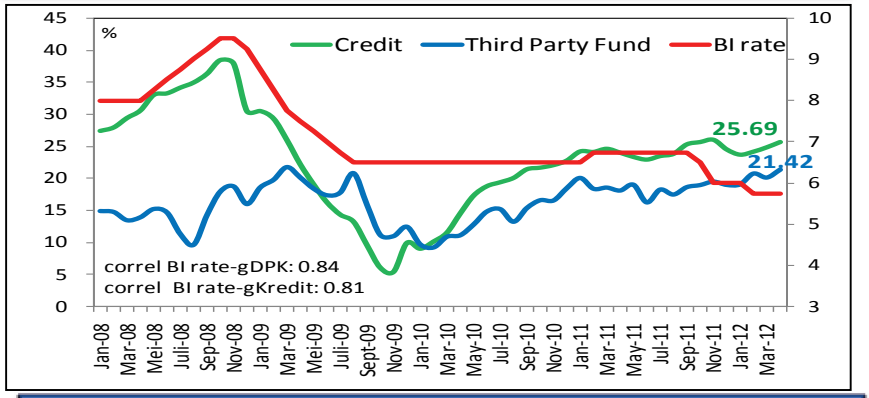
Graph 4

Monetary and credit developments

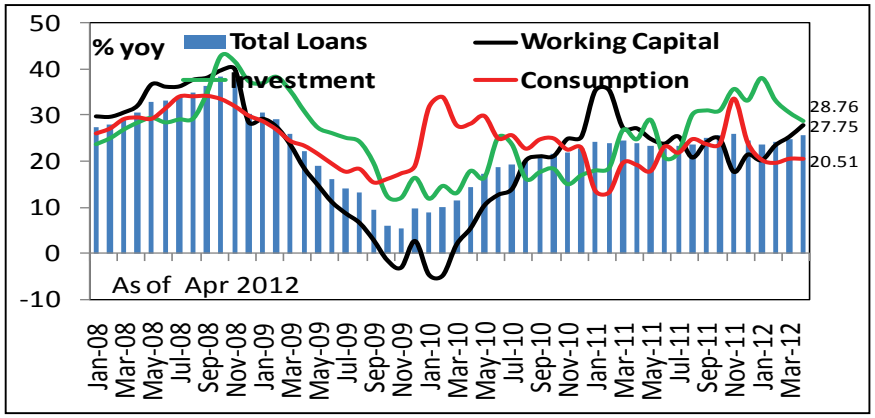
BI Rate and Bank Interest Rates



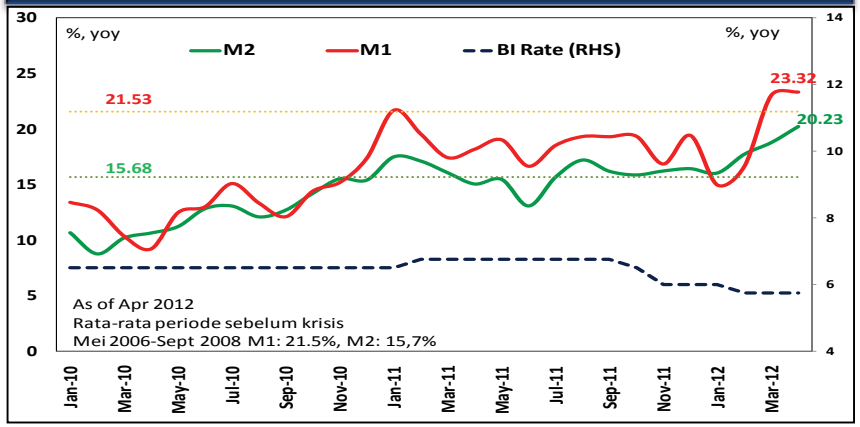
Bank Funds and Credits



Bank Credits: By Types



Monetary Aggregates



Monetary and macroprudential policy mix

The discussions in the previous section point to the complexity of monetary policymaking in a small open economy under the conditions of volatile global commodity prices and capital flows. In such circumstances, interest rate policy alone is ineffective as an instrument for meeting the price stability objective, to say nothing of preserving overall macroeconomic and financial system stability. A mix of monetary and macroprudential policy measures is required to deal with the multiple challenges of "the impossible trinity" and the preservation of monetary and financial system stability. Even though interest rate policy is still the primary instrument, monetary policy needs to work through all available transmission channels, including interest rates, exchange rates, money and credit, and expectations.

These considerations form the basis for the monetary policy framework adopted in Indonesia since mid-2010. Starting from the inflation targeting framework, we have added macroprudential measures to manage capital flows and safeguard financial system stability. We call this an enhanced inflation targeting framework based on a monetary and macroprudential policy mix (Graph 5). The policy mix consists of five instruments: first, the **interest rate policy** aims to achieve price stability, taking into account the overall macroeconomic outlook and financial system stability. The policy rate is targeted on anticipated inflation two years ahead, as commonly seen under an inflation targeting regime. Second, the **exchange rate policy** is consistent with the overall macroeconomic outlook and has the aim of smoothing out excessive volatility. Thus, the long-term objective for the exchange rate path is adjusted to the inflation and growth forecasts, and hence the policy rate. At the same time, the short-term goal is to smooth out exchange rate volatility along the chosen path. Third, **capital flows are managed** with an emphasis on short-term and speculative capital flows, and on mitigating the risks of sudden reversals in capital flows. The aim is to support the exchange rate policy against the risk of overshooting and to guide its movement along a path that is appropriate for the overall macroeconomic outlook. Fourth, **macroprudential policies** for managing domestic liquidity, money and credit are consistent with overall outlook for the economy and financial stability. Such policies are an important support for interest rate policy, as monetary and credit movements tend to be procyclical and thus less sensitive to interest rate changes. And fifth, **monetary policy communication** is required to manage expectations in an uncertain environment. This is important not only from a transparency viewpoint but, more importantly, as a way of building forward-looking expectations and thus strengthening the monetary policy response.

Our experience over the past three years shows that this new framework has been effective. The following three episodes illustrate the Indonesian monetary policy challenges and the corresponding monetary and macroprudential policy responses. The first period corresponds to the period from 2010 to August 2011. During this period, we faced three policy challenges: (i) strong growth driven by both external and domestic demand; (ii) rising inflation pressure from both high global commodity prices and domestic disruptions in food supplies; and (iii) large capital inflows from both FDI and portfolio investment. Under such circumstances, it would not have been effective to rely solely on an interest rate response to contain inflation pressures. We therefore complemented the interest rate policy with an exchange rate policy and macroprudential measures to manage capital flows and domestic liquidity. Table 2 gives details of policy instruments, policy measures, and the rationale for adopting the policy mix.

Graph 5

Monetary and macroprudential policy mix

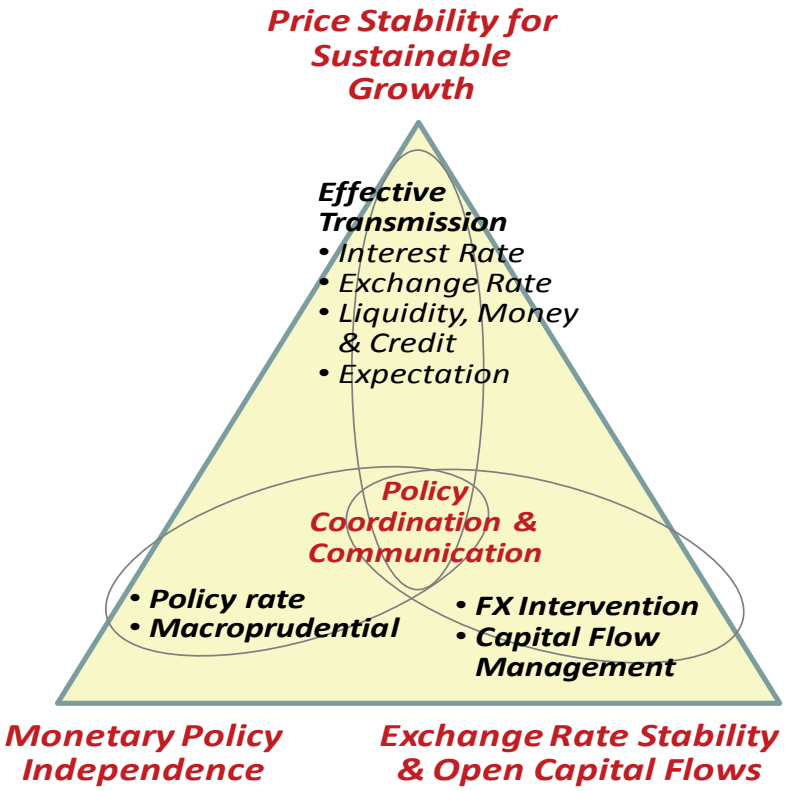


Table 2

Policy measures, 2010 to August 2011

Instrument	Policy	Rationale
1. Interest rate policy	• BI Rate increase by 25 bps to 6.75% in February 2011.	• To signal monetary tightening to mitigate increasing inflation pressures from food prices and inflation expectation.
2. Exchange rate policy	• Rupiah appreciation: 14.9% in 2009, 4.6% in 2010, 5.4% to August 2011 .	• To stabilize exchange rate and help mitigate imported inflation from high global commodity prices
3. Capital flows management	• Apply holding period on BI certificates, from one month since June 2010 and to six month since May 2011. • Reinstate limits on short-term offshore borrowing of the banks to a maximum of 30% of capital, January 2011	• To "put sand in the wheels" on short-term and speculative capital inflows, and mitigate risks of sudden reversals. • To limit FX exposure of the banking system and short-term/volatile capital inflows.
4. Macroprudential measures	• Increase Rupiah reserve requirement from 5% to 8%, effective Nov 2010.	• To absorb domestic liquidity and enhance liquidity management of the banks, without exerting negative impact on lendings that are needed to stimulate growth.

The second period corresponds to the period from September 2011 to February 2012. During this period, we faced the following three policy challenges: (i) inflation was under control at 3.8% at end-2011, below the lower bound of the 5%±1% inflation target; (ii) a downward risk of global economic slowdown necessitated a countercyclical policy response to maintain domestic growth momentum in Indonesia; and (iii) large capital flow reversals from the worsening European crisis put pressure on the exchange rate and liquidity in both the FX and rupiah money markets. Again, an interest rate response alone would not have been effective under such circumstances. Thus, during this period we adopted a policy mix by setting the interest rate on a countercyclical basis with the aim of stimulating growth (without jeopardising the inflation target), while exchange rate pressures and capital reversals were dealt with by FX interventions complemented by central bank purchases of government bonds from the secondary market. Table 3 gives details of policy instruments, policy measures, and the rationale for adopting the policy mix.

Table 3

Policy measures, September 2011 to February 2012

Instrument	Policy	Rationale
1. Interest rate policy	• BI Rate cuts three times by a total of 100 bps to 5.75%.	• With a low inflation, the interest rate cuts are for counter-cyclical response to mitigate the negative impacts of global economic slowdown to Indonesian economic growth.
2. Exchange rate policy	• FX Intervention to supply the excess demand from capital reversals .	• To stabilize exchange rate consistent with macroeconomic outlook and smooth out volatility in tandem with exchange rate movements in the region
	• Purchase of government bonds from the secondary market	• To help stabilizing the exchange rate and to manage liquidity in the Rupiah money market.

The third period extends from March 2012 to the present. In this period, we have again faced three policy challenges, namely: (i) rising inflation expectations from the planned (and then cancelled) increase in domestic fuel prices (March and April); (ii) large capital outflows have continued as the deepening European crisis put pressure on exchange rate and liquidity in both the FX and rupiah money markets; and (iii) lending growth to certain sectors (automotive, property and credit cards) is too high, even though overall lending growth is still in line with the macroeconomic forecast. Thus, we have complemented interest rate and exchange rate policy with macroprudential measures to manage lending growth within certain sectors. Table 4 gives details of policy instruments, policy measures, and the rationale for adopting the policy mix.

Table 4

Policy measures, March 2012 to present

Instrument	Policy	Rationale
1. Interest rate policy	• BI Rate maintained at 5.75%.	• Deemed consistent with the inflation targets of 4.5%±1% for 2012 and 2013, as well as growth forecast of 6.3-6.7% in 2012 and 6.4-6.8% in 2013.
2. Exchange rate policy	• Continue FX Intervention and purchase of government bonds from the secondary market	• To stabilize exchange rate and to manage liquidity in the Rupiah money market.
3. Macroprudential policy	• Introduce LTV for lending to automotive and property, tighten standards for credit cards	• To reduce excessive lending to these sectors while maintain the overall lending growth to be consistent with macroeconomic outlook.

Final remarks

The economic outlook for 2012 and 2013 is robust. However, policymakers face a complex challenge in managing strong domestic demand in an uncertain global economic and financial environment. The key question is how to balance price stability for sustainable growth while maintaining external and financial system stability in the face of highly volatile capital flows, exchange rates, and global commodity prices. The monetary and macroprudential policy mix applied by Bank Indonesia since 2010 has struck an effective balance between coping with the impossible trinity and safeguarding monetary and financial system stability. The policy mix is not always easy to design and implement, and it needs to be appropriately and continuously calibrated according to the evolving dynamics of the global and domestic economic environment. Communicating the policy mix is also a challenge. We need to be clear at all times which instrument is directed to which specific objective, and we must also avoid substituting the interest rate policy for other instruments in the mix. Even when we are successful in these aims, there is always a risk that the market may perceive matters differently, given that the monetary policy response is generally (and often only) associated with interest rate adjustments.

The impact of external shocks on inflation dynamics in CESEE[1]

Doris Ritzberger-Grünwald[2]

This contribution compares and contrasts Emerging Asia with Emerging Europe – the CESEE region[3] to be specific – in terms of their inflation dynamics. The idea is to single out factors which are similar as well as factors which are different. To start with, the inflation performance of the CESEE region has been remarkable. In the context of economic stabilisation, taking place in the late 1990s and early 2000s, the region was characterized by a strong disinflation process, mainly driven by a few countries, for instance Romania. Inflation subsequently returned and picked up in the period from 2006 to 2008, but since then inflation rates have been rather modest. Overall, Emerging Asia has exhibited fairly similar inflation patterns, yet its crisis response seems to have been rather different. Whereas inflation rates in Emerging Europe stayed at very low levels or declined even further, inflation rates in Emerging Asia returned to elevated pre-crisis levels relatively soon (Chart 1 a + b). A possible explanation is the sovereign debt crisis in some Euro Area countries, which prevented growth in the CESEE region from recovering as quickly as it did elsewhere. Due to the strong economic linkages between the Euro Area and CESEE there were several negative spill-overs to the CESEE region, with negative economic sentiment triggering severe setbacks in demand.

Monetary policy strategies in CESEE: the smaller the country, the closer to the Euro

One of the major factors determining inflation dynamics in general is a country's monetary policy strategy. The monetary policy strategy is, in turn, influenced by the institutional environment, in particular with regard to the EU or even Euro Area membership of some Emerging Europe countries. In the CESEE region one can find all kinds of monetary policy strategies. The small and very open economies of the region, which are very much dependent on foreign demand, opted for Euro Area entry at an early stage (Slovenia in 2007, Slovakia in 2009 and Estonia in 2011). Others decided to strongly orientate their exchange rate regimes towards the euro (Bulgaria has a currency board, Latvia and Lithuania joined ERM II with unilateral commitments to narrow exchange rate bands). Last but not least, the bigger economies of the region have introduced inflation targets as a monetary policy regime. This reflects their larger domestic markets, which make them somewhat less dependent on Euro Area developments (Table 1). This wide variety of monetary strategies is, incidentally, characteristic of Emerging Asia as well (Filardo, 2012).

Current inflation dynamics in the CESEE region are being driven by several factors. Three important groups of factors can be singled out: (sovereign debt) crisis-related, international

[1] Many thanks go to Mathias Lahnsteiner and Josef Schreiner (both OeNB / Foreign Research Division) who supported me in the preparation of my presentation.

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[3] Here the term Emerging Europe is used to mean the Central, Eastern and Southeastern European (CESEE) countries that have joined the EU: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

and domestic ones. To start with the crisis-related ones, firstly there are real economic spill-overs from the Euro Area, resulting in weak growth and lower demand-side pressures on inflation. Secondly, rising risk aversion in international markets towards Europe is not only weighing on the exchange rate of the euro but also on the exchange rates of the CESEE economies. Currency depreciation has in fact been very substantial, affecting inflation via exchange rate pass-through (but also indirectly by complicating the conduct of monetary policy, especially in the presence of an inflation target, as increased attention has to be paid to financial stability considerations). Thirdly, fiscal consolidation needs which prompted governments throughout the region to increase (indirect) tax rates have led to elevated inflation rates.

International factors are affecting all countries worldwide, although in different ways, depending on their economic structure. High commodity prices (oil, but also agricultural commodities) strongly influence the HICPs of the CESEE region, also given the relatively high weight of energy and food items in CESEE HICP baskets. Domestic factors are home-made ones. The most prominent are housing bubbles, which popped up in several countries of the region (e.g. the Baltics). All these factors will be looked at in more depth below.

Crisis-related factors work via different channels

Whereas the financial market crisis affected all regions worldwide in a similar vein, in Europe it also triggered a sovereign debt crisis, which led to very low growth rates in the Euro Area. As most CESEE exports are to the Euro Area, this development resulted in a lack of demand for CESEE products, causing lower wage growth, lower investments and a significantly lower growth performance of CESEE countries. Average growth in the region declined strongly during the crisis from over 6% in 2006 and 2007 to -3.6% in 2009. After some recovery in 2010 and 2011 (2.7% and 3.3%, respectively), growth is again set to be comparatively low in 2012. Forecasts produced by OeNB staff experts estimate growth to come in at 1.4% this year, which is broadly in line with the forecasts of other important institutions (Woerz, 2012). Against this background, the lack of external and internal demand resulted in less upward pressure on prices in Emerging Europe, especially when the situation is compared with those of the boom years.

Another channel is the exchange rate channel. In CESEE countries with a floating exchange rate system (the Czech Republic, Hungary, Poland and Romania) the crisis triggered an exchange rate depreciation which highly correlated with spikes in risk perception as measured by CDS premiums. Chart 2 a + b distinguishes between three phases: the first phase is the Lehman crisis, the second phase covers the first rescue package for Greece, and the third phase shows the increasing uncertainty concerning the Greek situation (write-off of Greek debt by banks, referendum on austerity etc.) and the heightening tensions in Hungary (suspension of talks on IMF program due to controversial laws e.g. concerning the central bank and a new constitution). In some countries the depreciation was substantial; for instance, in Hungary the forint depreciated by 35% in nominal terms after Lehman.

Exchange rate swings do have different country-specific impacts on inflation developments. ECB research has shown the following: in Hungary a 1% currency depreciation leads to a rise in the inflation rate of 0.91 percentage points within eight quarters, in the Czech Republic the rise amounts to 0.77 pp and in Poland to 0.56 pp (Ca'Zorzi et al., 2007). Interestingly, this impact is much higher compared to the impact in other emerging markets, especially Asian ones (in Hong Kong SAR it is 0.37 pp, in Korea 0.13 pp, in Taiwan, China 0.01 pp and in Singapore -0.06 pp). Possible explanations for these differences are structural inefficiencies or significantly less competition, leading to greater price-setting power in CESEE.

Euroization as a special factor in CESEE

The relationship between monetary policy and financial market stability has been, and still is, widely discussed. Especially when it comes to quantitative easing, the question of first and second priority arises. The enormous amount of euroization in several CESEE countries adds another dimension to this ongoing discussion.

Exchange rate depreciation influences inflation both directly, via pass-through, and indirectly. In an environment of widespread currency substitution, exchange rate depreciation may force a central bank to give financial stability considerations priority over its inflation target when setting monetary policy. The OeNB EuroSurvey (Ritzberger-Grünwald and Scheiber, 2012) shows that currency substitution is a widespread phenomenon in Eastern Europe (Chart 3). Whereas liability substitution (FX loans) is popular throughout the region, asset substitution (cash and deposits) can be found mostly in countries with an exchange rate target – especially in the Western Balkans (to the right of the black bar in the chart).

Fiscal policy – a crisis-related response

In many countries the financial market crisis has increased budget deficits significantly. The good news is that public debt started from relatively low levels, but although fiscal support was limited, fiscal deficits increased due to lower fiscal revenues. As the Stability and Growth Pact is also valid for the CESEE economies, some countries violated the benchmarks and ended up in an Excessive Deficit procedure. To increase the crisis resistance in general, but also to fulfill the EU policy commitments in particular, the authorities have increased their consolidation efforts recently. Quite often this has been done via (indirect) tax increases. In many countries the VAT rate was raised, and in some countries new taxes have been introduced. Chart 4 shows the importance of tax rate changes for the development of inflation in the CESEE area via the example of two countries, Hungary and Romania. In Hungary the VAT rate was raised from 20% to 25% in July 2009. This caused the HICP to increase by more than 2 pp to 6% in late 2009/early 2010. Without this change in taxation, HICP inflation would have decreased by 3 pp to around 1%. In early 2012 the standard VAT rate was raised again, this time from 25% to 27%. A similar pattern can be observed for Romania and, to a lesser extent, also for the Czech Republic, Poland and Slovakia.

The composition of the domestic inflation basket – food and energy prevail

The transformation from an emerging market to an advanced economy goes hand in hand with increasing consumption by households of sophisticated goods and services, which implicitly decreases the share of (basic) food in the consumer basket. Concerning energy, the picture is not so clear-cut. Whereas the demand for energy increases due to the higher standard of living, in parallel to GDP per capita, the widespread use of energy-saving machines and products works in the opposite direction.

Compared with the Euro Area, many CESEE countries are characterized by a relatively high share of (processed and unprocessed) food in their HICP baskets. This share ranges from 23% in Slovenia to almost 40% in Romania (average 29%). The corresponding figure for the Euro Area is 19% (Chart 5). Energy also has a higher weight in the consumer basket of CESEE, but the difference to the Euro Area is not so pronounced (ranging from12.5% in Romania to 19% in Slovakia; average: 15%; Euro Area: 11%).

During recent years the world has seen a significant increase in global commodity prices, as a result not only of the financial market crisis but also of political turmoil. Combined with the above-average share of food and energy in the HICP baskets, food and energy accounted for roughly two-thirds of the HICP increase in April 2012 in the Czech Republic and Hungary (Chart 6). This was a severe policy challenge for these inflation-targeting countries, but also for the others.

Comparing the consumer baskets of Emerging Europe and Emerging Asia, especially the different weights for food and energy, is difficult due to different underlying methodologies, and also due to different underlying methodologies, reflecting cultural differences (whereas eating out is classified under "services" in Emerging Europe, it is classified under "food" in at least some countries in Emerging Asia). Still, several general assessments hold for both regions. The weights for food and energy in CPI baskets are large in both Emerging Asia and Emerging Europe. Similarly, the weights for food run a very broad range, starting from 12.7% in Korea and 14.6% in Thailand, and going up to 27.5% in Hong Kong SAR, 30.5% in China, 39% in the Philippines and 41% in Sri Lanka. Energy weights are also elevated, but not as pronounced as the weights for food. Accordingly, Asian inflation rates have also been affected by a global rise in commodity prices, with a full pass-through mostly occurring after six months (Neumann and Mukherjee, 2012).

Housing bubbles affect inflation dynamics

Property prices in CESEE have generally risen strongly since the late 1990s. While this was partially a catching-up phenomenon, bubbles emerged in several countries, especially in the mid-2000s. The crisis forced a marked price correction in all countries of the region, especially in the Baltics. The situation was characterized by a recent boom and bust of residential property prices across the whole region (Chart 7). High levels of home ownership and low costs of external housing financing caused residential property prices to rise. Besides the small size of the rental market, rising demand for affordable good-quality housing suggests that price developments during the forthcoming catching-up of residential property markets are likely to be dynamic (Hildebrandt et al., 2012).

However, it has to be taken into account that most inflation indicators do not cover housing prices. This was, and still is, the result of the debate concerning the pros and cons of including asset prices. Still, housing prices are a matter of concern when it comes to financial stability, although the analysis of inflation dynamics cannot be disentangled from their development, either.

Summary

At least in the CESEE region, catching-up was, and still is, a longer story than expected. On the one hand, expectations were too optimistic; on the other hand, the financial market, above all the sovereign debt crisis, created a less favorable economic environment.

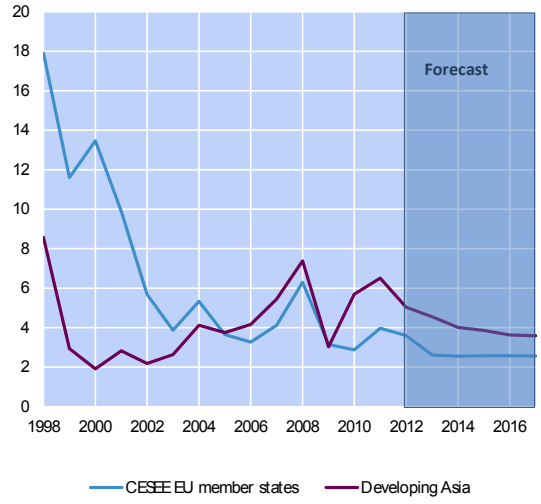
This difficult situation has caused very fundamental concerns about future growth rates (will there be any catching-up in the future at all?) and financial market stability in general. The CESEE region had the good luck that its financial markets were not directly involved, but it had the bad luck that there are not only intensive real economic linkages. The current deleveraging process of both foreign- and domestically owned banks in the region, regardless if it is voluntary or enforced by new supervisory standards, weighs on the region too. Overall this seems to be one of the main differences to other emerging market economies, especially Asian economies.

The good news concerns inflation and inflation dynamics. Whereas previous analyses were full of explanations for the constantly and systematically higher inflation rate in CESEE (see, for instance, the extensive literature on the Balassa-Samuelson effect), more recent analyses do not see any (or only few) inflation risks. This is in line with the general assessment in Europe as a whole, where the main focus is on financial stability as well as on fiscal risks, which could trigger a double-dip recession with all its consequences. Another possible, even more pessimistic, interpretation of the fact that inflation is a non-topic, at least for the moment, is that the catching-up process has come to a halt in general and for a longer period of time. More positively, it could be interpreted as a monetary success story: obviously, in many CESEE countries a certain stage of economic and institutional development has been reached, including a stable and credible monetary policy.

Chart 1 a + b

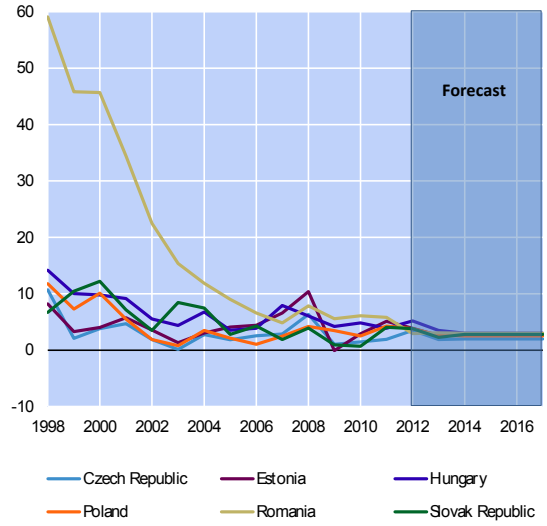
CESEE compared to Developing Asia

CPI/HICP, period average, % year on year



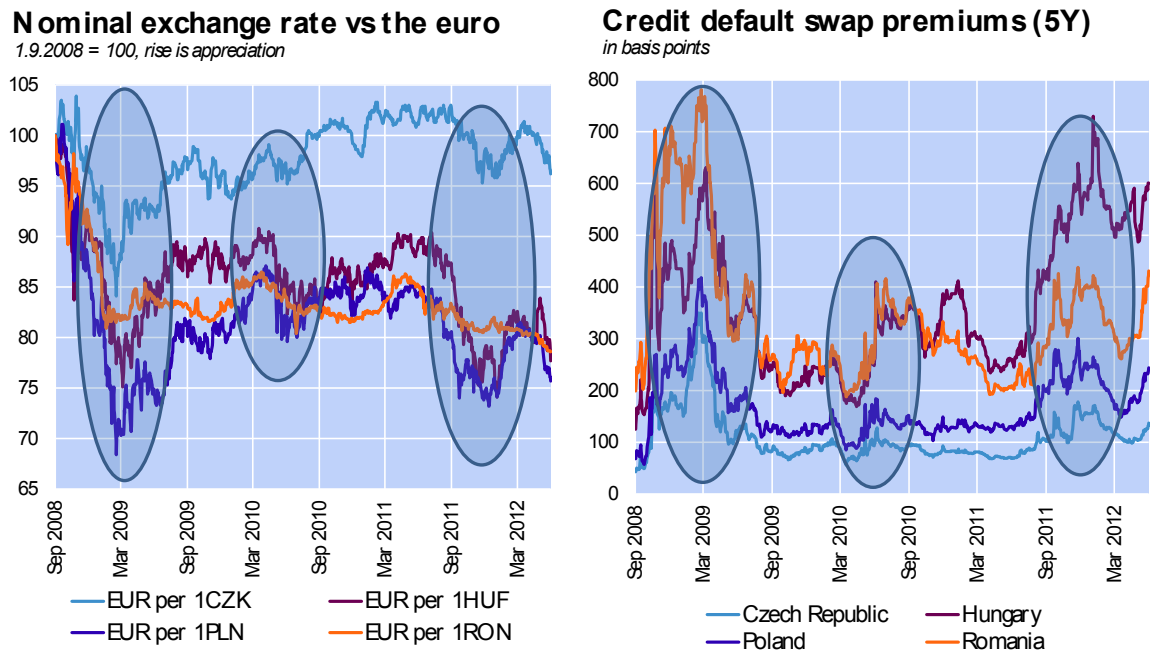
Selected CESEE countries

HICP, period average, % year on year



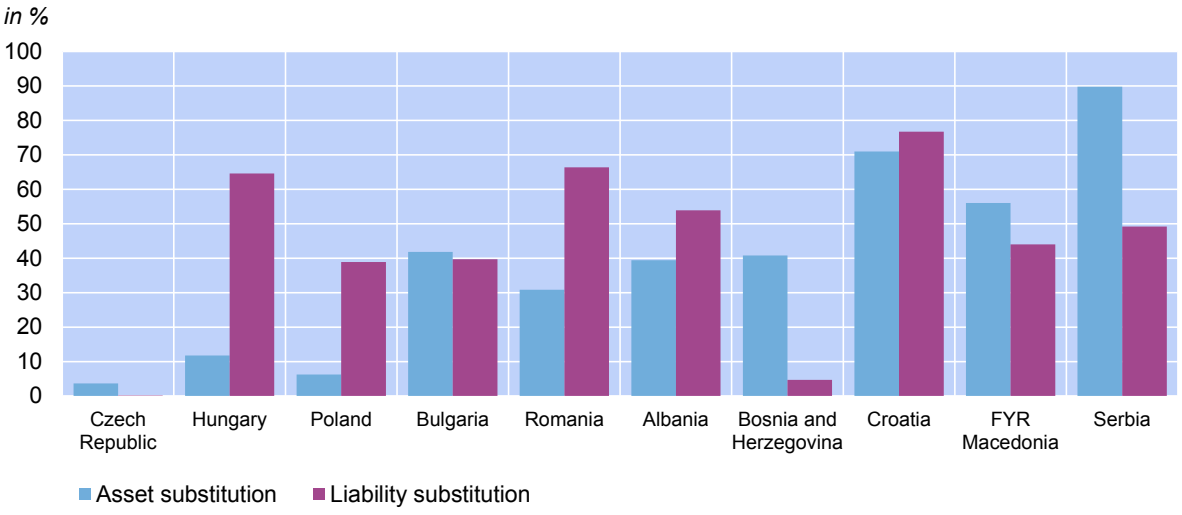
Source: IMF.
Note: CPI=Consumer Price Index, HICP=Harmonized Index of Consumer Prices. Developing Asia as defined in the IMF World Economic Outlook.

Chart 2 a + b



Note: latest observation: 01/06/2012
Source: Thomson Reuters.

Chart 3

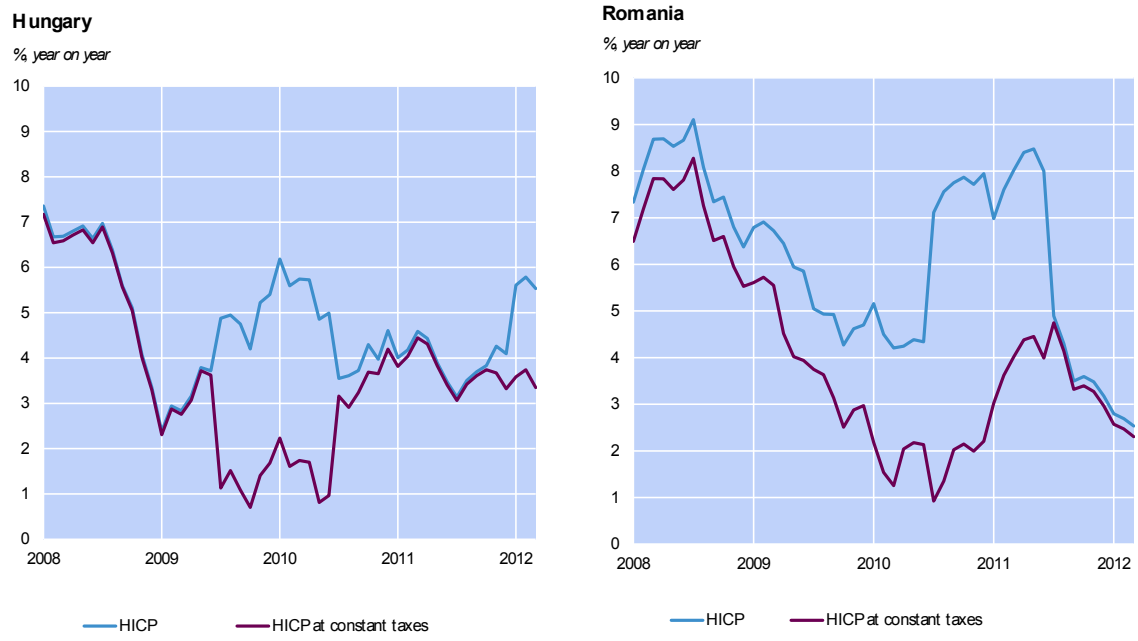


Source: OeNB Euro Survey, National Central Banks.

Note: Asset substitution is measured by the Euroization index which is defined as (euro cash + foreign currency deposits) / (total cash + total deposits), using OeNB Euro Survey data for projecting euro cash holdings of CESEE households. Liability substitution is calculated as foreign currency loans over total loans of households and NPISH (non-profit institutions serving households). The entry on liability substitution for Bosnia and Herzegovina refers to loans of resident non-MFIs.

Chart 4 a + b

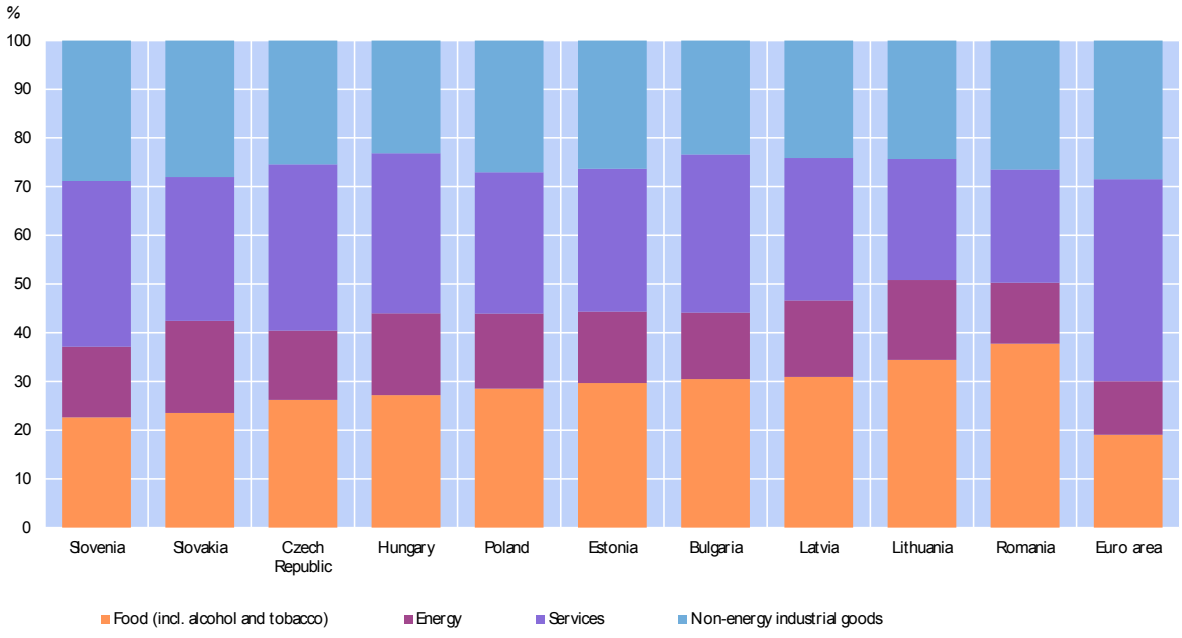
Total inflation and inflation at constant taxes



Source: Eurostat.
Note: HICP=Harmonized Index of Consumer Prices.

Chart 5

HICP item weights

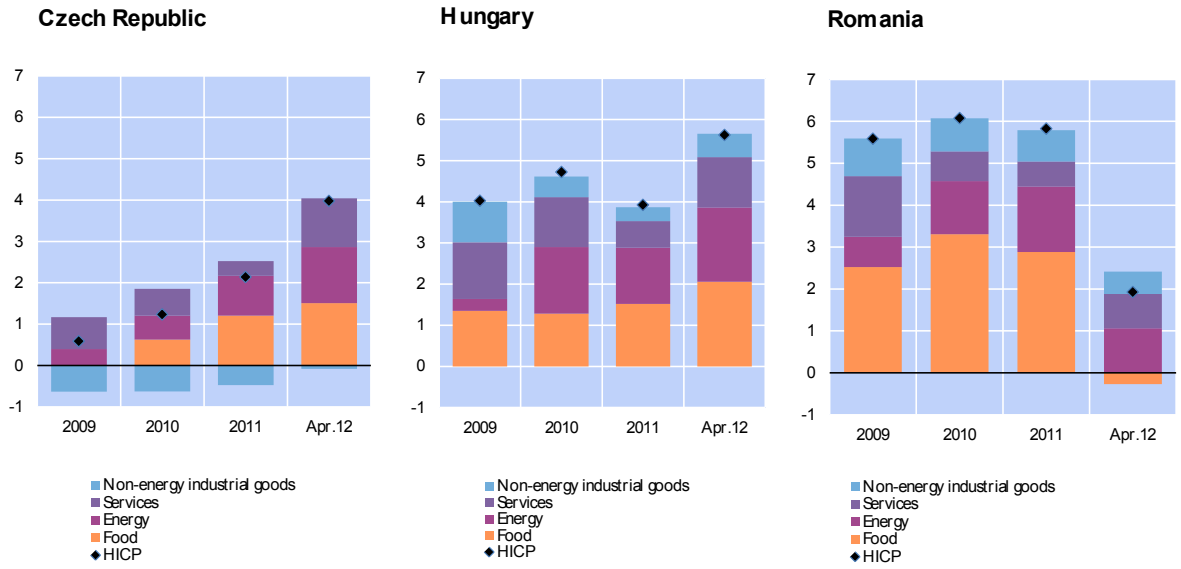


Source: Eurostat.
Note: HICP=Harmonized Index of Consumer Prices.

Chart 6

HICP inflation and its main drivers

percentage points, contribution to year-on-year change in HICP, HICP in %

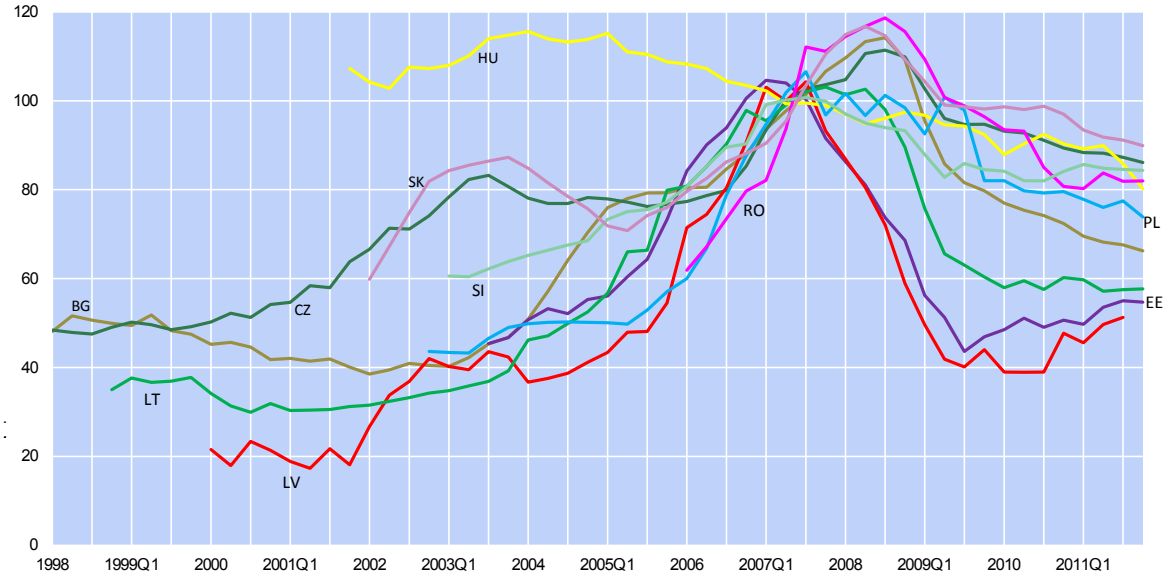


Source: Eurostat.
Note: HICP=Harmonized Index of Consumer Prices.

Chart 7

Residential Property Price Developments in CESEE EU Countries' Capital Cities

Index (2007=100), in real terms



Source: BIS, ECB, National Central Banks, National Statistical Offices, REAS (Residential Advisors).
Note: The price indices in BG refer to property in large cities. All indices are deflated by the HICP.

Table 1

Features of the monetary policy strategies of CESEE EU member states

Bulgaria	Exchange rate target: peg to the euro at BGN 1.95583 per euro within the framework of a currency board arrangement.
Czech Republic	Inflation target: 3% +/– 1 percentage point until end-2009: thereafter 2% +/– 1 percentage point. Managed floating exchange rate.
Hungary	Inflation target: 3% +/– 1 percentage point medium term target since 2007. Free floating exchange rate.
Latvia	Participates in ERM II with a +/–15% fluctuation band around a central rate of LVL 0.702804 per euro. Latvia continues with a fluctuation band of +/–1% as a unilateral commitment.
Lithuania	Participates in ERM II with a +/–15% fluctuation band around a central rate of LTL 3.45280 per euro. Lithuania continues with its currency board arrangement as a unilateral commitment.
Poland	Inflation target 3.0% +/– 1 percentage point (12-month increase in the CPI). Free floating exchange rate.
Romania	Inflation target: 3.0% +/– 1 percentage point for end-2011 and 2012 and 2.5% +/– 1 percentage point from 2013. Managed floating exchange rate.

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Woerz, J., Outlook for Selected CESEE Countries: Mixed External Environment Compounds Weak Domestic Demand, Focus on European Economic Integration, Oesterreichische Nationalbank, Q2/2012.

Panel Discussion 2

Monetary policy frameworks in Asia-Pacific – beyond inflation targeting?

The future of inflation targeting?

John McDermott[1]

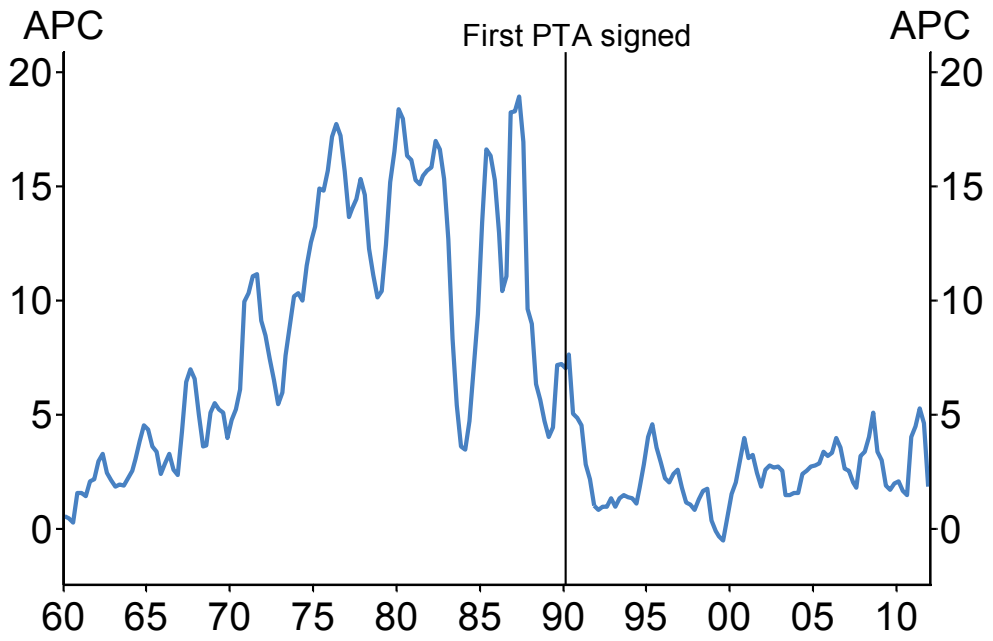
Introduction

Inflation targeting as a monetary policy framework has been largely successful at keeping inflation in check in the many countries that have adopted it over the past 20 years or so.[2] Certainly the inflation performance in New Zealand has been far superior under the inflation targeting regime (figure 1).

I expect inflation targeting is very familiar to most people here, but let me briefly recap what that framework entails in the New Zealand context. Then I will use the most recent business cycle in New Zealand to illustrate how the framework coped with some very significant shocks to the New Zealand economy.

Figure 1

Headline CPI inflation



Note: APC : Annual Percent Change.

Source: Statistics New Zealand

[1] Assistant Governor, Reserve Bank of New Zealand.

[2] Roger, S (2009) "Inflation targeting at 20: achievements and challenges" IMF working paper, WP/09/236, October.

What inflation targeting looks like in New Zealand

Inflation targeting frameworks have a number of elements, including an explicit numerical target to be met over a defined time horizon, as well as typically specifying a process for how the central bank is to be held accountable for its monetary policy actions and how it is expected to communicate its monetary policy decisions.

In New Zealand, we aim to keep future consumer price inflation between 1 and 3 per cent on average over the medium term.[3] Like many other central banks we have a range of publications we can use to provide our view of inflationary pressure and explain our monetary policy actions. The most prominent is the quarterly *Monetary Policy Statement*. Although the principles of inflation targeting are the same across countries, there are some differences in the details. For example, New Zealand has a different accountability structure in that we have a single decision maker rather than a committee for monetary policy decisions. We also differ to most central banks in that we publish an interest rate track that we think would be necessary to achieve our inflation target. These differences do not appear to have made a difference in the ability to achieve the inflation target.

How did the inflation targeting framework cope with the most recent business cycle in New Zealand?

The most recent business cycle in New Zealand was one of the longest and largest in the past 60 years.[4] The Reserve Bank has been analysing this cycle to help assess its monetary policy. This analysis provides a useful case study on the use of inflation targeting in a small open economy like New Zealand's. An analysis of the drivers of the business cycle was published in the Bank's March *Bulletin* while a discussion of monetary policy over the business cycle will be published in the Bank's June *Bulletin* in a few weeks.

In summary, that analysis notes that the New Zealand's economy expanded from 1998 to 2007 and then had a six quarter recession in 2008–09. From 1998 to 2007, there were a number of significant shocks that determined the shape of the business cycle (figure 2). First, there was a strong and unexpected increase in population growth from net immigration in 2002–03. Second, there was a significant boost to the economy from a rising terms of trade from 2000, which accelerated late in the period. Third, oil prices roughly doubled from mid-2007 to mid-2008. Fourth, government spending rose rapidly from 2005. This came at a time of pre-existing excess demand in the economy.

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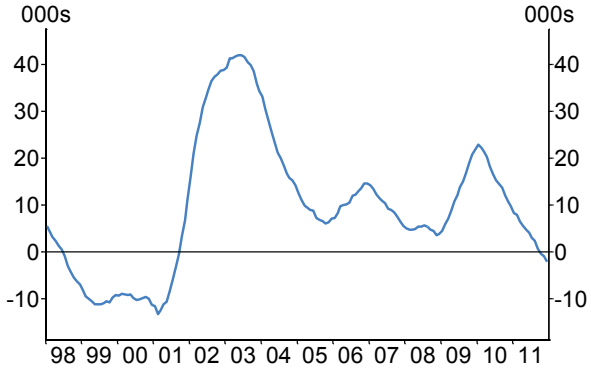
[3] In New Zealand, the inflation targeting framework is founded on the Reserve Bank Act 1989 (the Act) and the Policy Targets Agreement (PTA). The Act makes price stability the primary function of monetary policy and gives the Reserve Bank independence in operating monetary policy, subject to an agreement between the Minister of Finance and the Governor (the sole decision maker) specifying the functional target. The PTA defines price stability in the form of an inflation target, currently future annual CPI inflation "... between 1 per cent and 3 per cent on average over the medium term". The PTA says that in pursuing price stability monetary policy should "seek to avoid unnecessary instability in output, interest rates and the exchange rate".

[4] For details of the dating for New Zealand's business cycles, see Hall, V B and C J McDermott (2009) "The New Zealand business cycle" Econometric Theory, 25, 1050–1069.

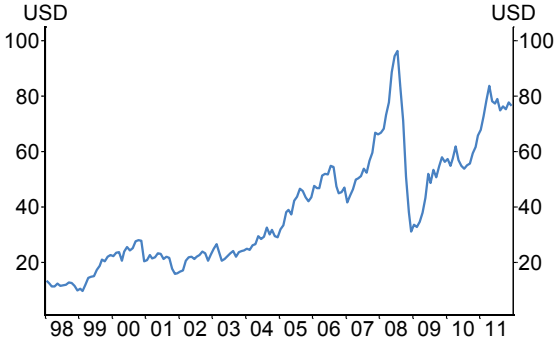
Figure 2

Net permanent and long-term migration



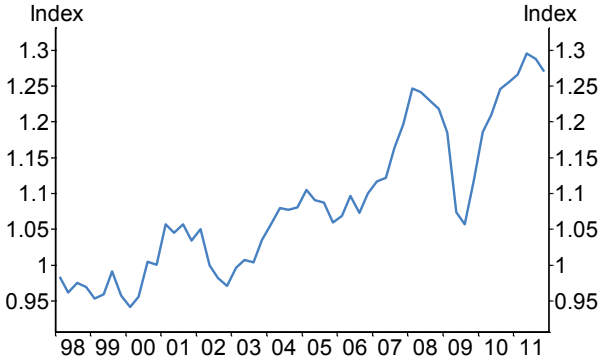
Source: Statistics New Zealand

Real Dubai oil prices (1998 prices)



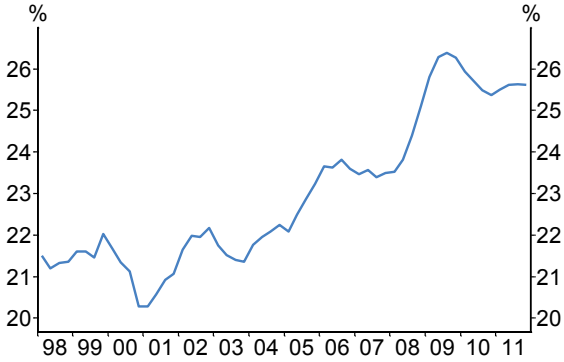
Source: Reuters, Haver Analytics, RBNZ calculation

Terms of trade



Source: Statistics New Zealand

Government spending (consumption plus investment, per cent of annual GDP)



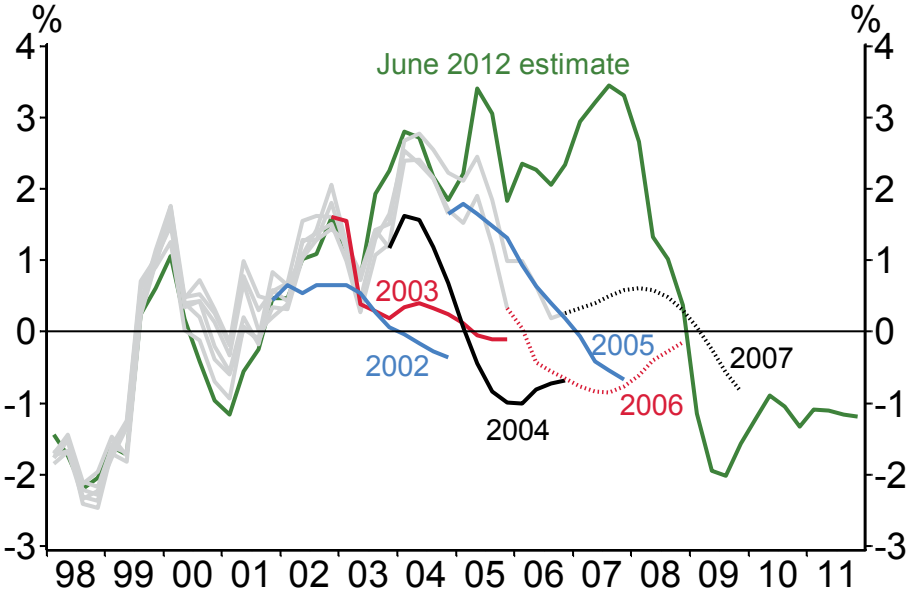
Source: Statistics New Zealand, RBNZ calculations

In setting monetary policy we had to take a view both on how these shocks would unfold and on how they might change the inflationary pressure in the economy, as summarised by our view of the output gap. As our forthcoming *Bulletin* article[5] notes, throughout the recent boom we expected the output gap to dissipate rapidly. However, as it turned out the output gap remained positive for an extended period (figure 3).

[5] Chetwin, W (2012) "Business cycle review, 1998–2011" Reserve Bank of New Zealand Bulletin 75(1), 14–27, and Chetwin, W and M Reddell (2012) "Monetary policy in the last business cycle: some perspectives" Reserve Bank of New Zealand Bulletin 75(2), forthcoming.

Figure 3

Output gap estimates from June quarter Monetary Policy Statements (per cent of potential output)



Source: Statistics New Zealand, RBNZ calculations

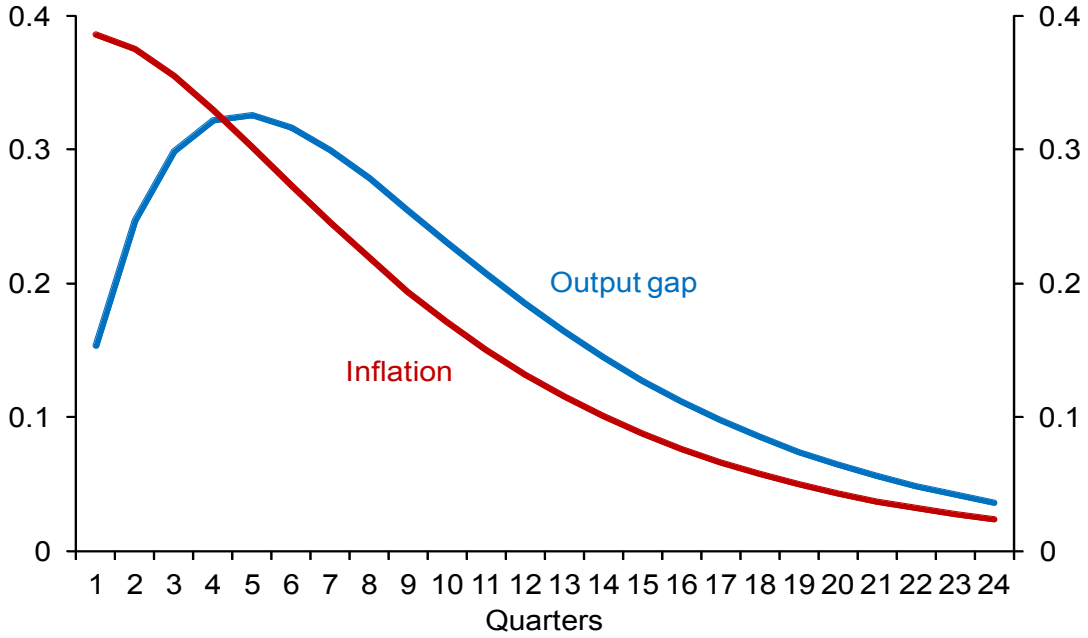
With an extended period of excess demand pressure, average inflation tracked in the upper half of our target zone. While the persistent component of inflation was higher than we would have ideally liked during the business cycle expansion, it did remain anchored within the target zone. That outcome was far superior to our experience of the 1970s when inflation was persistently at double-digit levels.

The difficulty of anticipating how long an inflationary shock will last is central to the forecasting process required for monetary policy. In many models that are used for monetary policy analysis, the output gap often quickly returns close to zero following a simple aggregate demand shock, and it is natural to think in those terms.[6] However, the interaction of a persistent aggregate demand shock and inertia in the economy can considerably prolong the time for which the economy is in a state of excess demand pressure. Figure 4 illustrates this point by showing the response of an aggregate demand shock with a half-life of only two quarters in a stylised model of monetary policy with typical parameter settings. The point is that excess demand can remain material in the economy long after the underlying shock has gone.

[6] Here I am referring to the New Keynesian style models as described in, for example, Woodford, M (2003) Interest and Prices: Foundations of a Theory of Monetary Policy, Princeton University Press; and Benes, J, A Binning, M Fukac, K Lees, T Matheson (2009) K.I.T.T.: Kiwi Inflation Targeting Technology, Reserve Bank of New Zealand.

Figure 4

Response of output gap and inflation to a persistent aggregate demand shock



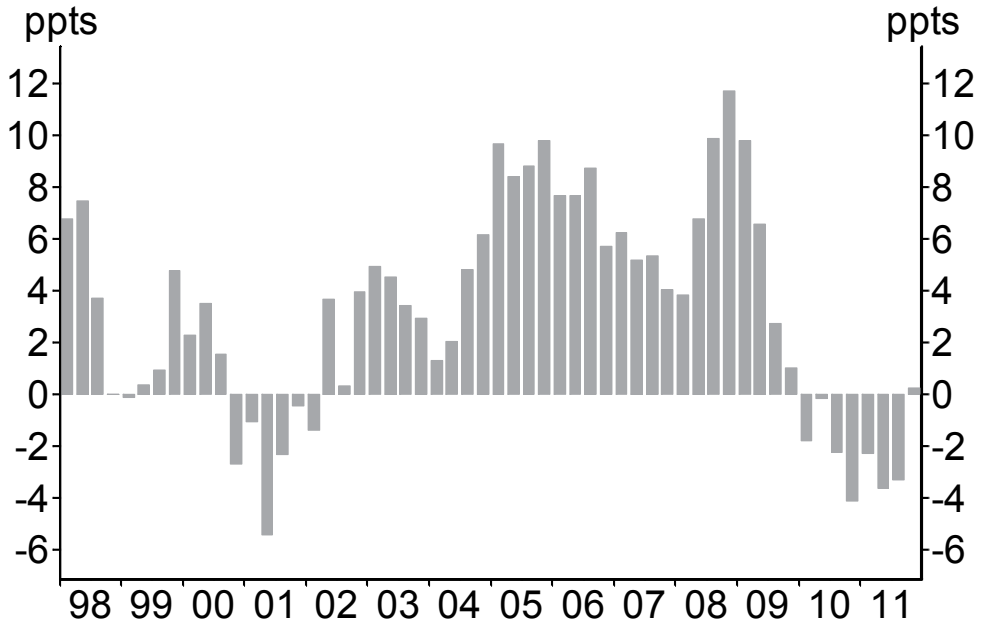
Source: RBNZ calculations

Of course, the shocks we face in the economy can be far more complicated than in this simple illustration. Three of the shocks shown in figure 2 delivered ongoing pressure to the economy. Even the relatively short-lived large inflow of migrants in 2002–03 had ongoing impacts. The housing stock cannot be increased as quickly as the changes in migrant flows. Consequently, house prices rose and, even after the boost to population subsided, continued to rise beyond all forecasters' expectations. Higher house prices in turn stimulated a large construction boom which put further pressure on resources. Private sector credit started to expand well in excess of the nominal growth in the economy (figure 5). In line with conventional wisdom, we put relatively less weight on credit data than on interest rates. [7] Had we had a higher weighting on credit growth data, our view of the persistence of pressure on resources would likely have been stronger much earlier in the boom.

[7] The academic consensus on monetary policy used to be that there was no independent information for monetary formulation in money and credit numbers over and above that available in interest rates. See, for example, Gali, J (2008) Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework, Princeton University Press. While this view was never completely accepted at the Reserve Bank of New Zealand (Bollard, A (2005) "Housing debt, inflation and the exchange rate" Address to the Employers and Manufacturers Association (Northern) AGM), money and credit aggregates were never very prominent in the formulation of monetary policy. One of the processes we changed following the global financial crisis was to formally present information on monetary and credit aggregates to the Monetary Policy Committee to assist with the production of the Bank's forecasting in its Monetary Policy Statement.

Figure 5

Excess of domestic credit growth over nominal GDP growth



Source: Statistics New Zealand, RBNZ calculations

Monetary policy in New Zealand is also complicated by exchange rate issues. In a small open economy the inflation target is a complement to a floating exchange rate regime. During the boom period, expectations of tight monetary policy to offset the excess demand pressure probably contributed to the persistently high exchange rate throughout the period, causing considerable discomfort and worries about the sustainability of parts of New Zealand's tradable sector.

After the global finance crisis, there are new challenges for monetary policy to deal with. The current recovery in the business cycle, both in New Zealand and in other advanced economies, is proving weaker than historical precedents. Our forecasting frameworks need to be expanded so we can examine possible sources of the disappointing recoveries, such as the impact of the overhang of public and private debt on the economy.

Inflation targeting works, and other lessons for the future

Despite the challenges and the ongoing shocks to the economy, monetary policy did what it was supposed to do: keep inflation low. The framework maintained the Reserve Bank's focus on the target, and the frequent publication of forecasts forced us to constantly update our views of the economy and the inflation pressure within it.

The Bank's analysis on the recent business cycle underscores that the inflation targeting framework is an effective way to conduct monetary policy under a range of testing circumstances and that the framework is a useful tool for future inflation control.

With low inflation and the credibility of inflation targeting came much lower volatility in the general level of prices. That is helpful for resource allocation, affecting longer-term performance, and for macroeconomic stability over the medium term. This credibility was very helpful when the global financial crisis hit. To help offset the very large negative shock,

the Bank started lowering interest rates even while annual inflation was above its 1 to 3 per cent target.

Of course, that is not to say the framework cannot be improved in any way. Over the course of the past 20 years or so the framework has evolved to reflect lessons learned and is likely to evolve further in response to new developments. In particular, our monitoring of monetary and credit information has increased in the wake of the global financial crisis. The Reserve Bank has also been looking into the effectiveness of some macroprudential instruments that may limit build-ups of problems in future periods of rapid credit growth.[8]

[8] For details see Spencer (2012) "Prudential lessons from the Global Financial Crisis", Presentation to Financial Institutions of New Zealand 2012 Remuneration Forum, May.

Property prices, inflation, and policy challenges in Hong Kong

Dong He[1]

Hong Kong plays various important roles in the Asia-Pacific region. One key role is to serve as an entrepôt of trade and fund flows; the Special Administrative Region is a bridge between Mainland China and the rest of the world. Hong Kong has developed into a highly service-based economy, with 93% of GDP contributed by service industries. In terms of both output and inflation, the Hong Kong property market is an important driver of macroeconomic outcomes. In 2010, real estate services accounted for 5% of GDP, while the ownership of premises amounted to 11% of GDP. At the same time, housing costs comprised 31.7% of the Hong Kong CPI basket.

In terms of macroeconomic policy setting, the Hong Kong Monetary Authority has a unique policy framework that has served the economy well. Capital flows freely in and out of the Region. The stable external value of the currency, set in the context of the Linked Exchange Rate system through a currency board arrangement, has also contributed to microeconomic efficiency gains. Overall, macroeconomic policy in Hong Kong puts emphasis on long-term (through-the-cycle) stability rather than demand management.

Table 1

Drivers of economic fluctuations in Hong Kong

Variance Decomposition of Shocks: Impact on Hong Kong

	Output			Price		
	US	CN	HK	US	CN	HK
1 quarter	16.26	18.70	65.04	23.44	1.73	74.83
1 year	40.03	16.01	43.96	22.22	12.22	65.56
5 years	41.70	17.36	40.95	33.08	22.05	44.86
10 years	43.71	16.79	39.50	36.42	21.26	42.32

Notes: The data sample covers the period from the first quarter of 1995 to the third quarter of 2010. The structural VAR system contains seven variables: CPI inflation and real GDP growth in the US, Mainland China and Hong Kong, and the three-month US Treasury bill rate. For identification, assumptions were made on the transmissions of economic shocks based on the relative sizes of the three economies. The economic developments in the global market, represented by the US factors, will influence the Mainland and Hong Kong, but not vice-versa. Similarly, the economic developments on the Mainland can influence Hong Kong but not the opposite.

Empirical evidence confirms the relative importance of Mainland China and global factors in driving macroeconomic developments in Hong Kong. Table 1 shows the results from a structural vector autoregressive model that contains macroeconomic variables from the United States, Mainland China and Hong Kong. The results suggest that while in the short

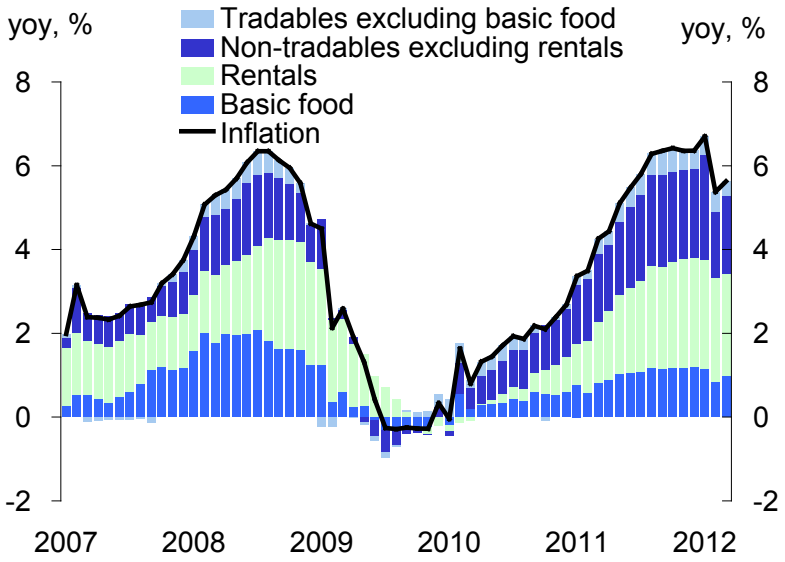
[1] Executive Director, Hong Kong Monetary Authority.

run both output and price dynamics in Hong Kong are mainly driven by domestic shocks, the importance of shocks from the United States and Mainland China strongly increases in the medium and long run. In terms of inflation fluctuations, Hong Kong's own shocks are the dominant contributors to price dynamics even in the long run.

One local factor in particular – rental prices – has been a significant driver of inflation dynamics in Hong Kong. As shown in Figure 1, the contribution of housing rentals was large during the two recent upturns in inflation cycles. As CPI inflation peaked in mid-2008 and early 2012, the rental component alone accounted for roughly 2 percentage points of overall CPI inflation around both inflation peaks. The increase in rentals has been accompanied by increases in inflation of other non-tradables, while inflation in tradables excluding basic food has remained moderate.

Figure 1

Growth in components of CPI inflation

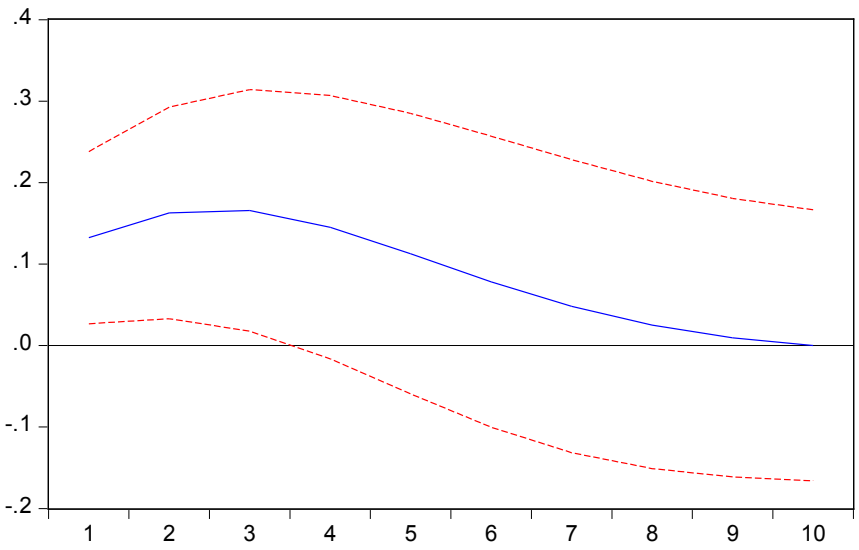


Moreover, property price developments influence the non-rental components of Hong Kong's consumer prices. Figure 2 shows the estimated response of the non-rental component of the Hong Kong composite CPI to a shock in local property price inflation. There is an immediate increase in the non-rental component following a positive shock to Hong Kong's property price inflation. The impact of the shock is statistically significant for approximately three quarters and then dies out slowly.

These price dynamics – housing prices influencing CPI movements through both its rental and non-rental components – underscore the importance of macroprudential tools in Hong Kong's policy framework. The Hong Kong Monetary Authority has been using macroprudential policies to prevent bank credit from fuelling property price bubbles and to ensure that banks and their customers have a sufficient cushion on their balance sheets to survive volatilities in property prices. These policies do not aim at targeting property prices but may help to dampen the amplitude of property price cycles and to prevent the collateral damage that other, more blunt policies might cause.

Figure 2

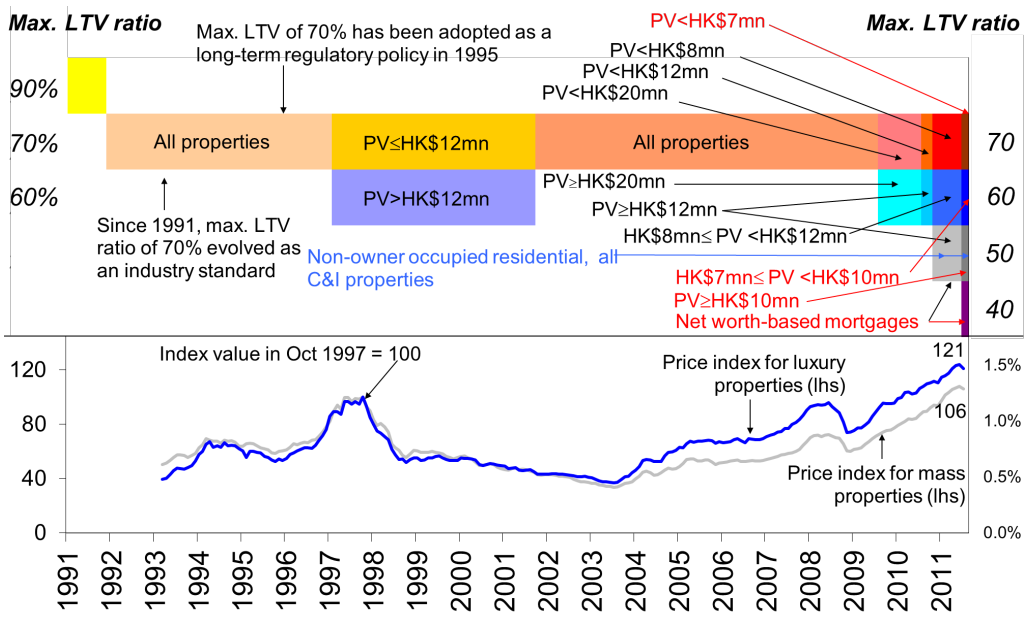
Impact of property prices on non-rental components of consumer prices



Indeed, over the past two decades, the Hong Kong Monetary Authority has used loan-to-value ratios (LTVs) as one type of targeted policy tool to manage banks' credit exposures to the property market and lean against the amplitude of property price cycles. Figure 3 shows how this policy has evolved over time. Hong Kong started off in the early 1990s with a maximum loan-to-value ratio of 70% for all property types, introducing more differentiated ratios over time depending on the property type and its value. Thus, the policy has expanded in terms of both its scale and its scope. In recent years, the use of LTVs has become more intensive as a means to address the strong upward pressure on the housing market.

Figure 3

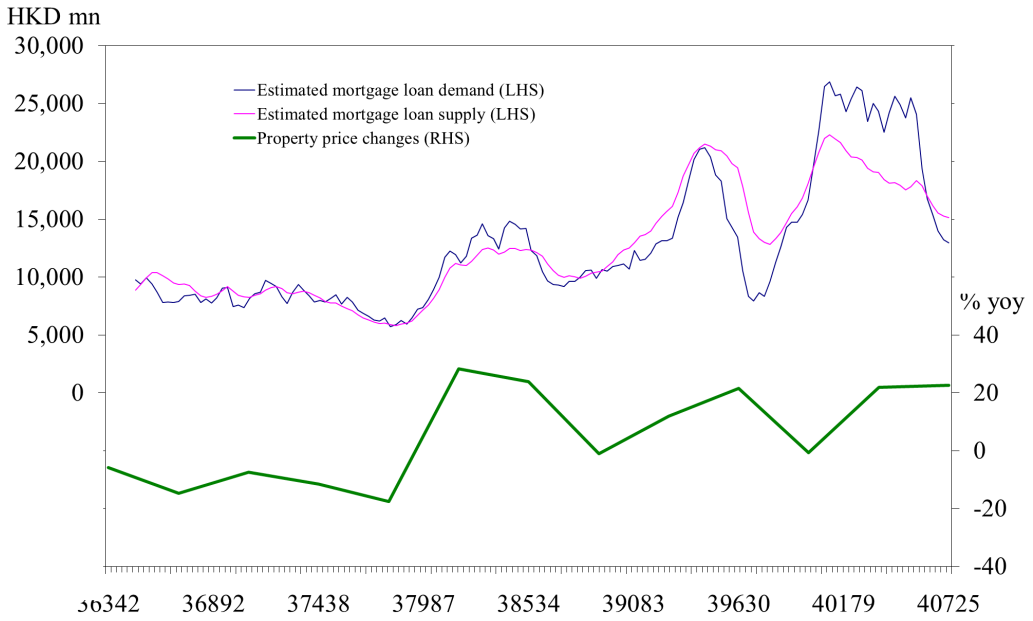
History of loan-to-value (LTV) policies



In an important sense, macroprudential policies are effective tools to limit the quantity of leverage in an economy like Hong Kong. In terms of loan supply and demand, the supply of mortgage loans has been effectively constrained by the LTVs and this helped lean against property price dynamics, as shown in Figure 4. In other words, if the demand for mortgage loans had been fully satisfied by banks, then upward pressures on property prices would have been even higher. These policy actions have shown that managing the quantity of leverage in the system has contributed to financial stability in Hong Kong.

Figure 4

Effect of LTV caps on property prices



Overall, Hong Kong's experience shows that simple and transparent limits on leverage in residential mortgages have served to prevent bank credit from fuelling asset prices and helped dampen the amplitude of property price cycles. By leaning against property price fluctuations, they have helped reduce the swings in overall CPI inflation. The adopted macroprudential measures have therefore contributed to both macroeconomic and financial stability.

Monetary policy frameworks in Asia-Pacific: beyond inflation targeting?

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Do frameworks matter? From one perspective, the answer is 'no' – provided that the relevant frameworks are all based on prudent principles. Asia has had a diversity of frameworks but, irrespective of the differences, most Asian economies have enjoyed low to moderate inflation in the period since the Asian financial crisis. In the pre-Lehman period, central banks in the region were assisted by global developments. That is, monetary policy frameworks were less important than the economic environment in which monetary policy operated: more benign global conditions, fewer large supply shocks, globalisation and the importation of lower inflation through the trade channel. Economic liberalisation led to increased domestic and international competition, while an expansion in regional labour supply and increased cross-border mobility of low-skilled workers helped to dampen wage growth.

From another perspective, the answer is 'yes'. Not only have differences in the actual conduct of monetary policy narrowed, the overall quality of the policymaking frameworks has improved. Irrespective of frameworks, many central banks in the region have adopted certain best practices: primary focus on inflation, committee-based decision-making, increased transparency and regular communication on issues related to monetary policy. Asian central banks have generally adopted more flexible policy frameworks that have responded to other risks besides those related to inflation. They have undertaken foreign exchange intervention to manage pressure on their exchange rates and some have implemented measures to manage large capital flows. They have also responded to asset prices – not always with interest rates, often using macro-prudential and other administrative measures. Better-regulated financial systems contributed to the effectiveness of monetary policy. In the case of Malaysia, these improvements have included things such as the setting-up of a centralised borrower information database accessible to all financial institutions, improved risk management practices by the financial institutions, more rigorous supervisory practices and improvements in the knowledge and quality of board members of banks.

A reduction in fiscal dominance was probably the single most important factor in terms of improving the monetary policy performance in the emerging economies of Asia. In economies that continue to experience persistent inflation, it is often the case that monetary policy is still subservient to fiscal policy. In a dismal global growth environment, fiscal dominance remains a key risk to monetary policy and long-term sustainable growth.

A long-running debate related to monetary policy frameworks has been about the role of monetary policy in managing asset prices. My own view has always been that central banks cannot afford to ignore asset prices – key financial variables that affect asset prices are under the control of central banks and the bursting of asset bubbles undermines key objectives of central banks related to macroeconomic and financial stability. While I agree that one would not want to aggressively use interest rates to manage housing bubbles, having a reasonable level of interest rates is still a good starting point to reduce incentives for risky behaviour. If real interest rates are not too low but there are nevertheless incipient signs of asset price bubbles and rapid credit growth, then targeted macro-prudential measures may be warranted. But you have to get the level of interest rates right first.

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This raises a potential issue for exchange rate based frameworks. From an inflation perspective, exchange rate based frameworks are useful if the major influence on domestic inflation is external. However, given that interest rates are set elsewhere under such frameworks, the usefulness of such frameworks may be less when inflation is being driven by domestic factors. Furthermore, if interest rates are too low, they can lead to financial imbalances, increased risk-taking, and asset price bubbles. In these circumstances, macro-prudential tools can be useful, but they do not address the core issue of low returns on bank liabilities. Because of this, macro-prudential measures alone may drive speculation into other assets or lead to capital flight to assets in other countries.

Historically low interest rates characterised much of the decade prior to the crisis, with real rates often dipping below zero for extended periods. During this period, irrespective of the monetary policy frameworks, real interest rates were also low in much of Asia. From 2002–2007, there was relatively strong GDP growth across Asia, inflation was on a rising trend, but real interest rates were declining, low and often negative. Surges of large capital flows into many regional economies did not help the situation. It should be no surprise then that in the period before the crisis, the availability of ample liquidity and low returns led to a search for yields and risky behaviour in some economies. Real interest rates are again very low in the major economies and these are being transmitted to the economies in Asia. As in the past, sustained low interest rates raise concerns about excessive risk-taking and over-leveraging. Asia is also vulnerable to other risks; given its high saving rate and the concentration of those savings in the banking system – low interest rates could lead to a disintermediation of these savings into the asset markets and other risky investments. Financial scams also proliferate when savers' desperation for higher returns on their savings increases their vulnerability to such schemes.

Why were interest rates so low before the crisis? There could be a number of possible reasons, and it is not possible to go through all of them here. Let me mention just three. First, the major economy central banks had largely adopted an inflation focused policy framework, and with inflation falling, interest rates were correspondingly allowed to fall to historically low levels. These focused monetary frameworks did not accommodate the other potential risks to the economy arising from having such low interest rates. Second, monetary policy had developed an asymmetric perspective on the level of interest rates. Low interest rates are considered good for economic growth and high interest rates are viewed as being bad for growth. The manifestation of this was a tendency to ease quickly but to tighten only gradually, and more broadly, complacency about keeping interest rates at low levels for extended periods. Third, there is a high degree of uncertainty surrounding the setting of monetary policy, which then raises the question of what exactly is the basis for determining an appropriate level of the policy rate? Central banks have their models and Taylor rules, but at the end of the day, monetary policy setting is still very much a process of judgment in an environment of significant uncertainty. The widely adopted practice of gradualism in monetary policy setting recognises the risk of making errors. In the current circumstances, with nominal policy interest rates already at close to zero in many advanced economies, their central banks have still not been able to state with certainty if there is some optimal level of their interest rates that will get economic growth going again. The problem is even worse if we consider the possibility that the level of interest rates may no longer be relevant as a solution to the problem.

For emerging markets, globalisation has made it more difficult to set appropriate interest rates. Real globalisation has led to a higher frequency of inflationary and growth shocks coming from the global economy. Financial globalisation has increased vulnerability to yield-seeking and speculative capital flows as well as to the overshooting of everything from exchange rates to the prices of bonds and commodities. The spillovers from the policies in the advanced economies have always been a source of added complexity for policy setting in small open economies. In the current circumstance, while we understand what policymakers in advanced crisis-affected economies are trying to achieve, the consequence

of these policies, in terms of financial repression, a global search for yield/safety and volatility in global markets, are creating risks for our own economies and limiting the policy space available to us. We cannot escape these externalities.

Finally, within the constraints of the global factors I have just outlined, let me briefly share my thoughts on what a monetary policy framework should look like. A robust monetary policy framework must have three elements (3 pillars):

Price Stability *plus* **Exchange Rate** *plus* **Financial Conditions (Credit)**

The framework tries to take on board the lessons from the crisis and reflects the policy trade-offs that are inherent in policy setting. Many regional central banks may have already been operating on such a framework, with differences perhaps in the amount of attention devoted by each central bank to the different components. In this framework, price stability continues to be a primary objective of monetary policy, but it is not the only objective. Price stability reflects the traditional focus on the domestic purchasing power of the currency. However, in a globalised world with growing trade dependence, the external purchasing power of the currency is also important to national economic welfare. Increased short-term capital flows and the risk of exchange rate misalignment make the monitoring and management of the exchange rate a desirable policy objective. Under normal circumstances, the optimal response would be to allow the exchange rate to respond flexibly to developments, but intervention may be necessary when the exchange rate becomes too volatile or is at risk of overshooting (appreciation or depreciation). The third component of the monetary framework would be for the central bank to monitor both the quantity and the direction of flow of credit within the economy, and to take action if credit is growing too strongly or is being excessively concentrated in a particular sector, especially one that poses risks to asset prices. Bringing this third objective into focus may prevent the repetition of the mistake of dropping interest rates too low when inflation is low. It would ensure that monetary policy develops a holistic and symmetric response to financial conditions – not only easing when financial conditions deteriorate but also tightening when financial conditions are too buoyant.