Sveriges Riksbank Economic Review

2013:3

Special Issue

Two Decades of Inflation Targeting: Main Lessons and Remaining Challenges

SVERIGES RIKSBANK

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Economic Review

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SVERIGES RIKSBANK ECONOMIC REVIEW
is issued by Sveriges Riksbank.

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The Review is published on the Riksbank's website
www.riksbank.se/en/Press-and-published/Reports/Economic-Review

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ISSN 2001-029X

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Two Decades of Inflation Targeting: Main Lessons and Remaining Challenges

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Introduction

In June 2013, the Riksbank arranged an international conference to mark 20 years of inflation targeting in Sweden. The four papers presented at the conference are published in this special issue.

Today, around 30 central banks worldwide work with floating exchange rates and a numerical target for inflation.[1] The pioneers include New Zealand and Canada, which introduced inflation targeting in 1990 and 1991, respectively. The UK and Sweden introduced inflation targeting early on (in 1992 and 1993, respectively) following the breakdown of their fixed exchange rate regimes. Several emerging market economies switched to inflation targeting in the latter half of the 1990s, such as the Czech Republic (1997), Korea (1998) and Brazil (1999). In recent years, two major advanced economies have introduced inflation targeting – the US (2012) and Japan (2013) – by specifying a numerical target for inflation and starting to publish inflation forecasts.

Inflation-targeting monetary policy comprises several parts. The main purpose is to achieve price stability. The inflation target is numerical and publicly known.[2] The central bank produces and publishes inflation forecasts and adapts monetary policy to attempt to reach the target. Monetary policy also generally aims to achieve stability in the real economy, which is sometimes expressed as "flexible" inflation targeting. Some central banks, including the Riksbank, also publish projections for the policy rate, which are deemed to provide an appropriate balance between stabilising inflation and stabilising the real economy. Inflation-targeting central banks are typically independent, transparent in their assessments and stand publicly accountable for their decisions. The purpose of an inflation-targeting regime is to facilitate economic decisions by establishing a high degree of confidence in low inflation, low inflation volatility and a stable real economy.

In countries that have introduced inflation targeting, inflation has been low and inflation expectations clearly anchored around the target.[3] Stable inflation expectations have meant that various temporary shocks, such as major fluctuations in the oil price and exchange

1 See Hammond (2012) for an overview of the regulations in various inflation-targeting countries.
2 Most advanced economies have opted for inflation targets around 2 per cent, while emerging market economies may have a slightly higher target, often around 4-5 per cent.
3 Svensson (2010).

rates, have had limited effects on inflation.[4] This has been achieved without GDP growth becoming more volatile. Table 1 compares key macroeconomic variables in countries with different monetary policy regimes. Inflation-targeting countries fare well in this comparison, particularly inflation-targeting emerging market economies. Since 2000, fluctuations in inflation, GDP growth and inflation expectations have been lower in emerging market economies with an inflation target than in countries without an inflation target. The more stable development in inflation-targeting emerging market economies is even clearer during the period since 2007, which includes the global financial crisis. In advanced economies, the differences between countries with and without inflation targets are smaller. This is probably because monetary policy in several major currency areas (e.g. the US and the euro area) has in practice worked in a way similar to the inflation-targeting countries.[5]

Table 1. Macroeconomic variables in countries with inflation targets and other countries

	INFLATION				INFLATION EXPECTATIONS				GDP GROWTH			
	2000-2006		2007-2012		2000-2006		2007-2012		2000-2006		2007-2012	
	MEAN	ST. DEV.	MEAN	ST. DEV.	MEAN	ST. DEV.	MEAN	ST. DEV.	MEAN	ST. DEV.	MEAN	ST. DEV.
Inflation-targeting advanced economies	2.20	1.38	2.30	1.60	2.12	0.24	2.25	0.51	2.99	1.63	1.26	2.53
Non-inflation-targeting advanced economies	1.47	0.70	1.41	1.59	1.44	0.24	1.29	0.55	1.97	1.66	0.40	3.38
Inflation-targeting emerging market economies	4.14	1.19	4.50	1.76	4.29	0.73	4.19	0.54	4.51	1.80	3.65	3.85
Non-inflation-targeting emerging market economies	7.29	3.01	5.25	2.72	7.33	2.69	4.65	1.20	7.13	4.50	4.13	5.53

Note. The mean and standard deviation are calculated as an unweighted annual average in each group. Inflation and GDP growth are based on the quarterly percentage change calculated in annualised terms of seasonally-adjusted CPI and real GDP. Inflation expectations refer to the average of the current and the following years' inflation forecasts in per cent according to Consensus Forecast. Inflation-targeting advanced economies: Australia, Canada, New Zealand, Norway, the UK and Sweden. Non-inflation-targeting advanced economies: Denmark, the euro area, Japan, Switzerland and the US. Inflation-targeting emerging market economies : Brazil, Chile, Colombia, the Czech Republic, Hungary, Indonesia, Israel, Korea, Mexico, Peru, the Philippines, Poland, Romania, South Africa, Thailand and Turkey (Indonesia, Romania and Turkey not included, however, before 2006). Non-inflation-targeting emerging market economies: Argentina, Bulgaria, China, Croatia, Hong Kong, India, Latvia, Lithuania, Malaysia, Russia and Singapore.

Source: Banerjee, Cecchetti and Hofmann (2013)

Monetary policy with inflation targeting may also have provided certain advantages during the financial crisis. When production fell sharply in connection with the financial crisis, confidence in inflation targets contributed to the ability of inflation-targeting central banks to cut interest rates more than other central banks.[6] Inflation expectations remained relatively stable during the crisis. However, countries with inflation targeting could not

4 Mishkin and Schmidt-Hebbel (2007).

5 According to the ECB's price stability target, inflation in the euro area shall be less than (but close to) 2 per cent. The ECB also attaches importance to the trend for credit aggregates in the euro area when monetary policy is determined. In 2012 the Federal Reserve announced an explicit inflation target of 2 per cent, which many experts had previously perceived to be an implicit target. Another objective of the Federal Reserve is striving to achieve maximum employment.

6 Carvalho-Filho (2011).

avoid being affected by the crisis. A key lesson learned is therefore that price stability in itself is no guarantee for countries to avoid the impact of financial crises. Low, stable inflation forms a basis for financial stability, but does not suffice. Risks in the financial system can build up nevertheless. A discussion is thus under way about whether central banks, besides stable inflation and a stable real economy, also ought to aim at reducing the risk and costs of financial crises.[7] At the same time, extensive efforts are being made to introduce new macroprudential tools to curb risk-taking and make the financial system more resilient.

Against this backdrop, the four papers presented at the conference described monetary policy experiences and challenges.

The first challenge is about the trade-off between stabilising inflation and the real economy, and how this trade-off affects monetary policy decisions. It also addresses how the effects of monetary policy can be estimated and evaluated. These matters have been under discussion for a long time and are addressed in the papers of Lars Svensson and Michael Woodford, both of whom have played a key role in developing the framework for "flexible" inflation targeting.

The second challenge is about how monetary policy decisions can best be communicated to the public. Transparency and clarity have always formed an important part of inflation targeting, but there are differences in the degree of openness between different central banks. Even before the crisis, some central banks started to publish their view on future monetary policy (i.e. the policy rate), while others have provided less information. The financial crisis and subsequent sluggish recovery have, however, prompted many more central banks to opt for clarifying their own intentions regarding future monetary policy. In their papers, Lars Svensson and particularly Michael Woodford discuss how central banks communicate monetary policy.

The third challenge is about how monetary policy is affected by financial imbalances and the introduction of new macroprudential tools. Before the financial crisis, the view of many was that monetary policy should focus on stabilising inflation and possibly the real economy, but it should not take explicit account of financial imbalances and risks to financial stability. The financial crisis has called this view into question. Lars Svensson and, in particular, Frank Smets discuss these matters in their papers. Smets analyses the relationship between monetary policy and financial stability and also describes different perspectives on the role of central banks in achieving financial stability.

The fourth challenge relates to how financial globalisation affects the possibility of conducting domestic oriented autonomous monetary policy. The matter relates to what economists call the "trilemma" of the economy, i.e. that there are three jointly unattainable objectives: monetary policy independence, fixed exchange rates and free capital mobility. There is, for instance, empirical support for the view that, with free capital mobility, countries with floating exchange rates have greater possibilities of conducting autonomous

7 See e.g. Woodford (2012) and Svensson (2012).

monetary policy than those with stable exchange rates. Linda Goldberg discusses in her paper the role of banking globalisation in the possibility of conducting independent monetary policy.

Conference papers

LESSONS FROM PRACTICAL MONETARY POLICY

The first paper, "Some Lessons from Six Years of Practical Inflation Targeting" was written by Professor **Lars E.O. Svensson**, Deputy Governor of the Riksbank from May 2007 to May 2013. Svensson summarizes his experiences from his time at the Riksbank into six lessons.

The first lesson is that the central bank must be clear about its mandate and not diverge from this. The Riksbank's monetary policy mandate is characterised as "flexible" inflation targeting,[8] which Svensson specifies as the Riksbank seeking to achieve price stability and the highest sustainable employment – an interpretation based on the preparatory work for the Sveriges Riksbank Act. A clear monetary policy objective leads to more systematic monetary policy and facilitates evaluation, which is necessary for an independent central bank. In order not to neglect inflation targeting, monetary policy should focus on keeping average inflation over a longer period on target. Svensson also argues that the deviation of unemployment from a long-run sustainable level is the best measure of resource utilisation, and that monetary policy should thus focus on stabilising unemployment around an estimated long-run sustainable level (which is determined by factors independent of monetary policy). Compared with other measures of resource utilisation (e.g. the deviation of GDP from a long-run sustainable trend), the long-run unemployment level is easier to estimate, and high unemployment has clearer effects on people's well-being.

A second lesson is that monetary policy should not use household indebtedness as an additional target variable besides price stability and the highest sustainable employment. Recently, a majority of the Riksbank's Executive Board voted in favour of an unchanged repo rate, even though a lower rate would have meant CPIF inflation approaching the target faster, and lower unemployment. Svensson argues that this policy, "leaning against the wind", has involved unnecessarily tight monetary policy for a long time, leading to unnecessarily low inflation and high unemployment. He argues that a higher repo rate does not have any major effects on household debt in the short run (and perhaps even leads to *higher* real indebtedness and debt ratio to disposable income). But in the long run, actual inflation and expected inflation below the inflation target will lead to a higher real debt in the form of an unexpected and unwanted capital loss for borrowers, in comparison with inflation in line with the target. Also, interest rate changes are not an efficient instrument in affecting household debt; different types of microprudential and macroprudential instruments are more appropriate.

8 See Sveriges Riksbank (2010).

Svensson's third lesson is that inflation targeting based on forecasts of inflation and resource utilisation (unemployment) should in practice be carried out in two steps. In the first step, forecasts are made under the assumption that the repo rate path is kept unchanged since the last decision. This shows how new information since the previous decision affects the economy. In the second step, the rate path that leads to the best trade-off between inflation and resource utilisation (unemployment) is selected. This trade-off can be formalised using mean squared gaps, which measure the average squared deviation of the inflation forecast from the inflation target and the unemployment forecast from the long-run sustainable level.[9]

A fourth lesson is about how to evaluate monetary policy ex ante and ex post. Ex ante, i.e. when the monetary policy decision is to be made, different monetary policy alternatives can be evaluated by assessing how the inflation forecast stands in relation to the inflation target, and how the resource utilisation forecast stands in relation to its normal level. The deviations can be measured using mean squared gaps. Ex post, i.e. after the fact, the monetary policy conducted can be evaluated by analysing, using counterfactual experiments, how different monetary policy would have affected the economy. Svensson has himself used four-panel graphs at monetary policy meetings to show how alternative interest rate paths lead to different inflation and resource utilisation forecasts. He has also used counterfactual experiments to illustrate how more expansionary monetary policy would have affected the economy.[10]

Svensson's fifth lesson is about the classic trade-off in monetary policy between inflation and unemployment. According to mainstream economic theory, there is a short-term relationship between inflation and unemployment – lower unemployment is linked to higher inflation and vice versa – so a trade-off in monetary policy can arise between these two objectives, but in the long term there is no such relationship. However, if the inflation target is credible and inflation expectations are stable at the target, a long-term relationship emerges between inflation and unemployment, and hence so too a trade-off in monetary policy. Svensson argues that it is then very important that inflation is not below the inflation target on average for a long period of time, because unemployment would then be higher than normal.[11] Between 1997 and 2011, average CPI inflation in Sweden was 1.4 per cent, i.e. 0.6 percentage points below the inflation target. Svensson notes that, despite this, inflation expectations have been stable around the target and he estimates that the average low inflation has therefore led to unemployment being around 0.8 percentage points higher than necessary. Svensson's conclusion is that it is important to keep average inflation over a longer period in line with the target – a monetary policy strategy that resembles price level targeting.

Svensson's sixth lesson is that central banks should not confuse monetary policy and "financial policy", i.e. policy aimed at securing financial stability. Instead, central banks

9 See the article "A method for comparing different monetary policy alternatives" in Sveriges Riksbank (2012).
10 Svensson (2013).
11 See Svensson (2013) for a detailed account and Guibourg, Nilsson and Söderström (2013) for a summary.

should use monetary policy to achieve its monetary policy objectives (price stability and the highest possible employment), and financial policy to maintain financial stability. If the two areas are confused, the central bank risks poorer fulfilment for both targets. This does not mean that monetary policy does not affect financial stability, and that financial policy does not affect monetary policy objectives. Under normal circumstances, however, it is more efficient to separate the two policy areas. This is in line with the government's decision to give Finansinspektionen (The financial supervisory authority) the main responsibility for various macroprudential instruments in Sweden.

Eric Leeper, professor at Indiana University and advisor to the Riksbank, discussed Svensson's article at the conference. Leeper focused on the interplay between monetary policy and financial stability and, in particular, household debt. He began by referring to his own research on the sustainability of fiscal policy. Sustainable fiscal policy is fundamental to successful monetary policy, and the reforms to the fiscal policy framework in Sweden in the 1990s have likely been an important reason for the stable economic development since then.

Fiscal policy is sustainable when the government's future possibilities of collecting taxes are greater than expected total expenditures. If this is not the case, there is a risk of hitting a "fiscal limit," defined as the maximum expected present value of primary fiscal surpluses. As a country's level of government debt approaches the distribution of the fiscal limit, the probability rises that fiscal policy becomes unsustainable. In addition, at the fiscal limit monetary policy is not able to meet the inflation target as private agents anticipate that the only way to reduce the real value of sovereign debt is through high inflation. In such situations, monetary policy is exposed to "fiscal dominance".

Leeper extended this conceptual framework to household indebtedness and pointed out that households' possibility of holding debt partly depends on the cost of the debt burden (i.e. the interest rate), but also on their expected future income. The policy discussion about household indebtedness focuses primarily on the cost of holding debt, and on the fact that a lower interest rate increases total household debt and thus makes households more vulnerable to shocks. However, monetary policy also affects households' future income; in the medium term, a lower interest rate increases economic activity and hence household income. This strengthens households' ability to hold debt. Monetary policy thus affects households' vulnerability in different ways, and the overall effect is ambiguous.

In addition, fiscal policy affects households' income in the longer term too, for instance, through the tax and pension system. A tightening of fiscal policy which is intended to make fiscal policy more sustainable, e.g. through higher taxes or lower pensions, could at the same time reduce household income and make households more vulnerable in the long run. More sustainable fiscal policy could thus reduce the sustainability of household indebtedness.

Leeper therefore drew the conclusion that a comprehensive conceptual framework for analysing household indebtedness and the effects of monetary policy on households' debt must also take into account the stance of fiscal policy and macroprudential policy.

CHALLENGES FOR MONETARY POLICY COMMUNICATION

The second article, "Forward Guidance by Inflation-Targeting Central Banks" is written by **Michael Woodford**, professor at Columbia University and scientific advisor to the Riksbank.

Woodford analyses how inflation-targeting central banks ought to communicate to the public about their policy intentions. He first discusses communication about how the interest rate is set to meet the target, and describes how central bank communication about this has become more sophisticated over time. When inflation targeting was introduced, it was common for central banks to base their inflation projection on the assumption that the policy rate would be kept unchanged throughout the projection period. Such an assumption is generally not internally consistent, however, as the resulting projections about inflation and the real economy may themselves imply that the interest-rate target should be expected to change, if the same sort of forecast-targeting procedure is employed in the future. In most cases, private agents (for example, financial market participants) will understand that the interest rate will be changed in the future. Their expectations and decisions (which determine how the economy develops) would then be based on a different view of monetary policy than that which forms the basis of the central bank's projections. To avoid this problem, many central banks began basing their inflation projections on market expectations of the future path of short-term interest rates. However, Woodford points out that, even with such an assumption, a problem still persists in monetary policy communication, because in practice the view of the central bank of the future rate path may differ from that of financial market participants. Uncertainty then persists about the reasoning behind policy decisions. Woodford argues that the risk of being misunderstood by market participants can be decreased if the central bank is clearer about its own intentions regarding future policy. The central bank should therefore publish its own policy rate projection. Woodford also discusses how the policy rate path should ideally be based on criteria for how inflation approaches the target and how the real economy is stabilised.

Woodford discusses the Riksbank's method of communicating using repo rate projections, which have been published since 2007. During the initial years, communication of the rate path is deemed to have worked relatively well. There have sometimes been substantial deviations between the Riksbank's rate path and monetary policy expectations in financial markets. This could be due to the fact that the repo rate projection is a "forecast", and not a "promise" of the future policy rate, while at the same time market participants may hold a different view of inflation and the real economy than the Riksbank. The gap between the Riksbank's forecasts and market expectations may, however, be narrowed by increasing market confidence in the rate path. This could be achieved through the Riksbank strengthening its commitment to pursuing a clearly specified approach to making interest rate decisions, that is in turn assumed in its repo rate projections.

Woodford also discusses the special advantages of increasing the explicitness of a central bank's policy commitments and enhancing the transparency of decision-making at a time when the policy rate reaches its lower bound, while at the same time the economy requires further stimulus. A clearly binding commitment from the central bank can then contribute

to influencing expectations about economic developments in a positive direction. In this context, Woodford gives particular attention to the type of inflation and unemployment thresholds introduced by the Federal Reserve and Bank of England for facilitating the understanding of monetary policy.[12] He sees advantages in conditioning the future rate path upon how the economy develops. However, at the same time he raises questions about whether formulating this conditionality in terms of thresholds for unemployment and inflation expectations is the best approach. In particular, he questions how clear such an approach may be in practice, e.g. if inflation and unemployment give opposite signals about how the thresholds affect the interest rate decision. An alternative approach that he recommends would be to base monetary policy on a target for the path of nominal GDP. This would mean making statements about the economy's future evolution that would represent a promise rather than merely a projection, though no promise would be made about the specific rate path that the policy would require.

John Williams, President of Federal Reserve Bank of San Francisco, discussed Woodford's article at the conference. Williams pointed out that, during the past decade, the Federal Reserve has become increasingly transparent in how it communicates its views of future monetary policy. Williams also noted that there is empirical support for the view that the Federal Reserve's monetary policy forward guidance influences the market's view of future policy rates.[13] At the same time, however, it is important to be aware of the fact that, in practical monetary policy, there are certain limitations. Central bank communication is given limited media space, which calls for simplified clarity on a few points, rather than a comprehensive description of policy. Also, there are many different views held within the FOMC (Federal Open Market Committee) and it is difficult to describe a "consensus" policy reaction function. Instead, the FOMC communicates through multiple channels: a consensus statement about longer-run goals and policy principles, FOMC policy statements and minutes, quarterly policy projections based on individual assessments of appropriate monetary policy, as well as speeches and testimony to Congress. Much of the communication therefore focuses on turning points, such as the timing of an interest rate lift-off from near zero and the scaling down of the Federal Reserve's asset purchases, rather than a more general monetary policy reaction function.

12 The FOMC (Federal Open Market Committee) stated in December 2012 that [the current] exceptionally low range for the federal funds rate will be appropriate at least as long as unemployment remains above 6.5 per cent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 per cent longer-run target and longer-term inflation expectations continue to be well anchored. The MPC (Monetary Policy Committee) of the Bank of England stated in August 2013 that it did not intend to raise the policy rate or reduce asset purchases until unemployment had fallen to a "threshold" of 7 per cent. However, the proposition linking the policy rate and asset sales to the unemployment threshold would cease to hold if any of the following three "knockouts" were breached: in the MPC's view, it is more likely than not that CPI inflation 18 to 24 months ahead will be 0.5 percentage points or more above the 2 per cent target; medium-term inflation expectations no longer remain sufficiently well anchored; or the FPC (Financial Policy Committee) judges that the stance of monetary policy poses a significant threat to financial stability that cannot be contained by the substantial range of mitigating policy actions available to the FPC, the Financial Conduct Authority and the Prudential Regulation Authority in a way consistent with their objectives.

13 Swanson and Williams (2012).

As for a nominal GDP target, as Woodford advocates, Williams agreed that it has several theoretical advantages. Such a monetary policy target would probably be robust to uncertainty in terms of the long-term sustainable unemployment rate level and uncertainty about the functioning of the economy.[14] A nominal GDP target would also ease economic recovery when the interest rate approaches zero, as indicated by Woodford.[15] Monetary policy communication could also benefit because a nominal GDP target imposes a "balanced approach" to monetary policy (equal weights being given to the price level target and the target for stabilising the real economy).

But there are, according to Williams, also a number of practical problems in using a nominal GDP level as a monetary policy target. One problem is that GDP statistics are revised quarterly, even far back historically. It could therefore be difficult to conduct and communicate monetary policy in a way that is consistent over time. In addition, unanticipated shifts in potential output growth would for example translate into persistent deviations of inflation from the desired target. This could contribute to a difficult challenge for the central bank. Another problem with nominal GDP targeting is that it relies on a credible commitment to not let "bygones be bygones". In practice, it might be difficult to communicate that temporary deviations from the inflation target in one year will affect monetary policy in subsequent years.

MONETARY POLICY AND FINANCIAL STABILITY

The third article, "Financial Stability and Monetary Policy: How Closely Interlinked?" is written by **Frank Smets**, Director General of the Directorate General Research of the European Central Bank, ECB.

The paper starts by describing the financial imbalances that emerged in the euro area in the 2000s. A lesson learned from the events of that period is that achieving price stability does not suffice to achieve financial stability. Moreover, financial instability can complicate the ability of monetary policy to achieve price stability. The experience also shows that banking crises are often protracted and very costly. It therefore does not suffice for policymakers to focus on cleaning up after a crisis – instead preventive policy measures are called for in order to avoid a crisis emerging.

Since the financial crisis, a consensus view has therefore emerged that a new macroprudential policy framework must be bolstered to increase resilience in the financial sector and reduce the risk of financial cycles. The implications of the crisis for the monetary policy framework are, however, more debated, according to Smets. Some argue for minimal changes to the pre-crisis framework, while others argue for a radical rethink, giving financial stability and price stability equal weights as monetary policy objectives. Smets distinguishes three views in the literature. He calls them: (i) the "modified Jackson Hole consensus", (ii) "leaning against the wind vindicated", and (iii) "financial stability is price stability".

14 Orphanides and Williams (2002, 2006).
15 Williams (2006).

The "modified Jackson Hole consensus" view argues in favour of only slight changes to the framework, with the central bank keeping its relatively narrow mandate of maintaining price stability and stabilizing resource utilisation, whereas macroprudential authorities should pursue financial stability, with each having their own instruments. In this view, monetary policy should only care about financial stability to the extent that it affects the outlook for inflation and resource utilisation. This resembles the view argued by Lars Svensson in his paper.

The "leaning against the wind vindicated" view is that macroprudential policy cannot fully address the financial cycle, and that this cycle interacts with the business cycle in complicated and often non-linear ways. This implies that, while inflation stabilization should remain the primary objective of monetary policy, the central bank cannot avoid keeping an eye on financial stability as a secondary objective. In this view, the central bank should lean against the build-up of financial imbalances by raising the policy rate by more than would be justified on the basis of the short-run inflation outlook, in order to reduce the probability of a financial crisis later on. Practically, this can be done by extending the policy horizon, as the financial cycle is typically longer than the business cycle. In this approach, central banks may thus face additional trade-offs, which will require increased credibility of the medium-term inflation target.

The final view, "financial stability is price stability", involves a more radical reshaping of the traditional inflation targeting framework for monetary policy. This view argues that financial stability and price stability are so intimately intertwined that it is impossible to make a distinction. It assumes that monetary policy is fundamentally about stabilising the financial system, leaning against emerging financial imbalances in the boom and addressing malfunctioning markets and unclogging the monetary transmission process in the bust.

Smets argues that which view one is likely to adhere to depends on the answers one gives to the three following questions: (a) how effective is the new macroprudential policy framework in maintaining financial stability?; (b) what is the impact of monetary policy on financial stability?; and (c) what is the risk of "financial dominance", i.e. a situation in which financial stability concerns dominate monetary policy considerations and undermine the credibility of the central bank's price stability objective.

On the first question, both the literature and the actual country experiences in advanced economies are relatively scant. Overall, the relatively few empirical studies that analyse the effectiveness of various macroprudential tools support their effectiveness in dampening fluctuations in the financial cycle. Recent negative country experiences, such as in Spain, show, however, also that the extent to which such tools significantly curb overall systemic risk is still unclear. The effectiveness of macroprudential policies will also depend on the ability to avoid regulatory arbitrage, i.e. attempts by the financial sector to circumvent regulatory measures, and to coordinate such policies internationally.

Regarding the second question, views on the effectiveness of monetary policy in addressing financial stability vary. On the one hand, Smets refers to the literature that indicates that monetary policy does affect risk-taking in the financial system. Keeping

interest rates low for a long period may sow the seeds of financial instability by increasing the risk-taking especially of banks with low capital buffers. On the other hand, a number of studies have highlighted the collateral damage to the real economy that may arise from attempts to curb risk-taking by raising policy rates. According to Smets, there is a need for further research, e.g. on the potential non-linear relationships between interest rate changes, lending and house prices, to reconcile those different views.

Finally, on the last question Smets presents an analytical framework to illustrate the risk of "financial dominance" if macroprudential authorities fail to take sufficient measures to curb credit growth (e.g. due to political pressures) and thereby shift the burden of maintaining financial stability to the monetary authority. The financial crisis has clearly demonstrated that central banks have a unique role as lenders of last resort; i.e. in times of financial stress they can provide liquidity support to prevent a bank from being forced to suspend payments, and thereby avoid the contagious effects throughout the system. This role as crisis manager gives central banks an incentive to attempt to prevent the occurrence of financial crises. At the same time, this role can also give rise to problems because expectations emerge about the central banks always acting in a crisis, which increases the risk of having to intervene. Smets discusses different ways of reducing this risk.

Based on this review, Smets concludes that the "leaning against the wind" view may be the most reasonable view at the current stage. First, while macroprudential tools should form the first line of defense against the building up of financial imbalances, the macroprudential policy framework is still under construction, and its effectiveness in avoiding systemic crises is as yet unproven. Second, there are signs that monetary policy interacts with variables linked to the emergence of financial imbalances, such as lending, liquidity and risk-taking. Third, as lenders of last resort, central banks cannot avoid having to deal with financial stability in crisis times. Moreover, a number of monetary policy measures are closely associated with macroprudential tools. However, in order to mitigate the risk of overburdening monetary policy and undermining its credibility, Smets finds it is important that price stability remains the primary objective of monetary policy and that a lexicographic ordering is introduced with financial stability as a secondary objective. This would enable the central bank to lean against the wind as needed, while at the same time the primary focus on price stability is maintained in the medium to long run.

Stefan Gerlach, Deputy Governor of the Central Bank of Ireland, discussed Smets' paper during the conference. He started by saying that he agreed with most of what Smets writes about. He then chose to focus on four aspects in his presentation: the euro area, fiscal policy, another implication of the risk-taking channel and, finally, the question of the risk of a central bank not meeting its inflation target.

First of all, he discussed whether the choice between using monetary policy and macroprudential policy differs for the euro area and other currency areas. He stated that there are many arguments for using macroprudential policy in the euro area. For instance, if financial imbalances arise in just one country, this cannot be addressed by the common monetary policy. The imbalances must be managed by national macroprudential policy.

This also ensues from the mandate held by the European Central Bank, ECB. The ECB is to contribute to financial stability, but this is not its primary objective – that is instead price stability. Financial stability and macroprudential policy should primarily be addressed by national authorities.

The fact that the financial system in the euro area is bank-based also suggests that the use of macroprudential policy in addressing financial imbalances is justified.[16] In the opposite case – that of a market-based financial system – monetary policy might be more justified, because it then works on a broader front and reaches more parts of the financial system. Gerlach furthermore noted that fiscal policy is not mentioned in the paper. Fiscal policy is of importance, because it can often give rise to financial imbalances since, for instance, a tightening of fiscal policy might prove hard when asset prices are rising rapidly. In his view, monetary policy is not suitable for addressing rapidly increasing house prices. One reason is that the real costs (in terms of e.g. GDP or employment) can be high if monetary policy needs tightening to curb house prices. The advantage of macroprudential policy in this case is that the measures can be more focused.

Gerlach did not find the risk-taking channel to be an argument against expansionary monetary policy. Overly high risk-taking at banks is mainly due to banks being insufficiently capitalised. The effects of expansionary monetary policy on the risk-taking of banks can then be counteracted by higher capital requirements and better supervision of poorly capitalised banks.

Finally, Gerlach argued against the idea that inflation can get too high if monetary policy also focuses on financial stability. Such a risk is motivated by the fact that monetary policy can be forced into a highly expansionary mode in connection with a financial crisis. In his opinion, however, the risk is rather the opposite. If a financial crisis emerges, conducting a sufficiently expansionary monetary policy would be difficult. The risk instead is that of inflation being below the target. In Gerlach's view, this suggests that monetary policy should maintain its focus on price stability.

MONETARY POLICY WITH GLOBAL BANKS

The fourth article, "Banking Globalization, Transmission, and Monetary Policy Autonomy" is written by **Linda S. Goldberg**, Vice President of Financial Intermediation at the Federal Reserve Bank of New York.

Goldberg departs her analysis from the "international policy trilemma" i.e. that there are three desirable but jointly unattainable objectives: monetary policy autonomy, stable exchange rates and free capital mobility. Free capital mobility might force a country to relinquish either the stable exchange rate or monetary policy autonomy. The country

16 There is a tradition of differentiating between bank-based and market-based financial systems by analysing measures that relate the size of financial markets to the assets or lending of banks. In such an analysis, Germany for instance is considered to have a bank-based financial system, while the UK and US have market-based financial systems. There are signs, however, that the differences between these two types of system have diminished over time.

may choose to keep monetary policy autonomy and free capital mobility by introducing a floating exchange rate, as Sweden has done. Another alternative is to relinquish monetary policy autonomy and introduce a currency board to address the stable exchange rate, as Lithuania has done, or support a fixed exchange rate, as Denmark had done vis-à-vis the euro. A third alternative is to limit international capital mobility. By curbing cross-border capital mobility, for example through the use of binding capital controls, monetary policy can be conducted independently of other countries while the exchange rate is stable.

Earlier empirical research provides some support for the trilemma. Countries with stable exchange rates have, for instance, less freedom in monetary policy than other countries. Countries with floating exchange rates or capital controls have greater possibilities of conducting autonomous monetary policy.

Goldberg's article discusses the role of the globalisation of banks in the possibility of conducting domestic-oriented monetary policy. First Goldberg provides evidence on the changing form and scale of global banking in recent decades. She then argues that the establishment of banks' subsidiaries and affiliates in other countries can reduce financial frictions in international capital markets. In that sense, the increased globalisation of banks can contribute to greater capital mobility and exacerbate the trilemma – especially in countries with stable exchange rates. At the same time, global banking achieved through branches and affiliates established in another country can increase the information that the parent bank has about its counterparties in lending and other transactions. Enhanced information content in capital flows could contribute to greater stability in lending, especially in connection with financial stress, which can weaken the trilemma, rather than enhance it. The form and function of the global bank's activities in a country should matter for the trilemma outcomes.

Expanding on the literature, Goldberg conducts empirical tests of the trilemma and analyses the co-movement of the short nominal interest rate in a country with the interest rate in a country to which the home country has some degree of *de facto* or *de jure* exchange rate pegs. She studies how the choice of the exchange rate regime, capital controls and global bank presence in the first country affect the degree of interest rate co-movement. The results show that in countries with pegged exchange rate regimes, rate co-movement is higher and monetary policy is more dependent on the monetary policy of the pegged country. However, she finds less clear support than earlier studies for the view that countries with capital controls have more autonomous monetary policy than other countries. Goldberg also finds some support for the view that the presence of global banks affects interest rate co-movement. Both for countries with pegged and flexible exchange rates, there is an increase in rate co-movement in countries where foreign banks account for a large proportion of lending. This result is especially strong for economies that already have a high degree of capital account openness. However, the statistical explanatory power does not increase much when variables that are to capture the scope of global bank presence are added. According to Goldberg, this results arises because global banks conduct their business very differently across the countries that serve as their hosts. The

overall effect of the globalisation of banks on the possibility of conducting autonomous monetary policy will depend on the degree and information-intensity of lending in host markets, especially relative to the overall international activities of the global banks hosted by a country.

Karolina Ekholm, Deputy Governor, Sveriges Riksbank, discussed Goldberg's paper at the conference.

Ekholm considered that the way banking globalization affects central bank policy is an important and under-researched issue, most likely partly due to a lack of relevant data. From a central bank perspective, the globalization of banks raises many questions that are not necessarily related to the autonomy of monetary policy. For instance, banking globalization could be a reflection of "too-big-to fail": banks become global because by becoming large they get a stronger insurance from taxpayers. If so, one could wonder whether a SIFI surcharge (the amount of extra capital that will have to be held by systemically important financial institutions) is sufficient to deter "excessive" globalization. On the other hand, Ekholm wondered whether uncertainties regarding the recovery and resolution of cross-border banks could be so large that there is "too little" globalization. She added that an issue that emerged in connection with the financial crisis 2008-2009 was the difficulty to determine global banks' real need for liquidity support and thereby the difficulty to avoid creating opportunity for arbitrage. These banks have access to liquidity from more than one central bank.

Ekholm also stressed that to evaluate monetary policy autonomy, it is important to address how monetary policy abroad affects expectations of domestic monetary policy and what role the exchange rate plays in shaping those expectations. Even with a completely flexible exchange rate, the co-movement in policy rate expectations might be strong simply because market participants find it unlikely that the monetary policy authorities would welcome exchange rate movements brought about by increased interest rate differentials.

Although she considered Goldberg's analysis important, she found it difficult to draw strong conclusions given some limitations in the analysis. Among those, she mentioned that the analysis focuses solely on the host country perspective, it ignores the nationality of foreign banks and in particular whether they originate in the country to which there is some degree of *de facto* or *de jure* exchange rate peg, and there may be endogeneity problems affecting the econometric estimations. She suggested that it could be useful to quantify the results by simulating the response to interest rate changes abroad for particular type of countries, such as for instance the Baltic States, which have had fixed exchange rates and their banking sectors dominated by foreign banks.

Last, Ekholm mentioned that it could be interesting to include macroprudential policy in the analysis, since such policy is sometimes used in order to create more monetary policy autonomy in countries with exchange rate pegs. She speculated that a possible result could be that the presence of global banks would make such policy less effective.

Editors' comments

WHAT ROLE CAN FORWARD GUIDANCE PLAY IN INCREASING THE UNDERSTANDING OF MONETARY POLICY?

The papers presented at the conference gave rise to several discussions. A key area discussed was how monetary policy forward guidance of central banks can affect the economy, and how such guidance should be implemented.

During the financial crisis, most central banks cut their policy rates to historically low levels, and in many countries policy rates reached what is considered to be their lower bound. In order to make monetary policy more expansionary despite the inability to cut the policy rate further, central banks have started to use two different strategies. Many central banks have introduced quantitative easing, purchasing great volumes of financial assets (e.g. government bonds or mortgage bonds) in order to raise asset prices and stimulate the economy. Many central banks have also become clearer in their forward guidance for monetary policy.[17]

In the past year, both the Federal Reserve and the Bank of England have announced their intention to keep the policy rate low at least until unemployment comes down to a certain level (6.5 per cent in the US and 7 per cent in the UK), as long as they see no risks to price stability or (in the Bank of England's case) financial stability. The idea is to influence long-term interest rates by convincing households, companies and financial market participants that monetary policy will be expansionary for a long time. By linking any policy rate increases to economic development, the central bank's "reaction function" (i.e. how it reacts to the economy) is also clarified.

Similar communication has been used by other central banks on various occasions both before and after the financial crisis. For example, in April 1999 the Bank of Japan announced that it would keep the policy rate low until the risk of deflation was considered to be over, and when the policy rate of the Federal Reserve reached 1 per cent during the 2003-2004 recession, it was announced that monetary policy would be expansionary for a long period of time.

The Riksbank has, like the Reserve Bank of New Zealand, Norges Bank and the Czech central bank, gone further by publishing policy rate forecasts for the coming years. In this way, the central banks are clear about how they believe monetary policy will develop ahead.[18] In addition, the Riksbank (and other central banks) publishes alternative scenarios showing how monetary policy could react if the economy develops differently to the way it does in the main scenario. This serves to illustrate the central bank's reaction patterns.

The Riksbank's communication can thus be considered more general than that used by e.g. the Federal Reserve and the Bank of England. The communication of these central

17 Söderström and Westermark (2009) describe various monetary policy alternatives when the policy rate has reached its lower bound.

18 Since January 2012, the Federal Reserve's Federal Open Market Committee (FOMC) has been publishing information about how the various members believe the policy rate will develop in the coming three years.

banks is focused on describing monetary policy at the lower bound of the policy rate, and attempts to communicate a simple rule for when the central bank will start to increase the rate. The Riksbank's choice to publish an interest rate path is a more general strategy that can be used in all circumstances, irrespective of the policy rate level. And, together with alternative scenarios for macroeconomic developments, the Riksbank attempts to provide a more comprehensive presentation of the fundamentals of monetary policy, and describe how various shocks affect the economy and monetary policy. The Riksbank's strategy of publishing an interest rate path could also be used if the rate were to reach its lower bound, for describing the circumstances in which rate increases could commence. This was actually done in 2009-10 when the repo rate was at 0.25 per cent, which was considered to be the lower bound by the Riksbank's Executive Board. At the time, alternative scenarios were published describing circumstances which could cause the repo rate to be increased earlier than in the main scenario, later than in the main scenario, or even be cut to below 0.25 per cent.

However, it is possible that the guidance used by the Federal Reserve and the Bank of England is more effective at the lower bound, because it clearly ties changes in monetary policy to a handful of observable macro variables (unemployment and inflation).[19] This resembles the tradition of describing monetary policy in terms of a simple rule for the policy rate, such as a Taylor rule and, like for a simple rule, there are pros and cons. Simplicity can be good and increase clarity in monetary policy, but reality is naturally more complicated. Therefore, both the Federal Reserve and Bank of England have announced that, in certain circumstances, they may increase the policy rate even if unemployment has not reached its threshold, for instance if inflation is too high or (in the Bank of England's case) if financial stability is considered to be under threat. Moreover, both central banks have pointed out that they monitor a broad array of indicators to assess labour market developments.

The Riksbank's communication is more general and could therefore be perceived as less clear, but it can take into account many different relevant factors. How monetary policy reacts to the development of a certain macroeconomic variable generally depends on why the variable has developed in a certain way, i.e. which underlying shock has affected the economy. This is often illustrated in the alternative scenarios published in the Monetary Policy Report. Adding to that, the Riksbank's strategy is useful whatever the state of the economy, irrespective of the repo rate level.

HAS MONETARY POLICY IN SWEDEN CONTRIBUTED TO UNNECESSARILY HIGH UNEMPLOYMENT?

Another key question is whether inflation targeting in Sweden has contributed to unnecessarily high unemployment, as maintained by Lars Svensson in his paper. At the same time as actual inflation has on average been below the target, inflation expectations, which have formed the basis for wage contracts, have been stable at around 2 per cent.

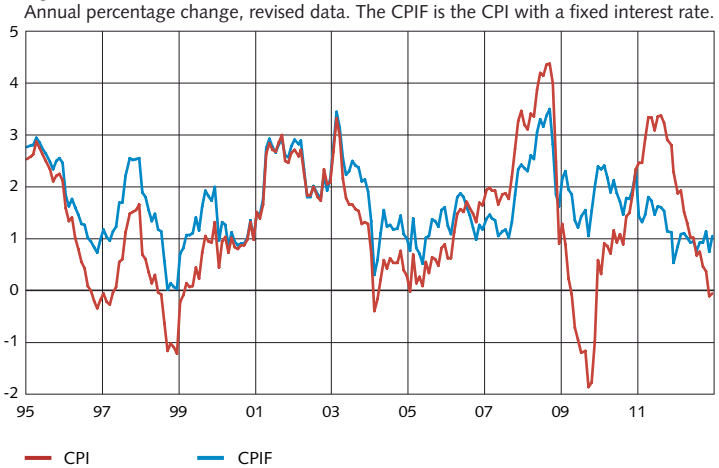
19 At the conference, John Williams stressed the advantages of providing guidance in a simple manner.

If over a long period of time actual inflation is below the inflation target while wage demands are based on expectations of inflation being close to the target, real wages for the employed might be higher and employment lower, even in the long run. This rationale is supported by traditional macroeconomic theory.

There is, however, reason for exercising caution when estimating the long-term Phillips curve and interpreting the results.

First, the choice of inflation measure can be discussed. Svensson bases the analysis on CPI inflation. After the introduction of the inflation target in Sweden, the general level of interest rates has been much lower than before. Lower interest rates have led to lower costs for housing and housing costs are included in the CPI. Housing costs are measured by the interest rate costs of households for their mortgages. When the Riksbank cuts the policy rate to stimulate the economy, this leads to lower mortgage rates and hence lower CPI inflation in the short term. Because the general level of interest rates has fallen for a long time, this effect is not only temporary in nature. In order to study the relationship between inflation and unemployment, there may therefore be a reason to discount the effects of falling interest rates on the CPI by using CPIF inflation (the CPI with a fixed rate of interest). Then, inflation averages 1.7-1.8 per cent since 1995, which is much closer to the target than CPI inflation (see Figure 1).[20]

Figure 1. CPI inflation and CPIF inflation 1995-2012
Annual percentage change, revised data. The CPIF is the CPI with a fixed interest rate.



Source: Statistics Sweden

Second, there are econometric difficulties in estimating a long-term Phillips curve. At the beginning of the 1970s, Robert Lucas and Thomas Sargent published fundamental criticism of econometric estimates based only on one equation, because a valid test involves several equations of a complete model of the economy. According to Benati (2012), this criticism

20 See Andersson, Palmqvist and Österholm (2012) for an in-depth analysis of the Riksbank's attainment of the inflation target over a longer period of time.

may also apply to the estimates made by Svensson. Benati claims that inflation over time has become less persistent in countries with a credible inflation target, which adds to the unreliability of estimates of the relationship between unemployment and inflation. Even in an economy with a long-run vertical Phillips curve (such that there is no long-term relationship between inflation and unemployment), an estimate based on only one equation that relates inflation to unemployment may, according to Benati's calculations, lead to the incorrect conclusion that the Phillips curve is flat (sloping downwards) and that there is a long-term relationship.

Other economists have pointed out that the relationship in the Phillips curve is only valid in the long term if it is assumed that inflation expectations are constant – an assumption that is not explicitly tested in Svensson's paper.[21] In addition, different measures of inflation expectations behave differently over time. While survey data from Prospera (used by Svensson) are stable around the inflation target, inflation expectations for the corporate sector as measured by the National Institute of Economic Research's survey are more variable over time.[22]

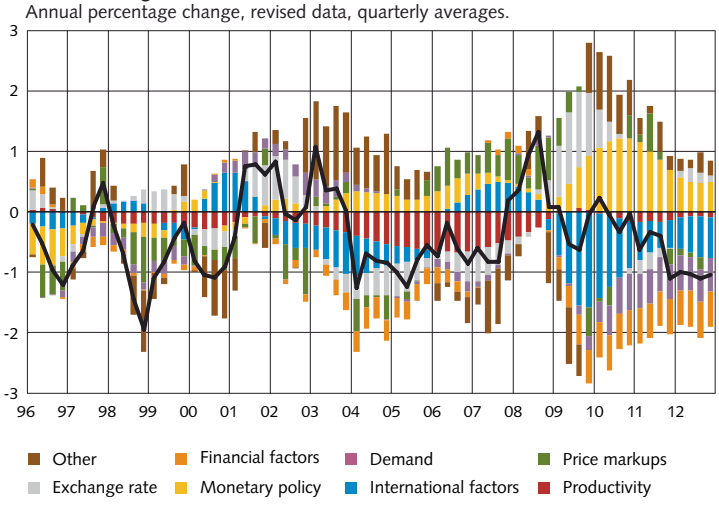
It is thus difficult to interpret the relationship between unemployment and inflation as a causal link. In practice, many different factors can affect inflation, unemployment and other real economic variables in the long run. Since the beginning of the 1990s, inflation in Sweden has been much lower than previously, while GDP growth has increased slightly. However, it is not only the inflation target and monetary policy that have contributed to this. The Swedish economy has also been affected by joining the EU, a more stable regulatory fiscal policy framework, new rules and regulations for wage formation and the deregulation of various product markets. Adding to that, globalisation and increased competition curbed inflation in several countries during the decades preceding the financial crisis that started in 2008.

Inflation and unemployment are thus affected by different types of shocks on both the supply and demand side. This speaks in favour of using an econometric model with more relations for analysing the role that monetary policy has played since the inflation target became credible. Using the Riksbank's macroeconomic model Ramses, the development of inflation since 1995 can be explained as follows.[23]

Figure 2 shows how the deviation of CPIF inflation from 2 per cent can be broken down into a number of exogenous shocks according to Ramses. Inflation was low mainly in 1998-2000, 2004-07, 2009 and 2012. According to the model, the low inflation can mainly be explained by unexpectedly strong productivity (the red bars). We can also see that developments abroad have kept a lid on inflation during several periods, mainly 2002–2005 and from 2009 onwards (the blue bars). At the same time, the model shows that monetary policy has contributed to buoying inflation by being more expansionary than normal (the yellow bars) for a long time.

21 See also Guibourg, Nilsson and Söderström (2013).
22 Flodén (2012).
23 Söderström and Vredin (2013).

Figure 2. Historical explanation of CPIF inflation's deviation from two per cent since 1995 according to the Riksbank's macro model Ramses
Annual percentage change, revised data, quarterly averages.



Source: Söderström and Vredin (2013)

The main reason for inflation being low since 1995 is therefore, according to the model, that productivity has been unexpectedly strong. If productivity rises faster than expected, it can contribute to increased unemployment in the short term. Companies can produce the same volume of goods or services with a slimmer workforce. However, in the longer term, increased productivity leads to the ability of companies to pay higher salaries and employ more people, which stimulates demand, boosts employment and reduces unemployment. The model also shows that unexpectedly strong productivity developments have contributed to keeping unemployment below its long-term trend.[24] However, developments abroad have led to higher unemployment. The conclusion is that productivity has contributed to keeping a lid on both inflation and unemployment, while developments abroad have curbed inflation and increased unemployment. The relationship between inflation and unemployment is therefore not stable over time, but is affected by the shocks to which the economy is exposed.

It is thus difficult to estimate how low average inflation has affected employment and unemployment. Yet this is an important question for inflation-targeting central banks. Inflation expectations being well anchored around the inflation target is a major success for inflation targeting, because the economy is then less vulnerable to shocks. At the same time, however, well-anchored expectations make it important for the central bank to avoid inflation falling below the target for long periods of time, because this could have negative effects on, for instance, employment.

24 Söderström and Vredin (2013).

HOW IS MONETARY POLICY AFFECTED BY FINANCIAL IMBALANCES AND THE INTRODUCTION OF NEW MACROPRUDENTIAL TOOLS?

A third question discussed in many of the papers is how monetary policy is affected by financial imbalances and the introduction of new macroprudential tools. There is an international consensus view that microprudential policy must be bolstered while, at the same time, new macroprudential tools are being introduced to make the financial sector more resilient and reduce the risk of financial crises. Macroprudential tools are normally divided into structural tools, i.e. those intended to reduce the structural risks in the financial sector, and cyclical tools intended to vary over time, e.g. the countercyclical capital buffer. Internationally, the European macroprudential body – the ESRB (European Systemic Risk Board), has a key role. For instance, the ESRB has issued a recommendation on intermediate targets and macroprudential instruments in the EU countries. This helps provide the EU countries with a carefully considered and similar toolbox.

However, views about how macroprudential policy should be organised and its implications for monetary policy diverge between different countries. In some countries, central banks have been assigned a key role in macroprudential policy, while in other countries they have been given a less prominent role.

In the UK, there is a specific committee responsible for macroprudential policy in the Bank of England – the FPC (Financial Policy Committee). The central bank Governor and two Deputy Governors are members of both the FPC and MPC (Monetary Policy Committee), which is a way of promoting coordination between monetary policy and macroprudential policy. A reason for why such coordination might be needed is that monetary policy and macroprudential policy to a great extent operate through the same channels. Both the policy rate and several macroprudential tools affect credit growth and asset prices, for example.

In Sweden, the government has proposed that Finansinspektionen (The financial supervisory authority) be given the main responsibility for the macroprudential tools, including the countercyclical capital buffer. The government has also proposed that a formalised financial stability council be established, comprising the Minister for Financial Markets and the heads of Finansinspektionen, the Riksbank and the National Debt Office. The council is to be a forum with meetings recorded by minutes, but not a decision-making body. In the council, risks in the financial system and views on appropriate measures for managing and counteracting such risks will be discussed.

It is not expected that the new macroprudential policy order will affect the Riksbank's formal tasks and objectives. The Riksbank will still maintain price stability and promote a safe and efficient payment system, i.e. in practice promote the stability of the financial system. The Riksbank will also support the objectives of general economic policy, the purpose of which is to achieve sustainable growth and high employment. This gives the Riksbank a key role also in the future in terms of ensuring sustainable and stable macroeconomic developments.

It can also be noted, however, that in Sweden it will not be possible to coordinate macroprudential policy and monetary policy as closely as in the UK.[25] The introduction of new macroprudential tools will nevertheless affect the fundamentals for monetary policy. But how they will be affected and at which rate is difficult to ascertain at present. As indicated by Smets, there is still only limited experience of how macroprudential policy works in practice. Academic research in the area is in its infancy in terms of both empirical and theoretical studies.

Even when macroprudential policy is in place, however, monetary policy might have a role in counteracting financial imbalances, in line with Smets' "leaning against the wind" view. One reason is that it may be hard to devise macroprudential tools that are not circumvented by innovative market participants by means of regulatory arbitrage, which aims to transfer financial operations from a regulated to an unregulated sector. An advantage of monetary policy is that it operates on a broader and more efficient front than the macroprudential tools by "getting into all of the cracks", even the parts of the financial system not covered by financial regulation.[26]

Exactly how the interplay between macroprudential policy and monetary policy will be devised ahead is hard to know. However, as various macroprudential tools are introduced and knowledge increases about how they work in practice, the implications for monetary policy will gradually become clearer. The Riksbank will, just like before, need to follow and analyse risks and resilience in the financial system, partly to see how they affect the general economic development (and hence monetary policy) and particularly to contribute to promoting financial stability.

HOW DOES FINANCIAL GLOBALISATION AFFECT THE POSSIBILITY OF CONDUCTING AUTONOMOUS MONETARY POLICY?

A fourth question is how financial globalisation affects the possibility of conducting autonomous and domestic-oriented monetary policy. This question is linked to the economic trilemma, i.e. that there are three jointly unattainable objectives: monetary policy independence, stable exchange rates and free capital mobility.

According to Goldberg's paper, it is difficult to draw any certain conclusions about the overall effect of the globalisation of banks on the possibility of conducting domestic-oriented monetary policy. On the one hand, the establishment of banks in other countries can contribute to reducing financial frictions, which increases cross-border capital mobility and hence the risk of financial imbalances emerging. On the other hand, such establishment could involve strengthening the parent bank's control of the subsidiary's lending in another country, which could contribute to improving financial stability.

In a broader perspective, one might wonder what happens if financial globalisation and completely free capital mobility lead to real interest rates being fully equalised between

25 Ingves (2013).
26 Stein (2013).

different countries. Would the possibility of conducting autonomous monetary policy then disappear? Theoretically, no, because monetary policy, through effects on the exchange rate, can still influence demand and inflation.[27] The idea is that the difference in inflation between two countries is determined by the exchange rate. The central bank can thus announce an altered orientation in monetary policy, e.g. a change in the inflation target, which affects inflation expectations and the exchange rate. Even in a financially globalised world, it is theoretically possible for a central bank to autonomously influence inflation.

However, there is empirical research that suggests that flexibility in domestic-oriented monetary policy is limited in practice, one reason being that there is a global financial cycle that is affected by the policy rate in major currency areas.[28] For example, cross-border capital flows, asset prices, domestic lending and the leverage of banks are seemingly affected by monetary policy in the US. There is a certain degree of empirical support for the view that this global financial cycle poses a limitation on how autonomous monetary policy can be, whatever a country's choice of exchange rate regime.[29]

This also means that the trilemma of the economy could be a dilemma of the economy in practice, i.e. it is difficult to combine domestic-oriented monetary policy with free capital mobility, even with a floating exchange rate. Such signs have emerged lately in several emerging market economies. The reason is the protracted process of recovery that emerged after the global financial crisis, which has contributed to the monetary policy of several advanced economies being unusually expansionary. Low policy rates and quantitative easing have kept a lid on the general interest rate level in the US and Europe, leading to capital flows to emerging market economies. This has raised the question about the risk of capital outflows from emerging market economies in connection with monetary policy starting to normalise in the US and other major currency areas. Capital outflows and a weakening of the exchange rate could then limit flexibility in monetary policy, especially in emerging market economies with large current account deficits and/or substantial debts in foreign currency.[30]

This suggests that inflation targeting, particularly in emerging market economies, might need supplementing with different types of macroprudential measures and/or capital controls. Such measures could enable limiting the growth rate for domestic lending and risk-taking in the financial sector, particularly in the upturn phase of the global financial cycle.

27 Woodford (2009).
28 Rey (2013).
29 Rey (2013).
30 After the Federal Reserve signalled in May 2013 that asset purchases could start to be scaled down, the exchange rate of e.g. Brazil, India, Indonesia, South Africa and Turkey weakened.

Concluding remarks

Monetary policy with inflation targeting has been very successful, both in Sweden and other countries. Inflation has been low and stable, while at the same time production and employment have been high. However, the financial crisis shows that many challenges remain. The articles in this issue of the Sveriges Riksbank Economic Review discuss some important challenges, to both practical monetary policy and academic research.

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Some Lessons from Six Years of Practical Inflation Targeting

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My lessons from six years of practical policy-making include (1) being clear about and not deviating from the mandate of flexible inflation targeting (price stability and the highest sustainable employment), including keeping average inflation over a longer period on target; (2) not adding household debt as a new (intermediate) target variable, in addition to inflation and unemployment – not "leaning against the wind," which is counterproductive, but leaving any problems with household debt to financial policy; (3) using a two-step algorithm to implement "forecast targeting"; (4) using four-panel graphs to evaluate monetary policy ex ante (in real time) and ex post (after the fact); (5) taking a credible inflation target and a resulting downward-sloping Phillips curve into account by keeping average inflation over a longer period on target; and (6) not confusing monetary and financial policy but using monetary policy to achieve the monetary-policy objectives and financial policy to maintain financial stability, with each policy taking into account the conduct of the other.

This paper discusses some of my lessons from six years of practical inflation targeting as a policy maker at the Riksbank (21 May 2007-20 May 2013). They are lessons mainly for central banking and monetary policy in an economy similar to that of Sweden, with its small very open economy and its special and oligopolistic financial sector. One thing I have learnt is that things are very different in different economies. The lessons may thus apply in varying degrees for other economies, depending on how similar they are to Sweden in relevant aspects.

In summary, my lessons from six years of practical inflation targeting as a policy maker at the Riksbank are the following: First, be clear about and do not deviate from the mandate for flexible inflation targeting – price stability and the highest sustainable employment. This means stabilizing inflation around the inflation target and unemployment around a long-run sustainable unemployment rate. To avoid any prejudice to the objective of price

* A previous version was prepared for the conference "Two Decades of Inflation Targeting: Main Lessons and Remaining Challenges," organized by Sveriges Riksbank, 3 June 2013. I thank Karolina Ekholm and many Riksbank staff members, too many to mention, for many useful discussions over the years at the Riksbank. I also thank Claes Berg, Eric Leeper, Edward Nelson, Roger Farmer, Ulf Söderström, and participants in the Riksbank conference, the Bank of Canada/CREI conference on "Challenges for Monetary Policy in the 21st Century," the Norges Bank conference on "Monetary Policy Revisited," and a seminar at IGIER, Università Bocconi, Milan, for comments. Carl-Johan Belfrage, Julia Rådahl, and Hanna Stenbacka of the Riksbank's staff have contributed to this article. The views expressed and any errors are my own responsibility.

stability, keep average inflation over a longer period on target, as other inflation-targeting central banks have done successfully.

Second, do not include household debt as an additional (intermediate) target variable in addition to inflation and unemployment. This is especially important since "leaning against the wind" – a tighter policy than justified by the mandate of flexible inflation targeting – is under realistic assumptions *counterproductive* as a way of reducing household real debt and debt ratios. It actually *increases* rather than reduces the household debt-to-GDP and household debt-to-disposable income ratios (Svensson 2013c). Over time "leaning against the wind" leads to a substantially lower price level and a substantially higher real debt and debt ratios than if inflation is on average equal to the target (Svensson 2013d).

Instead, leave any problems with household debt to Finansinspektionen (the Swedish Financial Supervisory Authority) and its micro- and macroprudential instruments. This is now even more warranted than before, since the Swedish government in August 2013 (Swedish Government 2013b) announced a new strengthened framework for financial stability in Sweden, where Finansinspektionen is assigned the main responsibility for financial stability and the control of all the micro- and macroprudential instruments.

Third, use a two-step algorithm to implement "forecast targeting". In step 1, examine the effects on the forecasts for inflation and unemployment of new information and assessments for an unchanged policy-rate path, the policy-rate path from the previous policy decision. In step 2, adjust the policy rate and the policy-rate path so the forecasts for inflation and unemployment "look good," that is, best stabilize inflation around the inflation target and unemployment around an estimated long-run sustainable rate. Use four-panel graphs to summarize these steps, where the four panels include the policy-rate path, the inflation forecast, the unemployment forecast, and the mean squared gaps (the mean squared deviations of inflation from the target and of unemployment from the estimated long-run sustainable rate).

Fourth, use four-panel graphs as one element in evaluating monetary policy ex ante, that is, in real time, meaning taking into account only the information available at the time of the decision. Use counterfactual experiments as one element in such evaluations ex post, that is, after the fact, meaning taking into account also information available after the policy decision.

Fifth, with a credible inflation target, that is, with inflation expectations anchored at the target, the long-run Phillips curve is no longer vertical. Then, keep average inflation over a longer period on the target. Especially, do not let average inflation fall below the target, since this will cause average unemployment to be unnecessarily high.

Sixth, as far as I can see, flexible inflation targeting remains the best-practice monetary policy, before, during, and after the recent financial crisis. It was not monetary policy that failed before the crisis; it was supervisory and regulatory policies, that is, financial policy that failed. Do not confuse monetary policy and financial policy. Use monetary policy and the monetary-policy instruments to achieve the monetary-policy objectives (price stability and highest sustainable employment) and financial policy (micro- and macroprudential

policy) and the financial-policy instruments to maintain financial stability. Conduct each policy separately, taking into account the conduct of the other policy, as with monetary policy and fiscal policy. Between the alternatives of the Modified Jackson Hole Consensus and Leaning Against the Wind Vindicated views (in the terminology of Smets 2013, in this volume), the former is the relevant one for Sweden. The new strengthened framework for financial stability in Sweden, assigning the main responsibility for financial stability and the control of the micro- and macroprudential tools to the Finansinspektionen, is in line with this.

The paper is structured as follows. The first section deals with the mandate of flexible inflation targeting, where flexible inflation targeting means that the central bank strives not only to stabilize inflation around the inflation target but also to stabilize the real economy. It compares the mandates for monetary policy of the Riksbank and the Federal Reserve and discusses how stabilization of the real economy can be specified. The second section discusses an issue much debated in Sweden and a source of deep division within the Riksbank Executive Board – whether household indebtedness should be an additional (intermediate) target for Swedish monetary policy and a justification for inflation below target and unemployment above a long-run sustainable rate. The third section deals with forecast targeting, how to choose the policy rate and the policy-rate path so as to best stabilize inflation and the real economy. The fourth section deals with policy evaluation both ex ante and ex post. Ex ante evaluation is about how flexible inflation targeting can be evaluated and the central bank held accountable for its policy in real time, taking into account only the information available at the time of the policy decision. Ex post evaluation is evaluation after the fact, taking into account also information on the outcome for the economy during the years after the policy decision. The fifth section discusses implications for the Phillips curve and monetary policy of the circumstance that inflation targets have become credible in the sense of private-sector inflation expectations having become anchored to the inflation target. The sixth section discusses any conclusions for monetary policy of the financial crisis and the relation between financial policy (micro- and macroprudential policy) and monetary policy. The seventh and final section summarizes my conclusions.

The lessons from the rather dramatic experience of forward guidance in Sweden during these years are not discussed in this paper; they are instead discussed in Svensson (2013a).

The mandate

Flexible inflation targeting involves both stabilizing inflation around an inflation target and stabilizing the real economy (Svensson 2010a). A clear objective for monetary policy contributes to monetary policy being systematic and not arbitrary. Furthermore, for central-bank independence to be consistent with a democratic society, it must be possible to evaluate monetary policy and hold the central bank accountable for achieving its objective. This requires that the degree of achieving the objective can be measured. A numerical

inflation target allows target achievement with regard to inflation to be measured and the central bank to be held accountable for its performance regarding inflation stabilization. But, if monetary policy also has the objective of stabilizing the real economy, that part of the objective must also be measurable, in order for monetary policy to be evaluated and the central bank be held accountable. Given this, how should stabilization of the real economy be measured?

Stabilization of the real economy can be specified as the stabilization of resource utilization around an estimated sustainable rate of resource utilization, accepting the conventional wisdom that the sustainable rate of resource utilization is determined by nonmonetary factors and not monetary policy, has to be estimated, and once estimated taken as given. But how should resource utilization be measured? More precisely, besides inflation, what target variable (or variables) should enter the monetary-policy loss function? One can answer this question by interpreting the legislated mandate for monetary policy and by examining what economic analysis suggests about a suitable measure of resource utilization.

THE MANDATES OF THE RIKSBANK AND THE FEDERAL RESERVE

Let me start with the legislated mandate for monetary policy and compare the Riksbank's and the Fed's mandates. The Riksbank's mandate for monetary policy follows from the Sveriges Riksbank Act 1988:1385 and the preparatory works of the Act, the Government Bill 1997/98:4 to the Riksdag (Swedish Government 1997) that contained the proposal for this legislation. In Sweden, the preparatory works of laws carry legal weight, since they contain guidance on how the laws should be interpreted. According to the Riksbank Act, the objective of monetary policy is "to maintain price stability." The Bill further states (p. 1): "As an authority under the Riksdag, the Riksbank should, without prejudice to the objective of price stability, support the objectives of the general economic policy with the aim to achieve sustainable growth and high employment."

The idea in the Bill is hardly that there is any conflict or tradeoff between sustainable growth and high employment. Furthermore, for many years Swedish governments have emphasized full employment as the main objective for general economic policy.[1] Also, in this context, high employment should be interpreted as the highest *sustainable* rate of employment, where the sustainable rate of employment is determined by nonmonetary factors. According to this line of reasoning, the Riksbank's mandate for monetary policy is price stability and the highest sustainable rate of employment.

According to the Federal Reserve Act, the Federal Reserve should "promote effectively the goals of maximum employment and stable prices". Again, maximum employment should be interpreted as the maximum *sustainable* employment. Thus, according to this reasoning the Riksbank and the Fed have the same mandate.

1 For instance, the Spring Fiscal Policy Bill 2013 states that that "the goal of the Government's policy is full employment" (Swedish Government 2013a, p. 23).

THE MEANING OF "WITHOUT PREJUDICE TO THE OBJECTIVE OF PRICE STABILITY"

However, the Government Bill has the clause "without prejudice to the objective of price stability" preceding the statement about sustainable growth and high employment. What does it mean? I believe that the clause can cause, and has caused, some confusion. As far as I can see, it just means that average inflation over a longer period should be kept on target, and that allowing average inflation over a longer period to deviate from the target is to show prejudice to the objective of price stability.

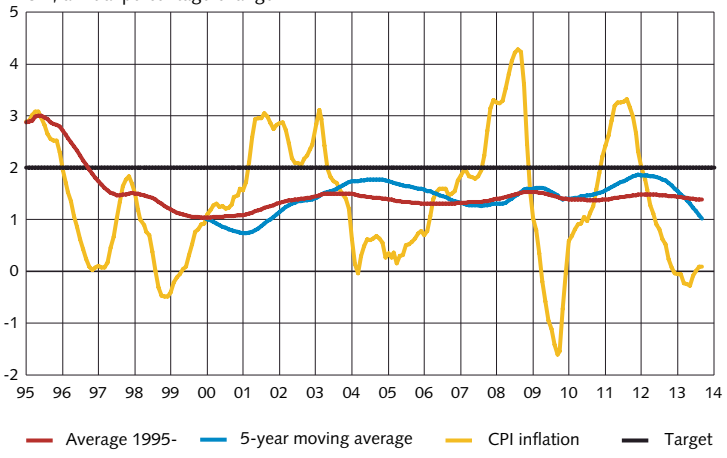
It is not possible to keep inflation at the inflation target all the time, since the control of inflation is imperfect because inflation responds with a lag to monetary-policy actions and is affected by unobservable shocks. Thus, some deviations of inflation from the target are unavoidable and do not mean that the price-stability objective has been disregarded. However, it is possible to keep average inflation on target over a longer period, such as 5-10 years or longer. Thus, a deviation of average inflation from the target over a longer period can be seen as indicating prejudice to the price-stability objective. Also, even if average inflation over a longer period is close to the target, substantially higher variability of inflation than what monetary policy can achieve could be seen as indicating prejudice to the price-stability objective. But the phrase can hardly mean that the variability of inflation around the target should be the minimum possible that monetary policy can achieve, regardless of what volatility of the real economy such policy would imply. At least it has never to my knowledge been applied in practical policy that way. So, if the phrase has some sensible meaning, it is simply that a longer-run average of inflation should be close to the target.[2] This has actually been achieved by the central banks of Australia, Canada, and the UK from the mid-1990s and by the Fed and the ECB from 2000 until now, but not by the Riksbank, as discussed in section 5 below and in Svensson (2013d).[3]

2 The phrase "without prejudice to the objective of price stability" or the fact that the Riksbank Act only mentions price stability whereas sustainable growth and high employment is only mentioned in the Government Bill is sometimes claimed to imply that the Riksbank's mandate is a so-called hierarchical or single mandate, while the Federal Reserve's mandate is a so-called dual mandate. With a hierarchical mandate, price stability is a primary objective and highest sustainable employment is a subordinate objective, while with a dual mandate price stability and highest sustainable employment have equal status. The phrase "without prejudice to the objective of price stability" is sometimes interpreted in this way, but as I have argued above, it is better interpreted as just longer-run average of inflation should be close to the inflation target. Then there is no practical difference between the mandates. As I point out in Svensson (2004), the issue can be understood by distinguishing between means and variances, what is known in statistics as first and second moments. With regard to mean inflation and mean employment, the mandate is hierarchical. The central bank sets just one target, which is the inflation target. The highest sustainable rate of employment is not set by the central bank; it is not determined by monetary factors but by the structure of the economy and the way it functions, and it may change over time. It can only be estimated, not set, by the central bank. With regard to the variance in inflation and employment, the mandate is dual. There it is a matter of stabilizing both, in an appropriate trade-off. This applies both to the Riksbank and the Federal Reserve.

3 To be precise, in the U.K. average inflation has been on target through 2007. Since 2008, inflation has been above target. However, with unemployment above a long-run sustainable rate, it is arguably optimal to keep inflation above target.

In order to apply this idea and provide some more detail, the yellow line in figure 1 shows annual CPI inflation in Sweden from 1995 onwards.[4] The inflation target of 2 percent for the annual increase in the CPI was announced in January 1993 to apply from 1995 onwards. The blue line shows 5-year moving averages of CPI inflation. The red line shows averages of inflation from 1995. We see that the 5-year moving averages clearly fall below the inflation target of 2 percent and never reach up to the 2 percent level. We also see that, from 1997 onwards, the average inflation from 1995 to any year falls below 2 percent. Furthermore, there is no trend in the 5-year moving averages or in average inflation from 1995. The 5-year moving averages fluctuate around 1.4 percent and the average from 1995 seems to converge around 1.4. However, in the last two years, the average from 1995 has been falling slightly, and the 5-year moving average is at its lowest level since 2002, 1 percent.

Figure 1. CPI inflation in Sweden
CPI, annual percentage change



Source: Statistics Sweden

From figure 1 it is difficult not to conclude that the Riksbank has systematically and significantly deviated from the inflation target and been guilty of prejudice to the objective of price stability. The evidence is that the Riksbank has effectively aimed at a lower target of 1.4 percent. The reasons for and consequences of this will be further discussed below.

4 During 1995-2005, the figure shows CPI inflation as reported by Statistics Sweden at the time. As is explained in Sveriges Riksbank (2004), before 2005 CPI inflation was measured by Statistics Sweden not as the annual percentage increase in the CPI, but with a method that excluded substitution effects on the composition of the consumption basket, making measured inflation on average 0.2 percentage points higher. From 2005, CPI inflation is measured as the annual percentage change in the CPI.

A SUITABLE MEASURE OF RESOURCE UTILIZATION

The Federal Reserve took a major step in clarifying its mandate in its statement on longer-run goals and monetary policy strategy in January 2012, amended in January 2013 (Federal Open Market Committee 2013). The Fed set an inflation target of 2 percent for annual PCE inflation, an action that meant they joined the many central banks around the world that have set an explicit, numerical inflation target over the past two decades.

However, the Fed arguably took a worldwide lead in transparency by clarifying its interpretation of and weight on "maximum employment." It emphasized that in contrast to inflation, the maximum level of employment is largely determined by nonmonetary factors that affect the structure and dynamics of the labour market, that these factors may change over time and may not be directly measurable, and that consequently it would not be appropriate to specify a fixed goal for employment; rather, the FOMC policy decisions must be informed by assessments of the maximum level of employment, recognizing that such assessments are necessarily uncertain and subject to revision. The FOMC reported that its participants' estimates of the longer-run normal rate of unemployment had a central tendency of 5.2 percent to 6.0 percent, unchanged from one year ago but substantially higher than the corresponding interval several years earlier. The FOMC stated that in setting monetary policy, it seeks to mitigate deviations of inflation from its longer-run goal and deviations of employment from the Committee's assessments of its maximum level, and that in circumstances when the objectives are not complementary, it follows a balanced approach in promoting them, taking into account the magnitude of the deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate. This places price stability and maximum employment on an equal footing as objectives of the Federal Reserve's monetary policy. The Fed expressed this more clearly and directly than other inflation-targeting central banks have done in the past.[5]

Whereas the FOMC statement emphasizes employment and unemployment as the relevant measurable target variables representing resource utilization, the Riksbank in a clarification of the implication of the Government Bill's statement writes at the beginning of every Monetary Policy Report that the Riksbank,

> in addition to stabilising inflation around the inflation target, [is] also striving to stabilise production and employment around long-term sustainable paths. The Riksbank therefore conducts what is generally referred to as flexible inflation targeting.

5 On two points of transparency, however, the Riksbank may still have an edge over the Federal Reserve. First, the Riksbank (similarly to several other inflation-targeting central banks) publishes either an extensive *Monetary Policy Report* or a shorter *Monetary Policy Update* after each policy meeting. Second, the Riksbank (as far as I know, uniquely among inflation-targeting central banks) publishes extensive and detailed *attributed* minutes after each policy meeting.

The idea here is also hardly that there is any conflict between stabilizing output and employment around a long-run sustainable path. Stabilizing employment around an estimated long-run sustainable path is in practice, at least when the participation gap can be regarded as small or at least exogenous, the same thing as stabilizing the unemployment gap, the gap between unemployment around an estimated, long-run sustainable rate of unemployment (LSRU).[6]

The above quote is followed by the sentence: "This does not mean that the Riksbank neglects the fact that the inflation target is the overriding objective." However, the phrase "the inflation target is the overriding objective" hardly has any other meaning than "without prejudice to price stability," which I have already discussed.

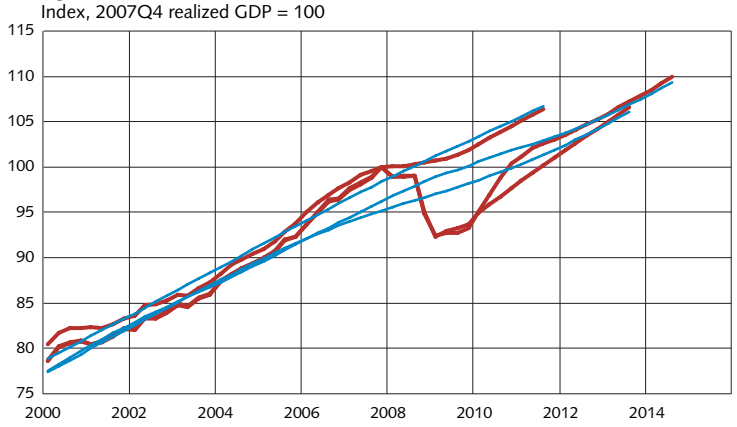
An alternative to stabilizing the employment or unemployment gap might be to stabilize another measure of resource utilization, namely the output gap, the gap between GDP and a long-run sustainable path for GDP, potential output. What does economic analysis say about the output gap as a measure of resource utilization? Estimates of potential output actually have severe problems. Estimates of potential output requires estimates or assumptions not only of the potential labour force but also of potential hours worked, potential total factor productivity, and the potential capital stock. Furthermore, potential output is not stationary but grows over time, whereas the LSRU is stationary and changes slowly. Output is measured less frequently, is subject to substantial revisions, and has larger measurement errors compared to employment and unemployment data. This makes estimates of potential output not only very uncertain and unreliable but more or less impossible to verify and also possible to manipulate for various purposes, for instance, to give better target achievement and rationalizing a particular policy choice. This problem is clearly larger for potential output than for the LSRU.

As I have discussed in detail in Svensson (2011b), I believe the Riksbank's potential-output measures are problematic. They have shifted down substantially relative to pre-crisis levels (figure 2, from Svensson 2011b, figure 4). Potential output for September 2008 and June 2010 were constructed with a Hodrick-Prescott (HP) filter, which has a well-known endpoint problem, which implies that the output gap always tends to be closed at the end of the forecast horizon (see, for instance, Apel, Hansen, and Lindberg 1996). Potential output for June 2011 is constructed using a new production-function approach, but it retains the properties of an HP filter, as potential productivity is still estimated with an HP filter. If the shock to the Swedish economy in 2008-2009 was mainly a shock to aggregate demand through a fall in exports, it is not clear why potential output would be much

6 The employment gap between the rate of employment and a long-run sustainable rate of employment equals the labor-market participation gap less the unemployment gap, where the participation gap is the gap between the actual rate of labor-market participation and a long-run sustainable rate. In Sweden, the participation gap is currently considered to be small and stable. For the U.S., Erceg and Levin (2013) argue that the participation gap is significant and endogenous and has fallen in response to the recession. Then the unemployment gap needs to be adjusted for the participation gap in order to be consistent with the employment gap.

affected. Nor is it clear why past potential output would have to be adjusted so much that 2007 Q4 comes to be considered a boom as high as the recession in 2009 Q1 was deep, particularly given that in September 2008, the boom in the previous year was considered quite moderate.[7]

Figure 2. GDP, Realized and Forecast, and Potential GDP, Sweden
Index, 2007Q4 realized GDP = 100



Note. For each date (September 2008, June 2010, and July 2011b), the thick solid line represents the most recently available estimates of realized GDP, the dashed line the Riksbank's GDP forecast, and the thin solid line the Riksbank's then-current estimate and forecast of potential GDP. The forecasts for the different dates can be distinguished since the September 2008, June 2010, and July 2011 forecast end in the 3rd quarter of 2011, the 3rd quarter of 2013, and the 3rd quarter of 2014, respectively.

Sources: Sveriges Riksbank and Statistics Sweden. Svensson (2011b, figure 4)

Compared to potential-output estimates, estimates of the LSRU are much easier to verify, more difficult to manipulate and can be publicly debated. Independent academic labour economists can and do provide estimates of the LSRU and can verify or dispute central-bank estimates. Several government agencies have labour-market expertise and provide verifiable estimates of the LSRU. One could even think of an arrangement where an independent committee rather than the central bank provides an estimate of the LSRU that the central bank should use as its estimate, to minimize the risk of manipulation by the central bank. Furthermore, unemployment is better known and understood by the general public than output and GDP.[8]

7 In figure 1, compare the large gap between 2007Q4 GDP and potential GDP as of June 2010 with the small gap between the 2007Q4 GDP and potential GDP as of September 2008.

8 Bank of England (2013) in its discussion of monetary-policy tradeoffs and forward guidance provides a thorough discussion of the unemployment rate as an indicator of economic activity. It concludes that "[t]he best collective judgement of the MPC is that the unemployment rate is the most suitable indicator of economic activity, given present uncertainties about the evolution of supply."

Most importantly, it has much more drastic effects on welfare. As expressed by Blanchflower (2009):

> Unemployment hurts. Unemployment has undeniably adverse effects on those unfortunate enough to experience it. A range of evidence indicates that unemployment tends to be associated with malnutrition, illness, mental stress, depression, increases in the suicide rate, poor physical health in later life and reductions in life expectancy. However, there is also a wider social aspect. Many studies find a strong relationship between crime rates and unemployment, particularly for property crime. Sustained unemployment while young is especially damaging. By preventing labour market entrants from gaining a foothold in employment, sustained youth unemployment may reduce their productivity. Those that suffer youth unemployment tend to have lower incomes and poorer labour market experiences in later life. Unemployment while young creates permanent scars rather than temporary blemishes.
>
> When unemployment rises, the happiness of both workers and non-workers falls. Unemployment affects not only the mental wellbeing of those concerned but also that of their families, colleagues, neighbours and others who are in direct or indirect contact with them.

Thus, I think there are strong reasons to use the gap between unemployment and an estimated LSRU as the measure of resource utilization that the central bank should stabilize in addition to stabilizing inflation around the inflation target.[9]

DISTINGUISH BETWEEN MEASURES OF RESOURCE UTILIZATION AS AN INDICATOR OF INFLATIONARY PRESSURE AND AS A TARGET VARIABLE

I also believe it is important to distinguish between using measures of resource utilization as indicators of inflationary pressures and as target variables (Svensson 2011b). As an indicator of inflationary pressure, it is the gap between the unemployment rate and a short-run NAIRU that is relevant. As a target variable, however, I am convinced that the relevant measure is the gap between the actual unemployment rate and the long-run sustainable rate. Using instead a short-run NAIRU as a target and stabilizing unemployment around it effectively implies introducing inflation smoothing as an objective, which makes little sense. This issue is discussed further in Svensson (2011b, online appendix A1). This is not to say that short-run slack in the economy should be disregarded. Short-run slack does have an impact on inflation and the inflation forecast, but it is only for that analysis that it matters.[10]

9 In Sweden, estimates of the LSRU relying on historical averages of the unemployment rate should take into account that average inflation falling below average inflation expectations since 1997 may introduce an upward bias in average unemployment as an estimate of the LSRU, as discussed in Svensson (2012b, 2013b).

10 Blanchard and Galí (2010) provide a model where a quadratic approximation of household welfare contains the squared gap between the unemployment rate and the long-run sustainable rate but the Phillips curve ends up containing the gap between the unemployment rate and a suitably defined short-run NAIRU.Bank of England (2013) includes a discussion of different concepts of equilibrium unemployment.

Should the household debt-to-income ratio be added as a target for monetary policy?

There is a lively current debate in- and outside the Riksbank about whether Swedish monetary policy should have an additional target variable, namely the household debt ratio (the debt-to-disposable income ratio). This has also been a source of deep division inside the Executive Board during my term there. Since the fall of 2012 it has become clear that a majority of the Executive Board justifies a policy that results in both inflation considerably below target and unemployment considerably above any reasonable sustainable rate with concerns about a high household debt ratio. It may at first not be obvious that the issue is about having a new target variable or not. But to allow poor current target achievement for inflation and unemployment with reference to the debt ratio must mean that for all practical purposes the debt ratio has become an independent target variable, or at least an intermediate target variable.

An intermediate target variable is a variable that is not a target in itself but is correlated with the target variables, for instance correlated with future target achievement for inflation and unemployment. However, a standard result in modern monetary economics is that there is no good reason to rely on intermediate targets – it is better to aim for the target variables directly (see, for instance, Svensson 1999). Thus, if the debt ratio is included because it is somehow correlated with the future outcome for inflation and unemployment, it is better to extend the standard forecast horizon for inflation and unemployment and incorporate the impact of the debt ratio on the forecast of future inflation and unemployment.

RIKSBANK CONCERNS OVER HOUSEHOLD INDEBTEDNESS HAVE LED TO A TIGHTER POLICY

In their evaluation of Swedish monetary policy, Giavazzi and Mishkin (2006, p. 53-55, 71-73, 77-78) noted that policy seemed to have been too tight since autumn 2003 because of concerns about housing prices. They criticized the Riksbank for having justified policy-rate increases with reference to rising household debt and housing prices, thereby creating confusion about the Riksbank's objectives for its policy. Indeed, they draw attention to a confusing statement in the Riksbank's press release of 26 February 2006 that could be interpreted as housing prices and household indebtedness having become targets for monetary policy:

> *The inflation forecast has been revised down slightly in comparison with the December forecast.*
> *…*
>
> All in all, UND1X inflation is expected to rise gradually and to be close to the 2 per cent target a couple of years from now. This forecast is based on, for instance, the assumption of strong growth in Sweden and abroad and of gradual increases in the repo rate. *As before, there is also reason to observe that household indebtedness and house prices are continuing to rise rapidly. Given this*, the Executive Board decided to raise the repo rate by 0.25 percentage points at yesterday's

> meeting. Even after this increase, interest rates are relatively low from a historical perspective. [Italics added. UND1X was later renamed by the Riksbank to CPIX.]

Giavazzi and Mishkin observed that not only had the inflation forecast been shifted down, as noted in the first paragraph above, but the *Inflation Report* published on the same day showed UND1X forecasts below the 2% target at every horizon. Furthermore, the second paragraph mentions the rise in house prices and household indebtedness as a reason why the policy rate was increased. They also observed that a similar reference to housing prices right before announcing the decision to raise rates was made in the press release of January 20, 2006. They noted that "[a] reader of this statement could easily conclude that the Riksbank is setting the policy instrument not only to control inflation, but to restrain housing prices." That is, the statement gave the definite impression that the Riksbank had introduced housing prices and household indebtedness as new target variables for monetary policy in addition to inflation, and that the Riksbank could allow the inflation rate to undershoot the inflation target in order to restrain housing prices and indebtedness.

There are more recent statements that indicate that household debt may have become an additional target variable. In the press release of 1 July 2010 (about the June 30 decision) a paragraph reads:

> Inflationary pressures are currently low, but are expected to increase as economic activity strengthens. The repo rate now needs to be raised gradually towards more normal levels to attain the inflation target of 2 per cent and at the same time ensure stable growth in the real economy. The Executive Board of the Riksbank has therefore decided to raise the repo rate by 0.25 of a percentage point to 0.5 per cent. *Another factor is that household indebtedness has increased significantly in recent years.* [Italics added.]

The inflation forecast in the *Monetary Policy Report* actually shows the CPIF inflation forecast falling significantly below the inflation target, except towards the end of the forecasting period where it hits the inflation target from below. The June 2010 decision is discussed more thoroughly in the section on policy evaluation below. Does "factor" here mean an indicator, a target, or an intermediate target for future inflation and unemployment?

The April 2013 press release has this paragraph:

> Over the past year, the repo rate has been gradually cut to 1 per cent and monetary policy is currently very expansionary. There are now signs of a gradual recovery in the economy, at the same time as household debt is expected to increase from an already high level. However, it will take longer than was previously assumed before inflation rises towards the target. *An even lower repo rate today would mean that inflation attained the target somewhat more quickly, but at the same time it would further increase the risk of imbalances building up. The monetary policy conducted is expected to stimulate the economy and inflation at the same time as taking into account the risks linked to households' high indebtedness.* [Italics added.]

The April 2013 Monetary Policy Update (Sveriges Riksbank has this paragraph:

> The increase in household debt as a percentage of their income is from an already very high level. *A high level of debt risks leading to poorer economic developments in the long run, with soaring unemployment and prolonged difficulties attaining the inflation target.* This is therefore something that monetary policy needs to take into account. The monetary policy conducted is expected to stimulate economic developments and inflation at the same time as taking into account the risks linked to high indebtedness. [Italics added.]

Thus, whereas the press release refers to "risks of imbalances" the Update suggest that "a high level of debt risks leading to poorer economic developments in the long run, with soaring unemployment and prolonged difficulties attaining the inflation target", without explaining through what mechanism this might happen. Clearly a coherent discussion and justification is needed.

In the July 2013 Monetary Policy Report (Sveriges Riksbank 2013e), the Riksbank provides more detail in the section "Alternative scenarios for the repo rate":

> A lower repo rate [by 25 basis points during 4 quarters] would mean, according to the calculations described here, that CPIF inflation approaches 2 per cent more quickly during the forecast period, compared with the main scenario (see Figure 2:19). Resource utilisation would also attain a normal level sooner (see Figures 2:21 and 2:22). *On this basis, one could justify a more expansionary monetary policy.* [Figures refer to figures in Sveriges Riksbank 2013e.]
>
> *But the monetary policy deliberations are also affected by other factors. One important factor is household debt.* Experiences from other countries in recent years illustrate the risks of an overly rapid build-up of debt. A rapid increase in debt, even if it is not considered to threaten financial stability, could make the economy more sensitive to shocks. *A less expansionary monetary policy, which dampens the rate of increase in debt*, could then contribute to reducing the risk of major fluctuations in inflation and resource utilisation in the future (see the article "Financial imbalances in the monetary policy assessment"). [Italics added.]

Furthermore, in the article "Financial imbalances in the monetary policy assessment" (Sveriges Riksbank 2013e, p. 42-48), the Riksbank provides a figure with two alternative repo-rate paths. The Riksbank again suggests that the lower repo-rate path will increase household debt and increase any risks associated with household debt.[11]

This raises several issues. For instance, should not the addition of a new (intermediate?) target variable, with a possibly lower target achievement for inflation and unemployment, be preceded by an open and thorough analysis of and conclusions about whether this is justified for economic and economic-policy reasons, including precisely what economic

11 "Two monetary policy alternatives have been illustrated in this article: a higher and a lower repo-rate path. During the usual three-year forecast period, the lower repo-rate path provides better expected target attainment in terms of inflation and resource utilisation. However, as *a lower repo-rate path can contribute to increased indebtedness*, it also increases the risk of an unfavourable scenario beyond the forecast horizon, for example in the form of a fall in housing prices in connection with a high level of household indebtedness." (Sveriges Riksbank 2013e, p. 47, italics added.)

mechanism and channels of transmission are involved, including how the policy rate is supposed to affect the target variable and any risks connected with the target variable. And, importantly, is this addition consistent with the Riksbank Act and its preparatory works? I believe the legal argument should not be taken lightly, since it is through the Riksbank Act and the preparatory works that the Riksdag specifies the objectives for the Riksbank. But let me here leave the legal argument aside, and look at the economics.[12] As discussed in Svensson (2012d), in order to justify the introduction of the debt ratio as an additional target variable besides inflation and unemployment, it seems that three claims must all hold true:

(1) The level of household debt in Sweden today entails sufficiently large risks that it needs to be restrained.

(2) A higher policy rate could, by restraining the debt ratio, tangibly reduce these risks, and the reduction of the risks thus achieved is worth the lower inflation and higher unemployment caused by the higher repo rate.

(3) There is no better policy instrument available than the policy rate, with greater or the same effect on the risks and less effect on inflation and unemployment.

Let me examine claims (2) and (3), starting with claim (2). Crucial for this claim to hold true is that the policy rate has a *significant negative* effect on the debt ratio, that is, that a higher policy rate significantly reduces the debt ratio. Without a significant negative effect, it is difficult to see how any risks associated with the debt ratio could be affected. Furthermore, the magnitude of the effect on the debt ratio should be reasonably large in relation to the effect on inflation and unemployment; otherwise it would be difficult to argue that the reduction in risks would be worth more than the increased unemployment and reduced inflation.

Extensive research and several inquiries, including the Riksbank's own inquiry into the risks in the Swedish housing market, have reached similar conclusions.[13] This is that monetary policy normally has very little effect on housing prices and debt within a few years' time and, with low and stable inflation *and* inflation expectations equal to actual inflation, no effect on real housing prices and real debt the long run.[14] A small effect on housing prices and debt means that there is no significant effect on any risks associated

12 In spite of the Government Bill (Swedish Government 1997, p. 54) stating, in the context of monetary policy in a financial crisis, that "[t]he monetary policy instruments shall however, according the Government Bill, only be used to maintain price stability." As clarified in the Bill, only if a crisis in the financial system and the payment system threatens the price-stability objective shall the monetary policy instruments be used to contain the crisis.

13 See, for example, Assenmascher-Wesche and Gerlach (2010), Bean, Paustian, Penalver and Taylor (2010), Claussen, Jonsson and Lagerwall (2011), Englund (2011), Iacoviello and Neri (2010), Kuttner (2012), Svensson (2013b, 2013c), and Walentin and Sellin (2010).

14 The addition "with low and stable inflation" is justified by the fact that the value of the tax deductions for interest rates and thus the real mortgage rate after tax depend on inflation, and the real mortgage rate after tax in turn affects housing prices and debt. With low and stable inflation and inflation expectations equal to actual inflation, monetary policy has no long-run effect on the real mortgage rate after tax and thereby no effect on housing prices and debt.

with household debt. Indeed, as Deputy Governor Charles Bean concluded in a paper for the Jackson Hole Symposium 2010 (Bean, Paustian, Penalver, and Taylor 2010):

> [G]enerally speaking, monetary policy seems too weak an instrument reliably to moderate a credit/asset-price boom without inflicting unacceptable collateral damage on activity. Instead, with an additional objective of managing credit growth and asset prices in order to avoid financial instability, one really wants another instrument that acts more directly on the source of the problem.

A HIGHER POLICY RATE INCREASES (NOT REDUCES) THE DEBT RATIO

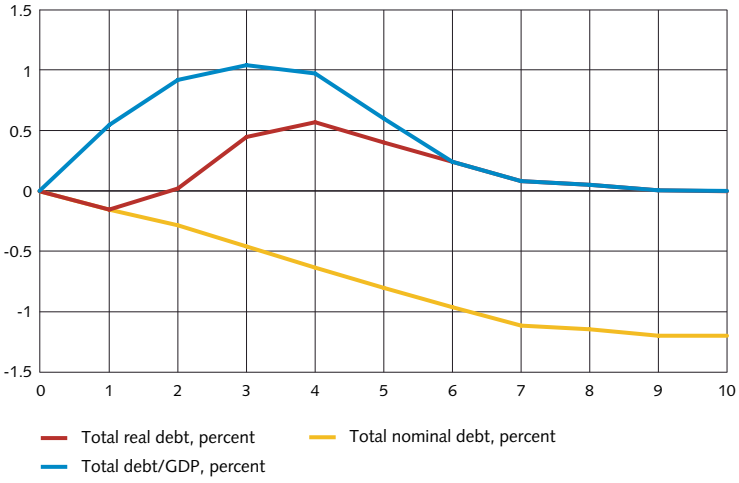
However, a closer study of the issue actually reveals that, under realistic assumptions, a higher policy rate has a small *positive* effect, *not* a negative effect, on the debt ratio. That is, a higher policy rate *increases* the debt ratio rather than reduces it. Svensson (2013c) shows that a higher policy rate leads to a *higher* debt ratio, not a lower one. This result may be surprising to some, certainly at the Riksbank, which apparently made have made a sign error in its assumptions. The result is actually quite intuitive once one carefully considers how debt, GDP and inflation are affected by a higher policy rate.

As explained in detail in Svensson (2013c), a higher policy rate during a year relative to a baseline leads to temporarily lower inflation, real GDP, and real housing prices for a few years, relative to the baseline. After 3-5 years, inflation, real GDP, and real housing prices have returned to the baseline.

The temporarily lower inflation leads to a permanently lower price level and permanently lower nominal GDP and nominal housing prices relative to the baseline. Lower nominal housing prices mean that new mortgages will be lower. But a year's new mortgages are only a small share, say 6-7 percent, of the total nominal (mortgage) debt. Since the turnover of the mortgage stock is so small, the total nominal debt will fall very slowly. The price level and nominal GDP will fall much faster to their new lower permanent level.

Since the nominal debt falls so slowly and the price level and nominal GDP fall much faster, the real debt will rise almost as much and as fast as the price level falls, and the debt-to-GDP ratio will rise almost as much and as fast the nominal GDP falls. After a few years when the price level and nominal GDP have reached their permanent lower level, real debt and the debt-to-GDP ratio start to slowly fall back towards the baseline. After more than a decade, they have returned to the baseline and the level they would have had in the absence of the temporary policy-rate increase. Figure 3 shows the response over 10 years of total nominal debt, total real debt, and the debt-to-GDP ratio, relative to the baseline, from a 1 percentage point higher policy rate than the baseline during year 1.

Figure 3. The response of total nominal debt, total real debt, and the debt-to-GDP ratio over 10 years from an increase in the policy rate of 1 percentage point during year 1, relative to the baseline



Source: Svensson (2013c)

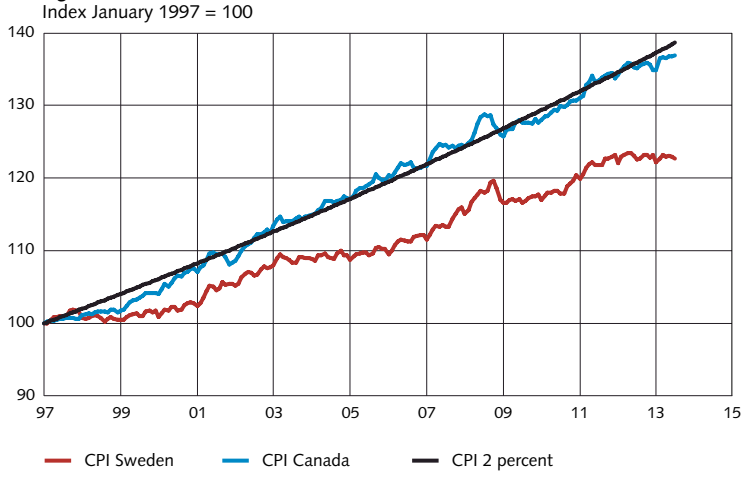
Disposable income moves in the same direction as GDP but not as much. This means that the ratio of debt to disposable income, the debt ratio, also first rises during a few years, more than real debt but less than the debt-to-GDP ratio. Then it slowly falls back to the baseline. Thus, a 1 percentage point higher policy rate than a baseline during a year results in an increase relative to the baseline in the debt ratio of about 0.8 percent in 3-4 years, after which the debt ratio starts to fall back towards the baseline.

THE LONG-RUN EFFECT ON HOUSEHOLD DEBT OF AVERAGE INFLATION BELOW THE TARGET

Tighter policy over a longer period with inflation below the target adds up to a considerably lower price level than if inflation had been on target. As noted above, average CPI inflation has fallen significantly below the inflation target of 2 percent since 1997. This means that the price level has fallen significantly below what the price level would have been if average inflation had been equal to the target. Since, as further discussed in the section on the downward-sloping Phillips curve, average inflation expectations have since the end of 1996 been close to 2 percent, even though average inflation has fallen significantly below the target. This means that the price level has not only fallen below the level consistent with inflation equal to target, it has also fallen below the level previously anticipated by borrowers. Importantly, this means that the real value of any given nominal debt has not only risen above the real value consistent with inflation equal to the target, it has also risen above the real value previously anticipated.

In figure 4, the red line shows the CPI for Sweden, with the index set to 100 in January 1997. The black line shows what the CPI would have been if inflation had equalled 2 percent. We see that the price level would have increased by almost 40 percent by now. It has actually increased by only 23 percent. The blue line shows the CPI for Canada. Bank of Canada has an inflation target of 2 percent for the CPI. It has kept average inflation very close to 2 percent.

Figure 4. The CPI in Sweden and Canada
Index January 1997 = 100



Source: Datastream and Statistics Sweden (Svensson 2013d, figure 1)

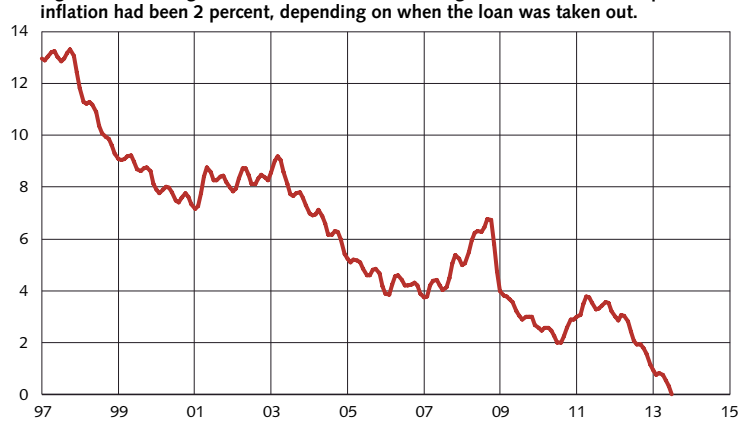
As further discussed in Svensson (2013d), a lower price level than previously anticipated results in a Fisherian debt deflation (the essence of Fisherian debt deflation is not deflation but a lower price level than anticipated). Indebted households find themselves with higher real debt than anticipated and consistent with inflation equal to the target. This means that households' debt-to-income and loan-to-value ratios are higher, and their net wealth and net wealth-to-total assets ratio are lower than if inflation had equalled the target and the inflation expectations.

Thus, the statement above that monetary policy has no effect on household real debt and debt ratios in the long run relies on the assumption that inflation expectations equal actual inflation. If, during a long period, actual inflation is significantly different from inflation expectations, as has been the case for Sweden, monetary policy has a longer-run effect on real debt and debt ratios. Average inflation below expectations will lead in the long-run to higher real debt, higher debt-to-income ratios, and higher loan-to-value ratios and to lower net worth and lower net worth-to-asset ratios than when average inflation equals expectations.

These longer-run consequences of the Riksbank's leaning-against-the-wind policy seem to be large. Figure 5 shows the percentage increase in the real value in August 2013 of a given nominal debt, depending on the date at which the debt was taken out. We see

that nominal debt taken out in the beginning of 2003 now has a real value that is about 9 percent higher than if the Riksbank had held average inflation equal to the target.

Figure 5. Percentage increase in the real value of a given nominal loan compared to if inflation had been 2 percent, depending on when the loan was taken out.



Source: Statistics Sweden and own calculations (Svensson 2013d, figure 2)

THE RIKSBANK'S JUSTIFICATION FOR ITS TIGHT POLICY IS NOT VALID

The conclusion is that a higher policy rate increases the household real debt and the debt-to-income ratio. The higher policy rate indeed reduces nominal housing prices and new mortgages, but since the new mortgages are such a small share of total mortgages, the total nominal debt falls very slowly. At the same time, nominal GDP and nominal disposable income fall much faster. The debt-to-GDP and the debt-to-income ratios rise. The magnitude of effect on the debt-to-income ratio, about 0.8 percent increase in the ratio after a few years for a 1 percentage point increase in the policy rate, is too small to have any effect on any risks associated with the debt ratio. And, importantly, it has the opposite sign to what the Riksbank has assumed. The policy rate clearly does not have a significant negative effect on the debt ratio. Thus, claim (2) is simply wrong![15]

Furthermore, over time, tighter policy with inflation adds up to a considerably lower price level than if inflation had been on target. This means that for any given nominal debt that was taken out sufficiently many years ago, the real value is substantially higher than if inflation had been on target. Since inflation expectations have been equal to the target, it also means that the real value of the debt has become substantially higher than anticipated.

Thus, the Riksbank's leaning-against-the-wind policy is clearly counterproductive as a way to reduce real debt and debt-to-income and loan-to-value ratios.

15 In policy discussions and speeches, I have previously used as a rule of thumb (mentioned in the minutes from the monetary policy meeting in December 2012 (Sveriges Riksbank 2012c, p. 5) that a policy rate which is raised by 1 percentage point in one step, held at this higher level for a year and then returned to its original level leads to a household debt ratio that is approximately 1 percentage point lower a couple of years ahead than would otherwise have been the case. This reasoning took for granted that nominal debt varies together with housing prices. Now, taking into account that total nominal debt varies very slowly, it turns out that the magnitude of the effect is about the same, but that the sign is opposite.

As for claim (3), that there are no better instruments available, in Sweden Finansinspektionen (the Swedish Financial Supervisory Authority) and the Government have taken or announced several effective measures, namely a mortgage loan-to-value cap (which has a clear effect on the loan-to-value ratio for new mortgages according to the Finansinspektionen's *Swedish Mortgage Market Report* (Finansinspektionen 2013)), higher capital-adequacy requirements for systemically-important banks, and higher risk weights on mortgages. The Finansinspektionen in its *Mortgage Market Reports* also thoroughly monitors that mortgage lending standards are strict, that borrowers' debt-service capacity is good, and that borrowers' resilience to disturbances in the form of increased mortgage rates, increased unemployment, and housing price falls is sufficient. Thus, it seems difficult to argue that claim (3) holds true.

In particular, in August 2013, the Swedish government announced a new strengthened framework for financial stability (Swedish Government 2013b). Finansinspektionen will have the main responsibility for micro- and macroprudential policy and control the micro- and macroprudential instruments. Assigning the main responsibility and control of both micro- and macroprudential instruments, including instruments such as the countercyclical capital buffer, to a single authority allows for both efficiency and accountability. A Stability Council will be created with the Minister of Financial Markets as the chair and with the Director Generals of Finansinspektionen and of the Swedish National Debt Office and the Governor of the Riksbank as additional members. The Council will assess financial stability, manage crises, and publish their positions and assessments. Sweden should now have an effective framework for financial policy and financial stability.

Thus, even if claim (1) were true, there does not seem to be any good reason to add the household debt ratio as another target or intermediate target variable for monetary policy. It is simply not consistent with the fundamental principles of instrument assignment in economic policy. As restated by Bini Smaghi (2013):

> Whatever improvement we will make in our understanding of monetary policy, we should not depart from a few fundamental principles, in particular those related to assigning policy instruments to targets. Two principles are worth remembering in all circumstances. The first principle is that each instrument should be assigned to a specific target. The second principle is that the assignment should be based on efficiency, i.e. each instrument should be assigned to the target it can achieve most effectively.

More generally, variables such as the household debt ratio, real housing prices, and housing prices relative to disposable income are real variables, not nominal variables. That means that their long-run sustainable paths are determined by nonmonetary factors. Real housing prices, that is, housing prices deflated by a consumer price index, are the relative prices between housing and consumption. We know that monetary policy can affect nominal prices but, when inflation expectations adjust to actual inflation, not relative prices in the long run.

Some of us may be concerned about the risk of an accident at a nuclear power plant or the risk of an environmental disaster and global warming. Some might argue that a recession with less electricity demand reduces somewhat the risk of overheating a nuclear power plant and that a recession with less output reduces somewhat the emission of hazardous waste and carbon dioxide. Should we therefore use monetary policy to try to reduce the risks of a nuclear-power accident or an environmental disaster and global warming? Most of us would agree that other policy measures should be used instead.

As noted, once claims (2) and (3) do not hold, it does not matter for the issue of whether monetary policy should try to restrain household debt whether claim (1) is true or not. However, for those that advocate such use of monetary policy, it would seem important to show that claim (1) is true. As far as I can see, the analysis of the risks connected with debt to which the Executive Board majority has referred to mainly consist of superficial comparisons with other countries, without a proper discussion of the causes and triggers of crises in other countries. "The Swedish debt ratio is at a level that has caused problems in other countries" is a typical statement, without further details. This does not seem sufficient to justify a policy that has had large consequences for unemployment and inflation. Claim (1) is further discussed in section 7.2 below.

Forecast targeting

With the mandate of flexible inflation targeting specified to stabilize inflation around the inflation target and unemployment around an estimated long-run sustainable rate, the policy choice boils down to what can be called *forecast targeting:* choosing a policy rate and a policy-rate path such that the corresponding forecasts for inflation and unemployment "look good," that is, best stabilize inflation around the target and unemployment around the LSRU.[16] How can this be done in practice? How can all the relevant information be taken into account, including judgment, that is, information, knowledge and views outside the scope of a particular model?[17] In this context we can actually talk about an algorithm for forecast targeting.

This algorithm can be summarized as follows. It consists of two steps. Consider a particular monetary-policy decision. In step 1, start from the policy-rate path and the corresponding (mean) forecasts for inflation and unemployment from the previous policy decision. Consider the new information about the current situation of and the outlook for the domestic and foreign economies that has arrived since the last policy meeting and that has an impact on the forecast for inflation and unemployment. For an unchanged policy-rate path, that is, for the previous policy-rate path, incorporate the new information in the forecasts for inflation and unemployment. They will then normally differ from the previous forecasts for inflation and unemployment. This procedure means that new information is "filtered through the forecast" – that is, information that has an impact on the forecasts for

16 Forecasts are here considered to be mean forecasts, as discussed in, for instance, Svensson (2010a). See Svensson (1999, 2010a) and Woodford (2007) for more discussion and details of forecast targeting.
17 Monetary policy with judgment is further discussed in Svensson (2005).

inflation and unemployment is taken into account, whereas information that does not have an impact on the forecasts is disregarded. This concludes step 1, which thus incorporates the new relevant information for policy in the forecasts.[18]

In step 2, consider whether the new forecasts for inflation and unemployment look good or not. If the previous forecasts looked good, and the new information has significantly shifted the new forecasts for inflation and unemployment, the new forecasts may not look good. If the previous forecasts did not look good, that is, if the previous policy decision was not good (or was constrained from being good, for instance by the policy rate having reached its lower bound), the new forecasts would look good only by chance. If the new forecasts do not look good, consider alternative policy-rate paths and corresponding forecasts for inflation and unemployment until a policy rate and a policy-rate path has been found that results in the forecasts of inflation and unemployment looking good. This new policy rate and policy-rate path is then the new policy decision. Thus, step 2 selects the new policy rate and policy-rate path for given new information.

It then remains to announce the new policy decision, the policy-rate path, and the forecasts for inflation and unemployment in a statement and report that justify the policy decision.

Ideally, the report on monetary policy should report both steps 1 and 2, so as to best justify and explain the decision. In practice, step 1 is not published. Indeed, at least at the Riksbank, step 1 has been done explicitly in the policy process only very exceptionally and has, to my knowledge, never been published. Instead, only the new policy-rate path and the new forecasts of inflation and unemployment have been published. This makes it difficult to assess what of the change in forecasts is due to new information and what is due to a shift in the policy-rate path. Then it is difficult to assess the internal consistency of the decision.

Importantly, in step 1 the forecasts of inflation may change for an unchanged policy-rate path not only due to new information about the current state and outlook for the domestic and foreign economies but also due to new assessments of the impact of previous information on the forecast, new assessments of the transmission mechanism and working of the economy, and so on. For instance, in the April 2013 *Monetary Policy Update* the Riksbank adjusted down its inflation forecast due to a new assessment of inflationary pressure in the Swedish economy. Also, in step 2, the changes in the forecasts from a given change in the policy-rate path may differ from previous changes in the forecasts for the same given change in the policy-rate path, due to new assessments of the response of the economy to changes in the policy-rate path. Such things need to be explained, in order to best justify policy and allow external evaluation of policy.

I find that a particular four-panel graph is ideal for explaining the two steps. The four panels show the policy-rate path, the inflation forecast, the unemployment forecast, and

18 Laséen and Svensson (2011) show that the equilibrium for an "unchanged policy-rate path" with new information is unique and well-defined provided that the given policy-rate path is understood to involve a switch to a well-behaved policy rule at some future date.

mean squared gaps for inflation and unemployment. The mean squared gaps are numerical measures of target achievement for inflation and unemployment. Step 1 can then be illustrated with the previous policy-rate path and the previous and new inflation and unemployment forecasts, where the new forecasts show how new information affects the forecasts for an unchanged policy-rate path.

Step 2 can then be illustrated with the previous and the new policy-rate paths together with the new forecasts of inflation and unemployment for the unchanged and for the new policy-rate paths. Such an illustration would be very illuminating, I believe. Unfortunately, four-panel graphs with this clear distinction between steps 1 and 2 are not published at the Riksbank.

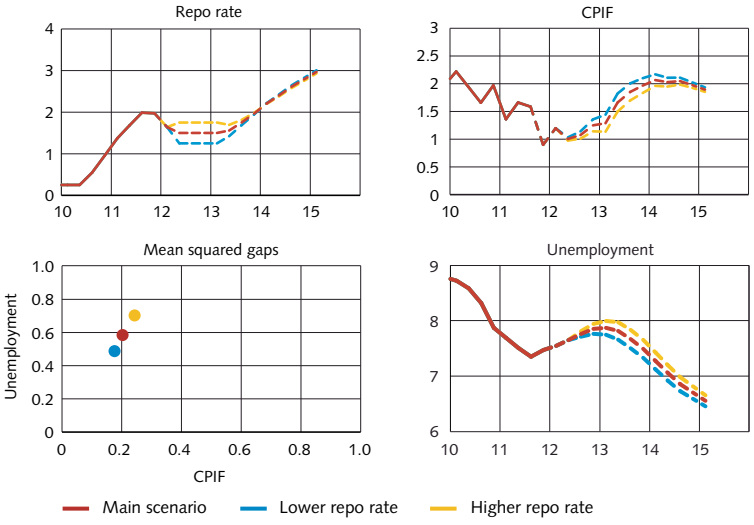
What is done at the Riksbank, and what I have brought to every policy meeting in recent years, are somewhat different four-panel graphs. One kind of four-panel graph shows the main-scenario policy-rate path and the corresponding main-scenario forecasts for inflation and unemployment, together with alternative policy-rate paths and the corresponding forecasts for inflation and unemployment. This exercise takes the assumptions and new information behind the main scenario as given and just examines whether, given that, alternative policy-rate paths would result in better or worse target achievement.

Another kind of four-panel graph deals with different assumptions than those in the main scenario about exogenous variables, such as a different forecast for foreign interest rates, the transmission mechanism, or private-sector expectations. The graphs can then show forecasts for inflation and unemployment for the main-scenario and alternative policy-rate paths under those alternative assumptions, in order to judge what policy-rate path makes forecasts of inflation and unemployment look good under those assumptions.

Figure 6, from the February 2012 minutes (Sveriges Riksbank 2012a), is an example of the first kind of four-panel graphs. The assumptions behind the main scenario and the resulting forecasts of CPIF inflation and unemployment are taken as given and the policy outcomes for a higher and lower policy-rate path are considered.[19] The mean squared gaps show the mean squared deviations of inflation from the target of 2 percent and of the unemployment rate from an assumed LSRU of 6.5 percent. Smaller mean squared gaps hence imply better target achievement. We see that the lower policy-rate leads to better target achievement for both inflation and unemployment.

19 The CPIF inflation forecast instead of CPI inflation is included since there is a generally accepted principle at the Riksbank that over the coming few years it is CPIF inflation that is relevant. The reason for this is that in the short term, CPI inflation is affected directly by the Riksbank's own policy-rate adjustments and monetary policy should not react to these temporary effects. If there is reason to believe that average CPIF and CPI inflation would differ in the longer run, due to a trend in the housing cost component of the CPI, this could be managed by monetary policy aiming for an average CPIF inflation rate that deviates from the target, so that average CPI inflation is in line with the target.

Figure 6. Monetary policy alternatives, February 2012
Policy rates abroad according to the main scenario. Long-run sustainable unemployment rate 6.5 per cent.

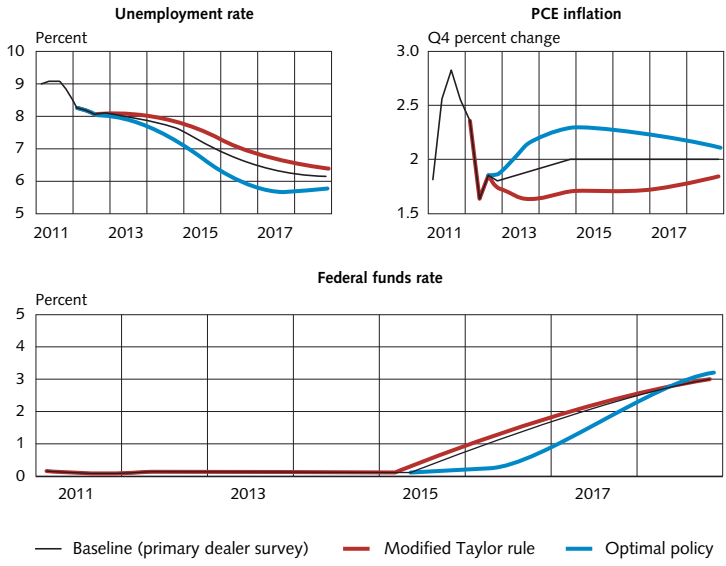


Sources: Statistics Sweden and the Riksbank. (Sveriges Riksbank 2012a, figure 4)

Similar graphs (without the mean squared gaps) have been used by Federal Reserve Board Vice Chair Yellen, for instance in Yellen (2012), reproduced here as figure 7. The three alternatives are a baseline consistent with the New York Fed Primary Dealer Survey, September 2012, and FRB/US simulations with a modified Taylor rule and with optimal policy.[20]

20 As explained in Yellen (2012, footnote 17): "More precisely, the loss function that the central bank is assumed to minimize is the discounted sum of current and future squared deviations of inflation from 2 percent, current and future squared deviations of the unemployment rate from 6 percent, and current and future quarterly changes in the federal funds rate. The last term is included to avoid unrealistically large quarterly movements in the 'optimal' federal funds rate path."

Figure 7. Three policy paths: An illustrative exercise

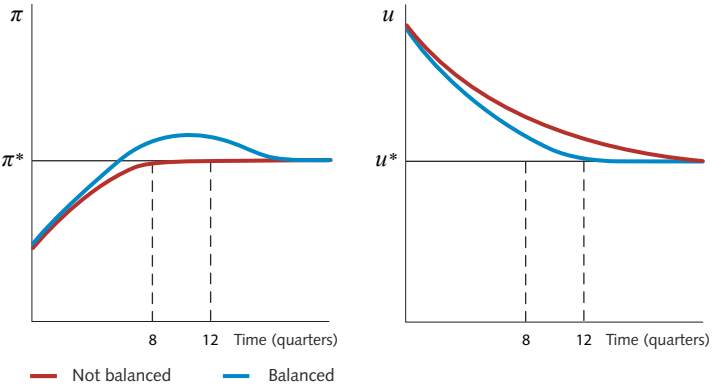


Sources: Yellen (2012) and Federal Reserve Bank of New York, Survey of Primary Dealers, September 2012.

One point that follows from Yellen's graphs is that, in a situation when initially inflation is low and unemployment high relative to the target and an estimated LSRU, inflation may need to overshoot and exceed the inflation target for some time. This is a property of optimal policy emphasized by Deputy Governor Jan Qvigstad (2005) that by many at the Riksbank is called "Qvigstad's rule". When applied to inflation and the unemployment gap, it says that, normally, the inflation and unemployment gaps should have the same sign.

The same point is made by Federal Reserve Bank of Minneapolis President Narayana Kocherlakota (2013). In a graph (figure 8) he explains that a balanced approach in promoting the objectives of mitigating deviations of inflation from its longer-run goal and deviations of employment from the Committee's assessment of its maximum level may in current circumstances require an overshooting of the inflation forecast.

Figure 8. Balanced and unbalanced approaches to monetary policy



Source: Kocherlakota (2013)

Of course, if average inflation over a longer period shall be close to the target, which according to the discussion in the section above on the mandate is what the phrase "without prejudice to price stability" must mean, the inflation target cannot be considered a ceiling but must be considered a midpoint target, in the sense that over time inflation must be as much and often above the target as below.

It follows that in the example of figure 6, target achievement would be better if inflation is allowed to overshoot the inflation target. It is indeed easy to see that a lower policy-rate path than the blue would lead to better target achievement.

A frequent counter-argument to the four-panel graphs (and indirectly to the above algorithm of forecast targeting) is that they do not give consideration to effects on the household debt ratio (the ratio of household debt to disposable income). For, example, Sveriges Riksbank (2013a, p. 34) states that "There is currently no simple way of taking considerations of this nature [that is, regarding debt] into account within the framework of the method [using four-panel graphs]." However, it is indeed quite possible to add to the graphs debt-ratio forecasts (or any other variable) for alternative policy-rate paths, using the impulse responses discussed in detail in Svensson (2013c) and shown in figure 2 above.

Thus, if the debt ratio is regarded as a target variable or as an intermediate target variable, it could be included in these graphs. An argument that has often been made in this context is that the debt ratio has an impact on the forecast of inflation and unemployment at a longer horizon, beyond the 3-year forecast horizon of the Riksbank. The idea is that a higher debt ratio would lead to a larger fall in aggregate demand in the future, due to more deleveraging in case of a fall in future housing prices. A higher debt ratio would then possibly shift down the (mean) inflation forecast and shift up the (mean) unemployment forecast farther into the future. If such considerations should have an impact on the current policy decision, it would seem desirable to try to quantify any such effect and extend the forecasts for inflation and unemployment farther into the future. The fact that the impact on the debt ratio of the policy rate is so small within a few years and

that according to existing research and conventional wisdom, when inflation expectations adjust to actual inflation, it is zero in the longer run does, however, indicate that any changes in the mean forecast at a longer horizon would be very small. Furthermore, Svensson (2013c) shows that an increase in the policy rate reduces the debt ratio rather than increases, and Svensson (2013d) observes that, when average inflation falls short of both the inflation target and expected inflation, real debt and the debt ratio become substantially larger than if average inflation equals the target. This makes the argument completely invalid.

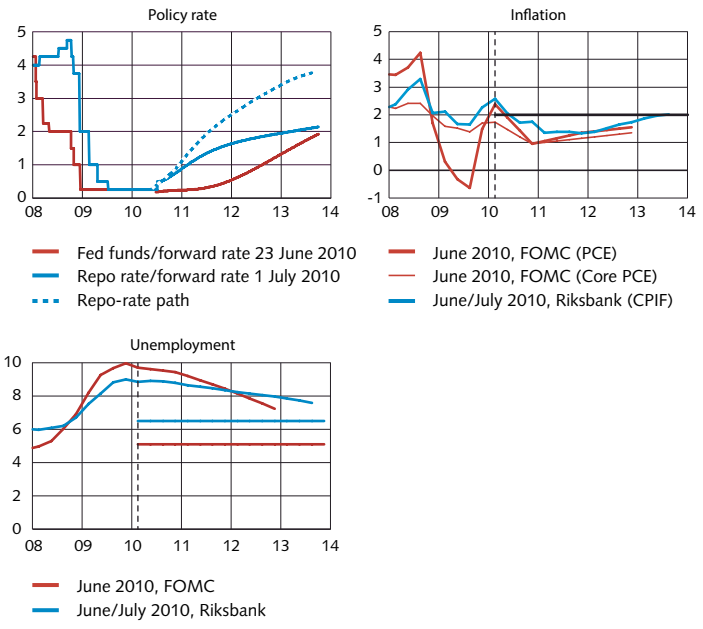
Evaluating monetary policy, ex ante and ex post

With clear objectives and enough information from the central bank, policy can be evaluated both ex ante, in real time, that is, considering only the information available at the time of the decision, and ex post, after the fact, that is, when information about what happened after the decision is available (see Svensson 2012c and Sveriges Riksbank 2013a).

EX ANTE POLICY EVALUATION

Suppose that the central bank publishes the policy-rate path and the forecast of inflation and unemployment as well as estimates of how these forecasts shift when the policy-rate paths shifts. Then it is possible to evaluate policy in real time with the help of the four-panel graphs mentioned above and to judge whether or not a different policy-rate path would be better. Figure 6 above allows such an evaluation of the Riksbank's policy decisions in February 2012.

Figure 9. Policy rates, forward rates, and inflation and unemployment forecasts, FOMC and Riksbank, June 2010



Source: Svensson (2011b, figures 1-3)

In Svensson (2011b), I carry out such an ex ante evaluation and compare the decisions of the Fed and the Riksbank in June 2010. Figure 9 summarizes the relevant information. The top left panel shows the realized Federal funds rate and market expectations estimated from forward rates. It also shows the realized repo rate as well as market expectations and the Riksbank's repo-rate path. The top right panel shows the realized and forecasted PCE and core PCE inflation for the Fed and realized and forecasted CPIF inflation for the Riksbank.[21] The bottom right panel shows realized and forecasted unemployment for the Fed and the Riksbank. We see that the inflation forecasts are similar, in that they are below the Riksbank's explicit and the Fed's assumed implicit target of 2 percent. Also, the unemployment forecasts are similar, in that they are above the Fed's and Riksbank's estimates of long-run sustainable rates at the time.[22] In this situation, with similar forecasts, the two central banks took very different policy actions. The Fed kept their policy rate near zero and started to prepare for QE2, whereas the Riksbank started a period of rapid policy-rate increases. It is clear from these graphs that a lower policy-rate path for the Riksbank would bring better target achievement for both inflation and unemployment. If policy is evaluated according to ex ante target achievement for inflation and unemployment in line with the forecasts, it seems that the Fed did the right thing whereas the Riksbank did the wrong thing.

21 The Fed forecasts shown are the median of the FOMC participants' forecasts. See Svensson (2011b) for details.

22 The horizontal red line is the median of the central tendency of the FOMC participants' forecasts of the long-run unemployment rate in June 2010. The horizontal blue line is the Riksbank's estimate in June 2010, 6.5 percent. See Svensson (2011b) for details.

EX POST POLICY EVALUATION: COUNTER-FACTUAL POLICY EXPERIMENTS

Ex post, given information about how the economy evolved after the policy decision, it is possible to evaluate how appropriate monetary policy has been in the light of the actual outcome for the economy.

Figure 1 above is an example of the most basic ex post evaluation, a comparison of average inflation over a longer period with the inflation target, in order to assess whether the central bank has achieved the inflation target or is guilty of prejudice to the price stability objective.

A more elaborate ex post evaluation is to analyse what kind of policy would have been required to reach a good target achievement. Such a so-called counterfactual analysis is quite possible to do, although the results have to be interpreted with some caution.

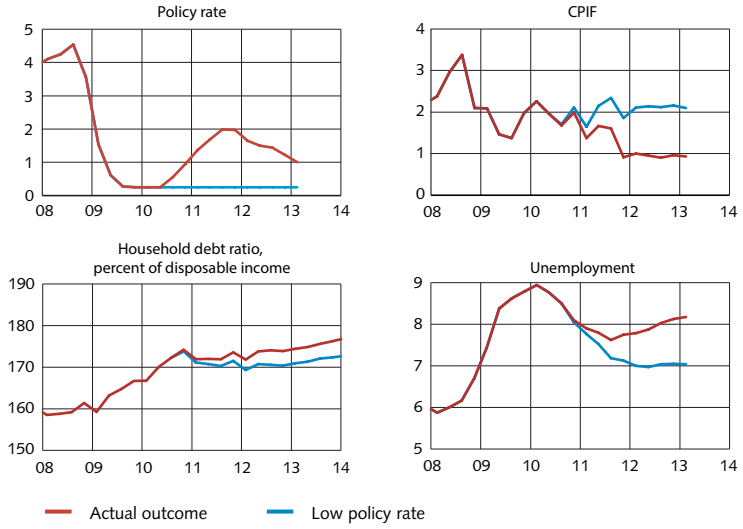
From and including the monetary policy meeting in June 2010, the majority on the Executive Board steadily raised the policy rate at every monetary policy meeting, from 0.25 per cent in June 2010 to 2 per cent in July 2011, an increase of 1.75 percentage points. As mentioned, Svensson (2011b) shows that these increases began despite the CPIF forecast in June 2010 being below the target and the unemployment forecast being well above a reasonable long-run sustainable rate (figure 9). Since December 2011, the majority on the Executive Board has lowered the policy rate to 1 per cent in December 2012, a cut of 1 percentage point. On average, the policy rate has been approximately 1.5 percentage points higher than if it had remained at 0.25 per cent until now.

One might ask what would have happened if the policy rate had remained at 0.25 per cent until now. This can be examined using the standard method to calculate the effects of alternative policy-rate paths in the four-panel graphs.[23] I report the results of one such preliminary calculation in Svensson (2013f) and in the minutes of the meeting in April 2013 (Sveriges Riksbank 2013c). Figure 10 shows a revision of that calculation, taking into account the insight in Svensson (2013c) that a higher policy rate increases rather than reduces the debt ratio. Such an analysis implies that CPIF inflation would have remained fairly stable at around 2 per cent instead of falling to 1 per cent and below. Target achievement for CPIF inflation would then have been as good as possible. Unemployment would have been lower and would in the first quarter of 2013 have been about 1.2 percentage points lower, at around 7 percent instead of at 8.2 percent. Target achievement for unemployment would have been much better than at present, irrespective of whether one compares with a long-run sustainable rate of unemployment of 5.5 (my own estimate) or 6.25 per cent (the midpoint of the Riksbank's recently estimated interval). These calculations are of course uncertain, but they provide a clear indication of the magnitudes

23 The method uses the Riksbank's estimated macroeconomic model Ramses to calculate the impact on inflation and unemployment of the anticipated or unanticipated shocks to the central bank's reaction function that result in a given alternative policy-rate path. It builds on Leeper and Zha (2003) and Laséen and Svensson (2011) and is discussed in general terms in Svensson (2010b). For figure 10, unanticipated shocks are used. See Laséen and Svensson (2011, appendix 4) for details when unanticipated shocks are used.

we are talking about and allow an assessment of how much better the situation would have been if the Riksbank had not begun to increase the policy rate in the summer of 2010.[24]

Figure 10. Policy rate, CPIF inflation, unemployment, and the debt ratio; actual outcome and low policy-rate path from 2010



Sources: Statistics Sweden, the Riksbank and own calculations. Sveriges Riksbank (2013f, figure 3, revised and taking into account that according to Svensson (2013c) a higher policy rate increases rather than reduces the debt ratio).

The conclusion of this counterfactual analysis is that the actual monetary policy conducted has led to much lower inflation and much higher unemployment than a policy that would have held the policy rate unchanged at 0.25 per cent. As mentioned, concerns about the debt ratio have been mentioned as a justification for the policy conducted. Therefore, one wants to examine what the consequences for the debt ratio would have been with the policy rate unchanged at 0.25 percent. This is shown in the bottom left panel, using the results on the response of the debt ratio mentioned earlier. The debt ratio would have been about 171 percent of disposable income instead of 174. This is a small reduction in the debt ratio and would arguably not tangibly affect any potential risks connected to household debt. But if one thinks that any risks vary with the debt ratio, since there is a reduction in the debt ratio, there would certainly not be any increase in the risks, if anything a reduction in the risks.[25]

24 If this counterfactual experiment were to be repeated with a zero repo rate from June 2010 instead of a repo rate of 0.25 per cent, then CPIF inflation would be a couple of tenths higher and unemployment a few tenths lower. The counterfactual outcome would thus be even better.

25 The deviation of the counterfactual debt- ratio outcome from the actual debt-ratio outcome is constructed from the deviations of the counterfactual policy rate from the actual policy rate and the impulse response of the debt ratio to the policy rate. The impulse response of the debt ratio to the policy rate is assumed to be approximately the average of the impulse responses of total real debt and the debt-to-GDP ratio in figure 2. See Svensson (2013c) for details of how the impulse responses of total real debt and the debt-to-GDP ratio are calculated.

In summary, the policy tightening that the Riksbank undertook from the summer of 2010 has led to much lower inflation than the inflation target, much higher unemployment than a reasonable estimate of the long-run sustainable rate, and a somewhat higher debt ratio. The increase in the debt ratio is too small to have any tangible effect on any risks connected with household debt, but it has certainly not lead to any decrease in risks that might be worth the too high unemployment and too low inflation. Furthermore, over time average inflation below expected inflation may lead to a substantially higher debt ratio that might actually significantly increase any risks.

A downward-sloping long-run Phillips curve

The Riksbank's inflation target of 2 percent for annual CPI inflation was announced in January 1993 to apply from 1995. As discussed in Svensson (2013e), initially the inflation target was not credible, in that inflation expectations were much above 2 percent. Only towards the end of 1996 did the inflation target become credible, in that inflation expectations at one, two, and five years horizon became close to 2 percent. From 1997, inflation expectations measured by Prospera (now TNS Sifo Prospera) have been quite close to 2 percent and in that sense anchored to the target. However, average inflation has been significantly below 2 percent and equal to 1.4 percent during 1997-2011, the period examined in Svensson (2013e).

Sweden is actually an outlier in this context. Australia, Canada, and the U.K. have had inflation targets as long as Sweden, but in those countries average inflation has been quite close to the target during 1997-2011 (during 1997-2007 for the U.K.) as shown in Svensson (2013e, table 1), reproduced as table 1 here.

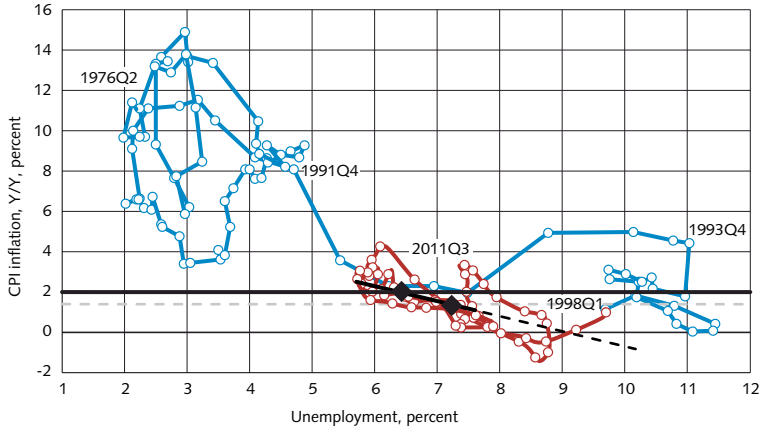
Table 1. Inflation target and average inflation for Australia, Canada, Sweden, and the U.K.; implicit inflation target and average inflation for the euro area and the U.S.

Country	Target	Index	Period	Average	Average less target
Australia	2-3	CPI	1997-2011	2.7	0.2
Canada	2	CPI	1997-2011	2.0	0.0
Sweden	**2**	CPI	1997-2011	**1.4**	**–0.6**
Sweden	**2**	CPI	1997-2007	**1.3**	**–0.7**
U.K.	2.5 (1992-2003)	RPIX	1997-2003	2.4	–0.1
	2 (2004-)	CPI	2004-2007	2.0	0.0
	2 (2004-)	CPI	2008-2011	3.4	1.4
Euro area	(< 2)	HICP	2000-2011	2.1	
U.S.	(≤ 2)	Core CPI	2000-2011	2.0	
	(≤ 2)	Core PCE	2000-2011	1.9	

Sources: Reuters EcoWin and Statistics Sweden. Svensson (2013e, table 1).

In Sweden, inflation expectations have been anchored at the inflation target even though average inflation has fallen significantly below the target. If inflation expectations are anchored at the inflation target when average inflation deviates from the target, the expectations-augmented Phillips curve for inflation and unemployment is no longer vertical but downward sloping. Svensson (2013e) estimates such a long-run Phillips curve for the period 1997-2011 and finds that a benchmark slope is 0.75, with a 95 percent confidence interval between 0.4 and 1.1. Figure 11 shows annual Swedish inflation and unemployment from 1976-2012, with the data from the period when inflation expectations have been anchored at the inflation target marked in red. The estimated long-run Phillips curve is shown as a solid black line for average inflation deviations from the inflation target up to 1 percentage points and as a dashed line for deviations larger than 1 percentage points, to emphasize that the long-run Phillips curve, as discussed in Svensson (2013e), would not apply for very large deviations from the inflation target.

Figure 11. Unemployment and annual CPI inflation, 1976Q1-2012Q3, and the benchmark long-run Phillips curve, 1997-2011



Source: Svensson (2013e, figure 10)

So average inflation has been 0.6 percentage points below the inflation target during 1997-2011. This means that average unemployment has been 0.6/0.75 = 0.8 percentage points higher than if average inflation had been equal to the target, corresponding to the horizontal distance between the two black diamonds in figure 11. The 95 percent confidence interval is between 0.55 and 1.5 percentage points.[26] Thus, the average unemployment cost of average inflation falling below the inflation target during 1997-2011 is substantial.

The anchoring of inflation expectations to inflation targets and the consequence that Phillips curves are then not vertical but downward-sloping appears to be a global phenomenon. Fuhrer (2011) noticed that measures of inflation expectations in the U.S.

26 With the 95 percent confidence interval for γ, the slope of the Phillips curve, symmetric around 0.75 and equal to [0.4, 1.1], the confidence interval for $0.6/\gamma$ is asymmetric around 0.8 and given by [0.6/1.1, 0.6/0.4] = [0.55, 1.5].

had stabilized around a widely perceived implicit inflation target of 2 percent from around 2000. He estimated a downward-sloping but quite flat Phillips curve for the U.S. for 2000-2011. Svensson (2013e) confirms Fuhrer's estimates of the U.S. Phillips curve and also estimates a downward-sloping Canadian Phillips curve for 1997-2012. IMF's *World Economic Outlook* of April 2013 (IMF 2013, chapter 3) notices that inflation expectations have become more firmly anchored and Phillips curves have become quite flat in a number of economies.

I believe the policy implication from this is that it is important to keep average inflation over a longer period in line with the target, a kind of average inflation targeting (Nessén and Vestin 2005). To allow average inflation to undershoot the inflation target significantly for long periods, as in Sweden 1997-2011 (and indeed up to today), may have large costs in terms of higher average unemployment. Fortunately, Sweden is an outlier, and in Australia, Canada, and the U.K., and more recently in the Euro area and the U.S., the central banks have kept average inflation very close to the (explicit or implicit) target (table 1). As discussed above in the section on the mandate, keeping average inflation on target is what the phrase "without prejudice to the price stability objective" must mean to be sensible.

The importance of keeping average inflation close to the target could be seen as an additional argument in favour of price-level targeting, with a price-level target rising at the rate of the inflation target. This would assert that average inflation is kept close to the target. On the other hand, in the economies other than Sweden just mentioned, the central banks have managed to keep average inflation on or close to the (explicit or implicit) target without an explicit price-level target.[27]

Should the central bank try to exploit the downward-sloping long-run Phillips curve and secretly be more expansionary and try to keep average inflation a bit above the target, so as to induce lower average unemployment than for average inflation on target? My answer to that question is no. It would involve saying one thing (the target is 2 percent) and deliberately doing another (keeping average inflation above 2 percent). This would be cheating and inconsistent with an open and transparent monetary policy. Regardless of the moral quality of the policy, the truth might eventually be leaked or discovered, in which case the inflation target would lose credibility and inflation expectations rise above the target, in which case the possible benefit of inflation above target would vanish.

Monetary policy and financial policy

What are the lessons for practical inflation targeting from the financial crisis that started in the United States in 2007 and affected Sweden in 2008-2009? The crisis affected Sweden through a dramatic fall in exports, a foreign-currency liquidity problem for Swedish banks because of difficulties to borrow in foreign currency, and risks for Swedish banks of credit losses from loans in the recession-hit Baltic economies.

27 This is further discussed in Kahn 2009 and Ruge-Murcia 2009.

Is the financial crisis a reason to modify this framework of flexible inflation targeting? That depends on the causes of the crisis. As I see it, the financial crisis was caused by factors that had very little to do with monetary policy (Svensson 2011a). These factors were the *macro conditions*, global imbalances that led to low real interest rates and high asset prices and the Great Moderation that led to a systematic underestimation of risk and a substantial expansion of credit; *distorted incentives* in financial markets that led to extreme levels of leverage and risk-taking and a lack of due diligence; *regulatory and supervisory failures* that underestimated or disregarded the fragility of the financial sector; eventually enormous *information problems* with extremely complex asset-backed securities and huge hidden off-balance-sheet liabilities; and some very *specific circumstances*, such as the U.S. housing policy to support home ownership for low-income households and related sub-prime mortgages contributing to the U.S. housing boom. Importantly, none of these causes had anything to do with monetary policy, except indirectly in that monetary policy may have contributed to the Great Moderation (Bean 2009). Easy U.S. monetary policy did not cause the crisis and could not have prevented the U.S. housing boom (Bernanke 2010, Dokko, Doyle, Kiley, Kim, Sherlund, Sim, and Van den Heuvel 2009). As for Swedish monetary policy, it is obvious that it could not have prevented the Swedish banks from borrowing and lending in foreign currency or investing in the Baltic republics.

So what conclusions can we draw from this about the conduct of monetary policy and any need to modify the framework of flexible inflation targeting? One obvious conclusion is that price stability is not enough to achieve financial stability (White 2006).

Another conclusion is that interest-rate policy would not be enough to achieve financial stability. The policy rate is an ineffective instrument for influencing financial stability, and policy rates high enough to have a noticeable effect on credit growth and housing prices will have a strong negative effect on inflation and unemployment, even in sectors that are not experiencing any speculative activity. The use of the policy rate to prevent an unsustainable boom in housing prices and credit growth poses major problems for the timely identification of such an unsustainable development, as well as for the assessment of whether policy-rate adjustment would have any noticeable impact on the unsustainable development, and of whether, in the longer run, the outcome for inflation and unemployment would be better.[28]

In particular, risks to financial stability are normally supposed to increase with the debt-to-GDP or debt-to-income ratios. As is shown in Svensson (2013c) and discussed above in the section on household debt, a higher policy rate than a baseline actually *increases* the debt-to-GDP and debt-to-income ratios for a few years relative to the baseline, since the denominator (nominal GDP or nominal disposable income) falls faster than the numerator (nominal debt). After a few years, the ratios then start falling slowly back towards the baseline and reach the baseline in a decade or more. This means that "leaning against the

28 See Assenmascher-Wesche and Gerlach (2010), Bean (2009), Bean, Paustian, Penalver and Taylor (2010), Bernanke (2010), and Dokko, Doyle, Kiley, Kim, Sherlund, Sim, and Van den Heuvel (2009), IMF (2009), and Kohn (2008, 2009).

wind" might, if anything, increase risks connected with the debt-to-GDP and debt-to-income ratios. In Sweden, as noticed above, tight monetary policy trying to restrain the household debt ratio has actually led not only to inflation considerably below the target and unemployment considerably above a long-run sustainable rate but also increased the debt ratios somewhat (although not as much as to materially affect any risks connected with the debt).

Thus, in regard to the financial crisis, it was financial policy (micro- and macroprudential policy) that failed, not monetary policy. Monetary policy in the form of flexible inflation targeting – applied in the right way and using all the information that is relevant for the forecast of inflation and unemployment, including the conduct of financial policy when appropriate – remains in my view the best-practice monetary policy before, during, and after the financial crisis.[29]

MONETARY POLICY AND FINANCIAL POLICY SHOULD NOT BE CONFUSED

This leads me to the more general question of what the relation between monetary policy and financial policy should be. For instance, it is sometimes said that the objectives of monetary policy should be expanded to include financial stability (Eichengreen, Rajan, and Prasad 2011, and Eichengreen et al. 2011). Such suggestions give the impression that monetary policy and financial policy are the same thing. But they are not. It is important to conceptually distinguish financial policy from monetary policy and avoid conceptual and practical confusion between the two policies. Confusion risks leading to a poorer outcome for both policies. It also makes it more difficult to hold the policymakers accountable. Trying to use monetary policy to achieve financial stability leads to poorer outcomes for monetary policy and is an ineffective way to achieve and maintain financial stability.

Different economic policies, such as fiscal policy, monetary policy, and labour-market policy, can be distinguished according to their objectives, the policy instruments that are suitable for achieving the objectives, and the authority or authorities that control the instruments and are responsible for achieving the objectives. From this point of view, it is clear that monetary policy and financial policy are distinct and different, and understanding this is important.

Monetary policy, in the form of flexible inflation targeting as specified above, has the objective of stabilizing both inflation around the inflation target and unemployment around an estimated long-run sustainable rate. Under normal circumstances, the suitable instruments are the policy rate and communication, including the publication of forecasts of inflation, unemployment, and (by some central banks) the policy rate. In times of crisis, as we have seen during the financial crisis, in particular when the policy rate is at or close to the zero lower bound, other more unconventional instruments can be used. These instruments include fixed-rate lending at longer maturities, asset purchases (quantitative

29 There is some evidence that inflation targeting served countries well during the financial crisis, see de Carvalho Filho (2011).

easing) to affect longer interest rates and expectations of future short rates, and foreign-exchange intervention to prevent currency appreciation or even to induce currency depreciation. The authority responsible for monetary policy is typically the central bank. In many countries, including all the member states of the EU, the central bank is given exclusive authority over monetary policy by statute and various measures to protect this policy independence are put in place.

Financial policy has the objective of maintaining and promoting financial stability. Financial stability can be defined as a situation in which the financial system can fulfil its main functions of submitting payments, transforming saving into financing and providing risk management with sufficient resilience to disruptions that threaten these functions. The available instruments are, under normal circumstances, supervision, regulation, and financial stability reports with analyses and leading indicators that may provide early warnings of stability threats.

In times of crisis, authorities may use instruments such as lending of last resort, variable-rate lending at longer maturities (credit policy, credit easing), government lending guarantees, government capital injections, special resolution regimes for insolvent financial firms, and so forth. The responsible authorities vary across countries, but the powers are typically divided between several authorities. The lender of last resort function is with the central bank, but other instruments are often in the hands of other authorities.

So, financial policy and monetary policy are conceptually distinct, with distinct objectives and distinct suitable instruments. The decision frequency is also different. In monetary policy, decisions are often taken 6-8 times a year. In financial policy, decisions in normal times may be taken 1-2 times a year. Any financial cycle is normally considerably longer than the business cycle. When it comes to the instruments, the interest rate is a blunt and unsuitable instrument for affecting financial stability and it thus makes little sense to assign the objective of financial stability to *monetary policy*. However, it may make sense to assign the objective of financial stability to the *central bank*, if the central bank is given control of the appropriate supervisory, regulatory, and crisis-management instruments. Whether giving the central bank such a broad remit would also be the best solution is too complex an issue to address here.

In particular, arguably the most important aspect of financial stability is that the financial system has sufficient *resilience* to disturbances that threaten its main functions. This resilience requires sufficient supervision and regulation of capital requirements, leverage, liquidity coverage ratios, net stable funding ratios, lending standards, risk taking, and so on. Clearly, monetary policy and the policy rate cannot systematically affect and ensure sufficient resilience of the financial system. Financial policy has to be used for that.

The fact that financial policy and monetary policy are distinct and different does not mean that there is no interaction between each policy and the other policy's objectives. Monetary policy affects the real economy and thereby profitability, asset prices, and balance sheets of the financial and non-financial sector. Thereby it indirectly affects financial stability. Financial policy directly affects spreads, lending, and other aspects of

financial conditions as well as the transmission mechanism of monetary policy. This means that monetary policy should normally be conducted taking the conduct of financial policy into account, and financial policy should be conducted taking the conduct of monetary policy into account. This is similar to how monetary policy is conducted when taking the conduct of fiscal policy into account, and vice versa. Note that this way of conducting monetary policy and financial policy – in line with a non-cooperative Nash equilibrium rather than a coordinated equilibrium – does not depend on how the authority for financial policy is shared between different institutions. It should be conducted this way regardless of whether the central bank has the sole authority or whether it is shared between several institutions.

Thus, under normal conditions, financial stability is handled by financial policy, not by monetary policy. In a second-best situation, without appropriate supervision and regulation, if the policy rate is the only available tool and there is a trade-off between its effect on the monetary-policy objectives and financial stability, that trade-off should be taken into account. Normally, however, the policy rate is not the only available tool, and much better instruments are available for affecting financial stability. Certainly this is the case in Sweden where, as mentioned above, Finansinspektionen (the Swedish Financial Supervisory Authority) and the Government have taken or announced several effective measures, namely the mortgage loan-to-value cap, higher capital-adequacy requirements for systemically-important banks, and higher risk weights on mortgages. Monetary policy should be the last line of defence of financial stability, not the first line.[30]

A "MODIFIED JACKSON HOLE CONSENSUS" VERSUS "LEANING AGAINST THE WIND VINDICATED" FOR SWEDEN?

Smets (2013, in this volume) provides a thorough discussion of the relation between financial policy and monetary policy and an extensive overview of the relevant literature. In particular, he identifies three different views about the interaction of the two policies and corresponding conceptual framework. The first is what he calls a "Modified Jackson

30 Woodford (2012) sets up a model where the probability of a financial crisis is assumed to be an increasing function of a state-variable that may be identified with leverage. Furthermore, leverage is assumed to be increasing in lagged leverage and the current output gap and is also subject to shocks. From these assumptions obviously follow a case for tighter monetary policy, "leaning against the wind," in order to, everything else equal, reduce the output gap and thereby leverage and the probability of a financial crisis. However, as noted in Svensson (2012a), the introduction in Woodford's model of financial instruments such as capital requirements, possibly cyclical ones, would allow leverage to be controlled more directly than indirectly and bluntly by the policy rate via the output gap. Monetary policy would be free to focus on stabilizing inflation and the output gap and need not lean against the wind. In the realistic case when the state variable affecting the probability of a financial crisis is a vector that includes not only leverage but, for instance, maturity mismatch and liquidity mismatch, it is even more the case that additional financial instruments such as restrictions on maturity and liquidity mismatches are superior to the policy rate in achieving and maintaining financial stability.

Hole Consensus", the second "Leaning Against the Wind Vindicated."[31] The views I have expressed above and argue are relevant for the Swedish economy are firmly within the Modified Jackson Hole Consensus.

The second view, "Leaning Against the Wind Vindicated," argues that monetary policy should take financial-stability objectives into account, that is, that financial stability should be added to the monetary policy objectives and monetary policy should be set with also financial-stability objectives in mind. As summarized by Smets (2013):

> [The view] acknowledges that there is a financial cycle that cannot be fully addressed by macro-prudential policy and interacts with the business cycle in various potentially non-linear ways. It also acknowledges that the monetary policy stance may affect risk-taking by the financial intermediation sector and, conversely, that the fragility of the intermediation sector affects the transmission process and the outlook for price stability. In this view, financial stability concerns should be part of the secondary objectives in the monetary policy strategy. The inclusion of secondary financial stability objectives naturally leads to a lengthening of the policy horizon of the monetary authorities as the financial cycle is typically longer than the business cycle. It suggest a modification of flexible inflation targeting whereby financial stability concerns are taken into account in deciding on the optimal adjustment path for inflation, introducing a term which resembles "leaning against the wind".

This view considers that financial policy and macroprudential tools are ineffective in managing the financial cycle and reducing the risk of a financial crisis, that monetary policy can complement financial policy in reducing the risk of a financial crisis, and that flexible inflation targeting may itself be a source of growing financial imbalances and increasing risks. Therefore, it is appropriate to take the financial stability implications of monetary policy into account and adjust monetary policy so as to reduce the risks of a financial crisis.

Are financial policy and macroprudential instruments ineffective in Sweden?

Starting from Smets (2013), I here consider whether the second view is relevant for the Swedish economy. A first crucial issue is whether financial policy and macroprudential instruments are ineffective in maintaining financial stability and reducing risks of a financial crisis in Sweden. Here it is important to consider some characteristics of the Swedish financial system. Importantly, it is dominated by four commercial banks in an oligopoly. There is no investment-banking sector to speak of. This makes supervision and regulation simpler compared to other countries with more complex financial sectors and considerable regulatory arbitrage. The four commercial banks have a history of supplying detailed information about assets, liabilities, realized and anticipated cash-flow, etc. to

31 The third view discussed by Smets (2013), "Financial Stability is Price Stability," is due to Brunnermeier and Sannikov (2013) and argues that fiscal, monetary, and financial policy are closely intertwined due to financial frictions. The close connection between monetary and financial policy comes from the fact that the health of the financial-intermediation sector determines the degree of inside money creation and the price of risk in the economy. Monetary policy works by distributing wealth between sectors of the economy. This view is not further discussed here.

Finansinspektionen and the Riksbank. This makes it relatively easy to monitor leverage, lending, credit growth, lending standards, etc. It also makes it easy to assign targeted macroprudential instruments if needed.

As Goodhart (2012) notes, a lack of competition brings "cosy profits", less risk-taking, and stability:

> One of the main reasons why the financial system was so stable between the 1930s and the 1970s was that competition was ruthlessly suppressed. It is the "challenger banks", the fringe banks, Northern Rock, the Icelandic banks, Anglo-Irish, the middle-sized banks, … struggling to get larger, that drive the financial system so often to disaster. The countries with the most stable outcomes in the recent crisis were those with the most oligopolistic, protected from foreign competition, domestic banking markets: Australia, much of Asia, Canada, etc. There is nothing like access to cosy profits to make managers risk averse. If British society really wants structural financial stability above all else, it should ban all foreign banks from the country and re-establish the London Clearing Bank cartel that held sway before 'Competition and Credit Control' in 1971. That would be a safe structure."

Goodhart should have added "Sweden" after "Canada." The point is that the oligopoly brings stability, although at the cost of competition and efficiency. Indeed, given the lack of competition, Swedish banks seem to be able to make profits in all circumstances, including during the current recession.

On the efficiency of macroprudential measures in Sweden, I have already noted in the discussion of claim (3) in section above on household debt, that in Sweden Finansinspektionen and the Government have taken or announced several effective measures to mitigate any possible risks associated with household debt namely the mortgage loan-to-value cap (which has a clear effect on the loan-to-value for new mortgages according to the Finansinspektionen's Swedish Mortgage Market Reports in 2012 and 2013), higher capital-adequacy requirements for systemically-important banks, and higher risk weights on mortgages. Finansinspektionen in its Mortgage Market Reports also thoroughly monitors that mortgage lending standards are strict, that borrowers' debt-service capacity is good, and that borrowers' resilience to disturbances in form of increased mortgage rates, unemployment, and housing price falls is sufficient.

According to the most recent *Financial Stability Report* (Sveriges Riksbank 2013b), the four banks satisfy Finansinspektionen's regulations that they should have a liquidity coverage ratio of at least 100 per cent, totally and separately for euro and US dollar. The requirement is based on the Basel Committee's LCR proposal from December 2010 and thus does not correspond to the less strict Basel Committee's revised LCR from 2013. The banks report Basel-III net stable funding ratios not far from 100 percent. They have fulfilled Finansinspektionen's previous recommendation to have a Basel-III CET 1 capital ratio of at least 10 percent by January 1 this year. Finansinspektionen has also issued a recommendation to have CET 1 capital ratios of at least 12 percent as of January 2015. This recommendation is already fulfilled as of March 2013 by three of the banks; the fourth has a capital ratio of 11.9 percent.

Thus, it is difficult to say that macro prudential instruments have been ineffective in Sweden. If there is a need, nothing prevents the Finansinspektionen and the Government from introducing new instruments, such as caps on debt-to-income or debt-service-to-income ratios, or modifying property taxes or mortgage-tax-deduction rules.

This is even more the case, as mentioned above in the section on household debt, after the Swedish government announcement of August 2013 (Swedish Government 2013b) of a new strengthened framework for financial stability in Sweden. Sweden should now have an effective framework for financial policy and financial stability, with the main responsibility for financial stability and the control of the micro- and macroprudential instruments assigned to the Finansinspektionen. This framework is consistent with monetary policy and financial policy being separate policies with separate objectives, instruments, and responsible authorities.

Do monetary policy and the policy rate have a significant impact on financial stability in Sweden?

Another crucial issue is whether monetary policy and the policy rate have a significant impact on financial stability and the risks of future financial crises. What risks to financial stability does the most recent *Financial Stability Report* (Sveriges Riksbank 2013b) identify?

In its summary, the report (p. 7) states that

> **At present, the major Swedish banks are financially strong**. The major Swedish banks' (Handelsbanken, Nordea, SEB and Swedbank) earnings have increased and their loan losses have been small. They have also continually increased their short-term liquidity and capital in accordance with the Riksbank's recommendations and are still well-capitalised, compared with many other European banks. As a result, they have good access to market funding in both Swedish kronor and foreign currencies. The Riksbank's assessment is therefore that the major Swedish banks are financially strong at present.
>
> **Developments in the euro area constitute the largest risk to financial stability.** However, it is expected that the Swedish economy will continue to be affected by weak economic development in the euro area. A long recession in the euro area accompanied by unease on the financial markets may lead to an increase in loan losses for the major Swedish banks and to a decline in their earnings. Moreover, the banks may experience greater difficulty in obtaining access to market funding. Swedish housing prices may also fall if Sweden is hit by a prolonged economic slowdown. The high level of household debt could then lead to a decline in consumption, which could have a negative impact on growth, as well as macroeconomic and financial stability. Companies could then experience problems with paying their day-to-day expenses, which risks leading to increased loan losses for the banks. However, the Riksbank's stress tests show that the major Swedish banks have strong resilience to increased loan losses.
>
> **The banks need more resilience in the long run.** There are vulnerabilities in the structure of the Swedish banking system that could have a negative effect on financial stability in the longer

run. For example, the banking system is large in relation to the Swedish economy and strongly interlinked, which means that a financial crisis could also require government intervention and thus become costly for taxpayers. The banks therefore need more resilience in the long run. The Riksbank recommends that the major banks continue to reduce their structural liquidity risks and ensure that they have enough capital to cope with potential future losses and disruptions on the financial markets. The Riksbank also recommends that the major banks improve their public liquidity reporting by providing an account of their structural liquidity risks in accordance with the definition in the Basel III Accord.

Thus, according to the second paragraph of the summary, developments in the euro area constitute the largest risk to financial stability. Those developments are clearly not something that Swedish monetary policy can affect.

The third paragraph emphasizes that Swedish banks need more resilience in the long run, mainly because of their size relative to the economy and their interlinkage. Obviously, monetary policy cannot do anything about the size or interlinkage of the Swedish banks.

However, the second paragraph identifies the risks associated with household debt. It relies on a particular chain of events and states that Swedish housing prices could fall if Sweden is hit by a prolonged economic slowdown and that the high level of household debt could then lead to a decline in consumption, which could have a negative impact on Swedish firms' cash-flow. This in turn could lead to credit losses for the banks that have lent to these firms. On the other hand, the summary states that "Swedish banks have strong resilience to increased loan losses." In the end, it is not really clear how great a risk to financial stability the household debt is.

Importantly, the risks are not in the form of direct credit losses on mortgages for the banks. The view accepted by both the Finansinspektionen and the Riksbank is that credit losses on mortgages are very unlikely, since borrowers have good debt-service capacity and have good resilience against disturbances in the form of higher mortgage rates, income losses because of increased unemployment, and falls in housing prices. Swedish mortgages are full recourse, and even during the deep Swedish financial and banking crisis in the 1990s, mortgages caused a small part of credit losses.[32] Instead, the risks are quite indirect. The idea is that a prolonged economic downturn may lead to a fall in housing prices which in turn results in indebted households' deleveraging and reducing their consumption, which then would then further reduce domestic aggregate demand, cause losses among domestic firms, and finally cause credit losses in banks that have lent to the firms.

The role of monetary policy in mitigating this chain of events is not entirely clear. Above we have already found that monetary policy has only very small effects on housing prices and the household debt ratio within a couple of years. In particular, tighter monetary policy *increases* the real debt and the debt-to-GDP and debt-to-income ratios. In the long run, *if* average inflation expectations equal average inflation, monetary policy would have no effect on real debt and the debt ratios. However, in Sweden, average inflation expectations

32 The household sector caused only about 6 percent of the credit losses of the four big banking groups when the banking crises peaked in 1992 (Sveriges Riksbank 1998, p. 15-16).

have been close to the inflation target but actual average inflation has fallen substantially below the target. This means that the price level has fallen substantially below the previously anticipated price level. Thus, as discussed above, the Riksbank's leaning-against-the-wind policy has led to substantially higher real debt and debt ratios than anticipated and consistent with average inflation equal to the target. If anything, the Riksbank policy has made the situation worse.

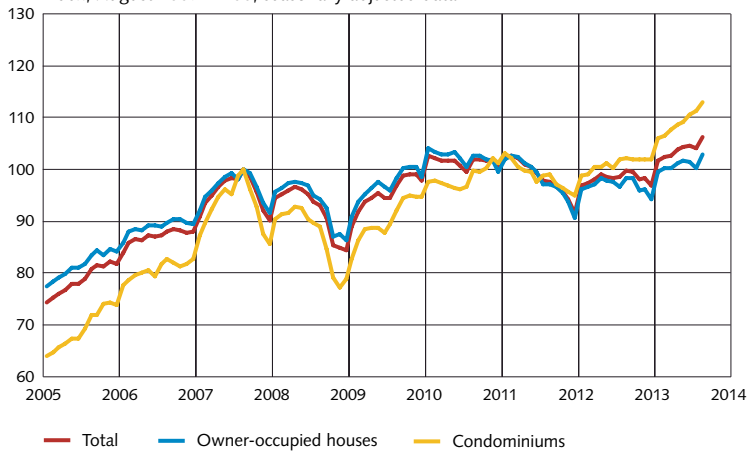
Instead, the main role of monetary policy would instead seem to be to mitigate with easy policy the consequences for the Swedish economy and Swedish export of a fall in demand from the euro area and any resulting fall in domestic aggregate demand, including consumption. A weak krona would help mitigating the effect on exporting firms, and a sizable proportion of variable-rate mortgages would help mitigating the effect on domestic consumption by borrowers. However, the initial high unemployment due to previous tight monetary policy makes the Swedish economy more vulnerable to disturbances from the euro area than if unemployment were closer to its long-run sustainable rate.

Overall, it is difficult to see that tighter policy would make the Swedish economy more resilient to shocks from the euro area. Indeed, the Riksbank's leaning-against-the-wind policy has instead increased any vulnerability due to household debt. The best contribution to financial stability for Swedish monetary policy is arguably to achieve the price stability objective and thus to stabilize inflation around the inflation target and unemployment around an estimated long-run sustainable rate.

What would be the consequences of a fall in housing prices?

Furthermore, the particular chain of events can be questioned. During the 2008-2009 crisis, Swedish real housing prices fell from autumn 2007 to autumn 2008 by more than 10 percent for single-family houses and almost 20 percent for condominiums (figure 12). Housing prices have since recovered and are now on average at about the same level as autumn 2007. During the crisis, when exports and investment collapsed, Swedish consumption held up pretty well and mitigated the impact on the economy. This is a real-time stress test of the effect of a housing price fall on consumption. I believe real-time stress tests should carry more weight than stress tests on paper.

Figure 12. Real prices for single-family houses and condominiums
Index, August 2007 = 100, seasonally adjusted data

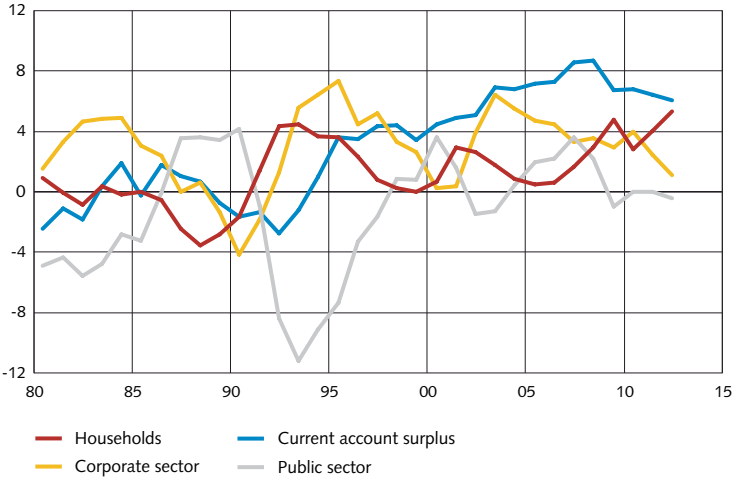


Source: Statistics Sweden and the Riksbank

The idea that a housing-price fall would lead to substantial deleveraging and a substantial fall in consumption can be questioned. Swedish households' saving as a share of disposable income is already very high. Households' total saving as a share of GDP is about 5 percent, higher than it was during the crisis in the 1990s (figure 13). Swedish households have strong balance sheets, with assets (excluding the collective pensions) that are three times their debt, and their savings excluding collective pensions as a share of disposable income are historically high (figure 14). Their net worth to total assets is thus about 67 percent, equal to the strongest Swedish companies and much larger than the 3 percent of the commercial banks (figure 15). Swedish households' average loan-to-value ratio is at about 55 percent, having trended down from about 70 percent since the late 1980s. There is no evidence that a low policy rate leads to a high loan-to-value ratio (figure 16). The households' largest asset is of course their earnings capacity, their human capital. For a household that will be working for the next 20 years, the present value of its disposable income is about 18 times its current disposable income, that is, more than 10 times the debt.[33] Many young households will work for considerably longer. As much as 60 percent of the debt is held by the 20 percent of the households that have the highest disposable incomes (Javeus 2012). Of course, these high-income households generally have good education and good jobs with high job-security or good job alternatives.

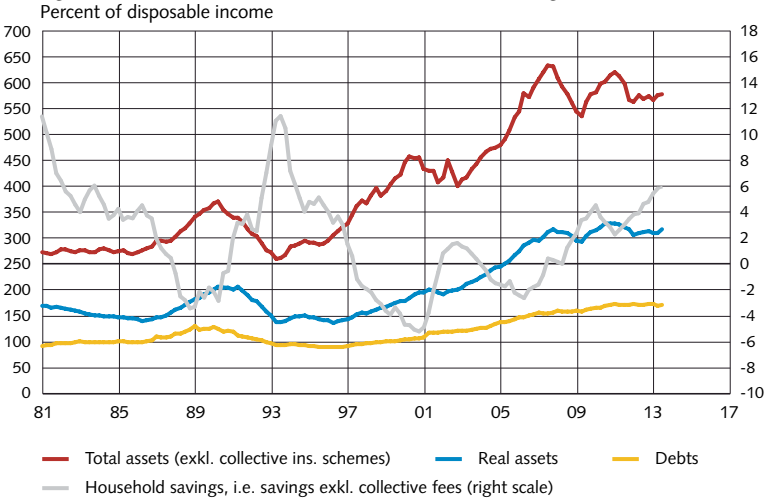
33 The present value calculated assuming a nominal interest rate after tax of 5 percent (7 percent before tax) and 4 percent growth per year of nominal income (2 percent real growth and 2 percent inflation).

Figure 13. Financial surplus for different sectors
Percent of GDP



Sources: Statistics Sweden and the Riksbank

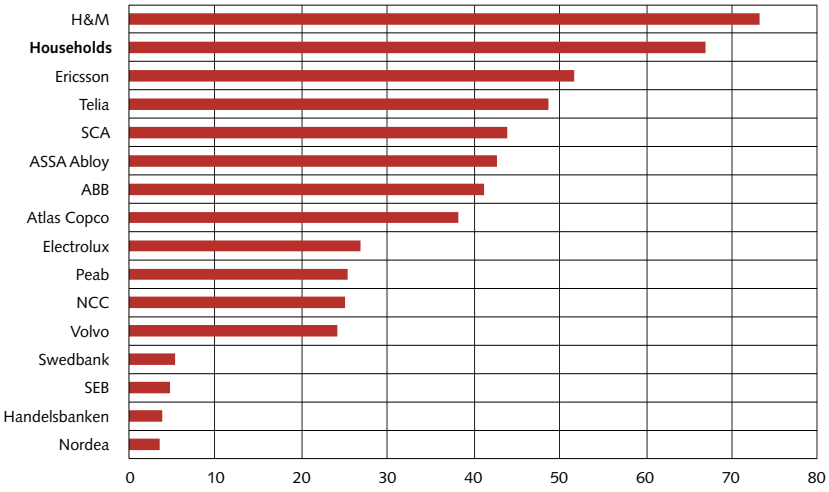
Figure 14. Household total wealth, real assets, debt, and saving
Percent of disposable income



Note. Collective pensions (excluded in the figure) are about 120 percent of disposable income.

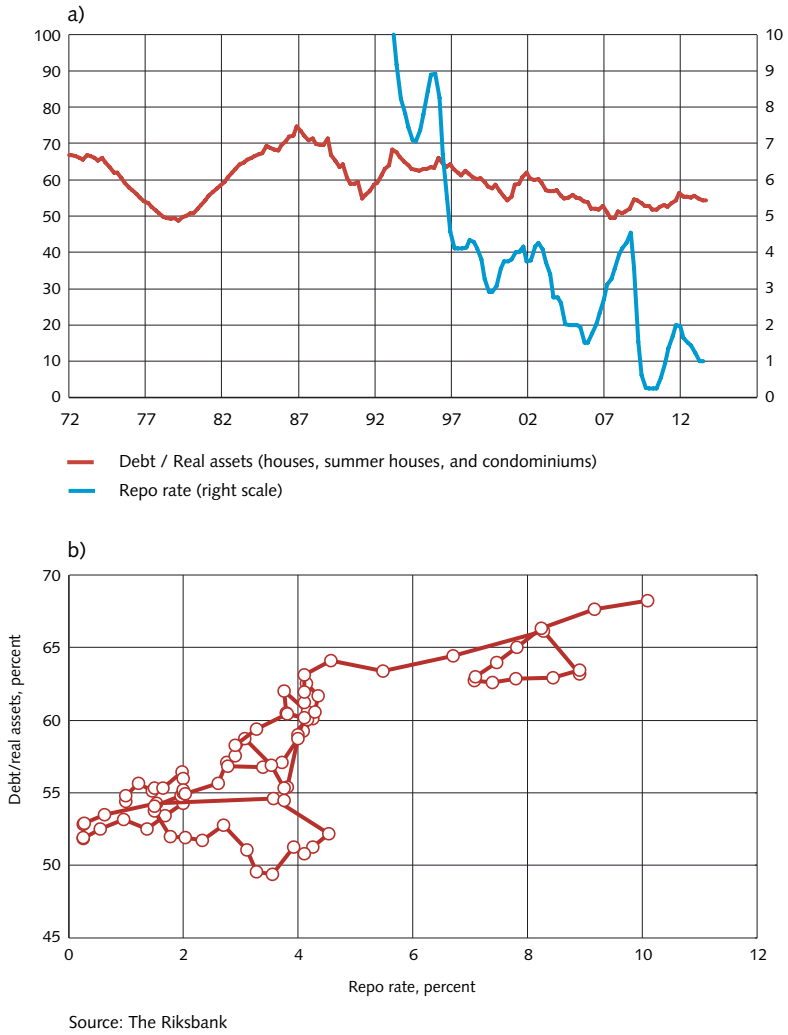
Sources: Statistics Sweden and the Riksbank

Figure 15. Net worth to total assets (the leverage ratio) of Swedish households, some large listed companies, and Swedish banks
Percent



Sources: Dagens Industri (leverage ratio 2011 for listed companies and Swedish banks) and the Riksbank (household leverage ratio)

Figure 16. The household loan-to-value ratio and the repo rate
Percent



Source: The Riksbank

The consequences for the Swedish economy of fall in housing prices are examined by Claussen, Jonsson, and Lagerwall (2011), part of the Riksbank's *Inquiry into the Risks in the Swedish Housing Market*. They show that the macroeconomic effects of a 20 per cent fall in housing prices would be relatively limited and possible to counteract by adopting a more expansionary monetary policy. This is shown in more detail in the minutes of the monetary policy meeting held in June 2010 (Sveriges Riksbank 2010), where I presented simulations showing how expansionary monetary policy can stabilize CPIF inflation and GDP growth quite effectively following such a fall in housing prices, also taking into account the zero lower bound for the policy rate.

Overall, it seems that the Riksbank's analysis and view of the chain of events is hardly satisfactory. In particular, there is no explicit analysis of under what circumstances housing prices would fall and what a possible scenario for that is.

The risk-taking channel in Sweden

Another crucial issue in the Leaning Against the Wind Vindicated view is the role of the so-called risk-taking channel, the idea that a low policy rate leads to more risk-taking and possibly excess risk-taking in the financial sector (Adrian and Shin 2011, Apel and Claussen 2012).

The arguments that low interest rates lead to more risk-taking usually refer to highly leveraged financial intermediaries, broker-dealers in the investment-banking sector (Adrian and Shin 2011). However, as mentioned, the Swedish financial sector is dominated by an oligopoly of four commercial banks, and there is no investment-banking sector to speak of. I am not aware of any evidence that these Swedish commercial banks tend to increase their leverage and risk-taking or lower lending standards when the policy rate is low.[34] Given the lack of competition, they can make cosy profits regardless of what the policy rate is.[35] In particular, I am not aware of any analysis of whether there is any "excessive" risk-taking compared to optimal or desired risk-taking.

Possible negative consequences of low interest rates mentioned in the debate include ever-greening of non-performing loans and the survival of zombie firms and zombie banks, or reduced incentives of balance-sheet repair by firms of banks. I don't know of any evidence that such phenomena are relevant for Sweden.

Furthermore, the general discussion about policy rates, the risk taking channel, and so on, and the existing models, seem to suffer from confusion between nominal policy rates and the general level of real interest rates. Models such as those of Adrian and Shin (2011) and Diamond and Rajan (2011) include a short real rate but no nominal policy rate and no explicit monetary policy.[36] Nor do they distinguish between the short real rate and the neutral real rate (also called the natural real rate). All that monetary policy can do by setting a short nominal policy rate is to temporarily make the short real rate deviate from the neutral real rate, which itself is beyond the control of monetary policy. The effects attributed to monetary policy should be the effects of that difference, not the level of the

34 Plots of commercial banks' leverage against the policy rate show no systematic relation between leverage and the policy rate.

35 Furthermore, even if lower policy rates did lead to more risk taking, it does not follow that the resulting amount of risk taking would be too much. That depends on what the optimal level of risk taking is. In the wake of the financial crisis, it might be that risk aversion and the perception of uncertainty are exceptionally high and that there is overall too little risk taking. Without further analysis, this cannot be known. The optimal adjustment of risk when real rates of return fall depends on the precise preferences for expected real rates of return and risk, as is revealed by the simplest mean-variance analysis when the investment line is shifted down (Apel and Claussen 2012). "Search for yield" regardless of the risk is difficult to understand in such mean-variance analysis, other than as the result of an unfortunate and ill-conceived unconditional promise of a particular rate of return, which regulators should prohibit.

36 Adrian and Shin (2011) and Diamond and Rajan (2011) also do not contain the frictions, such as sticky prices, that allow meaningful modeling of the effects of monetary policy.

neutral rate or the overall level of the real rate. The neutral real rate is affected by many things and can remain low for many years for several reasons, including global imbalances, fiscal policy, and shocks to aggregate demand and supply. Since the mid-1990s, there has been a global downward trend in real interest rates. This is not anything monetary policy can affect.

Conclusions

In summary, my lessons from my six years of practical inflation targeting as a policy maker at the Riksbank are the following: First, be clear about and do not deviate from the mandate for flexible inflation targeting – price stability and the highest sustainable employment. This means stabilizing inflation around the inflation target and unemployment around a long-run sustainable unemployment rate. To avoid any prejudice to the objective of price stability, keep average inflation over a longer period on target, as other inflation-targeting central banks successfully have done.

Second, do not include household debt as an additional (intermediate) target variable besides inflation and unemployment. This is especially important since "leaning against the wind" – a tighter policy than justified by the mandate of flexible inflation targeting – is under realistic assumptions *counterproductive* as a way of reducing household real debt and debt ratios. It actually *increases* rather than reduces the household debt-to-GDP and household debt-to-disposable income ratios (Svensson 2013c). Over time "leaning against the wind" leads to a substantially lower price level and a substantially higher real debt and debt ratios than if inflation is on average equal to the target (Svensson 2013d).

Instead, leave any problems with household debt to Finansinspektionen (the Swedish Financial Supervisory Authority) and its micro- and macroprudential instruments. This is now even more warranted than before, since the Swedish government in August 2013 (Swedish Government 2013b) has announced a new strengthened framework for financial stability in Sweden, where Finansinspektionen is assigned the main responsibility for financial stability and the control of all the micro- and macroprudential instruments.

Third, use a two-step algorithm to implement "forecast targeting". In step 1, examine the effects on the forecasts for inflation and unemployment of new information and assessments for an unchanged policy-rate path, the policy-rate path from the previous policy decision. In step 2, adjust the policy rate and the policy-rate path so the forecasts for inflation and unemployment "look good," that is, best stabilize inflation around the inflation target and unemployment around an estimated long-run sustainable rate. Use four-panel graphs to summarize these steps, where the four panels include the policy rate-path, the inflation forecast, the unemployment forecast, and the mean squared gaps (the mean squared deviations of inflation from the target and of unemployment from the estimated long-run sustainable rate).

Fourth, use four-panel graphs as one element in evaluating monetary policy ex ante, that is, in real time, meaning taking into account only the information available at the time

of the decision. Use counterfactual experiments as one element in such evaluations ex post, that is, after the fact, meaning taking into account also information available after the policy decision.

Fifth, with a credible inflation target and anchored inflation expectations, the long-run Phillips curve is no longer vertical. Then, keep average inflation over a longer period on the target. Especially, do not let average inflation fall below the target, since this will cause average unemployment to be unnecessarily high.

Sixth, as far as I can see, flexible inflation targeting remains the best-practice monetary policy, before, during, and after the recent financial crisis. It was not monetary policy that failed before the crisis; it was supervisory and regulatory policies, that is, financial policy, that failed. Do not confuse monetary policy and financial policy. Use monetary policy and the monetary-policy instruments to achieve the monetary-policy objectives (price stability and highest sustainable employment) and financial policy (micro- and macroprudential policy) and the financial-policy instruments to maintain financial stability. Conduct each policy separately, taking into account the conduct of the other policy, as with monetary policy and fiscal policy. Between the alternatives of the Modified Jackson Hole Consensus and Leaning Against the Wind Vindicated views (in the terminology of Smets 2013, in this volume), the former is the relevant one for Sweden – especially since leaning against the wind is counterproductive as a way of reducing household debt. The new strengthened framework for financial stability in Sweden, assigning the main responsibility for financial stability and the control of the micro- and macroprudential tools to the Finansinspektionen, is in line with this.

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Forward Guidance by Inflation-Targeting Central Banks*

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This paper assesses the value of central-bank communication about likely future policy, with particular reference to the regular publication of projections for the future path of the policy rate, as with the Riksbank's publication of the repo rate path. It first discusses why publication of a projected interest-rate path represents a natural and desirable evolution of inflation-forecast targeting procedures, and the conditions under which the assumptions about future policy underlying such projections will be intertemporally consistent. It then discusses evidence on the extent to which central-bank statements influence private-sector interest-rate expectations. Particular attention is given to the potential use of forward guidance as an additional tool of policy when an effective lower bound for the policy rate is reached, and alternative approaches to forward guidance in this context are compared, including the recent adoption of quantitative "thresholds" for unemployment and inflation expectations by the U.S. Federal Reserve. The potential role of a nominal GDP level target within an inflation-targeting regime is also considered.

One of the notable features of inflation targeting as an approach to the conduct of monetary policy has been the increased degree of transparency on the part of inflation-targeting central banks, not only as to their decisions but also with regard to the goals that policy seeks to achieve and the reasoning behind individual decisions. The degree to which this makes it appropriate, or even necessary, for inflation-targeting central banks to speak in advance about future policy decisions has been a topic of debate,[1] but over time, inflation-targeting central banks such as the Reserve Bank of New Zealand, Norges Bank, and Sveriges Riksbank have also led the way in increasing the degree of explicit communication about the likely forward path of short-term interest rates on a regular basis.

More recently, many central banks have found immediate cuts in their policy rate an insufficient response to the effects of the global financial crisis, and this has led to increased interest in explicit "forward guidance" about future interest-rate policy as an additional policy tool. This raises questions about the usefulness of this additional dimension of policy

* Prepared for the conference "Two Decades of Inflation Targeting: Main Lessons and Remaining Challenges," Sveriges Riksbank, June 3, 2013. Portions are based on work previously presented in Woodford (2012a, 2012b). I would like to thank Claes Berg, James Bullard, Charles Evans, Gauti Eggertsson, Narayana Kocherlakota, Argia Sbordone, Lars Svensson, Eric Swanson and John Williams for helpful discussions, while absolving them from responsibility for the arguments presented. I also thank Kyle Jurado and Savitar Sundaresan for research assistance, and the National Science Foundation for supporting my research on this issue under grant number SES-0820438.

1 See, *e.g.*, Goodhart (2005) for a skeptical discussion.

in the context of the kind of forecast-targeting procedures already used by many of the leading inflation-targeting central banks. Just in the past year, the Bank of Japan, the Bank of England, and the European Central Bank have all notably increased their use of explicit forward guidance.

Here I first review the general role of discussions of the forward path of the policy rate, and of explicit intermediate targets for policy, as elements of an inflation forecasttargeting approach to monetary policy. I then turn to the special role of forward guidance in the case that a central bank finds itself constrained by a practical lower bound on where it can (or is willing to) set its policy rate. I review recent experience with various approaches to forward guidance in that situation, including the Federal Reserve's December 2012 introduction of quantitative "thresholds," and discuss the appropriate role of such intermediate targets in a forecast-targeting framework.

The forward path of policy in a forecast-targeting framework

Central banks with explicit inflation targets have emphasized from the start that it is not reasonable to expect a central bank to be able to keep the measured rate of inflation exactly equal to the target rate at all times. They have in particular stressed that it is difficult for a shift in monetary policy, even a relatively drastic one, to greatly affect the rate of inflation over the near term (that is, for at least several months following the meeting at which a policy decision is taken); and they have accordingly stressed that the goal of policy should instead be to ensure that inflation can be expected to return to the target rate fairly soon, even when it currently differs from that rate. Hence both policy decisions and communication with the public about those decisions have come to focus on projections for the future path of the economy (and in particular, projections for one or more measures of inflation), and the extent to which these are consistent with the bank's official target.

But while inflation-targeting central banks have in this sense necessarily adopted a *forward-looking* approach to monetary policy, it has not obviously followed that the policy framework requires explicit consideration in advance of an intended forward path for the policy rate, or other policy instruments, still less any communication with the public about the policy committee's thoughts on that matter. Some early discussions of inflation-forecast targeting made it appear that one should be able to determine the appropriate current setting for the policy rate simply by reference to a projection for future inflation conditional on that rate, without having to make any specific assumption about future policy decisions. For example, in the early exposition of inflation-forecast targeting by Svensson (1997), a model is assumed in which the policy rate affects economic activity only with a lag of a year, and activity affects inflation, but only with an additional lag of a year. (Both effects are purely backward-looking; expectations play no role in the determination of either output or inflation.) Hence the model can be reduced to a single structural equation of the form

(1.1) $$\pi_t = u_t - \gamma i_{t-2},$$

where π_t is the inflation rate, it is the policy rate, u_t is a composite of all of the other factors influencing inflation (assumed to evolve independently of the path of the policy rate), periods correspond to years, and $\gamma > 0$ is a constant coefficient.

It is then easily shown that the policy that minimizes the expected squared deviation of the inflation rate from the inflation target π^* is one that sets i_t each period so as to ensure that the inflation forecast satisfies

(1.2) $$E_t \pi_{t+2} = \pi^*;$$

if the forecast is produced using the model (1.1), this will require that

(1.3) $$i_t = \gamma^{-1} [E_t u_{t+2} - \pi^*].$$

Note that the optimization required in order to determine the setting (1.3) for i_t can be carried out without considering how i_τ will be set for any $\tau > t$. Each meeting of the policy committee can be treated as involving an independent decision, and the inflation target alone suffices to allow a determinate decision on each occasion and to allow the decision to be justified to the public by reference to the target criterion (1.2).

However, these conclusions depend on overly simplistic features of the proposed model. The model (1.1) assumes not merely that interest-rate decisions have delayed effects, but that there are *no* effects until the future horizon (two years later) at which the main effect will suddenly occur. Even if one grants that the largest effects occur with a delay, it is nonetheless more reasonable to suppose that a policy change *begins* to have an effect at some point prior to the date at which the *largest* effect occurs. Yet even this small modification of one's assumptions would have important consequences for the forecast-targeting exercise. In general, one cannot treat the problem of inflation stabilization as a separate problem for each horizon, with an independent instrument choice that can be used to minimize inflation variability at that horizon; instead, one must solve a dynamic optimization problem, in which the optimal interest-rate decision at a given time is not independent of the intended conduct of policy at later dates.

Hence optimal policy, and indeed an internally consistent forecast-targeting exercise, will almost inevitably require a determination at each decision point of what the entire anticipated *forward path* of the policy rate should be, even though this need not mean that a once-and-for-all decision about policy is made at some initial date, and then simply executed thereafter. In practice, the number of future contingencies that may arise will be much too large to make it possible to solve explicitly for a state-contingent policy years in advance, and be content to simply implement it thereafter by deciding which of the contingencies that had been previously foreseen as possible has actually occurred. At the same time, a decision about current policy will require a *forecast* of how policy is expected to be made subsequently, even if it is inevitable that actual future policy will depend on complications that cannot yet be anticipated.

MEDIUM-RUN FORECAST TARGETING WITHOUT CHOOSING A FORWARD PATH

In practice, inflation-targeting central banks have not supposed that their procedures should seek to ensure that forecasted inflation must equal the target rate at the shortest horizon at which inflation can still be influenced, if indeed such a horizon can even be defined. It has generally been recognized that returning inflation to the target rate as quickly as possible would not necessarily be optimal; the focus has instead often been on ensuring that inflation should return to target *over some specified horizon*, where the horizon is chosen to be far enough in the future to ensure not only that inflation can actually be controlled with some accuracy over that horizon, but that always planning to return inflation to the target rate over that horizon should not require excessively sharp adjustments of real variables, while it is still near enough to maintain a reasonably tight bound on the implied variability of the inflation rate around its target value. (Typically, horizons two to three years in the future have been considered suitable.)

However, early discussions of forecast targeting in this vein still often sought to make it possible for a central bank to make a separate interest-rate decision at each decision point without prejudging future policy decisions. For example, the Bank of England's forecast-targeting procedure (Vickers, 1998; Goodhart, 2001) was described as being based on a *constant-interest-rate* forecast, in which forward paths for inflation and other variables were projected under the assumption of a constant value for the policy rate over the forecast horizon. Letting $F_{t,t+8}(i)$ be the forecast of π_{t+8}, the inflation rate eight quarters in the future, under the assumption that the policy rate is kept at an arbitrary level i until then,[2] then the procedure was described as choosing at each decision point an operating target it for the policy rate so as to ensure that

$$F_{t,t+8}(i_t) = \pi^*. \tag{1.4}$$

The policy decision was then justified to the public by presenting, at the beginning of each issue of the Bank's *Inflation Report*, a figure showing the projected path of inflation under the constant-interest-rate assumption, with the interest rate at the level chosen in the most recent meeting of the Monetary Policy Committee. (The projection was presented in the form of a "fan chart," showing a probability distribution for future inflation outcomes at each horizon, rather than a point forecast.) This figure always included a horizontal line at the target inflation rate, and a dashed vertical line at the horizon eight quarters in the future, so that the eye could easily determine the extent to which the projection was consistent with the target criterion (1.4), by observing whether the modal predicted path of inflation passed through the intersection of the two lines.

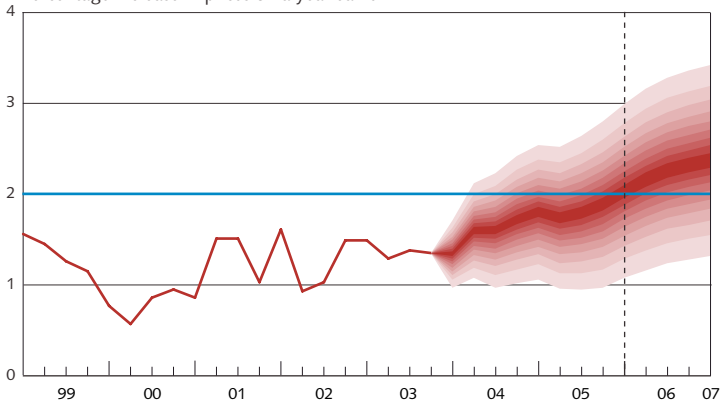
This approach had the advantage of allowing an interest-rate decision to be made at each decision point without requiring any explicit consideration of current intentions with regard to future policy. It also had the advantage of allowing definite decisions to be made

2 Note that this formulation of the exercise is only possible under the assumption that a purely backward-looking model is used to forecast inflation, as was the case at the Bank of England at the time. A similar approach to inflation-forecast targeting was used for some years by Sveriges Riksbank as well (Jansson and Vredin, 2003).

about the appropriate current level of the policy rate, by making even a quarter-percent change appear quite consequential, insofar it is treated as a *permanent* change of that size in the projection exercise, rather than only a change in the target to be pursued until the next meeting. Nonetheless, there were serious conceptual problems with the approach (Goodhart, 2001; Leitemo, 2003; Honkapohja and Mitra, 2005; Woodford, 2005).

While the assumption of a future policy rate at the same level as the current operating target might seem a natural one, at least in the absence of clear reasons to expect the future to be different from the present, it is actually not at all sensible to suppose that short-term nominal interest rates should remain fixed at some level, regardless of how inflation or other variables may evolve. Indeed, in forwardlooking (rational-expectations) models of the kind that are now often used by central banks, the assumption of a constant nominal interest rate typically implies an indeterminate price level, so that it becomes impossible to solve uniquely for an inflation forecast under any such interest-rate assumption.[3] In models with backward-looking expectations, the model can be solved, but such policies often imply explosive inflation dynamics. Such difficulties appears to have been a frequent problem with the constant-interest rate projections of the Bank of England (Goodhart, 2001), which often showed the inflation rate passing through the target rate at the eight-quarter horizon, but not converging to it. Figure 1 provides an example. In such a case, it is not obvious why anyone should believe that policy is consistent with the inflation target, or expect that inflation expectations should be anchored as a result of a commitment to such a policy.

Figure 1. The Bank of England's February 2004 CPI projection under the assumption of a constant 4.0 percent interest rate
Percentage increase in prices on a year earlier



Source: Bank of England, *Inflation Report*, August 2004

The most fundamental problem, however, is the internal inconsistency involved in the sequential application of such a procedure. The usefulness of a forecast-targeting procedure as a way of creating confidence that the inflation target should be expected to be satisfied

3 See Woodford (2003, chap. 4) for examples of this problem.

in the medium run – so that it should serve to anchor medium-run expectations – depends on the public's having reason to suppose that the central bank's projections do indeed represent reasonable forecasts of the economy's future evolution. But among the possible grounds for doubt is a tension inherent in the logic of a forecast-targeting procedure itself. Production of projections of the economy's evolution years into the future requires that the central bank make assumptions about the path of policy variables, such as nominal interest rates, not merely in the immediate future, but over the entire forecast horizon (and even beyond, in the case of a forward-looking model). But while the projections must specify policy far into the future each time they are produced, in each decision cycle policy is only *chosen* for a short period of time (say, for the coming month, after which there will be another decision).

This raises a question as to whether this decision procedure should be expected to actually produce the kind of future policy that is assumed in the projections. One might imagine, for example, a central bank wishing always to choose expansionary policy at the present moment, to keep employment high, while projecting that inflation will be reduced a year or two in the future, so that the expectation of disinflation will make it possible to have high employment with only moderate inflation. But if the procedure is one in which the disinflation is always promised two years farther in the future, private decisionmakers have no reason ever to expect any disinflation at all.

Thus a requirement for credibility of the central bank's projections is that the forecast-targeting procedure be *intertemporally consistent.* This means that the future policy that is assumed in the projections should coincide with the policy that the procedure itself can be expected to recommend, as long as those aspects of future conditions that are outside the control of the central bank turn out in the way that is currently anticipated. But the approach to forecast-targeting represented by requirement (1.4) fails to satisfy this criterion.

The problem is that there will often be no reason to expect interest rates to remain constant over the policy horizon. Indeed, constant-interest rate projections themselves often imply that the people making the projections should not expect the interest rate to be maintained over the forecast horizon. Consider, for example, the inflation projection shown in Figure 1, a constant-interest rate projection on the basis of which the February 2004 Bank of England *Inflation Report* concluded that a 4 percent policy rate was appropriate at that time.[4] The figure shows that under the assumption of a constant 4 percent policy rate, consumer price inflation was projected (under the most likely evolution, indicated by the darkest area) to pass through the target rate of 2.0 percent at the eight-quarter horizon (indicated by the vertical dashed line), and then to continue rising in the following year.

It follows that if the policy rate were to be held at 4 percent for a year, the Bank's expectation in February 2004 should have been that (under the most likely evolution, given what was known then) in February 2005 a similar exercise would forecast consumer price

4 In the February Report, only the projection up to the 8-quarter horizon was shown. The figure that has been extended to a horizon 12 quarters in the future is taken from the August 2004 *Inflation Report*, in which the Bank explained its reasons for abandoning the method of constant-interest-rate projections.

inflation to pass through 2.0 percent at the one-year horizon, and to exceed 2.0 percent during the second year of the projection. Hence, the Bank has essentially forecasted that in a year's time, under the most likely evolution, the policy committee would have reason to raise the policy rate. Thus the February 2004 projection itself could have been taken as evidence that the Bank should not have expected the policy rate to remain at 4 percent over the following eight quarters.

As these issues have come to be understood, a number of central banks that formerly relied upon constant-interest-rate projections (including the Bank of England, since August 2004) have switched to an alternative approach. This is the construction of projections based on *market expectations* of the future path of short-term interest rates, as inferred from the term structure of interest rates and/or futures markets. In the case that the projections constructed under this assumption satisfy the target criterion, the correct current interest-rate decision is taken to be the one consistent with market expectations. The use of projections based on market expectations allows a central bank to avoid assuming a constant interest rate when there are clear reasons to expect rates to change soon, while still not expressing any view of its own about the likely future path of interest rates.

But the market expectations approach does not really solve the problem of internal consistency just raised.[5] One problem is that market expectations can at most supply a single candidate forward path for policy; it is not clear what decision one is supposed to make if that path does *not* lead to projections consistent with the target criterion. Thus the procedure is incompletely specified; and if it is only the projections based on market expectations that are published, even though the central bank has chosen to contradict those expectations, the published projections cannot be expected to shape private decisionmakers' forecasts of the economy's evolution.

Moreover, even if the forward path implied by market expectations does lead to projections that fulfill the target criterion, the exercise is not intertemporally consistent if this path does not in fact correspond to the central bank's *own* forecast of the likely future path of interest rates. Why should it count as a justification of a current interest-rate decision that this would be the first step along a path that would imply satisfaction of the target criterion, but that the central bank does not actually expect to be followed? And why should anyone who correctly understands the central bank's procedures base their own forecasts on published projections constructed on such an assumption?

SEQUENTIAL CHOICE OF A FORWARD PATH

In fact, there is no possibility of an intertemporally consistent forecast-targeting procedure that does not require the central bank to *model its own likely future conduct* as part of the projection exercise. Approaches like both of those just described – which introduce an artificial assumption about the path of interest rates in order to allow the central bank to

5 For further discussion of problems with this approach, see Woodford (2005) and Rosenberg (2007).

avoid expressing any view about policy decisions that need not yet be made – necessarily result in inconsistencies. Instead, a consistent projection exercise must make assumptions that allow the evolution of the central bank's policy instrument to be projected, along with the projections for inflation and other endogenous variables.

In such a case, it would be possible, but somewhat awkward, for the central bank to remain silent about the implications of its assumptions for the forward path of interest rates; and so it is natural to include an interest-rate projection among the projections that are discussed in the *Monetary Policy Report*. This has been done for the past decade now by the Reserve Bank of New Zealand, and is now done by Norges Bank (since 2005) and the Riksbank (since 2007) as well. In the case of the latter two central banks, "fan charts" (similar to the one shown in Figure 1) are presented for the policy rate; this (among other things) makes it clear that the path is simply a forecast, rather than a definite intention that has already been formulated, let alone a promise.

But how should future policy be specified in such an exercise? It is sometimes suggested that the monetary policy committee should conceive of its task as the choice of a *path* for interest rates, rather than a single number for the current operating target, in each decision cycle. Discussions of the feasibility of such an approach have often stressed the potential difficulty of committee voting on a decision with so many dimensions.[6] And when announcing its intention to begin publishing its own view of the path of the policy rate, the Riksbank (Rosenberg, 2007) indicated that it would publish "forecasts ... based on an interest-rate path chosen by the Executive Board."[7]

However, the idea that one should simply ask the policy committee to decide which forward path for interest rates they prefer, presumably after asking their staff to produce projections for other variables conditional on each path that is considered, is problematic on several grounds that have nothing to do with the complexity of the decision or the need for a committee to agree among themselves. First of all, the specification of future policy by a simple path for a short-term nominal interest rate, independently of how endogenous variables may develop, is never a sensible choice, and is unlikely to lead to well-behaved results in a sensible model. (The problems mentioned above in connection with the assumption of a constant interestrate path apply equally to *any* specification of an exogenous path; they do not result from the assumption that the interest rate does not vary with time, but from the assumption that it is independent of outcomes for inflation and other variables.) Moreover, the assumption of a specific path for interest rates, unaffected by future shocks, would seem to require one to publish a specific path for this variable, alongside the fan charts for variables such as inflation; but this would encourage the

6 See, for example, Goodhart (2005) for a skeptical view; Svensson (2007) responds by proposing a voting mechanism intended to overcome potential intransitivities in majority preferences over alternative paths.

7 It is likely, of course, that this was only a loose way of speaking in a statement intended for a non-technical audience, and that the intention was to indicate that the Executive Board would have to endorse the assumptions about future policy involved in generating projections of an endogenous interest-rate path. The change in procedure does seem to have meant that the Executive Board is now required to approve the assumptions made in the projections in a way that was not previously true; this has made it necessary to allow for possible revisions in the projections following the meeting at which the policy decision is made.

dangerous misunderstanding that the bank has already committed itself to follow a definite path long in advance.

Even supposing that these technical issues have been finessed,[8] there remains the more fundamental problem of the intertemporal consistency of the procedure. Here it is important to realize that the mere use of a *consistent criterion* over time to rank alternative projected paths for the endogenous variables – not just a criterion that provides a transitive ordering of outcomes within each decision cycle, but one that ranks different possible paths the same way, regardless of the date at which the decision is being made – is not enough to ensure intertemporal consistency, in the sense defined above. Thus the problems of choosing a forward path for policy are not resolved simply by asking the members of the policy committee to agree on a loss function that they will then use (for an entire sequence of meetings) to rank alternative possible outcomes, as proposed by Svensson (2007).

Even in the case of a single decisionmaker who minimizes a well-defined loss function that remains the same over time, using a correct economic model that also remains the same over time, and who never makes any calculation errors, the choice of a new optimal path for policy each period will not general lead to intertemporal consistency. For in the case of a forward-looking model of the transmission mechanism, the procedure will lead to the choice of a forward path for policy that one will not be lead by the same procedure to continue in subsequent decision cycles, even if there have been no unexpected developments in the meantime.

The reason is the same as in the celebrated argument of Kydland and Prescott (1977) for the "time inconsistency of optimal plans": the forward path chosen at one time will take account of the benefits at earlier dates of certain expectations about policy at the later dates, but as the later dates approach (and the earlier expectations are now historical facts), there will no longer be a reason to take into account any effect of the policy chosen for those dates on earlier expectations. This problem does not arise solely in connection with the bias in the average rate of inflation chosen by a sequential optimizer, as in the example of Kydland and Prescott (1977). One may solve the problem of "inflationary bias" by assigning the central bank a loss function in which the target level of the output gap is not higher than the level consistent on average with its inflation target, but the optimal dynamic responses to shocks are still not generally the ones that would be chosen under sequential (or discretionary) optimization.

8 For example, one might specify future policy by a policy rule, such a Taylor rule, with some number of free parameters that are optimized, in each decision cycle, so as to result in projections that are acceptable to the monetary policy committee. If only rules that are considered that imply a determinate equilibrium, the first problem is avoided. And since the rule that is chosen would make the interest rate endogenous, an assumption about the distribution of shocks in each future period would result in a probability distribution for future interest rates, just as for the future inflation rate.

USING A TARGET CRITERION TO DETERMINE THE FORWARD PATH

An alternative approach, that avoids this problem, is to determine the forward path of policy as that path which results in projections that satisfy a *sequence* of quantitative target criteria, one for each of a sequence of future horizons. It is true that a *single* criterion – say, involving the projections for 8 quarters in the future only – can determine only a single dimension of policy, and thus can only determine an entire path if one is constrained to consider only a one-parameter family of possible paths (such as constant-interest-rate paths). But a sequence of similar criteria can independently determine the stance of policy at each of a sequence of dates, and thus can determine the entire forward path of policy. Moreover, if the sequence of target criteria for different horizons are of the *same form* – i.e., if the target criterion is independent of the horizon – then the forecast-targeting procedure will be intertemporally consistent.

As a practical example, consider the targeting procedure used by Norges Bank in 2005-06. Each issue of the Bank's *Inflation Report* included a box labeled "Criteria for an appropriate future interest rate path."[9] According to the first of the criteria listed, "inflation should be stabilized near the target [i.e., 2.5 percent per year] within a reasonable time horizon, normally 1-3 years," and moving *toward* that target rate even sooner. This criterion alone would sound similar to the Bank of England target criterion mentioned above, except with greater vagueness about the horizon. But there is then a second criterion: that "the inflation gap [the amount by which actual inflation exceeds the medium-run target rate] and the output gap should be in reasonable proportion to each other until they close," and in particular that the two gaps "should normally not be positive or negative at the same time."

The second criterion indicates not only what the projections should look like in some medium run, but also what the *transition path* should look like: there should be an inverse relation between the inflation gap and the output gap, with the two gaps shrinking to zero together. In order to allow visual inspection of the extent to which the projections satisfy this criterion, Norges Bank presents a figure in which the projections for its preferred measures of inflation[10] and of the output gap are superimposed. A criterion of this kind can determine the entire forward path for policy. And with such a criterion, it is not necessary to specify independently the rate at which the inflation rate should be projected to approach the target rate; the appropriate rate is exactly the rate that allows the output gap to remain in the desired proportion to the inflation gap. (Under such a criterion, the inflation gap *will* be projected to close eventually, as long as it is not possible to have a non-zero permanent output gap.)

9 The criteria used starting in 2005, when Norges Bank first began to announce a forward path for the policy rate as part of its explanation of its recent policy decisions, are discussed in more detail in Qvigstad (2006). Beginning with the 2007/1 issue of the Bank's Monetary Policy Report, the description of the criterion used to select the forward path of policy has been less explicit; see Qvigstad (2008) for a more recent discussion of the criteria.

10 The inflation measure emphasized by Norges Bank in its targeting procedure, CPI-ATE, is a consumer price index that is adjusted for tax changes and energy prices.

The criterion just cited applies to each of a sequence of future horizons. It can be represented formally as the requirement that

$$(\pi_{t+h,t} - \pi^*) + \varphi x_{t+h,t} = 0 \tag{1.5}$$

for each horizon $h \geq \underline{h}$, for some coefficient $\varphi > 0$. Here $y_{t+h,t}$ denotes the projected value at date t of some variable y, at a horizon h periods in the future; $\underline{h} \geq 0$ indicates the shortest horizon at which it is still possible for policy to affect the projections, and I shall assume that a sequence of criteria (1.5) for $h \geq \underline{h}$ suffices to uniquely determine the acceptable projections (including an implied forward path for policy).[11]

Suppose also that the central bank's forecast of its own forecasts in future decision cycles satisfy the principle that one should expect one's future forecasts to be the same as one's current forecasts (except, of course, as a result of developments that cannot currently be foreseen), so that

$$[y_{t+h_2,t+h_1}]_{,t} = y_{t+h_2,t}$$

for any horizons $h_2 \geq h_1 \geq 0$. Then if at date t a forward path for policy is chosen that leads to projections satisfying (1.5) for each $h \geq \underline{h}$, it should also be projected at that time that at any later date $t + h_1$, the continuation of that same path should lead to projections satisfying a corresponding sequential criterion, since at date t the bank should project that

$$[(\pi_{t+h_2,t+h_1} - \pi^*) + \varphi x_{t+h_2,t+h_1}]_{,t} = 0$$

for all horizons $h_2 \geq h_1 + \underline{h}$. This makes the procedure of choosing a forward path for policy on such a basis intertemporally consistent.

I believe that this kind of targeting procedure provides the most appealing solution to the problem of intertemporal consistency. The way in which the target criterion is used to determine an appropriate forward path for policy is essentially the same as under the procedure used by the Bank of England prior to 2004, as discussed above, except without either the arbitrary emphasis on a single horizon or the arbitrary restriction to forward paths for policy involving a constant interest rate. Since forecast-targeting central banks already publish charts showing their projections for each of a sequence of future horizons, rather than only presenting a set of numerical forecasts for a specific horizon, discussion of a target criterion that should apply at each horizon is fairly straightforward within the existing frameworks for deliberation and communication about policy, as the example of Norges Bank shows. Moreover, both Norges Bank and the Riksbank now discuss quite explicitly the fact that their targeting procedures involve the choice of a forward path for policy, and publish "fan charts" for the paths of short-term nominal interest rates implicit in their projections. Hence this aspect of the recommended approach is entirely possible within the context of existing procedures as well.

11 See Svensson and Woodford (2005) for algebraic analysis of a specific example. In the case considered there, prices and spending decisions are each predetermined a period in advance, so that $\underline{h} = 1$.

The main practical obstacle to such an approach, I believe, is that it would require a central bank to adopt a highly structured approach to policy deliberations, and to describe that approach rather explicitly to the public. It would require the bank to be more open about its own view of the likely future evolution of policy than even some forecast-targeting central banks have been willing to be thus far. And it would require the bank to discuss explicitly the nature of the trade-offs that determine an acceptable transition path following a disturbance, and not merely the nature of the "medium-run" targets that one hopes to reach some years in the future.

The latter goal will almost surely require that a bank be explicit about the ways in which projections for variables other than a single measure of inflation are relevant to judgments about the appropriate stance of policy. Even though all inflation-targeting central banks appear to care about projections for real variables as well as inflation, many have been quite cautious about discussing the way in which this may factor into their policy decisions. But this would have to be different if forecast targeting were to be adopted by an institution with a "dual mandate" like the U.S. Federal Reserve (at least, in the absence of a substantial modification of the Federal Reserve Act by Congress). And even in the case of other central banks, I believe that it would greatly enhance the transparency of policymaking – and ultimately, the credibility of their commitments to inflation control, by making clearer the extent to which temporary failures to return inflation immediately to its medium-run target level are nonetheless consistent with a systematic approach to policy that does indeed guarantee stability of inflation over the medium run.

WHICH FORM OF TARGET CRITERION?

These general considerations do not mean that the specific form of target criterion (1.5) used by Norges Bank in the period just cited is necessarily the one that should be adopted. In the context of a simple New Keynesian DSGE model, one can show (Woodford, 2003, chap. 7) that an optimal policy commitment involves maintaining proportionality, not between deviations of the inflation rate from its long-run target and the output gap, but between deviations of the inflation rate from target and the *change* in the output gap. That is, rather than requiring that $(\pi_t - \pi^*) + \varphi x_t$ be projected to equal zero at all future horizons, one should commit to a forward path of policy under which $(\pi_t - \pi^*) + \varphi(x_t - x_{t-1})$ is projected to equal zero at all horizons.[12] Like Norges Bank criterion, this one implies that both inflation and the output gap should be stabilized, in the absence of "cost-push shocks" that make the two stabilization goals mutually incompatible; and that in the event of such a disturbance, both the inflation gap and the output gap should be allowed to vary, each in order to reduce the amount of adjustment that is required by the other.

12 Svensson and Woodford (2005) extend this analysis to an arguably more realistic model in which monetary policy changes can affect inflation and output only with a one-period lag, and show that a target criterion of the same form continues to characterize optimal policy, except that the criterion must be projected to hold only at horizons one period or farther in the future.

The dynamic criterion differs from Norges Bank criterion, however, in that it implies that if inflation is allowed to increase, and the output gap to decrease, in response to a positive cost-push shock, a *below-target* inflation rate should subsequently be aimed at, as the output gap returns to its normal level (since the output gap is then *increasing*), rather than continuing to aim at an inflation rate *above target* (because the output gap remains negative, albeit to a decreasing extent). If the dynamic response is credible, an expectation of subsequent disinflation should reduce incentives for wage and price increases during the period of the cost-push shock, at any given level of economic activity, and so should shift the short-run Phillips curve tradeoff in a way that tends to offset some of the effects of a cost-push shock. This allows a superior degree of achievement of the stabilization objectives than would be possible under Norges Bank criterion.

An alternative way of seeing the difference between the two target criteria is to note that the dynamic criterion can alternatively be expressed in a *level* form, as a requirement that the condition

(1.6) $$p_t + \varphi x_t = p_t^*$$

be projected to be satisfied at all future horizons, where p_t is the log of the general price, and p_t^* is a deterministic target path for the log price level, growing at a constant rate π^* each period. Satisfaction of (1.6) each period would imply that

(1.7) $$\pi_t + \varphi(x_t - x_{t-1}) = \pi^*$$

each period, and vice versa, assuming that the initial level p^* for the target path is chosen so that (1.6) is satisfied by the (historically given) data for the period just before the first period in which either of the target criteria will be enforced.

But (1.6) and (1.7) are only equivalent under the assumption that either target criterion can be precisely satisfied by the realized values of inflation and the output gap each period. Under the more realistic assumption that target misses of some size will constantly occur, even if the target criterion is *projected* at each decision point to be satisfied in all future periods. That is, the requirement that a central bank's projections satisfy

(1.8) $$[(\pi_{t+h} - \pi^*) + \varphi(x_{t+h} - x_{t+h-1})]_{,t} = 0$$

for all horizons $h \geq 0$ at each decision point t is not equivalent to requiring them to satisfy

(1.9) $$[(p_{t+h} - p_{t+h}^*) + \varphi x_{t+h}]_{,t} = 0$$

each period. In the former case, the target p_t^* for the "output-gap adjusted price level" $p_t + \varphi x_t$ used in period t is effectively adjusted, relative to the target for the same variable used in the period $t-1$ projection exercise, by an amount equal to the target miss $p_{t-1} + \varphi x_{t-1} - p_{t-1}^*$ in the previous period; in the latter case, instead, the target path $\{p_t^*\}$ remains predetermined. Thus the "level" version of the target criterion incorporates a commitment to subsequent correction of past target misses, while the first-differenced (or "growth-rate") version does not.

Such a commitment to error-correction increases the robustness of the forecasttargeting procedure to errors of judgment on the part of the central bank.[13] There is less reason to worry that a sustained departure of the actual inflation rate from the target rate can occur, simply as a result of a persistent bias in the central bank's inflation forecast, that allows it to project at each decision point that (1.7) will be satisfied, though in fact the output-gap-adjusted inflation rate (i.e., the left-hand side of (1.7)) exceeds π^* each period. Under the level version of the target criterion, a positive overshoot in one period requires the central bank to aim for an output-gapadjusted inflation rate in subsequent periods that is *less* than π^*, and subsequent overshooting in the same direction (resulting from a systematic bias in the central bank's projections) will further increase the size of the correction that is called for. Eventually, the central bank will be required to aim at a value of the gap-adjusted inflation rate that is sufficiently far below π^* that the actual outcome will not exceed π^* on average, even given the bias in the central bank's projections.[14]

Hence continuing excess inflation will not result, even if the bias in the central bank's projections is never recognized and corrected by adjustment of the forecasting model. And even assuming eventual learning on the part of the central bank, the losses that result while the learning takes place are reduced in the case of a forecasttargeting exercise using criterion (1.6) rather than (1.7), as shown in a quantitative example by Aoki and Nikolov (2005).

A level version of the target criterion is also more robust to the occurrence of target misses owing to factors outside of the central bank's control, as opposed to errors in the central bank's forecasts. These include the fact that, inevitably, the central bank must choose its instrument setting without full information about the values of the current structural disturbances, so that even if the criterion is (correctly) projected to hold, conditional on the information available to the monetary policy committee at the time of its decision, the actual values of the structural disturbances not exactly known to the committee will almost certainly result in its not holding exactly.[15]

Woodford (2011) discusses how to characterize an optimal policy commitment under such an informational constraint, and shows that it involves a commitment to error-correction of the same sign as automatically occurs under a level criterion such as (1.6).[16] The same result applies when the failure to achieve the target criterion results from a constraint on the degree to which the policy instrument can currently be moved, rather

13 See Woodford (2011, 2012a) for further discussion of this issue.

14 Svensson (2012) also discusses the advantages of a level target (a price level target, in his case), but suggests that "a less dramatic change" would be to target a five-to ten-year moving average of inflation, as proposed by Nessen and Vestin (2005). Proposals of this kind have similar virtues as a level target, though I believe that a level target would be simpler both to implement and to explain.

15 For example, Gorodnichenko and Shapiro (2006) discuss the advantages of a level target in minimizing the effects of mis-estimation of the output gap.

16 The optimal commitment actually involves a slightly *stronger* degree of error-correction than the level criterion prescribes; when imperfect information results in a gap-adjusted inflation rate higher than π^*, the subsequent target should be reduced by an amount slightly *greater* than the size of the target overshoot, though the multiplicative factor approaches 1 as the rate of time discounting in the central bank's stabilization objective approaches zero. Even allowing for discounting, errorcorrection of the kind prescribed by the level version of the full-information optimal target criterion is clearly desirable relative to the criterion with no such correction at all.

than a lack of more precise information about how it should be set. Hence there are substantial advantages to the level version of the target criterion when the central bank is constrained by an effective lower bound on the level of its policy rate, as discussed in the second section.

The numerical value of the coefficient φ in the target criterion (1.6) that is best depends on the relative importance assigned to inflation stabilization and output-gap stabilization respectively.[17] In the case that $\varphi=1$, the proposed target criterion has an especially simple interpretation, as it can alternative be written in the form

(1.10) $$Y_t = Y_t^*,$$

where $Y_t \equiv p_t + y_t$ is the log of nominal GDP (if y_t is the log of real GDP), and the target Y_t^* is given by

(1.11) $$Y_t^* = y_t^n + \pi^* \cdot t,$$

where y_t^n is the log of the natural rate of output (so that the output gap is defined as $x_t \equiv y_t - y_t^n$). In this case, the target criterion can be expressed as a target path for the level of nominal GDP, a concept that is easier to explain than a target path for the output-gap-adjusted price level. Setting the coefficient φ equal to 1 might be viewed as representing a "balanced approach" to the dual goals of inflation and output-gap stabilization, and avoids the need to justify using a particular numerical value in the criterion (1.6). Hence this particular form of intermediate target criterion is likely to be an especially practical way of achieving the general objectives discussed above.

Forward guidance at the interest-rate lower bound

Thus far I have discussed reasons for a central bank to be explicit about its intended future conduct of policy – both in its internal deliberations and in its explanations of its policy decisions to the public – as a routine element of the conduct of monetary policy. But there are special reasons for explicit discussion of future policy in the case that a central bank reaches the effective lower bound for its policy rate, as has occurred for a number of central banks since the fall of 2008.[18] It is no accident that these circumstances have resulted in increased interest in explicit forward guidance as a policy tool.

There are two main advantages for a central bank from talking explicitly about its future policy, rather than simply allowing the public to form its own expectations about policy on the basis of observed behavior. First of all, in the absence of explanations by the

17 Woodford (2003, 2011) shows how the optimal coefficient depends both on the coefficients of the policymaker's loss function and the slope of the Phillips-curve tradeoff.

18 In some cases, like those of the U.S. Federal Reserve, the Bank of England, and the Bank of Japan, banks have kept their policy rates at levels that they have regarded as lower bounds continuously since late 2008 or early 2009, without achieving a degree of expansion of aggregate sufficient for full utilization of productive capacity, so that the question whether forward guidance can provide further stimulus continues to be relevant. In other cases, like those of the Bank of Canada and Sveriges Riksbank, effective lower bounds were reached in the first half of 2009, but the constraint remained relevant only during 2009-10.

central bank itself, misunderstandings of its policy intentions may easily develop, and this should not be left to chance, since uncertainty about how policy will be interpreted implies uncertainty about the effects of the policy. Explicit explanations of policy are most likely to be needed in unusual circumstances, or when a central bank intends to act in ways that could not easily be predicted from its previous behavior.

Hence it is not surprising that explicit forward guidance by central banks has increased precisely in a period when unprecedented policy actions are being taken, so that past rules of thumb are no longer adequate predictors of behavior. At the same time, a situation in which the current policy rate is constrained by floor on the level of short-term rates that the central bank is willing to contemplate[19] is also one in which expectational errors should be particularly costly. For one reason, the social cost of an expectational error that makes aggregate demand lower by a given number of percentage points (because of a mistaken expectation that future policy will be tighter than a correct forecast would have indicated) is greater, the greater the extent to which demand already falls short of the efficient level of activity. If a binding interest-rate lower bound results in a larger negative output gap than would be allowed to exist otherwise (since further interest-rate cuts would otherwise occur and reduce the gap), this is reason to be particularly concerned to minimize potential expectational errors at such a time.

In addition, in a situation where the policy rate is expected to remain fixed for a substantial period (because the interest-rate lower bound is expected to continue to bind), but the question is whether people have correct expectations about what will happen *after* that period, New Keynesian models typically imply that changes in expectations about what will happen after the several quarters of constant policy rate will have *larger* consequences for near-term aggregate demand and economic activity than if policy were expected to be conducted over that period in a "standard" way – in accordance with the Taylor rule, or with the reaction function of an inflation-targeting central bank under normal conditions – so that the policy rate would vary with economic activity and with inflation. If increased pessimism about future output or inflation does not lead to anticipated declines in the policy rate, owing to the expectation that the policy rate will already be at its lower bound, the resulting contraction in current demand – and hence the reduction in current output, employment and inflation – will be greater. Furthermore, to the extent that this mechanism is expected to result in lower output and inflation at future dates in the period when the lower bound still binds, such an expectation should produce even lower output and inflation, through a self-amplifying process.

19 The "effective lower bound" to which I refer here is not necessarily a technical constraint on the level of overnight interest rates that could be achieved. None of the central banks that I have described as constrained by their self-imposed lower bounds have actually reduced their targets for their policy rates all the way to zero, the rate of return on currency. (And some would question whether even zero is a genuine lower bound for overnight interest rates, given the existence of at least modest holding costs for currency.) Nonetheless, the floors were *treated* as lower bounds on the targets for the policy rate that would be considered, even if the constraints were prudential rather than technical in nature. The most commonly offered reason for not considering a further immediate cut in the policy rate has been concern for the consequences for private financial intermediaries of a complete elimination of any spread between the return on currency and money-market interest rates.

Hence output and inflation in a period when the lower bound is a binding constraint should be particularly sensitive to changes in expectations about macroeconomic conditions once the lower bound no longer prevents the central bank from achieving its normal stabilization objectives.[20] This explains the fact that in the numerical example of Eggertsson and Woodford (2003), even a commitment to a modestly expansionary policy after it would become possible to achieve the central bank's normal objectives has a dramatic effect on the severity of the output collapse and deflation that are predicted in the period when the interest-rate lower bound is binding.

A second reason why forward guidance may be needed – that again has particular force when the interest-rate lower bound is reached – is in order to facilitate *commitment* on the part of the central bank. As Krugman (1998) emphasizes using a simple two-period model, and Eggertsson and Woodford (2003) show in the con-text of a more fully articulated dynamic model, the future policy that one wishes for people to anticipate is one that the central bank will not have a motive to implement later, if it makes its decisions then in a *purely forward-looking* way, on the basis of its usual stabilization objectives. Hence a desirable outcome requires commitment, just as in the analysis of Kydland and Prescott (1977) – even though in this case, the problem is a lack of motive ex post to be as expansionary as one wanted people earlier to expect, rather than a lack of motive ex post to control inflation as tightly as one wanted them to expect. In practice, the most logical way to make such commitment achievable and credible is by *publicly stating the commitment*, in a way that is sufficiently unambiguous to make it embarrassing for policymakers to simply ignore the existence of the commitment when making decisions at a later time.

These considerations establish a straightforward case for the benefits that should be attainable, at least in principle, from the right kind of advance discussion of future policy intentions. On the other hand, some caution is appropriate as to the conditions under which such an approach should be expected to work. It does not make sense to suppose that *merely expressing* the view of the economy's future path that the central bank would currently wish for people to believe will automatically make them believe it. If speech were enough, without any demonstrable intention to *act* differently as well, this would be magic indeed – for it would allow the central bank to stimulate greater spending while constrained by the interest-rate lower bound, by telling people that they should expect expansionary policy later, and then also fully achieve its subsequent stabilization objectives, by behaving

20 The reason for this is closely related to the observation above that New Keynesian models commonly imply that a commitment to a fixed nominal interest rate forever results in indeterminacy of equilibrium. Mathematically, this indeterminacy reflects the fact that when the nominal interest rate is fixed and assumed not to vary with changes in output or inflation, the mapping from expected future macroeconomic conditions into current conditions has an eigenvalue greater than one, so that the deviation from steady-state values that must be expected a period in the future in order to generate a given size deviation from steady-state values now is smaller in magnitude than the current deviation that is produced. If the constant nominal interest rate is extended indefinitely into the future, this makes it possible for bounded departures from the steady-state values to be purely self-fulfilling. But even if the constant nominal interest rate lasts for only a finite time, the same result implies that small changes in expectations about conditions later can generate larger changes in current conditions.

in a way that is appropriate to conditions at the time and paying no attention to past forecasts. But there would be no reason for people believe central-bank speech offered in that spirit.

Hence it is important, under such an approach to policy, that the central bank not merely give thought to the future course of conduct that it would like for people to anticipate, and offer this as a forecast that it would like them to believe. It must also think about how it intends to approach policy decisions in the future, so that the policy that it wants people to anticipate will actually be put into effect, and about how the fact that this history-dependent approach to policy has been institutionalized can be made visible to people outside its own building. These matters are not simple ones, and require considerable attention to the way the central bank communicates about its objectives, procedures and decisions. The problem is all the more difficult when one must communicate about how an unprecedented situation will be dealt with.

DATE-BASED FORWARD GUIDANCE DURING THE RECENT CRISIS

As mentioned above, the global financial crisis that reached its most intense phase after the fall of 2008 resulted in many central banks slashing their policy rates to their effective lower bounds by early in 2009 (if not even sooner); yet economic activity remained far below potential and unemployment surged. The desire to provide further stimulus to aggregate demand other than through further cuts in the policy rate led to experimentation with a variety of types of "unconventional" policies, including unprecedented uses of explicit forward guidance. In particular, several central banks made statements indicating that they expected to maintain a fixed policy rate for a specific period of time. A particularly explicit example of forward guidance was the Bank of Canada's statement on April 21, 2009, which announced the following:

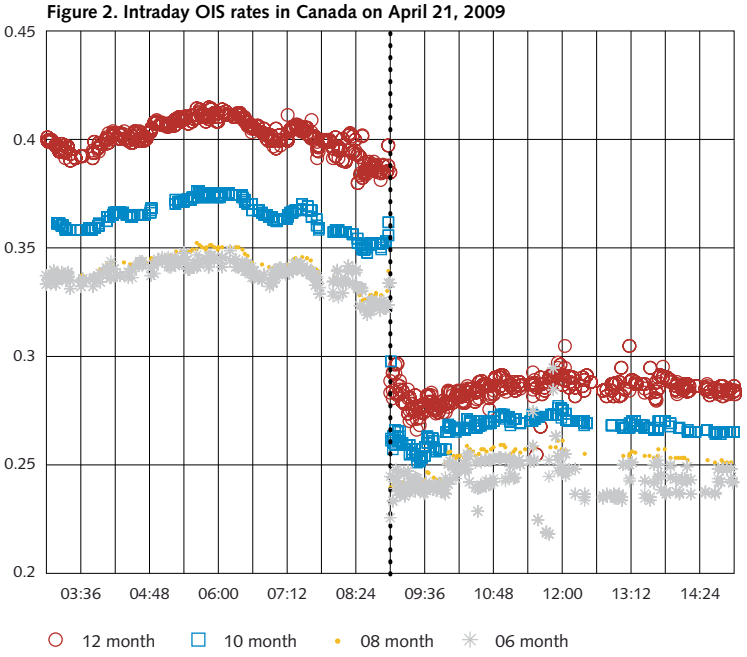
> The Bank of Canada today announced that it is lowering its target for the overnight rate by one-quarter of a percentage point to 1/4 per cent, which the Bank judges to be the effective lower bound for that rate… With monetary policy now operating at the effective lower bound for the overnight policy rate, it is appropriate to provide more explicit guidance than is usual regarding its future path so as to influence rates at longer maturities. Conditional on the outlook for inflation, the target overnight rate can be expected to remain at its current level until the end of the second quarter of 2010 in order to achieve the inflation target.

While the statement included the announcement of a reduction in the current target rate, it *also* offered explicit guidance about where the target should be expected to be, extending more than a year into the future. The release of the statement had an almost instantaneous effect on market expectations about the future path of the policy rate, as indicated by trading in overnight interest-rate swap (OIS) contracts (Figure 2).

The tick-by-tick transactions data plotted in the figure show that market OIS rates fell almost instantaneously at the time that the announcement was made (9:00 AM

EST, shown by the vertical line). Moreover, not only did OIS rates for maturities as long as six to twelve months fall, but the longer maturities *fell more*; that is, not only did the OIS yield curve fall in response to the announcement, but it also *flattened*. This implies either that expectations of policy rates for months in early 2010 fell even more than did nearer-term expectations, or that uncertainty about the path of the policy rate over the coming year was substantially reduced (reducing the term premium). Either of these interpretations could be a plausible consequence of the Bank's unprecedented (albeit conditional) commitment to a particular value for the policy rate over the coming year, on the assumption that it was (at least partially) *believed*. Instead, neither would be expected to follow from a simple announcement of a cut in the current policy rate, which would typically steepen the yield curve.[21]

Figure 2. Intraday OIS rates in Canada on April 21, 2009



Note. The dotted vertical line indicates the time of release of the Bank of Canada's announcement of its "conditional commitment" to maintain its policy rate target at 25 basis points through the end of the second quarter of 2010.

Source: Bloomberg

This seems a fairly clear example of interest-rate expectations being changed by explicit forward guidance from a central bank. It should not surprise one that the clearest such evidence occurs in the case where a central bank most clearly indicated its intention to provide such guidance – both referring to its statement as having made a "conditional

21 See Chehal and Trehan (2009) and Woodford (2012b) for further discussion of the effects of this announcement.

commitment"[22] rather than simply offering a forecast, and stating its intention to "provide more explicit guidance" in order to "influence [longer-term] rates."

The U.S. Federal Reserve has also made even more extensive use of date-based forward guidance in response to the crisis. In the case of the Fed, statements indicating an expectation that interest rates would remain low "for a considerable period" were first used as a substitute for further interest-rate cuts in 2003.[23] The FOMC began using similar language in its post-meeting statements as soon as its effective lower bound (a band between zero and 25 basis points for the federal funds rate target, with interest paid on reserves at 25 basis points) was reached in December 2008; at that time, it announced not only the target cut, but that it was expected to be maintained "for some time." In its statement of March 18, 2009, this declaration was strengthened (without any change in the target band), to state that conditions were likely to warrant a low funds rate "for an extended period." A more aggressive form of forward guidance was first adopted in the statement of August 9, 2011, in which the main news was the line: "The Committee currently anticipates that economic conditions… are likely to warrant exceptionally low levels of the federal funds rate at least through mid-2013." The forward guidance was further strengthened in the statement released on January 25, 2012, to say "… at least through late 2014." On September 13, 2012, the date was moved back to "at least through mid-2015," in addition to other changes in the forward guidance that are discussed further below.

As discussed in Swanson and Williams (2012), Woodford (2012b), and Raskin (2013), there is considerable evidence that these statements had substantial effects on market expectations regarding the future path of interest rates, particularly the ground-breaking introduction of reference to a specific date, nearly two years in the future, in August 2011. This includes high-frequency data on movements of the OIS yield curve around the announcements, similar to Figure 2; but it also includes survey evidence on professional forecasts of the future path of the federal funds rate, the implied probability distributions for future levels of the funds rate that can be inferred from market pricing of interest-rate options, and changes over time in the sensitivity of interest-rate futures prices to macroeconomic data releases (consistent with an acceptance that the funds rate was likely to remain pinned at the lower bound regardless of these developments).

DATE-BASED FORWARD GUIDANCE IN AN INFLATION-FORECAST TARGETING REGIME

The examples given in the previous section indicate that central-bank statements can influence the interest-rate expectations of market participants, in the case of central banks (such as the Bank of Canada and the Federal Reserve) that did not ordinarily offer guidance about the likely future path of their policy rates, outside of the unusual circumstances associated with reaching the interest-rate lower bound. But as discussed in the first section,

22 The word "commitment" was used in the title of the press release, as well as in the text.
23 See Woodford (2005) for a discussion of the earlier episode.

there is a case for the desirability of *routinely* publishing the central bank's projections of the forward path of the policy rate, as part of an inflation-forecast targeting procedure. If this is done, is there *also* room for forward guidance of the more special kind that the Bank of Canada and the Fed have sought to use, in the case that a bank finds itself constrained by the effective lower bound for its policy rate? The case of Sveriges Riksbank is of particular interest in this regard. As noted in the first section, the Riksbank has since February 2007 included in each issue of its *Monetary Policy Report* a projected forward path for the repo rate (the Riksbank's operating target for the overnight rate[24]), which is the ordinary instrument of policy. While in this sense the Riksbank had begun to routinely use forward guidance as a dimension of policy even prior to the global financial crisis, in the aftermath of the crisis the Riksbank has also announced on more than one occasion that its policy rate would remain fixed for a specified period of time, as a substitute for a larger immediate cut in the policy rate – a form of forward guidance with important similarities to the more *ad hoc* announcements discussed in the previous section.

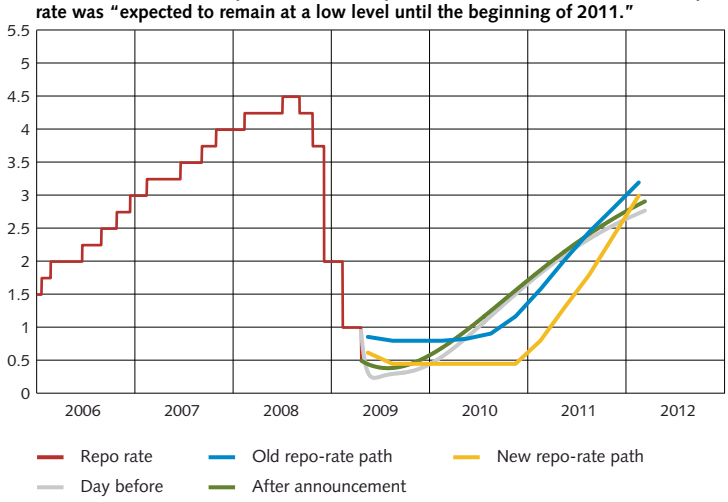
In a review of Sweden's experience, Deputy Governor Lars Svensson (2010) argues that, through December 2008, the Riksbank had been relatively successful at "managing expectations" through its policy. Often, he notes, market expectations were already fairly close to the announced forward path for the repo rate prior to the announcement, which he regards as an indication that the bank had succeeded in conducting a predictable policy and in making the systematic character of its policy evident to the public. "When there were some discrepancies," he writes, "in most cases the market adjusted its expectations towards the [announced] policy-rate path after the announcement" (p. 48).

The effects of the Riksbank's more recent experiments with announcements of an anticipated duration for the current repo rate have been more mixed.[25] On April 21, 2009 (a few hours before the Bank of Canada announcement discussed above), the Riksbank announced a cut of the repo rate to 50 basis points, together with a statement that "the repo rate is expected to remain at a low level until the beginning of 2011," a date nearly two years in the future. The statement was accompanied by the release of a *Monetary Policy Update*, with a projected forward path which showed the repo rate at a constant level of 50 basis points through the end of 2010, as shown in Figure 3.

24 It is called "the repo rate" because at one time the bank's policy was implemented through lending at that rate under repurchase agreements, though this is not currently the case. It now defines the center of a corridor for the overnight rate, 20 basis points in width, maintained by the Riksbank.

25 For the economic context of the experiments with forward guidance discussed here, and information about the Riksbank's other policy measures during the same period, see Elmér *et al.* (2012).

Figure 3. Market expectations of the forward path of the repo rate in Sweden, before and after the Riksbank's press release on April 21, 2009 that indicated that the repo rate was "expected to remain at a low level until the beginning of 2011."



Source: Sveriges Riksbank

The figure shows the actual path of the repo rate as a solid black line (a step function); the projected forward path from April onward that was published on April 21; the market expected forward path, as inferred by the Riksbank on the basis of interest-rate forward and swap rates[26] the day before the announcement; and the corresponding market expected forward path after the announcement.[27] Market participants evidently had expected an even larger cut in the repo rate than occurred, and for the repo rate to remain lower, at least for some months, than was indicated by the projected path. In response to the announcement, the market expected path rose, though still remaining lower than the path projected by the Riksbank, for the first few months after April. By early 2010, market participants had anticipated that the repo rate would already be rising above 50 basis

26 See Svensson (2010, footnote 7) for more details. The implied forward rates include corrections for credit risk and maturity premia. Of course, this represents only one possible measure of expectations regarding future Riksbank policy. Survey expectations provide another measure (also closely monitored within the bank); but these are not available at high enough frequency for the exercise undertaken in the figure. On the use of both measures by the Riksbank, see for example Elmér *et al.* (2012).

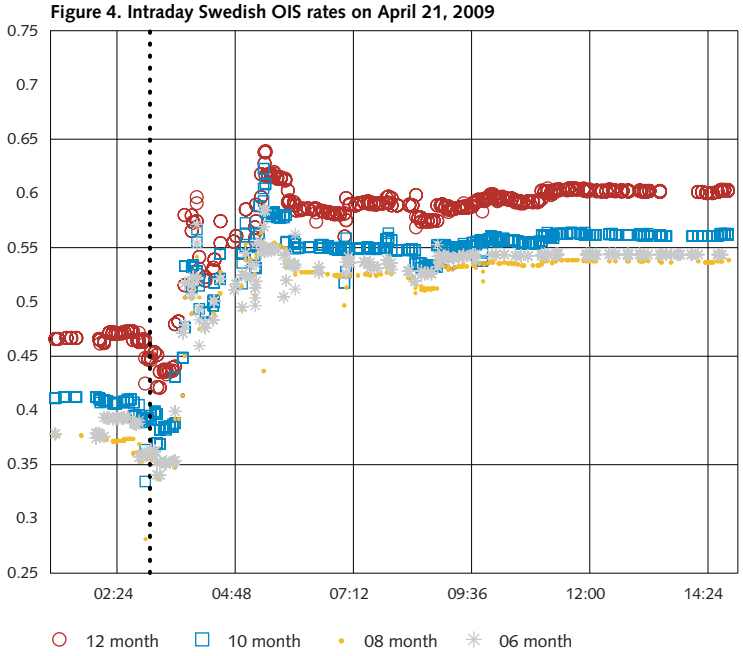
27 The figure also shows the Riksbank's previously announced repo-rate path, from February, so as to show to what extent the new path represented a change from the bank's own most recent forecast.

points, whereas the Riksbank projected it to remain at 50 basis points for another year; but in response to the announcement, the market expected path for 2010 rose still further.[28]

The result is that an announcement that was intended to shift *down* the anticipated forward path of rates, by announcing that a low rate would be maintained until the beginning of 2011, and so to immediately lower longer-term interest rates, had exactly the opposite effect: long rates rose, because the entire anticipated forward path of rates shifted *up*. What went wrong? While many things happened from one day to the next – as noted above, the Bank of Canada introduced its own "conditional commitment" six hours after the Riksbank's announcement – it seems clear that it was the Riksbank's announcement that moved market expectations. Figure 4 shows the intraday OIS rates for Sweden on April 21, with the time of the release of the *Monetary Policy Update* shown; the entire term structure of OIS rates moved up within two hours of the release, and well before any news from North America.

28 It is important to note that near the zero interest-rate lower bound, uncertainty about the future path of the policy rate is likely to have an asymmetric effect on the forward path that is inferred from forward and swap rates using the method employed in this figure: because it is possible for the rate to be higher than the path viewed as most likely, but not too much lower, the conditional expectation of the forward path is likely to lie above the path actually viewed as most likely by market participants. Hence the paths viewed as most likely by market participants, both before and after the announcement by the Riksbank, may well have been somewhat lower than those shown in the figure. This does not, however, change our conclusion that the market expected path rose in response to the announcement, rather than falling – unless, perhaps, one supposes that there was a substantial increase in uncertainty in response to the announcement. The latter interpretation would also indicate a failure of the Riksbank's forward guidance to be fully credible, albeit of a different sort than the one discussed in the text.

Figure 4. Intraday Swedish OIS rates on April 21, 2009



Note. The dotted vertical line indicates the time of the Riksbank's press release (9AM in Sweden, or 3AM EST).

Source: Bloomberg

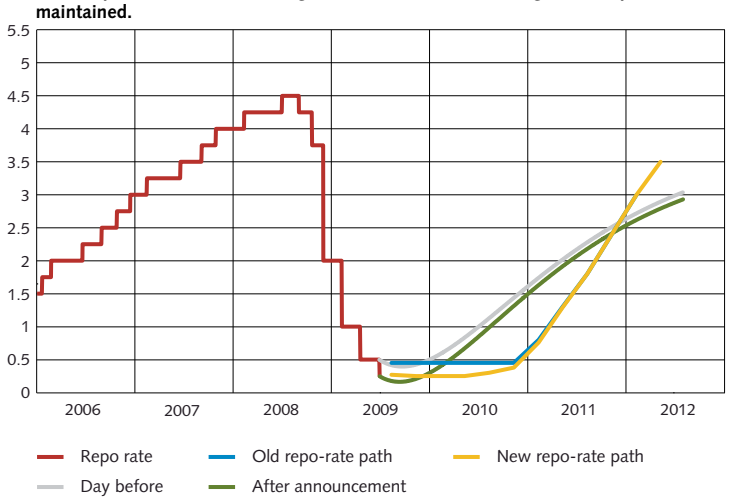
What seems to have happened is that market participants took on board *part* of the Riksbank's forward guidance, and modified their own forecasts to conform more with it: the projection of a path that never fell below 50 points convinced many that (contrary to prior expectations) the Riksbank would not cut the repo rate below that level. This implied an increase in the projected path for the next two quarters. But since the news, as far as market participants were concerned, was that the Riksbank was less inclined toward interest-rate cuts than they had supposed, the *entire* path was also shifted up.

In fact, the Riksbank's projected forward path contained *two* notable features: it was announced that the repo rate was projected to remain low for nearly two years into the future, *and*, quite remarkably relative to prior figures, it was projected to remain absolutely constant over that time – the only obvious reason for which would have to have been a decision to treat 50 basis points as the effective lower bound. It is true that the April *Monetary Policy Update* contained no announcement that this was a lower bound; it even referred to "some probability of further cuts in the future." But as Svensson (2010) notes, it also emphasized that "the repo rate is now close to its lower limit," and stated that "with a repo rate at this level, the traditional monetary policy has largely reached its lower limit." Moreover, immediately after admitting the possibility in principle of further cuts, it cautioned: "But when the repo rate is at such low levels, one must consider the fact that this could have negative effects on the functioning of the financial markets." It is

easy enough to see how market participants could have read such remarks as indicating an intention by the Riksbank not to reduce the rate below 50 basis points (at least, under any but exceedingly dire circumstances). Such an announcement would, of course, be precisely the sort that should most affect market expectations: because it was interpreted as revealing something not previously known about the central bank's *intentions* with regard to policy, rather than the central bank's judgments about the economic outlook – and so, a matter about which the bank could undoubtedly be regarded as the most knowledgeable authority.[29]

The Riksbank's other message – that it expected not to raise the repo rate before 2011 – evidently made less of an impression. One reason might have been an assumption that this reflected the Riksbank's pessimism about the Swedish economy, and market participants might have been more optimistic, and so expected rate increases to be justified sooner than the bank anticipated. Svensson (2010) argues instead that survey data on traders' forecasts of inflation and growth indicate that they were no more optimistic than the Riksbank, and hence that market participants simply did not accept the Riksbank's forecasts about *its own future approach to policy*.

Figure 5. Market expectations of the forward path of the repo rate in Sweden, before and after the Riksbank's press release on July 2, 2009, announcing an additional cut in the repo rate, and a shortening of the time that the low target was expected to be maintained.



Source: Sveriges Riksbank

Why might this have been? It is notable that a large (and persistent) discrepancy between the forward paths announced by the Riksbank and those expected by market participants appeared only when the Riksbank began attempting to use projections of a policy rate that would remain fixed for an unusually long time, as a consequence of having reached its (self-imposed) lower bound. One may conjecture that the Riksbank sought, as an

29 Nonetheless, the Riksbank did cut the rate further at its July meeting, as discussed below.

alternative to a deeper immediate interest-rate cut, to signal that rates would be kept low for a longer time than would ordinarily have been expected; and this supposition about future policy was incorporated into its projections. But this change in the assumption made about future policy was not credible to market participants, perhaps because no adequate explanation was given of how policy decisions would be made in the future. The mere fact that the Riksbank announced that it projected a low path for the repo rate until 2011 was not enough; market participants needed to have a view of how the Riksbank would make decisions in the future that would justify such a path (given their expectations regarding the economy's evolution), and evidently they were not provided with one.

In July 2009, the Riksbank announced a further cut in the repo rate, to 25 basis points, but now only indicated that the target was expected to remain at its low level "until autumn 2010." (This might be considered to vindicate skeptics who had not believed the April projection of a low rate through the beginning of 2011.) As shown in Figure 5, this announcement did shift down market expectations of the forward path,[30] but market participants continued to forecast that the repo rate would not remain at that level past the end of 2009, and expected it to be around 100 basis points by autumn 2010. (In fact, it was only raised to 50 basis points in July 2010 and to 75 basis points in September.) This apparent failure to credit the Riksbank's view of the length of time that the target would remain low made policy effectively tighter (in terms of its consequences for longer-term interest rates and hence for spending decisions) during 2009 than the Riksbank's projection assumed it would be.[31]

Why would statements of an apparently similar form by the Bank of Canada and the Federal Reserve have apparently had effects closer to those that were intended? A possible explanation is that forward guidance outside the context of routine predictions about the future path of interest rates is more easily interpreted as revealing central-bank *policy intentions*. Information about policy intentions is likely to affect the expectations of market participants more than information about the central bank's view of the economic outlook, because the way in which the bank intends to conduct policy is a matter about which the bank obviously knows more than do outsiders, no matter how closely they follow economic news. And a statement that is viewed as expressing a *commitment*, that by virtue of its having been stated should at least to some extent constrain future policy decisions, should be most informative of all.

The Bank of Canada's "conditional commitment" in April 2009 seems to have been one of the examples of forward guidance that most clearly changed market expectations, and this is also the case in which a central bank came closest to committing itself

30 It is difficult to be certain how much of the reduction in expectations of the forward path should be attributed purely to the Riksbank's forward guidance regarding the repo rate, and how much might instead be due to signalling effects of the Riksbank's announcement at the same time of its intention to offer fixed-rate loans, with a maturity of a year, at a rate consistent with its declared intentions regarding the repo rate. For a discussion of the Riksbank's loan policies, their possible signalling effects, and an assessment of their quantitative effects, see Elm«er et al. (2012).

31 Similar credibility problems persisted once the Riksbank began tightening policy again, as discussed in Svensson (2011) and Woodford (2012b).

to a future course of action. The Bank of Canada did not shy away from using the word "commitment" in its press release, even if this was qualified by the word "conditional," and the nature of the conditionality was not fully spelled out. Other central banks, such as the Federal Reserve, have not gone as far; the FOMC's statements have referred only to what the Committee currently anticipates that future conditions will warrant. Yet even in these cases, observers may well have assumed that the unusual announcement made sense only if interpreted as a commitment, and indeed a good deal of commentary interpreted the FOMC's statements this way (and discussed whether the supposed promise was credible). To the extent that reasons are given for a commitment to make sense – as in the case of the Bank of Canada's explicit reference to its desire to "influence rates" through "forward guidance" – the interpretation as a commitment is also more likely.

Releases of central-bank projections of the path of interest rates, in the context of a more general discussion of the central bank's forecast of the economy's evolution over the next few years, are less susceptible to interpretation as a commitment, or even as an expression of a definite intention about future policy that has already been formed. Apart from the fact that the central banks that use this communication strategy take pains to emphasize in the accompanying text that their projections for the policy rate are merely forecasts conditional on current information, the format in which the projections are presented also makes this evident. But to the extent that such projections are viewed simply as following from the bank's forecast of the economy's evolution, including a forecast of the evolution of the policy rate given how it is typically adjusted in response to varying economic conditions, then they provide news that should change other market observers' forecasts of the future path of interest rates *only* to the extent to which they are thought to reflect superior information about the economic outlook that is available to the central bank. Other close observers of the economy may or may not believe this is true; and even when they do believe they can learn something from what the central bank reveals about its information, their own assessment of the best forecast will in general not put a weight of 100 percent on the central bank's forecast.

I have remarked above that the degree to which market participants have regarded the Riksbank's projected repo rate path as informative about the likely future path of the repo rate more than a few months into the future seems to have decreased since April 2009, when the target reached a level that the Riksbank was reluctant to go below, and a statement that the target should remain at that rate for a specific (fairly long) time was offered instead of a sharper immediate reduction. This may well have been interpreted as a departure from the bank's previous practice in the way it produced its projections – but *not*, evidently, because the bank was now interpreted as making a commitment that it could be counted upon to fulfill.

A possible reason for the reduced credibility of the longer-horizon projections at this point is that this was the first occasion on which the announced path reflected a projection of future policy decisions that were *history-dependent* to any significant extent – that is, an assumption about future policy that differed from what one would expect that policy to

be simply on the basis of conditions at the time. The reason why it would be desirable for policy to be expected to be history-dependent, under precisely the circumstances reached by the Riksbank in April 2009, has already been explained above, in the first section: the anticipation *at the time of the binding lower bound* of a lower subsequent repo rate than *would be desirable on purely forward-looking grounds* at the later date could have beneficial (stimulative) effects at the time of the binding constraint, albeit at the cost of less successful stabilization later. This may well be the sort of calculation that led the Riksbank to choose a repo rate path that indicated low rates so far into the future as it did. But in the absence of any intention to actually make policy decisions in a history-dependent way later – or at any rate, in the absence of an explanation of the procedures that would be followed in the future, that made it *credible* that future policy would be made in that way – there would be no reason for market expectations about the future conduct of policy to change.

The Riksbank's official description of its approach to monetary policy states that "in connection with every monetary policy decision, the Executive Board makes an assessment of the repo-rate path needed for monetary policy to be well-balanced" (Sveriges Riksbank, 2010, p. 14). The document goes on to explain the competing considerations that must be taken into account in such an assessment; there is no suggestion that the exercise is anything but a purely forward-looking consideration, repeated afresh in each decision cycle, of which of the feasible forward paths for the economy from that date onward is most desirable, from the standpoint of a criterion that involves both the rate of inflation (and its distance from the official inflation target of 2.0 percent) and the level of real activity. Indeed, it stresses that the appropriate repo-rate path will be reassessed in each decision cycle, so that "the interest rate path is a forecast, not a promise" (p. 15).

If the model of the economy used in such an assessment of the possible forward paths at a given point in time incorporates forward-looking private-sector behavior – as the Riksbank's RAMSES model (Adolfson et al., 2013) certainly does – and if the model is solved under the assumption that the projected forward path of the policy rate is anticipated by those forward-looking decisionmakers, then it might easily be concluded that the most desirable forward path at a given point in time is one which assumes history-dependent policy later. This is particularly likely to be the case when the current policy rate is constrained at its lower bound. But in such a case, repetition of the forward-looking exercise at the later date will not result in a decision to continue the interest-rate path previously projected, *even if there have been no surprise developments in the meantime*; for a forward-looking assessment of "well-balanced policy" at the later date will take no account of the effects of expected policy at that date on decisions expected to be taken in the private-sector earlier, according to the policy projections made at the earlier date.[32] A purely forward-looking forecast-targeting exercise of such a kind would accordingly be intertemporally inconsistent, as discussed in the first section. This means that there would

32 In discussing this pitfall of a forecast-targeting approach to monetary policy, I do not mean to assert that the approach described is necessarily that of Riksbank. It is not clear, however, that current Riksbank policy institutionalizes history-dependence of the kind required by an optimal policy commitment, and still less that market participants have been given a reason to expect this.

be no reason for market participants to hold the expectations assumed in the projection exercise, even if they perfectly understand the central bank's decision procedure. The problem might be that they understand it too well – that they have a more accurate forecast of the way that future policy will be made than the one assumed in the projection exercise.

I do not mean to imply that a time-consistent procedure, that assumes that future policy will be determined in a purely forward-looking way, would necessarily be superior. Such a targeting procedure would be intertemporally consistent, but the equilibrium implemented will generally be suboptimal, from the standpoint of the criterion used by the bank itself to rank possible forward paths. In particular, in a situation where the lower bound on the policy rate becomes a binding constraint, an inability to commit to a history-dependent policy would mean acceptance of a lowoutput trap, and of the fact that interest-rate policy can accomplish nothing more once the lower bound on the current overnight rate is reached. What is needed in order to achieve a better outcome, despite a correct understanding of the determinants of future policy on the part of market participants, is for the central bank to adopt procedures under which it will indeed implement a history-dependent policy, and then to make its intentions clear to market participants. In fact, it does need to offer a "promise," and not merely a "forecast" – though the required form of promise need not be a commitment to a specific pre-announced path for the policy rate.

THE FEDERAL RESERVE'S "THRESHOLDS" FOR WITHDRAWAL OF POLICY ACCOMMODATION

The Federal Reserve's approach to forward guidance has changed in important respects over the past year. Rather than the simple date-based approach described above, the FOMC's more recent statements have sought to define the future economic conditions that should determine when a withdrawal of current unusually accommodative measures should begin. A first step in this direction occurred with the FOMC's statement of September 13, 2012. In addition to extending the date until which the "exceptionally low" federal funds rate target was anticipated to be warranted ("at least through mid-2015"), the statement included new language indicating that "if the outlook for the labor market does not improve substantially," the Committee would continue its program of MBS purchases, "undertake additional asset purchases, and employ its other policy tools as appropriate until such improvement is achieved in a context of price stability."

While referring primarily to the conditions under which asset purchases would continue or even be increased, this statement indicated for the first time a specific economic goal that would need to be achieved in order for less aggressively expansionary policies to be appropriate. It also indicated for the first time that "the Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens." This sentence refers more directly to intentions with regard to interest-rate policy, and also mentions a condition relating to the state of the real economy in connection with the timing of the eventual withdrawal of the current highly accommodative policy.

An even more dramatic change in the forward guidance with regard to interestrate policy came with the statement released on December 12, 2012, in which the reference to a particular date until which the federal funds rate target would remain unchanged was eliminated, in favor of a discussion of the economic conditions under which it would be appropriate to begin raising it. In addition to again indicating the expectation that accommodation would "remain appropriate for a considerable time after… the economic recovery strengthens," the FOMC indicated that it "currently anticipates that [the current] exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored." In addition to these necessary conditions for a withdrawal of accommodation, the statement indicated that the timing would also depend on "other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments." This reference to particular future economic conditions, and above all the specification of precise quantitative "thresholds" for two variables (the unemployment rate and the inflation projection), has attracted considerable comment, and in August 2013 the Bank of England adopted thresholds of a similar form as a basis for its own forward guidance.

The FOMC's move away from date-based forward guidance has much to recommend it. If viewed as an actual *commitment not* to raise the federal funds rate before the stated date, regardless of what might happen in the meantime, such a policy would be far from best – indeed, in the case of a commitment extending two years or more into the future, it could prove quite reckless. It is important to note that this is *not* the type of policy recommended by theoretical accounts of the desirability of forward guidance. Campbell *et al*. (2012) refer to the "late 2014" statement language introduced in January 2012 as implementing "the policy recommendations of Eggertsson and Woodford (2003)," but Eggertsson and Woodford (2003) do not argue for the desirability of a commitment to keep the policy rate at zero for a fixed period of time. They argue for the desirability of a commitment to conduct policy in a different way than a discretionary central banker would wish to, *ex post*, and show that in their New Keynesian model the optimal commitment involves keeping the policy rate at zero for some time after the point at which a forward-looking inflationtargeting bank (or a bank following a forward-looking Taylor Rule) would begin to raise interest rates. But the date T until which the policy rate should be kept at zero is not a date that can be announced with certainty at the time of the shock that causes the zero lower bound to bind; its optimal value depends on how the economy develops.[33]

The reason for this is simple: the interest rate that will be optimal, simply from the standpoint of its suitability to the conditions that have arisen *ex post*, will generally be

33 In their paper, they illustrate numerically how it should depend on the length of time for which the natural rate of interest remains abnormally low; and they give a more general analytical characterization of the optimal policy commitment that implies that T should depend on the evolution of cost-push disturbances as well.

state-contingent. An optimal commitment will generally specify a different policy than this, in order to take account of the effects of the anticipation of policy at earlier dates. But, at least to a first approximation, the latter effects depend only on the *average* level of interest rates that are expected at the later date, averaging over all of the various situations that might arise; so this consideration makes little change in the way in which it is desirable for interest-rate policy to *differ across states* at the later date.

In fact, the FOMC's date-based forward guidance was never expressed as a commitment in any event; the Committee was careful only to offer statements about what it "currently anticipate[d]" – and indeed, not what it anticipated about future policy decisions, but only what it anticipated that future "economic conditions [were] likely to warrant." Thus it offered only its own *predictions* of what was coming, with no indication that this represented a *decision* to behave in a different way.[34] It was thus always possible to interpret the FOMC's announcements about future policy as simply reflecting changes in the Committee's view of likely future economic conditions, and hence the path of the funds rate that could be expected under their normal reaction function. For example, when the FOMC announced in January 2012 that "the Committee … currently anticipates that economic conditions … are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014," the headline of the *New York Times* online story about the announcement was "Fed Signals That a Full Recovery Is Years Away."

But if an announcement that the date T at which the policy rate will first rise above its lower bound has moved farther into the future is interpreted as meaning that the first date at which a standard (purely forward-looking) Taylor Rule would require a policy rate above the floor has moved farther into the future because of a weakening of the economic outlook – without in any way challenging the expectation that the bank will, as always, follow such a rule – then the announcement (if also believed) should have a *contractionary* effect on aggregate demand, rather than an expansionary one. For rather than implying that, at a certain point in the future, interest rates will be held lower than one would have expected prior to the announcement (so that real incomes at that time will be greater than would previously have been expected, and likely inflation as well), the announcement would instead imply that real incomes at that time will be *lower* than would previously have been expected (and likely inflation as well) – which change in anticipations should reduce current willingness to spend rather than increasing it. Forward guidance of this kind would have a perverse effect, and be worse that not commenting on the outlook for future interest rates at all.

The only way to avoid this pitfall is to accompany any discussion of the forward path of interest rates with an explanation of the considerations behind it – in particular, of the policy commitments that the anticipated forward path reflects. Discussion of the forward path of interest rates implied by a central bank's policy commitments may well be useful,

34 This was even more obviously true of the forward guidance provided by the FOMC's decision to begin including information about individual committee members' forecasts of the future federal funds rate in the quarterly Survey of Economic Projections.

as discussed in the first section. But this does not mean that presentation of the implied forward path for interest rates suffices as an explanation of the bank's policy commitments.

The new form of forward guidance used in the FOMC's statements since September 2012 represents an important step in this direction, by providing information about the *economic conditions* that will need to be observed in order for the removal of policy accommodation to begin. A discussion cast in these terms is more likely to be understood as a *commitment*, and not a mere *forecast* of future conditions, and also represents a more reasonable form of commitment to make. In addition, the explicit statement in September that low rates would "remain appropriate for a considerable time after… the economic recovery strengthens" sought to counter the interpretation that moving the anticipated "lift-off" date back to "mid-2015" represented merely increased pessimism about the timing of the recovery, and also provided, for the first time, at least an oblique indication of a decision to behave differently than the Committee's usual reaction function would have dictated. The more specific quantitative criteria included in the December 2012 statement, together with the abandonment of any reference to a particular "lift-off" date, made both the state-contingency of the new guidance, and the extent to which it represented a shift in the reaction function relative to previous policy, even more evident.

Because of the wide attention that this development has received, it is worth commenting on the general desirability of the particular formulation chosen by the FOMC for its new form of forward guidance. The reference to a quantitative "threshold" for the unemployment rate is the feature that has attracted the greatest comment, with some presenting this as a repudiation of an inflation-targeting approach. But I do not believe that reference to an explicit quantitative target that involves the real economy, as opposed to one that refers *only* to the path of some general price index, should be viewed as incompatible with inflation targeting.

As discussed in the first section, the specification of a definite (and non-time-varying) medium-run target for inflation does not in itself suffice to determine how short-run policy decisions should be made, or how they should be expected to be made in various future contingencies; and in my view, a fully-specified inflation forecast-targeting procedure – one that actually makes it possible for the central bank to publicly justify its policy decisions by explaining how they are dictated by its policy targets – requires the medium-run inflation target to be supplemented by an intermediate *target criterion* to determine the short-run policy decision at each decision point. Given an objective for policy that takes into account real stabilization goals alongside the goal of inflation stabilization,[35] and the fact that a tradeoff between inflation and real activity does exist in the short run, a desirable intermediate target criterion will involve some measure of real activity or employment, rather than being a function of inflation or a price index alone. The "output-gap-adjusted

35 Most inflation targeting central banks are clearly expected to take such additional objectives into account, even if they have not been spelled out as precisely as the inflation target has been. In the case of the Federal Reserve, the fact that the goal of "maximum employment" is assigned the same status as "price stability" in the Federal Reserve Account makes it even clearer that concern for the real economy is appropriate under the form of flexible inflation targeting practiced by the Fed.

price level target" proposed by Eggertsson and Woodford (2003) provides an example; the nominal GDP level target path proposed by Woodford (2012b) is another.

A commitment to an intermediate target criterion other than a pure inflation target need not undermine the credibility of a central bank's claim to conduct policy so as to ensure a definite (and unchanging) medium-run rate of inflation. The intermediate target criterion can (and in my view should) be chosen so as to *imply* a definite long-run rate of inflation, equal to the inflation target, and should furthermore imply that inflation should be expected to return to the vicinity of the target over the span of a few quarters except under highly unusual circumstances. A target criterion of the form (1.6), for example, where the target path p_t^* grows linearly at the rate π^* (the constant inflation target), has the property that if (1.6) is expected to hold at all times, then the fact that the output gap is not expected to be different from zero on average in the long run, independently of monetary policy, will necessarily imply that in the long run, the log price index p_t should also be expected to grow at the rate π^* . (Even supposing, more realistically, that the central bank will not be able to ensure that (1.6) holds exactly at all times, the conclusion will still follow as long as it is understood that the central bank is committed to prevent discrepancies between the left and right-hand sides of (1.6) from persisting for too long a time.)

As noted above, a nominal GDP level path target, defined by (1.11), is just a special case of this; hence the same argument applies to a target criterion of this latter form. Moreover, even if the term ytn in (1.11) is replaced by some other estimate of the potential output trend, as long as the discrepancy between the estimate of potential that is implicit in the NGDP target path will not differ from the actual natural rate of output by an amount that is allowed to *grow cumulatively* over the long run, commitment to the NGDP target path should imply that the long-run inflation rate will necessarily equal π^*.

The kind of thresholds announced by the FOMC are not obviously inconsistent with the Fed's long run inflation target (announced in January 2012, and reaffirmed in January 2013), either. First, the announced thresholds are meant to determine policy only until "liftoff" from the current near-zero level of the federal funds rate occurs; they do not specify how interest-rate decisions will be made thereafter, and so are consistent with an expectation that policy thereafter will be conducted in a way that ensures an average inflation rate of 2 percent per year. Second, even the specification of the economic conditions required to consider raising the funds rate target refers explicitly to "the Committee's 2 percent longer-run goal" for inflation, and indicates that rates could be raised (even with unemployment still above 6-1/2 percent) if inflation is projected to be too far above that rate (or if inflation expectations are too far out of line with the target).

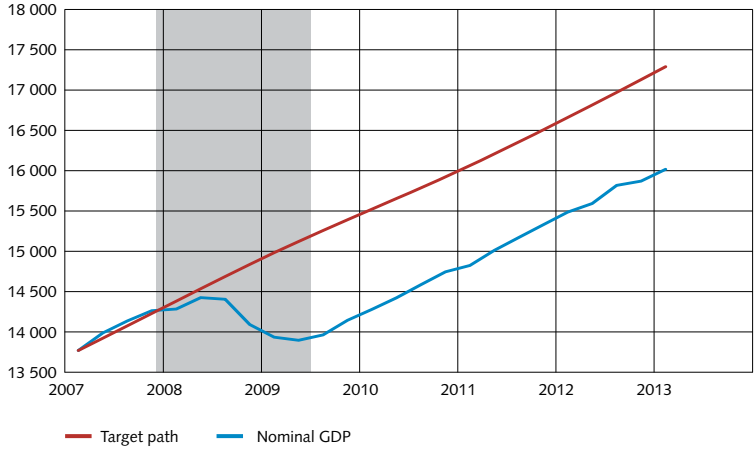
Nonetheless, the kind of thresholds adopted allow more grounds for doubt about the FOMC's long-run policy intentions than was necessary. First, the short-run policy regime that has been announced appears to represent a break from the guidelines used to make decisions about interest-rate policy in the recent past; but the fact that the reaction function can evidently suddenly change – with no need to justify the new rule as following from the same principles as had underlain past policy, but applied in a different situation

than those confronted in the past – might reasonably create doubts about how suddenly and how soon other new policies could be announced in the future.

Second, the new short-run regime is not specified with sufficient completeness for it to be clear how large a cumulative increase in prices might be allowed before the return to a more standard approach to policy. It is true that the FOMC only states that the near-zero federal funds rate will be maintained as long as projected inflation remains below 2.5 percent; but it does not actually commit to *raising rates* in the event that this threshold is breached, it simply does not commit *not* to raise them in that case. Because *two* thresholds are specified – one for the unemployment rate and one for the inflation projection – as determinants of a single decision, it is unclear what should be expected to happen in the event that the two indicators give opposite signals – that is, if the inflation projection were to exceed 2.5 percent while unemployment remains well above 6.5 percent. To the extent that one fears that the FOMC would find it difficult to tighten policy while unemployment remained above the announced threshold, after having offered a precise numerical benchmark, one would have reason to fear a scenario under which inflation could be allowed to run above the long-run target rate for a considerable period or to a considerable extent, as a result of a mis-judgment of the current location of the natural rate of unemployment.

An alternative approach would have had significant advantages on these dimensions. The FOMC might instead have committed themselves to maintain a federal funds rate near zero as long as the level of nominal GDP continues to fall short of a target path, while explaining that they would raise the federal funds rate target when necessary to prevent NGDP from overshooting that path; thereafter, they could explain, the funds rate would be managed so as to keep NGDP close to the path. The target path might be chosen in accordance with (1.11); that is, the target path for the log of NGDP could be chosen to equal the log of the FOMC's estimate of the path of potential real GDP, plus a nominal factor that grows deterministically at a constant rate corresponding to the long-run inflation target. The initial level of the nominal factor could be chosen so that the announced target path would represent a continuation of the path of nominal GDP prior to the crisis – that is, prior to the point at which at ceased to be possible for the Fed to keep nominal GDP on its prior trend path using its normal procedures.

Figure 6. US nominal GDP compared with a target path based on the CBO estimate of potential real GDP, as explained in the text
Billions of Dollars



Sources: Bureau of Economic Analysis and Congressional Budget Office

Figure 6 illustrates what such a target path might look like, under the current situation of the US economy. The target level shown is equal to the Congressional Budget Office's 2012 estimate of the path of US real GDP, plus a nominal factor growing at a constant rate of 2 percent per year, with the intercept chosen so that the nominal GDP target exactly equals actual nominal GDP in the first quarter of 2007, the last quarter in which real GDP was (according to the CBO) at potential, and one prior to the sharp drop in nominal GDP relative to its previous trend – hence a quarter in which one might suppose that the FOMC achieved a level of nominal expenditure reasonably close to the one that it desired.[36] (The initial level of the target path might be determined in a different way, for example so as to splice the target path going forward with an estimated trend for the years immediately prior to the crisis, without materially changing the message of Figure 6.)

One observes that since the onset of the financial crisis, nominal GDP has fallen well below this target path, and continues to run below it – still about 8 percentage points below as of the first quarter of 2013, with little sign that the gap is closing.[37] Hence a commitment to maintain the federal funds rate near zero until this gap is closed would imply that the funds rate target would not be increased anytime soon; indeed, a substantial acceleration of the growth rate of nominal GDP would be required in order for the funds rate to be raised before the end of 2015, as currently expected by most members of the FOMC.[38]

At the same time, it would also achieve the other goal of the FOMC's thresholds, namely, placing a bound on the amount of inflation that the policy might turn out to

36 This figure has been prepared using data available in April 2013.
37 The cumulative decline in the gap has been less than 0.8 percentage points since 2009Q4, a rate of convergence of less than a quarter of a percentage point per year.
38 See the FOMC Survey of Economic Projections, released April 10, 2013.

involve, by strictly limiting the cumulative nominal growth that would be allowed. To the extent that one expects that eventually, real GDP must return to the path of potential estimated by the CBO – which must almost certainly be the case, if the CBO's estimate of potential is correct – then the *cumulative* inflation resulting from the policy, integrating forward from 2007Q1, can be no more than two percent per year. Greater inflation would be possible if the CBO's estimate turned out to be incorrect, and the target path were not adjusted in response to the changed estimate of potential; but even then, the number of percentage points of cumulative growth in the price level that could result would be limited by the number of percentage points by which the CBO has over-estimated potential, and this would be unlikely to be large.

At the same time, this alternative form of intermediate target would avoid the disadvantages of the FOMC's thresholds cited above. Because a threshold for a single variable (albeit one that involves *both* the general level of prices and the real economy) would be offered as the criterion for determining when it is appropriate to tighten policy, the criterion offered would be more complete, and so would allow less ambiguity to remain – both about how much nominal growth might be allowed for the sake of the FOMC's goals for the real economy, and about whether policy might be tightened prematurely owing to an inflation scare. It ought to have a particular advantage in bounding uncertainty about future inflation, because it would involve a commitment to a nominal *level* variable, rather than only a growth rate; hence the policy would ensure that *actual* nominal growth would be limited, and not merely the amount of growth that was *forecasted* some years in advance.

And if the NGDP level path were determined in the way proposed above, it would be possible to present the policy as simply extending the principles that have guided FOMC policy in the past to novel circumstances, rather than a break with past policy; the temporary period of unusually accommodative policy would be justified by the fact that nominal GDP had been allowed to fall below its previous trend path to an unusual extent. Even more importantly, the policy announced for the next few years would be completely consistent with the policy that the FOMC would also want the public to anticipate will be followed farther in the future. The near-term commitment would be to increasing nominal GDP fast enough to return to the target path; but since the target path is chosen to be one that, if followed for a period of years, would guarantee an average inflation rate near the declared long-run target rate, an expectation that the FOMC would continue to make interest-rate policy on the basis of that target path would be fully consistent with what the FOMC has said about its longer-term policy intentions.

Thus the particular form of thresholds adopted by the FOMC are not obviously ideal, even as a solution for the special circumstances currently facing the Fed, and under the institutional constraints resulting from the Fed's history, legislative mandate, and declared policy commitments. It is even less apparent that they should be adopted by other inflation-targeting central banks, in the case that they find themselves constrained by an effective lower bound on their policy rate. As I have argued above, a bank that seeks to practice

inflation-forecast targeting needs in any event an intermediate target criterion as a basis for the forecast-targeting exercise through which short-term policy decisions are made, and this criterion should be one that is consistent with – indeed, the consistent pursuit of which should imply achievement of – the bank's inflation target in the medium-to-long run. (A fixed target for the unemployment rate, for example, would thus be unsuitable as a proposal of this form.) And if the target criterion that is adopted has the right form – specifically, if it specifies a target path for the level of some nominal variable and not merely the projected rate of growth looking forward from each date – there will be no need to change its form in response to a series of target misses owing to a binding interest-rate lower bound. A commitment to a target criterion such as a nominal GDP level path would already solve the problem which the FOMC's thresholds are intended to address, so that there would be no advantage to an introduction of temporary, *ad hoc* thresholds as a modification of the standard forecast-targeting procedure.

Conclusion

Inflation-targeting central banks have been notable for the amount of information that they provide to the public, not only about their longer-run goals, but about the way in which they expect to conduct policy in the future in order to achieve those goals. For reasons discussed above, I regard this development as a positive one. Greater clarity within the policy committee itself about the way in which policy is expected to be conducted in the future is likely to lead to more coherent policy decisions, and greater clarity on the part of the public as to how policy will be conducted is likely to improve the degree to which the central bank can count on achieving the effects that it intends through its policy. The value of this dimension of policy has become all the more apparent under the conditions recently encountered by many central banks, in which they have found themselves constrained by an effective lower bound on their policy rates.

But while the procedures developed by inflation-targeting central banks over the first two decades of inflation targeting represent important advances in the practice of central banking, and while important progress has been made over the course of that period – especially by methodological innovators like Sveriges Riksbank and Norges Bank – there remain dimensions on which the practice of inflation-forecast targeting could still be improved, relating to the degree to which explicit guidance is given about the way in which future policy decisions will be made. Two of these are of particular importance: the adoption of a more explicit intermediate target criterion to guide short-term policy decisions, that would explain how the projected effects of monetary policy on the real economy are traded off against its projected effects on inflation, and the introduction of a commitment to error-correction into the forecast-targeting procedure, by targeting the cumulative growth in a nominal variable (such as nominal GDP), rather than only its expected growth rate looking forward.

In my view, such changes could be viewed as a completion of the program of flexible inflation targeting, making the meaning of the central bank's policy commitments more explicit and enhancing the transparency of decisionmaking, rather than a modification of the objectives of policy, or even a fundamental change in the basic approach. Nonetheless, I believe that they would go a considerable way toward answering many of the critics who argue that inflation targeting has failed as an approach, and should be replaced. In particular, they would address two important difficulties exposed by recent developments. The first is the observation that in countries where (implicit or explicit) inflation targeting has achieved considerable stability of the inflation rate over the past two decades, even large variations in the output gap now seem to result in only mild changes in inflation or in inflation expectations; but this raises doubts about whether success in containing inflation and inflation expectations within acceptable bounds should be considered sufficient grounds for regarding monetary policy as successful. Some would draw the conclusion that inflation targets should be abandoned. The adoption of an intermediate target criterion, such as a target path for nominal GDP, that is however chosen to be consistent with (and indeed to deliver) the target inflation rate over the medium run, can address this objection, by providing a basis for short-run policy decisions that clearly would not ignore the level of real activity, while nonetheless retaining the focus on delivering a particular inflation rate over the medium run.

The second difficulty is the possibility that policy can be constrained by an effective lower bound on the policy rate. An expectation that the central bank will remain committed to a strict inflation target limits its ability to create the sort of expectations about future policy that provide the only channel through which interest-rate policy can provide additional macroeconomic stimulus in such a situation (as emphasized by Krugman, 1998); hence some would argue that the recognition that such a situation can arise in practice, and not only in theory, is a ground for abandoning inflation targets. But if inflation targeting is implemented through a commitment to a target path for the level of nominal GDP (or a similar nominal level variable), then a period of persistent target shortfalls owing to the binding lower-bound constraint on policy will require (and should be expected to require) a period of unusually aggressive easing to catch up with the target path again. Thus it should automatically create the kind of expectations regarding future policy that Krugman (1998) and others have called for, but without requiring even a temporary abandonment of standard policy targets. If the practice of inflation-forecast targeting is developed in this way, there will be less reason to doubt its suitability as an approach to the conduct of monetary policy adequate to the challenges of the twenty-first century.

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Financial Stability and Monetary Policy: How Closely Interlinked?

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The recent financial crisis has again raised the question to what extent price-stability oriented monetary policy frameworks should take into account financial stability objectives. In this paper I argue that the answer will depend on three questions: i) how effective is macroprudential policy in maintaining financial stability?; ii) what is the effect of monetary policy on risk taking and financial stability?; and iii) what is the risk of financial dominance, i.e. the risk that financial stability considerations undermine the credibility of the central bank's price stability mandate? I review the theory and evidence and conclude that, while the new macroprudential policy framework should be the main tool for maintaining financial stability, monetary policy authorities should also keep an eye on financial stability. This will allow the central bank to lean against the wind if necessary, while maintaining its primary focus on price stability over the medium term.

Introduction

The 2007-2008 financial crisis and its long-lasting legacy have shaken up the macro-economic policy framework that appeared to be so successful in stabilising the economy during the great moderation period. First, it led to a rethinking of monetary policy frameworks focused primarily on maintaining price stability, as price stability has proven not to be a sufficient condition for financial stability and lack of financial stability can have large negative feedback effects on price stability.[1] Second, it accelerated the introduction of a new policy domain called macroprudential policy, inspired by the early contributions of Crockett (2000) and his colleagues at the Bank for International Settlements (BIS).[2] This was based on the realisation that ensuring the soundness and safety of individual financial institutions is not enough to guarantee the stability of the whole financial system and that there is a need for a systemic approach to financial stability. Third, specifically to EMU, the sovereign debt and banking crisis made the financial trilemma of having a single monetary

* This paper was prepared for the Riksbank Conference on "Two Decades of Inflation Targeting: Main Lessons and Remaining Challenges", held in Stockholm on 3rd June 2013. The views expressed are my own and not necessarily those of the European Central Bank. I would like to thank Helge Berger, Stefan Gerlach, Manfred Kremer, Andy Levin, Nellie Liang, Tobias Linzert, Angela Maddaloni, Lars Svensson and Sweder van Wijnbergen for discussions and comments, and Elizaveta Krylova, Magdalena Lalik and Pawel Gertler for excellent help with the graphs and data.

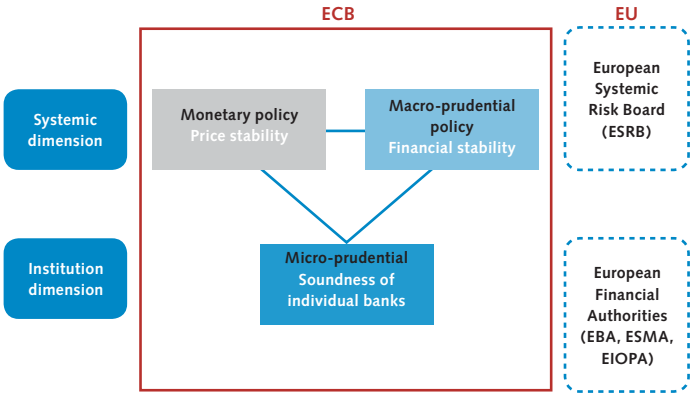
1 Early contributions to this debate include Bean et al. (2010), Blanchard et al. (2010) and Mishkin (2010). See also Baldwin and Reichlin (2013) for a variety of views and Eichengreen et al. (2011).

2 See, for example, Borio (2003) and Borio and White (2006). For a recent review of the literature on macroprudential policy, see Galati and Moessner (2011).

policy, an integrated financial market and a national financial supervisory system painfully clear.[3] In order to break the vicious circle between national banking and sovereign risks and to avoid cross-border externalities in supervision that may arise from the underprovision of national refunding for troubled cross-border banks, the incentive to ring-fence liquidity within national borders and the pressure to generate demand for government debt through national banks, the introduction of a banking union complementing the monetary union is long overdue. More generally, the crisis has underlined that also the microprudential policies need to be strengthened.

Against this background and with the expected establishment of the Single Supervisory Mechanism later this year, the new policy framework in the euro area can be schematised as in Figure 1.[4]

Figure 1. New institutional set-up in the euro area



Consistent with the description in IMF (2013), the newly emerging paradigm is one in which both monetary policy and macroprudential policies are used for countercyclical management: monetary policy primarily aimed at price stability; and macroprudential policies primarily aimed at financial stability, whereas microprudential policy focusses on the safety and soundness of individual financial institutions. The ECB has defined financial stability as "a condition in which the financial system – comprising financial intermediaries, markets and market infrastructures – is capable of withstanding shocks and the unravelling of financial imbalances in the financial intermediation process which are severe enough to significantly impair the allocation of savings to profitable investment opportunities".[5] Other definitions of financial stability that have been proposed also reflect the inherent complexity of the concept. Macro-prudential policies then aim to prevent, or at least to contain the build-up of financial imbalances and to ensure that the financial system is able

3 See Schoenmaker (2011).
4 Note that the macroprudential function remains largely in the remit of the national competent authorities. However, the Single Supervisory Mechanism can intervene on a stricter application of macroprudential policies.
5 See ECB Financial Stability Review, June 2009, p. 9.

to withstand their unwinding and be resilient to shocks.[6, 7] It is also worth noting that it is not always easy to distinguish micro from macroprudential policies as often the latter are implemented through microprudential tools such as capital adequacy and other supervisory ratios.

The assignment of the monetary and macroprudential policy domains to separate objectives is consistent with Tinbergen's effective assignment principle, which says that i) one should have as many instruments as objectives and ii) that the instruments should be assigned to those objectives that they can most efficiently achieve.[8] In general, the introduction of macroprudential policies can improve the trade-offs for monetary policy and increase its room for manoeuvre. Maintaining financial stability can help ensure a well-working financial system and an effective transmission process which makes achieving price stability more efficient. Moreover, macroprudential policies can by managing the financial cycle and increasing the resilience of the financial sector reduce the probability of systemic stress and therefore the probability that monetary policy becomes constrained by the zero lower bound and needs to resort to non-standard policies to address malfunctioning financial markets. It can also reduce trade-offs that may arise when exiting accommodative monetary policies.[9]

The relationship between monetary and macroprudential policies hinges, however, also on the "side effects" that one policy has on the objectives of the other and how perfectly each operates in the pursuit of its own primary goal.[10] For example, changes in policy interest rates or non-standard monetary policies may affect risk-taking behaviour ex ante and the tightness of credit constraints ex post. In a crisis situation, liquidity policies by the central bank may avoid a collapse of the banking sector, but also reduce the incentive for banks to recapitalise and restructure and promote the evergreening of non-performing loans and regulatory forbearance by supervisors. In principle, well-targeted macroprudential policies can offset the side effects of these monetary policies, but in practice there may be limits.[11] Similarly, changes in macroprudential policy may affect financing conditions, the real economy and price stability, which monetary policy may want to offset.[12] It is therefore important that both policies are coordinated and take those interactions into account. Conflicts of interest of a "push-me, pull-you" nature may arise when monetary and macro-prudential policy instruments are used more aggressively, in opposite directions, leading to a worse outcome than if the instruments had been

6 See Papademos (2009). The relative importance of the twin objectives of counteracting the procyclicality of the financial system (i.e. smoothing the financial cycle) and improving the resilience or fragility of the financial system in response to shocks is still a matter of debate. The answer depends in part on how effective macroprudential policies are expected to be in leaning against the wind, which is discussed in Section 4.1 below. In this paper, we mostly focus on the first objective.

7 For a related discussions of the objectives of macroprudential policy and the concept of systemic risk, see, for example, Brunnermeier et al. (2009), De Bandt et al. (2009), ECB (2010), ESRB (2011) and Hanson et al. (2011).

8 Or, as in Bean et al. (2010): "Policies should be assigned to the frictions that they have a comparative advantage in addressing".

9 See, for example, Bernanke (2013) for a discussion in the current context of exit from expansionary Fed policies.

10 See Gerlach et al. (2009), IMF (2012) and Carboni et al. (2013).

11 For example, as discussed in Section 4.1., Maddaloni and Peydro-Alcalde (2010) show that the effects of monetary policy on bank lending standards depend on the tightness of the prudential regime.

12 For an example of such an optimal monetary policy reaction, see Collard et al. (2012).

coordinated.[13] Alternatively, the respective policies can have positive externalities on each other and, if not taken into account, each policy response will be "too" strong and might risk overshooting the achievement of the policy objective. Finally, non-standard monetary policy instruments, like changes in haircuts for central bank operations or changes in reserve requirements, are not that different from macroprudential policy instruments such as liquidity constraints and regulation of margin requirements. It is therefore a legitimate question which instrument should be used for what objective.[14]

The need for coordination raises the question of the appropriate institutional set-up. Overall, as a result of the crisis central banks have been given a larger role in maintaining financial stability.[15] Bringing monetary and macroprudential policies under one central bank roof will tend to solve possible coordination problems that may arise from their interaction. At the same time, it may lead to incentive problems if failure of one policy domain affects the other policy domain. One example of such an incentive problem which may lead to time-inconsistency is that monetary policy is kept looser than is necessary for price stability because it helps maintaining financial stability. This may lead to an inflation bias, in particular if the objectives of the macroprudential policy function are not clearly specified, its effectiveness is not ensured, and/or macroprudential policy measures are subject to more intense political scrutiny and pressure. One solution is to maintain a clear separation of objectives, instruments and communication of the two policy domains. This will make the policy makers accountable for achieving their respective objectives and thereby increase the effectiveness and efficiency of the policies, while allowing an efficient information sharing between the two policy domains. In section 5 below I argue that it is particularly important to protect the credibility of the monetary policy framework for maintaining price stability while the macroprudential policy domain is building up its own reputation.[16]

Turning back to the ECB and its future role, Figure 2 shows schematically how monetary and macroprudential policy interact, while being geared at their specific objectives and using separate instruments. The current monetary policy strategy of the ECB with its medium-term orientation and emphasis on monetary analysis explicitly involves looking beyond short-term price developments and taking into account the medium-term implications of booming asset prices and credit markets for price stability.[17] Broadening and deepening the monetary analysis to better understand the health of the financial system and its implications for price stability over the medium term can be complementary to the use of new macroprudential policy instruments in leaning against the boom and bust behaviour in credit markets we have seen over the past decade.

13 Examples of such outcomes are shown in Bean et al. (2010), De Paoli and Paustian (2013) and Angelini et al. (2011).

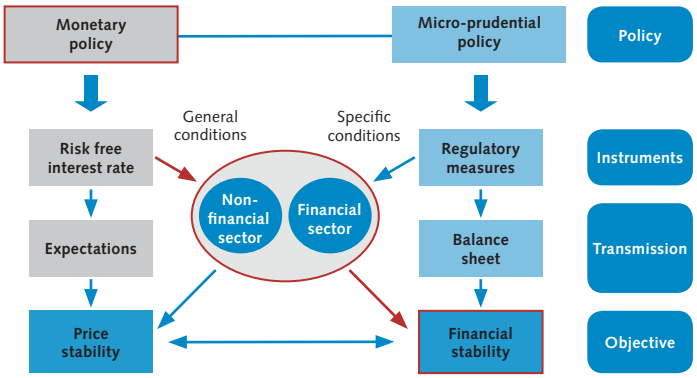
14 Cecchetti and Kohler (2012) provide an extreme example: In their model, it does not matter which authority uses which instrument.

15 See, for example, the new institutional frameworks in Belgium and the United Kingdom. For an overview, see the recent Ingves report (BIS, 2011).

16 Woodford (2013) argues that clear communication and transparency in monetary policy is even more important now to avoid the notion that unconventional measures will lead to unconventional outcomes (such as the abandonment of low inflation targets).

17 See, for example, Trichet (2004) and Issing (2002, 2003).

Figure 2. Macro-prudential and monetary policy
Policies with different objectives, but interacting instruments ("shared" transmission)



Next, I first review the macro-economic and financial experience of the euro area over the past decade. I focus on the period 2003 till 2012 following the bursting of the dot-com bubble, which covers both the boom period five years before the financial crisis of 2007-2008 and the aftermath characterised by the sovereign debt crisis and by private and public debt deleveraging. This review of the build-up and unravelling of financial imbalances in the euro area motivates the topic of the paper and illustrates some of the lessons learnt. In the rest of the paper, I then focus on the question whether the monetary policy mandate should be enlarged to explicitly include financial stability objectives. I summarise the discussion on this question by distinguishing three different views, respectively called: (i) "modified Jackson Hole consensus", (ii) "leaning against the wind vindicated"; and (iii) "financial stability is price stability". I also briefly discuss some of the analytical frameworks underlying those views. Then, I argue that which of these views one takes will depend on the answers to three questions: (i) how effective is the new macroprudential policy framework in maintaining financial stability; (ii) how significant is the risk-taking channel of monetary policy or, more generally, the impact of monetary policy on financial stability; and (iii) what is the risk of financial dominance, i.e. the risk that financial stability considerations undermine the credibility of the central bank's price stability mandate. In the next section I briefly review the empirical evidence on the first two questions. Next, I present a simple analytical framework due to Ueda and Valencia (2012) to illustrate the risk of time inconsistency of the price stability objective when the central bank cares about financial stability. Finally, I conclude by arguing for the middle position whereby price stability remains the primary objective of monetary policy and a lexicographic ordering with financial stability is maintained. This will allow the central bank to lean against the wind (if necessary, for example, because macroprudential policies fail), while maintaining its primary focus on price stability in the medium term.

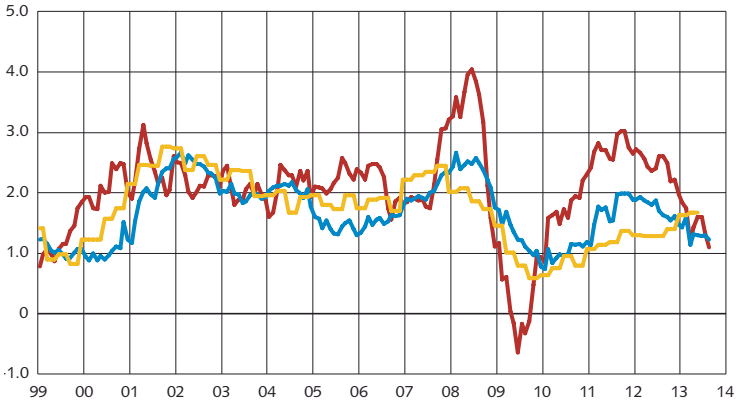
Price stability, booms and busts in asset and credit markets and intra-euro area imbalances[18]

The Treaty creating EMU establishes price stability as the primary objective of monetary policy in the euro area. In 1998, the ECB adopted a quantitative definition of price stability which says: "Price stability shall be defined as a year-on-year increase in the HICP for the euro area of below 2 per cent. Price stability is to be maintained over the medium term." Following an evaluation of the strategy in 2003, the ECB clarified that it aims to keep HICP inflation "below, but close to, 2 per cent". With some foresight, two main reasons for a small, but positive inflation rate were highlighted.[19] First, it provides a sufficient buffer against the probability of hitting the zero lower bound on the short-term nominal interest rate. And, second, it allows for a smoother adjustment of relative prices and wages across countries in a monetary union which still features a high degree of downward nominal wage rigidity.

Figure 3 shows that various measures of inflation (including the HICP) have been stable around 2 percent throughout this whole period. Similarly, both medium and long-term inflation expectations were solidly anchored throughout the decade (Figure 4). As argued in Fahr et al. (2010), the relative stability of inflation did not come at the cost of larger fluctuations in aggregate output, but, when the financial crisis hit, output volatility did increase dramatically. Smets (2010) argues that the solid anchoring of inflation expectations throughout the crisis period contributed to mitigating the fall-out in economic activity and avoiding a Fisherian debt deflation spiral. More generally, there is evidence that in regimes focused on price stability, the real effects of the financial crisis have been more subdued.[20]

18 This section follows the discussion in Fahr et al. (2010, 2013).
19 See ECB (2003).
20 See De Carvalho and Evangelista (2011).

Figure 3. Inflation developments in the euro area
Percent

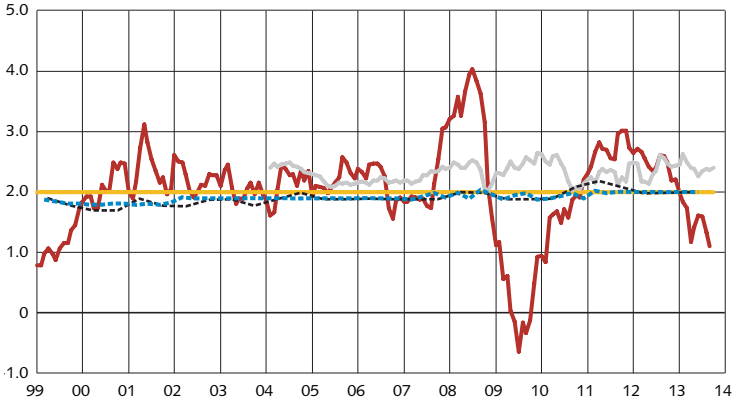


HICP headline inflation
HICP excluding unprocessed food and energy
GDP Deflator inflation

Note. Last observation: March 2013, 2012Q4 for GDP deflator.

Source: Eurostat

Figure 4. Inflation and inflation expectations
Percent



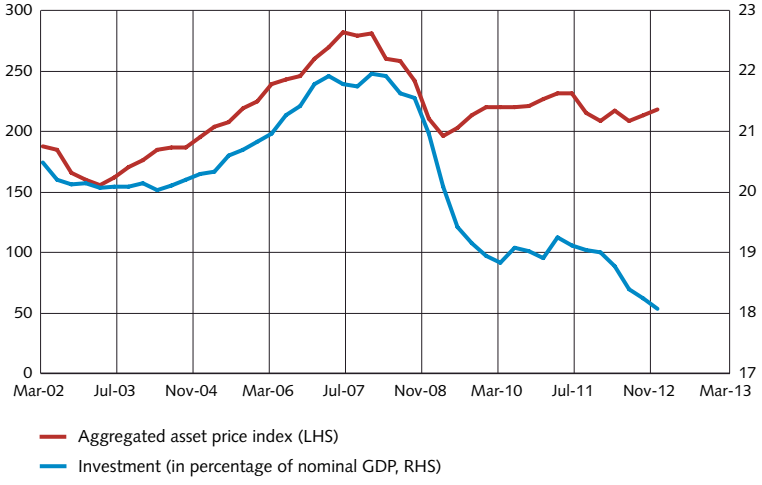
HICP inflation
HICP inflation expectations (SPF) for the five-year period ahead
Upper bound of definition of price stability
5-year forward 5-years ahead BEIR
Longer-term inflation expectations (Consensus Economics Forecasts, 6-10Y)

Note. Last observation refers to April 2013. Longer-term inflation expectations from Consensus Economics Forecasts refer to a horizon of six to ten years and,until December 2002,are constructed as a weighted average of the five largest euro area countries which together account for more than 80% of euro area GDP.

Sources: Eurostat, SPF, Consensus Forecast and ECB calculations

While the prices of goods and services were well anchored, low macro-economic volatility and the procyclicality of the financial system contributed to a boom and bust in credit, asset prices, and investment, leaving the economy with a large debt overhang. Figure 5 shows the boom and bust in aggregate asset prices and aggregate investment over nominal GDP in the euro area since 2002. Housing prices and residential investment played a significant role in this boom and bust behaviour.

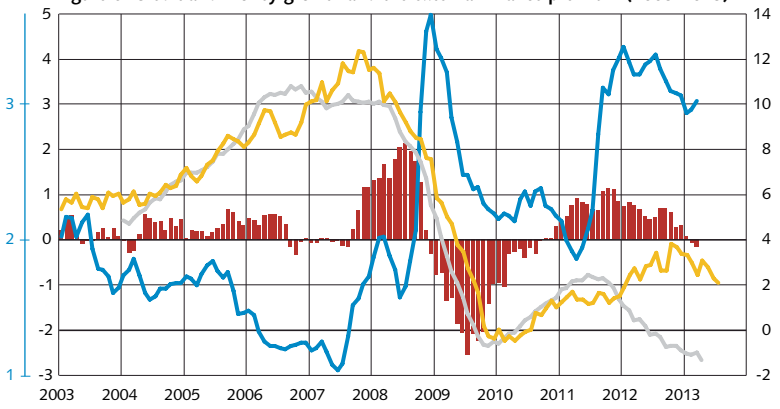
Figure 5. Aggregate asset prices and investment over nominal GDP in the euro area



Sources: BIS, ECB and Eurostat

The investment boom was fuelled by a rapid growth of bank lending and money creation, falling risk premia and an easing of bank lending standards. Following the start of the sub-prime crisis in 2007 and in particular the collapse of Lehman Brothers in October 2008, this procyclical process went quickly in reverse with the growth of money and credit falling rapidly, risk premia skyrocketing and bank lending standards tightening sharply (Figures 6 to 9). This translated in the deepest recession in 2008-2009 in the euro area since the Great Depression in spite of a rapid and coordinated policy response by both monetary and fiscal authorities.

Figure 6. Credit and money growth and the external finance premium (2003-2013)

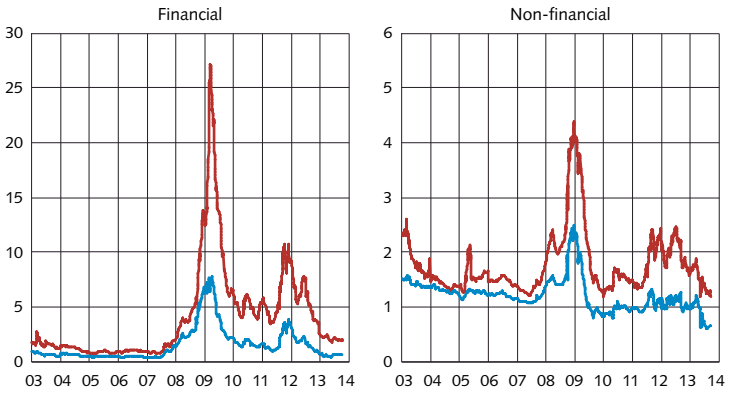


Inflationary pressures (percentage points, LHS)
External Finance Risk Premium (%, LLHS)
M3 corrected for portfolio shifts (yoy %, RHS)
Credit to non-financial private sector (yoy %, RHS)

Note. Inflationary pressures are HICP inflation in difference to 1.9 per cent. Credit to non-financial private sector includes credit to Households and NFCs. The external finance premium is measured as a weighted average of spreads between lending rates, including corporate bond yields, and measures of risk-free rates of corresponding maturities. Last observation: March 2013 (December 2012 for EFP).

Sources: ECB and ECB calculations

Figure 7. Market credit spreads in the euro area (2003-2013)
Basis points



BBB–AAA spread
A–AAA spread

Note. Last observation: 7 May 2013.

Sources: DataStream and ECB calculations

Figure 8 A. Spread between composite cost-of-lending indicator (CLI) to non-financial corporations (NFCs) and households and riskless rates
Basis points

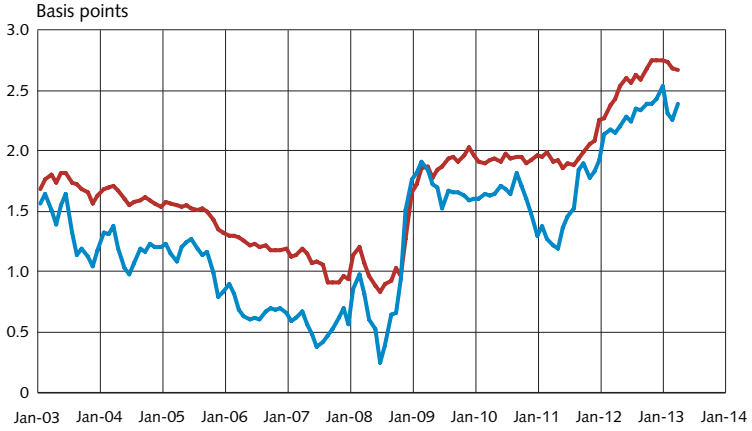


Figure 8 B. Spread between short-term CLI to NFCs and households and 3-month Euribor
Basis points

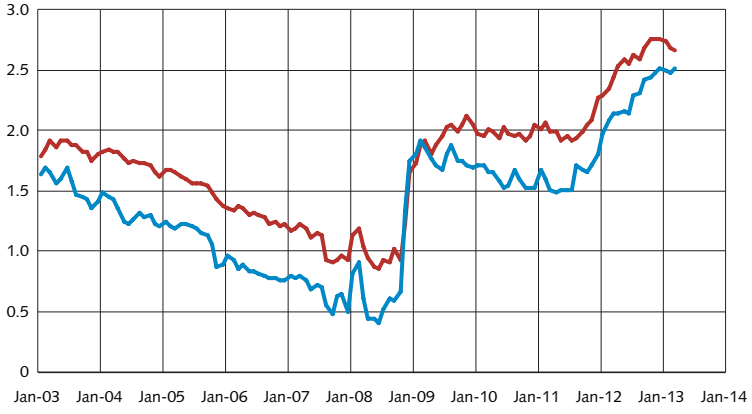
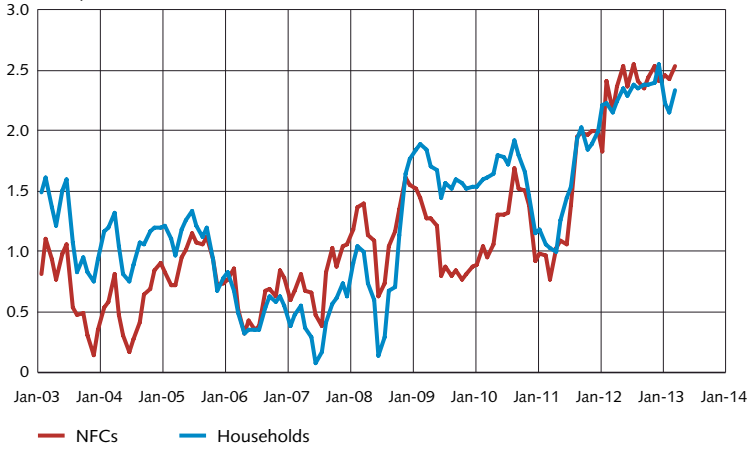


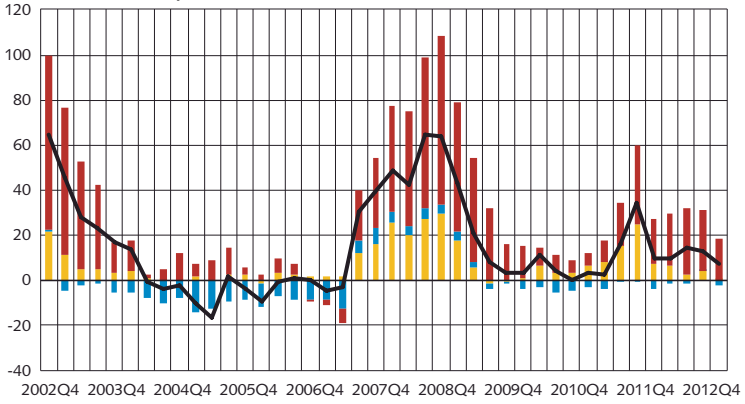
Figure 8 C. Spread between long-term CLIs to NFCs and households and 5-year swap rate
Basis points



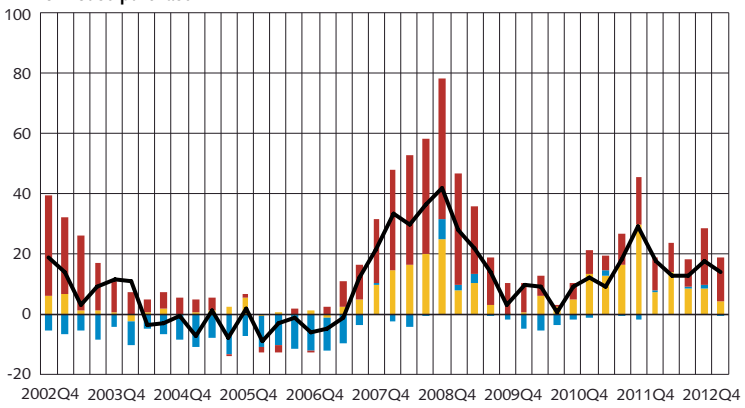
Sources: ECB and ECB calculations

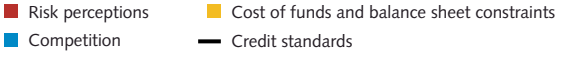
Figure 9. Bank lending standards to enterprises and households
Average net percentage per category

A. Factors contributing to a tightening of credit standards for loans to non-financial corporations



B. Factors contributing to a tightening of credit standards for loans to households for house purchase





Sources: BLS and ECB

As of 2010, the rapidly rising government debt led to a confidence crisis in government finances and rising sovereign spreads in a number of periphery countries. This set in motion a mutually reinforcing negative spiral between sovereign and banking risks, which is reflected in a large positive correlation between sovereign and bank bond premia in the euro area and a double-dip, more shallow but more persistent recession in 2012. The ECB responded by lowering its policy-controlled interest rates to close to zero (standard policy) and by taking a number of non-standard measures geared at addressing malfunctioning financial markets and avoiding that a collapse of the financial system would endanger

price stability.[21] In line with previous historical experience as, for example, extensively documented in Reinhart and Rogoff (2009, 2010), the debt overhang in both the private and public sector and the subsequent deleveraging process are shedding a long shadow on economic activity in the euro area.[22]

While the boom/bust nature of credit and asset prices is ex post clearly visible in the aggregate euro area data series, it is well-known that the underlying dynamics was characterised by growing cross-country imbalances within the euro area, making a response by the ECB's single monetary policy more complicated.[23] Table 1 compares average house price growth, credit growth to the private sector, residential investment, inflation rates and growth in unit labour costs between currently distressed countries (Greece, Ireland, Italy, Portugal and Spain) and non-distressed countries (Austria, Netherlands, Finland, France, Germany) over the pre- and post-2007 period. While the details differ somewhat across countries, the picture of a classic boom and bust in housing markets in the distressed countries is very clear. On average, growth in credit, house prices and residential investment was respectively 10, 4 and 2.5 percentage point higher in the distressed than in the non-distressed countries in the pre-2008 period.

The boom in the housing market was partly financed by a widening current account deficit and an accumulation of net foreign debt. As a result the net foreign debt position on average reached more than 50 per cent of GDP towards 2009. Until 2008, most of the foreign debt was financed by private capital inflows, often through the short-term interbank market. Claims of banks in the non-distressed countries on those in the distressed ones increased five-fold from 2002 till 2007. As domestic resources were reallocated to the real-estate and other non-traded sectors, these countries also experienced a loss of competitiveness, as is witnessed by a higher average inflation rate and increase in unit labour costs of 2.7 per cent. In turn, this contributed to lower real financing costs in the distressed compared with those in the non-distressed countries.

The large real estate boom went hand in hand with increasing financial fragility as illustrated most vividly by the case of Ireland. Leverage of Irish Monetary and Financial Institutions (MFIs), measured as total assets over capital and reserves, increased from 15 in 2000 to 25 in 2007, with almost 40 per cent of the funding coming from overseas short-term debt liabilities. At the same time, the risks of the mortgage loans increased, with the share of first-time buyer mortgages with a loan-to-value ratio of 100 per cent or more rising from less than 5 per cent in 2003 to almost 35 per cent in 2006.

The bursting of the house price bubble and the sudden stop in private capital inflows in the distressed countries, led to a deep recession, sharply rising unemployment, an

21 For a description and discussion of the ECB's response to the financial and sovereign debt crisis, see, for example, Pill and Smets (2013), Fahr et al. (2013), Smets (2012) and Smets (2013).

22 See also Cecchetti et al. (2011).

23 See Smets (2012) for a more detailed description of the growing intra-euro area imbalances and the ECB's monetary policy response.

exposed and fragile banking sector and a rapidly deteriorating fiscal deficit.[24] Ultimately, this contributed to a reversal of the ranking in the various indicators in Table 1. In the distressed countries house prices fell on average by 3 per cent in the post 2008 period, while residential investment fell by 9.5 per cent and a painful and protracted rebalancing process was set in motion.

A few lessons can be drawn from this descriptive analysis of the euro area economy over the past decade. First, price stability as defined by low inflation in goods and services prices has not been a sufficient condition for financial stability. A new set of instruments (macroprudential policy) is therefore needed to address the procyclicality of the financial system and its key role in the propagation and collapse of credit, asset prices and the real economy. This is particularly important in a monetary union where the single monetary policy stance may give rise to different real financing conditions in the presence of asymmetric developments. One element of the EU response was to set up the European Financial Authorities (EFAs) and the European Systemic Risk Board (ESRB) to strengthen micro and macroprudential supervision in the European Union.[25] More recently, considerable progress was made to set up a banking union for the euro area.

Second, as is often the case, excessive bank credit into overextended real estate markets leads to a build-up of financial fragility and a subsequent collapse. This is a pattern familiar in other big financial crises like the Scandinavian and the Japanese crises of the early 1990s, as well as the recent crisis in the United States and the United Kingdom. However, like in the United States the house price bubbles were not uniform. While the financial imbalances concentrated very much in the periphery countries, the financing and the exposure was euro area-wide. The new instruments must therefore be granular and address the imbalances where they arise. At the same time, these vulnerabilities appear to be fuelled by easy finance and therefore also the liability side, which may be more global, has to be addressed.

Third, there are important asymmetries in the boom and the bust phase due to fire sale dynamics, the interaction between market and funding liquidity and the negative loops of the financial sector with the real economy and fiscal sustainability. In their role of lenders/market makers of last resort and with the view of maintaining price stability, central banks have been called upon to backstop the financial system. This gives them the right incentives to also deal ex ante with the building up of financial imbalances, but also risks putting them in a corner when financial fragility and doubts on fiscal sustainability are not fundamentally addressed.

Fourth, the fall-out of a systemic banking crisis is often long and protracted due to political and distributional difficulties with addressing the debt overhang problem in

24 For a discussion of capital flows see, for example, Merler, S. and J. Pisani-Ferry (2012), Cour-Thimann (2013), Auer (2012). These papers also discuss how due to the ECB's fixed-rate, full-allotment policy the private capital flows were partly replaced by official capital flows as captured by the increase in Target2 balances.

25 See the de Larosière report (2009) for the rationale for setting up the European Financial Authorities and the European Systemic Risk Board.

a transparent and efficient way.[26] In a low inflation environment, the depth and the persistence of the recession may, moreover, be exacerbated by the zero lower bound on interest rates and downward rigidity of prices and wages which prolong the adjustment process and increase the costs of unemployment. An important overall lesson is therefore that it does not suffice to try to clean up after the bust, but that a preventive policy is called for.

Implications of financial stability considerations for monetary policy: Three views and their conceptual frameworks.

As highlighted above, in order to deal with the financial stability objective, policy makers have introduced a new macroprudential policy domain under the aegis of the G20. There is, however, a continuing debate about whether monetary policy frameworks focused on price stability should be amended to include financial stability objectives. In this section, we describe three different views and their conceptual frameworks. Figure 10 gives a schematic overview.

Figure 10. Three views

	MODIFIED JACKSON HOLE CONSENSUS	LEANING AGAINST THE WIND VINDICATED	FINANCIAL STABILITY IS PRICE STABILITY
Monetary policy	Framework largely unchanged Limited effects on credit and risk taking Blunt instrument to deal with imbalances	Financial stability as secondary objective: lengthening of horizon Affects risk-taking "Gets in all of the cracks"	Twin objectives on equal footing Unblocks balance sheet impairments; avoids financial imbalances in upturns
Macro prudential	Granular and effective	Cannot fully address financial cycle; arbitrage	Indistinguishable from monetary policy
Interaction	Limited interaction and easy separation of objectives, instruments, …	Financial fragility affects monetary transmission are price stability	Financial stability and price stability are intimately interlinked
Issues	Coordination? Lender of last resort?	Coordination? Overburden money policy?	Time inconsistency problems?
Models	Svensson; Collard, Dellas, Diba and Loisel (2012)	Borio; Woodford (2012)	Brunnermeier and Sannikov (2012)

26 For example, Van Wijnbergen and Homar (2013) show how the strength of the recovery following systemic banking crises depends on the restructuring of the banking sector.

VIEW 1: A MODIFIED JACKSON HOLE CONSENSUS

The first view argues that the monetary authority should keep its relatively narrow mandate of price stability and stabilising resource utilisation around a sustainable level, whereas macro prudential authorities should pursue financial stability, with each having their own instruments. It can be described as a modification of the popular "Jackson Hole consensus" that prevailed before the crisis: Financial stability concerns are only taken into account by the monetary authority to the extent that they affect the outlook for price stability and economic activity.[27] The biggest need for change as a result of the lessons learned from the financial crisis is the establishment of an effective and credible macroprudential policy framework with the objective of maintaining financial stability. Once this is in place, monetary policy can continue to focus on price stability as, for example, described in the flexible inflation targeting literature, but taking changes in the working of the economy and the monetary transmission process due to financial factors into account. Financial stability considerations will indirectly enter into monetary policy decisions to the extent that assessments of systemic tail risks change the expected outlook for inflation or real activity. There is therefore still a role for financial stability monitoring and information exchange with the macroprudential authorities (Adrian et al., 2013).

This view argues that the objectives, the instruments and the transmission mechanisms of monetary and macro-prudential policy can easily be separated. It is based on the judgement that the interaction between monetary policy and macroprudential instruments is limited, that the monetary policy stance did not significantly contribute to the building up of imbalances before the crisis, and that in contrast to macroprudential policy the short-term interest rate is not a very effective instrument to deal with those imbalances. One question is how this view deals with the lender-of-last-resort function of central banks.

Collard, Dellas, Diba and Loisel (2012) have recently developed a model that very much supports the modified Jackson Hole consensus view. The paper offers a characterisation of the jointly optimal setting of monetary and prudential policies (in a Ramsey sense) in a model with financial and price rigidities and discusses its implications for the business cycle. The source of financial fragility is the socially excessive risk-taking by banks due to limited liability and deposit insurance. Interestingly, the model links excessive risk-taking to the type of projects that banks may be tempted to fund because limited liability protects them from incurring large losses, and the degree of riskiness may not be reflected in a larger volume of credit. In this model, sufficiently high capital requirements can always force banks to internalise the riskiness of their loans and tame risk-taking.[28] Monetary policy, in contrast, is less suited for this task as it works primarily through the volume rather than

27 This view goes back to Greenspan (2002), Bernanke and Gertler (1999) and many others. Support for the modified version has been expressed, among others, by Gerlach (2010), Svensson (2012, 2013) and Bean et al. (2010).

28 Note that there is no uniform agreement on whether higher capital reduced risk-taking incentives. See, for example, Gale (2010).

the composition of credit and thus it has no first-order effect on risk-taking incentives.[29] In contrast to models that emphasise the credit cycle, this framework does not suggest a strong connection between interest rate policy and financial stability. In response to shocks that do not affect banks' risk-taking incentives prudential policy should leave the capital requirement constant and monetary policy should move the interest rate in the standard way to stabilise prices. In response to shocks that increase banks'risk-taking incentives, prudential policy should raise the capital requirement and monetary policy should cut the interest rate in order to mitigate the effects of prudential policy on bank lending and output. So, in this case, the two policies move in opposite directions over the cycle. The authors also show that, if the incentive to take risks increases with the volume of loans, a positive productivity shock may lead to an optimal joint tightening of the capital requirement and the interest rate. In this case, there is a complementarity between both policies in the sense that the optimal interest rate is smaller due to the tightening of capital requirements.[30]

In more standard New Keynesian models with credit constraints and a financial intermediation sector, interest rate policy and macroprudential policy (e.g geared at constraining the loan-to-value ratio or the capital ratio of banks) will naturally interact much more through their common effects on the cost of finance. For example, one striking finding of Cecchetti and Kohler (2012) is that the choice of the instrument itself does not matter (either policy maker could use it), as a capital requirement which affects loan supply and the policy controlled interest rate which has both a demand and a supply effect are perfect substitutes. Cecchetti and Kohler (2012) show that the optimal outcome can be reached in a coordinated optimisation of the two instruments, i.e. a situation where each policy maker takes into account the externality it has on the other policy maker. The papers by Angelini et al. (2011), Baillu et al. (2012), Darracq et al. (2011), De Paoli and Paustian (2013), Gelain et al. (2012), Kannan et al. (2009), Lambertini, Mendicino and Punzi (2011) and Beau et al. (2012) have similar features in a dynamic context.[31] For example, using a DSGE model with financial frictions a la Kiyotaki and Moore (1997), monopolistic competition in the banking sector and a role for bank capital and an ad-hoc loss function which includes the credit to GDP gap, Angelini, Neri and Panetta (2011) study the interaction between macroprudential and monetary policies and find that the benefits of introducing macroprudential policy that changes capital requirements become large when the economy is driven by financial shocks which affect the supply of loans through bank capital. They also find that a non-cooperative pursuit of macroprudential and monetary

29 This is a stark assumption, which contrasts, for example, with Stein (2012) who finds that a lower interest rate may encourage banks to take on more risk on the liability side by increasing short-term market funding.

30 In contrast, Dell'Ariccia, Laeven and Marquez (2010) argue that a lowering of the short-term interest rate may lead to lower risk-taking in a model with limited liability and risk-shifting. A lower funding rate may increase profits when the pass-through to lending rates is partial and thereby increase the franchise value of the bank. Under asymmetric information, this may lessen moral hazard and reduce bank risk taking.

31 Angelini et al. (2011), Darracq et al. (2011) and Beau et al. (2012) use ad-hoc loss functions, whereas De Paoli and Paustian (2013) and Lambertini et al. (2011) use a welfare-based criterion. See also ECB (2012), MaRs report, p33, for an overview of recent research that analyses the interaction between monetary and macroprudential policies.

policy may lead to higher volatility in the instruments of both policies because both policies act on closely related variables (bank rates, credit and asset prices), but have different objectives, so that they may push in different directions. Gelain et al. (2012) analyse the relative effectiveness of interest rate changes versus measures that affect the mortgage credit constraint (such as LTV and DTI). They find that DTI and LTV measures are more effective in controlling debt then the short-term interest rate. The latter has a relatively large negative side effect on inflation.

Two interesting recent papers that apply DSGE models with macroprudential and monetary policy to a monetary union (like the euro area) are Brzoza-Brzezinay et al. (2013) and Quint and Rabanal (2013). Brzoza-Brzezinay et al. (2013) show that countercyclical macro-prudential policies may help implement a more homogenous monetary policy stance across countries, while Quint and Rabanal (2013) find that the introduction of a national macroprudential policy may reduce macroeconomic volatility, improve welfare, and partially substitute for the lack of national monetary policies. These papers highlight the ability of macroprudential policies to be geared towards specific regional financial imbalances.

Overall, these studies conclude that i) introducing macroprudential policies is useful in leaning against the financial cycle driven by over-optimistic expectations or expectations of reduced volatility and risk premia and increase welfare; ii) there are potential coordination problems due to the "push me – pull you" nature of both policy instruments; iii) the introduction of macroprudential policies does not change the optimal reaction function of the monetary authorities very much.

VIEW 2: LEANING AGAINST THE WIND VINDICATED

The second view argues that the narrow focus of many central banks on the inflation outlook over the relatively short term of two to three years prevented them from leaning more aggressively against growing financial imbalances. This view vindicates the "leaning against the wind" strategy proposed by Borio and Lowe (2002), White (2006) and others.[32] It acknowledges that there is a financial cycle that cannot be fully addressed by macro-prudential policy and interacts with the business cycle in various potentially non-linear ways. It also acknowledges that the monetary policy stance may affect risk-taking by the financial intermediation sector and, conversely, that the fragility of the intermediation sector affects the transmission process and the outlook for price stability. In this view, financial stability concerns should be part of the secondary objectives in the monetary policy strategy. The inclusion of secondary financial stability objectives naturally leads to a lengthening of the policy horizon of the monetary authorities as the financial cycle is typically longer than the business cycle.[33] It suggest a modification of flexible inflation

32 See also Rajan (2005) who warned that price stability may not be sufficient for financial stability and suggested that central banks should lean against the emergence of financial imbalances by tightening their monetary policy stances. This view is also closer to the ECB's view as, for example, elaborated by Issing (2011) and Trichet (2010).

33 See Drehmann, Borio and Tsatsaronis (2012) for empirical evidence that the financial cycle is longer than the typical business cycle.

targeting whereby financial stability concerns are taken into account in deciding on the optimal adjustment path for inflation, introducing a term which resembles "leaning against the wind".

Woodford (2012) develops a stylised model along the lines of Curdia and Woodford (2012) to analyse the implications of financial imbalances for monetary policy. In order to address concerns about financial stability in an inflation targeting regime, he postulates a reduced-form model of the way in which endogenous state variables (like leverage) affect the probability of a crisis, and considers how allowance for such a relationship would change the standard theory of optimal monetary stabilisation policy. As in the papers discussed above, the presence of frictions in the financial intermediation sector leads to the inclusion of a financial stability objective in the loss function. This is then taken into account in the optimal targeting rule for monetary policy. The main finding is that the optimal targeting rule now involves not only the output gap, but also a financial stability related term, in addition to the price level gap. In particular, the usual optimal output gap adjusted price level targeting rule is augmented with a term that captures the marginal risk of a financial crisis. The implications for the monetary policy framework is that financial stability concerns should be taken into account in the adjustment path, but the overall primacy of maintaining a price stability objective over the medium-term is not affected. The model implies that it may be appropriate to use monetary policy to "lean against" a credit boom, even if this requires both inflation and the output gap to be below their medium-run target values for a time. One particular version of the model is Woodford (2011), who embeds Stein (2012)'s setting in which financial intermediation activity is distorted due to fire sales during a financial crisis, into a traditional new Keynesian model of monetary policy. This model effectively introduces a risk-taking channel of monetary policy into a macroeconomic setting.[34]

In the "leaning against the wind" view, central banks may face additional trade-offs which will require increased credibility of the price stability target. So, monetary policy becomes more complicated, but not different in set-up. Woodford (2012) argues that the additional complexity is less of a problem to the extent that the optimal targeting rule implies a commitment to a price level target. This means that any departure from the price level from its long-run target path that is justified by an assessment of variations in the projected marginal crisis risk will subsequently have to be reversed. For a number of central banks that already have mandates to contribute to financial stability, such as the European Central Bank, this may not require a big change. Its monetary policy strategy already includes a two-pillar approach involving monetary analysis. The latter has been presented as a way to take into account financial stability concerns and a leaning-against-the-wind approach. Fahr et al. (2013) use macro-economic simulations in an estimated model with financial frictions for the euro area to show how monetary policy leaning against credit

34 Angeloni and Faia (2013) analyze optimal policy in a model with a risk-taking channel. When policy eases bank risk increases because the short term funding ratio rises and therefore the lending rate drops by less. Agur and Demertzis (2011) also discuss interaction between monetary policy and risk taking.

developments may shift the price and output gap stability trade-off inward and therefore contribute to an overall improvement of macroeconomic performance.

VIEW 3: FINANCIAL STABILITY IS PRICE STABILITY

The third view proposes a more radical change in the objectives of monetary policy. It argues that financial stability and price stability are so intimately intertwined that it is impossible to make a distinction.[35] Under this view, both standard and non-standard monetary policies are in the first place attempts at stabilising the financial system, addressing malfunctioning financial markets and unclogging the monetary transmission process. This approach also highlights the time-inconsistency problems involved. Because of threats of financial dominance, the coordination of monetary policy with financial stability policy are crucial.[36]

A model that captures most clearly the intimate interaction between monetary policy and financial stability is the I(ntermediation)-theory of money of Brunnermeier and Sannikov (2012), which puts financial frictions at the centre of the monetary policy transmission mechanism. In the words of Brunnermeier and Sannikov (2013): "… the I-theory of money … argues that price, financial and fiscal stabilities are intertwined due to financial frictions. In downturns, optimal monetary policy should identify and unblock balance sheet impairments that obstruct the flow of funds to productive parts in the economy. In upturns, diligence is required to avoid imbalances that make the economy vulnerable to liquidity and deflationary spirals."

The close connection between price stability and financial stability comes from the fact that the health of the financial intermediation sector determines the degree of inside money creation and the price of risk in the economy.[37] Monetary policy works by redistributing wealth in such a way that dampens the amplification effects coming from balance sheet constraints. For example, cutting the short-term interest rate can increase the value of long-term bonds, thus stabilising banks' balance sheets. Similarly, purchasing specific assets such as mortgage-backed securities may support real-estate prices and thereby help households who suffer from excessive debt.

Brunnermeier and Sannikov (2013) conclude: "The framework of the I-theory suggests a new way of thinking (gives a new perspective) about optimal monetary policy that goes strictly beyond inflation targeting: In downturns: ex-post crisis management is like 'bottleneck monetary policy'. Central banks have to figure out which sectors suffer from impaired balance sheets. The key question is: where is the bottleneck in the economy? Monetary policy has to work against liquidity and deflationary spirals that redistribute wealth away from productive balance sheet-impaired sectors – especially if fiscal-policy

35 Recently, Alan Blinder argued that financial stability should come first in the ranking of objectives because "there is no price stability without financial stability".

36 Others, like Whelan (2013) argue that the mandates of central banks should be broadened to include financial stability, output gap stability and price stability to allow central banks to pursue the most efficient trade-offs. In this approach the time-inconsistency is not emphasised.

37 See also Adrian and Shin (2010).

measures cannot be implemented in a timely manner. Second, monetary-policy tools should be employed in such a way as to reduce negative moral-hazard implications in the long run. In upturns: ex-ante crisis prevention is essential in order to avoid being cornered later, and to be forced to conduct ex-post redistributive monetary policy. Central banks have to be aware of the interactions between the three stability concepts (price, financial, fiscal). They also should have a close eye on aggregate and sector-specific credit growth and other monetary aggregates. Simply following current interest rates is misleading, quantity aggregates have to be closely watched and acted upon because the economy becomes vulnerable when imbalances are building up. In a worst case, we might enter a regime of 'financial dominance', in which the financial industry corners the central banks to conduct certain policies that restrict their freedom to fight inflation."

WHICH OF THE THREE VIEWS?

The three views clearly have different implications for the optimal institutional set-up of financial stability and price stability oriented policies. Under the modified Jackson Hole consensus view, there is no need to bring macroprudential and monetary policies under one roof as long as there is sufficient information sharing amongst the authorities. In contrast, under the view that financial stability and price stability are largely overlapping, it is difficult to separate both objectives and the instruments to achieve those objectives.

Each of those different views acknowledges that there is an important interaction between financial stability and monetary policy in pursuit of price stability. There is, however, a different appreciation of the pervasiveness of this interaction, the effectiveness of independent macroprudential policies, the extent to which monetary policy may be a source of financial instability and the extent to which monetary policy can avoid being drawn into financial stability concerns in particular in times of crisis.

First, if the interaction is very intense, there will naturally be a larger role for coordination which may be more easily internalised when one institution, the central bank, pursues both objectives with the full set of instruments. Second, if macroprudential tools are ineffective in managing the financial cycle, it may be more appropriate for monetary policy instruments to also pursue a financial stability objective. Third, if pure price-stability monetary policy is itself a source of growing imbalances, it may be appropriate to take the financial stability implications of monetary policy into account. Finally, if monetary authorities cannot avoid being drawn into stabilising the financial system in times of crisis, it may be useful to bring both policies under one roof. De facto, many of the non-standard monetary policies (e.g. changes in reserve requirements or in haircuts in central bank operations) could also be seen as macroprudential policy instruments.[38] Moreover, being the first in line to clean up when the bubble bursts, central banks should have the right incentive to lean against the building up of the bubble ex ante.

38 One of the questions this raises is whether central banks should also use non-standard measures to lean against boom periods.

The main counterargument is that the central bank's involvement in financial stability may undermine the credibility of its pursuit of price stability. This may happen through two main channels. First, the central bank's involvement in financial stability requires a stronger involvement in distributional policies (as highlighted by Brunnermeier and Sannikov (2013)) and in quasi-fiscal operations (as emphasised in Pill (2013)). This requires a greater accountability and political involvement which may undermine the independence of the central bank and increase political pressures. Second, involvement in financial stability risks creating important time inconsistency problems for monetary policy. Central banks may get trapped in providing more liquidity than appropriate for long-run price stability if the fundamental problems of debt overhang following a financial crisis are not addressed.

In the next section we will review some of the evidence on the effectiveness of macroprudential policy measures and the risk-taking channel of monetary policy. In the following section we then have a look at the time-inconsistency problem.

Empirical evidence on the effectiveness of macroprudential policy measures and the role of monetary policy in risk-taking.

EVIDENCE ON THE EFFECTIVENESS OF MACROPRUDENTIAL POLICY INSTRUMENTS

As discussed above, whether macroprudential policy can take over as the first line of defence in reducing the probability of a financial crisis very much depends on its effectiveness. However, assessing effectiveness is difficult because i) there is a variety of possible macroprudential tools; ii) there is as yet no widely agreed and comprehensive theoretical framework for the optimal choice and calibration of macroprudential policy tools; and iii) there is only scant actual experience with such tools in advanced economies.[39] The intermediate targets of macroprudential policy may differ and vary over time and with it the choice of policy instruments, also in the light of emerging systemic risks and future financial innovation. For example, a recent report by the European Systemic Risk Board (ESRB, 2011) proposes that macro-prudential policy for the banking sector could include each of the following four intermediate targets: 1. Mitigate and prevent excessive credit growth and leverage; 2. Mitigate and prevent excessive maturity and liquidity mismatch; 3. Limit excessive direct and indirect exposure concentrations; and 4. Limit expectations of bail-out. The most effective instruments to achieve those intermediate objectives will differ across those intermediate objectives.[40] For example, a macroprudential policy of countercyclical capital requirements could help to lean against excessive credit growth and leverage. But, to the extent that many financial crises have their roots in excessive credit creation in mortgage markets and house price bubbles, countercyclical changes in the loan-to-value (LTV) or debt-service-to-income (DTI) ratios of mortgage borrowers may be more effective instruments. On the other hand, quantitative restrictions or a tax on short-term

39 See Progress Report to G20, Macroprudential tools and Frameworks, 27 October 2011 and ESRB (2011).
40 For a taxonomy of risks and instruments, see, for example, CGFS (2012).

funding may be the more appropriate macroprudential instrument to reduce excessive liquidity mismatch, etc.

One advantage of macroprudential policy is that in contrast to monetary policy the potential instruments are granular enough to address the growing imbalances where they arise. On the other hand, a shortcoming of specific macro prudential policies is that they may be subject to regulatory arbitrage and therefore less effective than thought, in particular when the policies are not internationally coordinated. The direct intervention in specific markets may also come at a higher political cost if it involves specific interest groups.

What is the evidence on effectiveness? Overall, there is still limited experience with macroprudential policies in the advanced economies as the policy framework has just been established. Most of the evidence on its effectiveness comes from experiences in emerging market economies, which raises the question how relevant this evidence is for advanced economies. Typically, the existing evidence analyses to what extent macroprudential measures have been successful in reigning in credit and asset price growth. Even less evidence is available on the impact on other intermediate targets such as liquidity mismatch or on the overall price of risk and, most importantly, the probability of a systemic crisis.[41]

Borio and Shim (2007) provides an early assessment of 15 country experiences with prudential measures. They argue that based on the authorities' own assessments as well as on those of outside observers, these measures have, on balance, been regarded as useful. In some cases, they have been reported to have slowed down credit expansion somewhat, at least temporarily, and to have acted as a restraint on imprudent practices. This is confirmed by simple bivariate analysis which suggests that, on average, they did have a restraining effect on credit expansion and asset prices.

More recently, Lim et al. (2011) provide a more comprehensive overview of the evidence on the effectiveness of macroprudential policies using three approaches. One approach is a set of case studies involving an examination of the use of instruments in a small but diverse group of countries (China, Colombia, Korea, New Zealand, Spain, the US, and some Eastern European countries). Overall, the experience is mixed. To various degrees, the instruments may be considered effective in addressing systemic risk in their respective country-specific circumstances, regardless of the size of their financial sector or exchange rate regime. At the same time, in a number of these countries, the instruments did not prevent a build-up of systemic risk. For our purposes, the experience in Spain is particularly interesting. In Spain, the authorities introduced dynamic provisioning as a macroprudential tool in 2000.[42] The instrument appears to have been effective in helping to cover rising credit losses during the early stages of the global financial crisis, but it did not prevent the big run up in house prices and mortgage credit and its systemic collapse. This may be partly due to the

41 An alternative approach to assess macroprudential policy would be to use the unified framework of Adrian, Covitz and Liang (2012). They see financial stability policies as policies that are designed to change the systemic risk/ return trade-off. More stringent regulatory and supervisory policies can raise the price of risk in periods when potential shocks are small in order to reduce systemic risk in the event of large adverse shocks. The balance between the higher pricing of risk (and therefore the higher financial intermediation costs) and the lower level of systemic risk is the crucial policy choice from a financial stability perspective.

42 For a definition and discusson of dynamic provisioning in Spain, see, for example, Saurina (2009).

cap imposed in 2005 on the size of provisions, but it may also point to the fact that the increase in capital requirements during the boom may need to be quite large before it has a restraining effect. Jimenez et al. (2012) confirm this conjecture. Using detailed micro-level data they show that countercyclical dynamic provisioning smoothens cycles in the supply of credit and in bad times upholds firm financing and performance, but may not be powerful enough to lean against the boom.

Lim et al. (2011) also examine the performance of the target (risk) variables, such as excessive credit growth, before and after an instrument is introduced to see if they have had the intended effect. They find that, throughout the economic cycle, macroprudential instruments seem to have been effective in reducing the correlation between credit and GDP growth. In countries that have introduced caps on the loan-to-value ratio, debt-to-income ratio and reserve requirements, the correlation is positive but much smaller than in countries without them. In countries that have introduced ceilings on credit growth or dynamic provisioning, the correlation between credit growth and GDP growth becomes negative. The change in the correlations is also statistically significant, except in the case of caps on foreign currency lending and restrictions on profit distribution.

One notable example is Korea, which has introduced LTV and DTI ratios in 2002 and 2005 respectively, and more recently imposed leverage caps on FX derivatives positions and a financial stability levy on non-core FX liabilities of banks to prevent currency and maturity mismatches in the banking sector from developing. Kim (2013) presents evidence that a tightening of LTV or DTI regulations tend to be associated with a statistically significant decline in the speed at which house prices and/or mortgage lending increases (Kim (2013, Figure 10, p4). Also the other measures taken in 2010 seem to have been effective in curbing the FX derivative positions of particularly foreign banks and lengthening the term structure of external debt. Kim (2013) warns, however, also for unintended consequences which may worsen systemic risk.[43]

Finally, Lim et al. (2011) also perform cross-country regression analysis, which suggests that caps on the loan-to-value ratio, caps on the debt-to-income ratio, ceilings on credit or credit growth, reserve requirements, countercyclical capital requirements, and time-varying/dynamic provisioning may help dampen pro-cyclicality of credit or leverage. The results also suggest that common exposures to foreign currency risk and wholesale funding can be effectively reduced by limits on net open positions in foreign currency and limits on maturity mismatch.

Overall, the empirical literature tentatively supports the effectiveness of macroprudential tools in dampening procyclicality, notably LTV and DTI caps to tame real estate booms, but also ceilings on credit or credit growth, reserve requirements, and dynamic provisioning.[44] To what extent such measures are effective enough to significantly reduce systemic risk is, however, as yet unclear. An example of a study that examines both costs and benefits of capital and liquidity regulation is BCBS (2010).

43 See also Igan and Kang (2011).
44 Overviews of the evidence is also available in Crowe et al. (2011) and CGFS (2012, Annex 4)).

EVIDENCE ON MONETARY POLICY AND RISK TAKING

Whether monetary policy should take an active, preventive role in maintaining financial stability also depends on how effective the standard monetary policy instrument is in leaning against growing financial imbalances and their unwinding and to what extent the short-term interest rate is a key variable in driving the risk-taking capacity of financial intermediaries.

Adrian and Shin (2008, 2009) argue in favour of a key role for the short-term interest rate, building on a central nexus between shifts in the short-term policy rate, future bank profitability, the risk-taking capacity of financial intermediaries and real activity. In this view, relatively small changes in short-term interest rates can have a large impact on risk taking.[45] Moreover, the monetary policy stance affects risk taking of the financial system as a whole. While macroprudential policies typically are designed to target specific vulnerabilities on an ex ante basis, monetary policy affects the cost of finance for all financial institutions, even the ones in the shadow banking system that are more difficult to target via typical supervisory or regulatory actions.[46] Due to their narrow focus, supervisory and regulatory tools may simply end up pushing vulnerabilities into other parts of the financial system where only monetary policy is an effective policy tool.

The main counterargument points to the blunt nature of standard monetary policy tightening and the large collateral damage that could result from attempts at reigning in growing asset price bubbles. In this view, short-term interest rates would have to be increased by a large amount to lower double-digit credit growth and effectively lean against overly optimistic expectations (see, e.g. Blanchard, Dell'Ariccia and Mauro (2009), Gerlach (2010), Svensson (2012)). Moreover, in this view, interest rate changes are a poor tool for targeting tail outcomes, whereas regulatory and supervisory tools may be able to more directly address financial vulnerabilities that emanate from specific markets or institutions.[47]

Following Rajan (2005) and Borio and Zhu (2008), an increasing number of papers have both theoretically and empirically investigated the link between the monetary policy stance and the risk-taking behaviour of banks and other investors. A recent survey can be found in De Nicolò, Dell'Ariccia, Laeven and Valencia (2010).[48] In this section we review some of the evidence for the euro area. This evidence is related to the question whether monetary

45 This follows from the fact that the business of banking is to borrow short and lend long. For an off-balance sheet vehicle such as a conduit or SIV (structured investment vehicle) that finances holdings of mortgage assets by issuing commercial paper, a difference of a quarter or half percent in the funding cost may make all the difference between a profitable venture and a loss-making one. This is because the conduit or SIV, like most financial intermediaries, is simultaneously both a creditor and a debtor – it borrows in order to lend. See also Adrian and Shin (2010).

46 Proponents of monetary policy leaning against the wind often rely on this argument as is illustrated by the following quotes: Monetary policy "sets the universal price of leverage and is not subject to regulatory arbitrage" (Borio and Drehmann, 2009); It allows CBs "to influence the behaviour of institutions that escape the regulatory perimeter" (Cecchetti and Kohler, 2012) and it "gets in all of the cracks and may reach into corners of the market that supervision and regulation cannot" (Stein, 2013).

47 It is worth noting that in crisis times non-standard monetary policy measures may be more appropriate for addressing some of those tail risks.

48 Holmström and Tirole (1998) is a classic reference on the impact of liquidity injections.

policy was too loose in the most recent boom and has contributed to the building up of imbalances.

Before doing so, it is worth distinguishing between two main channels of transmission. One is working through leverage and the riskiness on the asset side. In their review, De Nicolò et al. (2010) distinguish between i) portfolio reallocation such as asset substitution, search for yield (Rajan, 2005) and procyclical leverage (Adrian and Shin, 2009) channels which will tend to increase the share of risky assets and ii) risk shifting which will tend to lower risk taking. The latter effect will be larger, the better capitalised the financial sector is and the more skin-in-the-game there is. The other main channel is working mainly through the funding side like in Stein (2013). Easy monetary policy increases incentives to use more short-term funding.[49] Adrian and Shin (2010) provide evidence that increases in the Fed Funds target are associated with declines in short term funding liabilities. In reality, both channels are likely to interact and strengthen each other (as in Brunnermeier and Pedersen (2009)).[50]

In the light of the review of developments in the euro area above, one of the most interesting pieces of research is a series of papers by Jiménez et al. (2011, 2012) which use detailed credit register data to investigate the risk-taking channel in Spain. Peydro-Alcalde and Ongena (2011) summarise the impact of short-term interest rates on the risk composition of the supply of credit. They find that lower rates spur greater risk-taking by lower-capitalised banks and greater liquidity risk exposure. They highlight three main results for a decrease in the overnight interest rate (even when controlling for changes in the ten-year government-bond interest rate):

(1) On the intensive margin, a rate cut induces lowly capitalized banks to expand credit to riskier firms more than highly capitalized banks, where firm credit risk is either measured as having an ex ante bad credit history (i.e. past doubtful loans) or as facing future credit defaults.

(2) On the extensive margin of ended lending, a rate cut has if anything a similar impact, i.e. lowly capitalized banks end credit to riskier firms less often than highly capitalized banks.

(3) On the extensive margin of new lending, a rate cut leads lower-capitalized banks to more likely grant loans to applicants with a worse credit history, and to grant them larger loans or loans with a longer maturity. A decrease in the long-term rate has a much smaller or no such effects on bank risk-taking (on all margins of lending).

The results in Jiménez et al. (2011, 2012) suggest that, fully accounting for the credit-demand, firm, and bank balance-sheet channels, monetary policy affects the composition of credit supply. A lower monetary-policy rate spurs bank risk-taking. Suggestive of excessive risk-taking are their findings that risk-taking occurs especially at banks with

49 See also Allen and Gale (2007), Diamond and Rajan (2009) and Acharya and Naqvi (2010).

50 Angeloni et al. (2013) test, in a VAR context, for the two channels of increased bank risk by including measures of funding risk and borrower risk and overall bank risk. They argue that the transmission works primarily through funding risk. They also show that overall bank risk as measured by volatility of bank equity prices has a large impact on output.

less capital at stake, i.e. those afflicted by agency problems, and that credit risk-taking is combined with vigorous liquidity risk-taking (increase in long-term lending to high credit risk borrowers) even when controlling for a long-term interest rate.[51]

These findings are confirmed by related research by Altunbas et al. (2012), DellÁriccia et al. (2013), Gambacorta and Marquez (2011), Paligorova and Santos (2012) and Popov (2013). For example, using an equity-market-based probability of default as a bank risk indicator, Altunbas et al. (2012) show that easy monetary policy reduces bank risk in the short run, but increases it in the longer run. Paligorova and Santos (2012) investigate banks' corporate loan pricing policies in the United States over the past two decades and find that monetary policy is an important driver of banks' risk taking incentives. They show that banks charge riskier borrowers (relative to safer borrowers) a smaller premium in periods of easy monetary policy compared to periods of tight monetary policy. Using individual bank information about lending standards from the Senior Loan Officers Opinion Survey, they unveil evidence that the interest rate discount that riskier borrowers receive in periods of easy monetary policy is prevalent among banks with greater risk appetite. This finding confirms that the observed loan pricing discount is indeed driven by the bank risk-taking channel of monetary policy.

The important conclusion from this research is that monetary policy interacts with bank regulation. Banks that are sufficiently capitalised do not suffer from the risk-taking incentive when interest rates are low, consistent with the theoretical findings of the risk-shifting channel by Dell'Ariccia et al. (2010).

One important question is whether these results are macro-economically relevant. Maddaloni and Peydro-Alcalde (2011) use a data set of euro area and US bank lending standards to show that low policy-controlled interest rates soften standards, for household and corporate loans. The absolute impact of a one-standard deviation decrease of Taylor-rule residuals on lending standards is more than five times higher than the softening due to a comparable increase of real GDP growth. This softening – especially for mortgages – is amplified by securitisation activity, weak supervision for bank capital and monetary policy rates that stay too low for a long period. They also provide some suggestive evidence on the linkages between the excessive softening of lending standards and the costs of the crisis. Countries that prior to the financial crisis had softer lending standards related to comparatively low monetary policy rates experienced a worse economic performance afterwards, measured by real, fiscal and banking variables. Finally, the evidence that low

51 These results are confirmed by Ioannidou et al. (2009) who focus on the pricing of the risk banks take in Bolivia (relying on a different and complementary identification strategy to Jiménez, et al. 2011 and studying data from a developing country). Examining the credit register from Bolivia from 1999 to 2003, they find that, when the US federal-funds rate decreases, bank credit risk increases while loan spreads drop (the Bolivian economy is largely dollarised and most loans are dollar-denominated making the federal-funds rate the appropriate but exogenously determined monetary-policy rate). The latter result is again suggestive of excessive bank risk-taking following decreases in the monetary-policy rate. Despite using very different methodologies, and credit registers covering different countries, time periods, and monetary policy regimes, both papers find strikingly consistent results.

long-term rates do not have this impact may suggest that one important channel works through the funding side as financial intermediaries rely mostly on short-term funding.

Moreover, there is quite a bit of evidence that changes in bank lending standards also have significant effects on both credit growth and economic activity. Ciccarelli et al. (2010, 2013) further explore the link between monetary policy, bank lending standards and economic activity and inflation in the euro area using a panel VAR model. They decompose changes in total lending standards in two variables using the answers related to the factors affecting these changes. Innovations to changes of credit standards due to banks' changes in balance sheet strength and competition are interpreted as a measure of credit supply (bank lending channel), and an innovation to change of credit standards due to firms' (households') changes in balance sheet strength as a measure of borrower's quality (firm/household balance-sheet channel). Overall they find that a monetary policy easing has a significant effect on economic activity and inflation through both the bank lending and balance sheet channel. Somewhat surprisingly, they find that the pure bank lending channel is more relevant for loans to businesses than to households. Ciccarelli et al. (2013) show how the amplification effects through respectively the broad balance sheet channel and the bank lending channel changes over time in line with the conditions affecting the banking sector and the non-standard policies supporting liquidity provision. Overall, they find that outside the heat of the financial crisis, the broad balance sheet channel is more important than the bank lending channel.

While the literature review above suggests that the risk taking channel is active, various authors have argued that standard estimated multipliers of a monetary policy tightening on asset prices, credit and economic activity would suggest that attempts at reigning in asset price bubbles would require large interest rate changes with negative consequences for economic activity. For example, simulations by Bean et al. (2010) suggest that, to stabilise real house prices in the UK from 2004 on, interest rates would have to have been several percentage points higher and, by mid-2007, GDP 3.3 per cent lower. Bean et al. (2010) conclude: "But, at least most of the time, monetary policy does not seem like the most appropriate instrument to call on – it is not targeted at the key friction and involves too much collateral damage to activity". Moreover, as argued by Broadbent (2013), domestic mortgages, the most interest rate-sensitive part of their domestic balance sheets, accounted for less than a quarter of UK banks' assets immediately prior to the crisis and have contributed only a tiny fraction of their losses. Instead, it was losses on overseas assets – including US mortgages – that did most of the damage. So while stabilising domestic house prices would probably have involved material costs in foregone output, it's less clear it would have done much to reduce the likelihood or costs of the financial crisis. Similarly, Gerlach (2010) argues that the effects of a policy tightening on house prices is much less than on output, suggesting large collateral damage of leaning against house price bubbles.

The existing empirical analysis is, however, mostly performed using linear regression methodologies. In order to make a more thorough cost-benefit analysis it is important that non-linear approaches are developed which capture the possibly time-varying nature of

interest rate changes on credit and house prices and their effect on the probability of a crisis. Some early attempts at estimating such models are Hubrich and Tetlow (2012) and Hartmann, Hubrich, Kremer and Tetlow (2013). Similarly, the focus on credit and asset prices in this analysis ignores the important link with increasing fragility due to a shortening and much more complex liability side. One challenge for both analytical and empirical approaches is to combine the build-up of vulnerabilities on the asset side with those on the liability side.

Time inconsistency and the institutional framework

A recent BIS report (the "Ingves report", Bank for International Settlements (2011)) discusses the variety of ways in which central banks fulfil their macroprudential functions alongside their other roles. In some countries (like Malaysia and the United Kingdom), the central bank has clear responsibility for both macroprudential and microprudential policy. In others, central bankers account for a large share of the votes in the committee (as in the ESRB). In the US arrangements, the Federal Reserve is one of 10 voting members of the Financial Stability Oversight Council (FSOC), but it is charged with the regulation of systemically important banks and non-bank financial institutions, as designated by FSOC.

Giving the central bank a strong macroprudential policy objective (with the appropriate instruments) in addition to its price stability objective has a number of advantages. It allows for a better information sharing and coordination amongst both policy domains. It ensures that macroprudential policy is pursued by an independent institution with a lot of expertise in macroeconomic and financial surveillance. Finally, as lenders of last resort, central banks have an incentive to reduce the probability of a financial crisis, because they will be the first in line to clean up when the risks materialise. At the same time, there are two main challenges. First, as macroprudential policy is unlikely to fully prevent financial crises, there is a risk that the reputation of the central bank is damaged which may affect its independence and credibility also with respect to its monetary policy mandate. Second, when both objectives are equally ranked, it may give rise to time-inconsistency problems as ex-post monetary policy will have an incentive to inflate away some of the debt overhang and ex ante macroprudential policies may succumb to political pressures not to lean too much against the boom and rely on monetary policy to solve part of the debt overhang.[52]

In order to illustrate the latter risk, we use a simplified version of the static model analysed in Ueda and Valencia (2012). In this model, the objective of policy makers is to minimise the following loss function:

52 Macroprudential calibrations are often based on discretion and judgment rather than rules, although some countries have used rule-based instruments. While rules have merits – they can help to overcome policy inertia, enhance accountability, and create greater certainty for the industry – designing them may be difficult, especially when multiple instruments are being used in combination. This is why rules are often complemented with discretion.

(1) $$\tfrac{1}{2}(\pi)^2+\tfrac{a}{2}(y-y^*)^2+\tfrac{b}{2}(\theta-\theta^*)^2$$

where π is inflation, y is output, θ is leverage and the starred variables are optimal targets. We assume the inflation target is zero. The first two terms of the loss function are standard. The last one captures the cost of a real debt overhang and the associated financial crisis.

The economy is given by the following two equations:

(2) $$y=\hat{y}+\alpha(\pi-\pi^e)+\beta\delta$$

(3) $$\theta=\hat{\theta}-(\pi-\pi^e)+\delta$$

Equation (2) is a standard Phillips curve with an additional term reflecting the impact of macroprudential policy, where α and β are positive. Output is positively affected by unexpected inflation and by an easing of macroprudential policy. Think of δ as a macroprudential instrument positively affecting credit growth or negatively the cost of finance. Changes in macroprudential policy work like a cost-push shock. For example, a lowering of capital requirements (or an increase in the threshold for leverage) reduces the cost of capital, which in turn increases output and reduces inflation (e.g. through a working capital channel). The second equation determines ex-post leverage. Higher unexpected inflation (and possibly output) will tend to reduce the debt overhang, whereas looser macroprudential policy will tend to increase the debt overhang.

Furthermore, we assume that $\hat{y}<y^*$, reflecting the fact that potential output is lower than the efficient level of output, a standard assumption in the Barro-Gordon literature, which gives an incentive to boost output, and that $\hat{\theta}>\theta^*$, reflecting the assumption that there is a tendency for the financial sector to over-accumulate debt, for example, because of pecuniary externalities due to fire sale dynamics in the bust.[53]

This static model can be seen as illustrating the steady-state effects of a financial stability objective on monetary policy. We analyse two cases. First, assume that the central bank sets both monetary and macroprudential policy to minimise the loss function and can commit to these policies. This setting will give rise to the first best in this simple example. In this case, the central bank can credibly affect inflation expectations and we can set $\pi^e = \pi$ in equations (2) and (3). The central bank minimises loss function (1) subject to equations (2) and (3). The first-order-conditions with respect to monetary policy (π) and macroprudential policy (δ) are respectively:

(4) $$\delta=\tfrac{a\beta}{a\beta^2+b}(y^*-\hat{y})-\tfrac{b}{a\beta^2+b}(\hat{\theta}-\theta^*)$$

(5) $$\pi=0$$

Monetary policy sets inflation equal to zero (the inflation target) and macroprudential policy is set so as to optimally trade off the advantages of higher output versus the costs of a higher debt overhang. A higher steady-state distortion in output will lead to looser

53 See Jeanne and Korinek (2012), Bianchi and Mendoza (2010) for models in which pecuniary externalities due to fire sales give a rationale for ex ante prudential policy.

macroprudential policy, whereas a higher tendency to overaccumulate debt will result in tighter macroprudential policy. Whether there will be net tightening depends on the relative size of both distortions, their relative cost and the relative effectiveness of macroprudential policy.[54] We will assume that on balance macroprudential policy is tightened in the first best solution.

How can this first-best solution be implemented in an environment where the authorities cannot commit? As discussed above, when there is a debt overhang it is very likely that monetary policy will be the last one moving. It is therefore reasonable to assume that the macroprudential decision makers set policy taking the monetary policy reaction function as given (a Stackelberg equilibrium with the macroprudential authorities moving first). If the monetary authority has price stability as its sole objective, then the first-best can be replicated. The monetary authority will set inflation equal to zero. The macroprudential authority will realise this and will therefore have no incentive to relax macroprudential policy in order to have a higher output and let the monetary authorities do part of the work. Macroprudential policy will be set as in equation (4). This will be independent on whether the macroprudential policy authorities care about inflation or not.

The first-best will not be achieved if the monetary authority also cares about financial stability. If the monetary authority has a loss function with both price stability and financial stability (i.e. the first and third term of equation (1)), the monetary authority's reaction function will be given by:

$$\pi = b\,(\theta - \theta^{*}) - b\,(\pi - \pi^{e}) + \beta\delta \tag{6}$$

Inflation will be higher, the higher the debt overhang and the easier macroprudential policy. Knowing this, the macroprudential authority will have an incentive to make use of the fact that the monetary authority will accommodate a part of the debt overhang. The financial stability objective gives rise to an inflation bias.

To see this, assume the macroprudential authority minimises losses from output and leverage deviations taking the monetary policy reaction into account. Under rational expectations, this yields the following reaction function:

$$\delta = \frac{a(\beta(1+b)+\alpha b)}{b+\alpha\beta(\beta(1+b)+\alpha b)}(y^{*} - \hat{y}) - \frac{b}{b+\alpha\beta(\beta(1+b)+\alpha b)}(\hat{\theta} - \theta^{*}) \tag{7}$$

Comparing equation (7) with (4), it is easy to show that the reaction coefficient to the output gap is greater in (7), whereas the reaction coefficient in absolute terms to the leverage gap is smaller. In other words, because the macroprudential authority knows the monetary authority will have an incentive to inflate part of the debt overhang away, it will choose an easier macroprudential policy stance favouring output and allowing for a larger debt accumulation. The end result is a somewhat higher output, but also higher debt accumulation and an inflation bias. The inflation bias is larger than the one which would

54 In a more complete model, the costs of debt overhang need of course to be related to lower output. However, this way, we maintain the linear-quadratic structure.

result from the time-inconsistency problem that would result from the fact that ex-post a monetary authority that cannot commit will always have an incentive to inflate part of the debt away.

Both the reputational and time-inconsistency risks can be mitigated by clearly separating the objectives, instruments, communication and accountability of the macroprudential and monetary policy domains (even if they are performed by the same institution), while maintaining the benefits from information sharing. In particular, in order to avoid the time-inconsistency problem and also to ensure clear accountability, it is important that price stability remains the monetary authorities' primary objective. A lexicographic ordering with the price stability objective coming before the financial stability objective will avoid an inflationary bias that may arise from the central bank's involvement in financial stability, while ensuring that financial stability concerns are still taken into account. Such a credible mandate of the monetary authorities will also give the right incentives for the macroprudential policy makers to lean against the build-up of leverage and growing imbalances and not rely on inflation to solve their problems.

Conclusions

The financial crisis has highlighted the importance of financial stability for economic stabilisation and monetary policy. In this paper we illustrated this point by briefly reviewing the experience in the euro area over the past decade, which was characterised by stable inflation and a very costly boom and bust in credit and asset prices. Some of the lessons learned are very clear: Both macro and microprudential policies need to be strengthened in order to maintain financial stability by increasing the resilience of the financial sector and reducing its procyclicality. The implications for the monetary policy framework are, however, more debated, with some arguing for minimal changes to the price stability oriented frameworks that existed before the crisis and others arguing for a radical rethink putting financial stability on equal footing with price stability and merging the macroprudential and monetary policy objectives. After reviewing the various arguments and the empirical evidence in this paper, I find myself in the middle ground. The costs of financial instability and systemic financial crises are very large: just cleaning up is no longer an option. While the new macroprudential policy framework should be the main tool for maintaining financial stability, it is still very much under construction and its effectiveness in avoiding systemic crises largely unproven. At the same time, there is evidence that the standard monetary policy stance intimately interacts with important drivers of financial imbalances such as credit, liquidity and risk taking. And various non-standard monetary policy instruments used in the recent crisis (such as reserve requirements, collateral rules and asset purchases) are difficult to distinguish from macroprudential tools both in their intermediate objectives (addressing financial market malfunctioning) and in their transmission channels. All these arguments argue for making financial stability an explicit objective of monetary policy, to be used when macroprudential policies fail as an

instrument of last resort. But doing so entails important risks. First, as policy makers are unlikely to fully prevent financial crises, there is a risk that the reputation of the central bank is damaged which may affect its overall independence and credibility. Second, when both objectives are equally ranked, it may give rise to time-inconsistency problems as monetary policy ex-post has an incentive to inflate away some of the debt overhang associated with financial crises. More generally a concern for financial stability may lead to so-called financial dominance. To mitigate these risks, it is important that price stability remains the primary objective of monetary policy and a lexicographic ordering with financial stability is maintained. This will allow the central bank to lean against the wind (if necessary), while maintaining its primary focus on price stability in the medium term.

Another issue is whether macroprudential policy and monetary policy should be put under one central bank roof. In section 5 we listed a number of important arguments in favour related to synergies, expertise, independence and aligned incentives. However, in order to mitigate some of the risks mentioned above, it is advisable to clearly separate the objectives, instruments, communication and accountability of both policy domains, even if they are performed by the same institution.

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Table 1. Macroeconomic imbalances in the euro area
(average annual percentage changes, unless otherwise indicated)

	2003-2007			2008-2012		
	EURO AREA	NON-DISTRESSED	DISTRESSED	EURO AREA	NON-DISTRESSED	DISTRESSED
Private credit	8.2	4.5	14.9	1.4	2.5	0.0
Household debt[1]	86.7	93.8	76.3	96.3	97.5	94.6[2]
Corporate debt[3]	86.7	81.1	90.6	100.1	87.0	112.4
House prices	6.3	4.8	8.5	-0.3	1.6	-3.0
Residential investment	3.0	1.6	4.1	-4.7	-1.0	-9.5
Real lending rates[4]	2.2	2.4	2.0	1.6	1.2	2.7
Current account balance[3] (2007/2012)	0.1	4.1	-5.8	1.2	3.5	-0.8
Net foreign assets[3] (2007/2012)	-13.4	9.0	-50.3	-12.5	18.6[5]	-61.5
HICP inflation	2.1	1.8	2.7	2.1	1.9	2.3
GDP deflator	2.0	1.5	2.9	1.2	1.2	1.1
Unit labour costs	1.2	0.4	2.7	2.0	2.3	1.1
Real GDP	2.2	2.0	2.4	-0.2	0.4	-1.4
Changes in unemployment[6]	-0.2	0.0	-0.4	0.8	-0.1	2.0
Government debt[4] (2007/2012)	66.4	61.5	74.9	92.7	82.3	113.9
General government balance[4]	-2.7	-2.6	-2.9	-3.5	-2.6	-5.2
Government bond spreads against Germany[4]	0.06	0.02	0.12	1.07	0.25	2.61

Sources: ECB, Eurostat, European Commission
1. Average percentage of Gross Disposable Income
2. 2012 data for Greece estimated
3. Average percentage of GDP
4. Period average, in percentage points
5. 2012 data for France estimated
6. Average annual changes

Banking Globalization, Transmission, and Monetary Policy Autonomy

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International financial linkages, particularly through global bank flows, generate important questions about the consequences for economic and financial stability, including the ability of countries to conduct autonomous monetary policy. I address the monetary autonomy issue in the context of the international policy trilemma: countries seek three typically desirable but jointly unattainable objectives of stable exchange rates, free international capital mobility, and monetary policy autonomy oriented toward achieving domestic goals. I argue that global banking entails some features that are distinct from broad issues of capital market openness captured in existing studies. In principle, if global banks with affiliates established in foreign markets can reduce frictions in international capital flows then the macroeconomic policy trilemma could bind tighter and interest rates will exhibit more co-movement across countries. However, if the information content and stickiness of the claims and services provided are enhanced relative to a benchmark alternative, then global banks can weaken the trilemma rather than enhance it. The result is a prediction of heterogeneous effects of banking globalization on monetary autonomy, tied to the business models of the global banks and whether countries are investment or funding locations for those banks. Empirical tests of the trilemma support this view that global bank effects are heterogeneous, and also that the primary drivers of monetary autonomy are exchange rate regimes.

Keywords: international transmission, monetary policy, bank, global, liquidity, lending channel, internal capital markets, policy trilemma

JEL Classification: E44, F36, G32

* The views expressed in this paper are those of the individual authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. Arun Gupta provided excellent research assistance. I deeply appreciate comments and feedback received from participants at the Sveriges Riksbank Conference on Two Decades of Inflation Targeting: Main Lessons and Remaining Challenges, especially from Karolina Ekholm, and from Nicola Cetorelli, Michael Klein, Hamid Mehran, Maurice Obstfeld, Jay Shambaugh, and Chris Sims. Data from Michael Klein, Jay Shambaugh, and Neeltje van Horen are gratefully acknowledged.

Introduction

Financial globalization is frequently criticized, with concerns voiced about consequent increases in economic volatility and disruptions to monetary policy autonomy. Questions about the structure of the system for international capital flows and funding intermediation are of first order importance, and actively debated.[1] One concern is that such globalization amplifies the vulnerability of economies to shocks, while limiting the tools that central banks and policy authorities have for addressing the shocks generated at home and abroad. In the aftermath of the Great Recession and global financial crisis, particular attention has been focused on the activities of global banks and their contribution to economic vulnerability. Do these banks play a role in stabilizing or destabilizing host markets? Do global banks make it more difficult for countries to use local interest rates to address domestic cyclical needs, thereby reducing monetary autonomy?

In this paper, I focus on the relationship between global banks, international shock transmission, and monetary policy autonomy. Throughout, I consider banks as global when they have international activity achieved at least in part through networks of physical branches and subsidiaries in foreign countries. This type of global activity has increased dramatically in recent decades, whether measured in terms of cross-border funding flows, local lending by bank branches and subsidiaries in host markets, counts of foreign banks operating in local markets, or the share of local intermediation activity accounted for by global banks. The composition of international funds provided has also changed tremendously, with more emphasis on longer-term funding, greater use of internal capital markets as compared to cross-border transactions, and more off-balance sheet activity in the form of derivatives, credit guarantees, and commitments. Additionally, global banks use offshore financial centers to a greater degree, and have become more complex organizations in terms of their structure, geographical reach, and service provision.

The consequence of openness to international capital flows for monetary policy autonomy is not a new question. This theme is directly confronted in literature on the macroeconomic policy trilemma, wherein countries seek three typically desirable but jointly unattainable objectives: stable exchange rates, free international capital mobility, and monetary policy autonomy oriented toward achieving domestic goals (for example, see Obstfeld, Shambaugh, and Taylor 2005, 2010). Monetary autonomy, proxied by low interest rate co-movement, is most obtainable under flexible exchange rate regimes and some forms of capital flow restrictions (Klein and Shambaugh 2013).

Does the presence of global banks per se require some distinct considerations relative to other forms of international capital movements? I argue that this distinction matters. In principle, if global banks enter markets by establishing affiliates, this can lead to reduced frictions in international capital flows. In turn, the macroeconomic policy trilemma could bind tighter and interest rates will exhibit more co-movement across countries. Research

1 For example, at the 2013 Jackson Hole conference, both Rey (2013) and Landau (2013) addressed issues regarding the behavior of global liquidity and dynamics of the global financial cycle.

already shows that international capital flows through global banks adjust rapidly to shocks through cross-border and internal capital markets, so local monetary policy effects through the bank lending channel can be weakened (Cetorelli and Goldberg 2012a). However, it also could be the case that, if the global banks are engaged in local lending activity, the information content and stickiness of the claims and services provided in the host market are enhanced relative to a benchmark alternative. This higher information intensity may enable more stability of flows to individual non-bank counterparties in host markets, even in the face of larger macroeconomic disturbances and diminishing financial frictions. Such an argument is consistent with the observation that the presence of global banks is tied to the reduced incidence of crises within countries. In this case, the global banks can weaken the trilemma rather than enhance it. Overall, heterogeneity in shock transmission and autonomy effects across countries and types of counterparties should be expected, and could depend on the form of foreign bank entry, the information content of loans, and the role of affiliate markets in the overall parent organizations as funding sources or investment locations (Cetorelli and Goldberg 2012c).

I conduct empirical tests of the trilemma, closely following the analyses of Obstfeld, Taylor and Shambaugh (2005, 2010) and Klein and Shambaugh (2013), but also adding variables that introduce the extent of global bank penetration of local economies. I find that the share of global banks in domestic credit creation is correlated with interest rate co-movements in countries with pegged or floating exchange rate regimes. In particular, global bank presence is associated with stronger interest rate co-movements in the pegged rate countries that have the most open capital accounts. Global bank penetration matters, while standard measures of capital account openness do not, for floating exchange rate countries. At the same time, this penetration has heterogeneous effects. That said, exchange rate regimes matter most and are the primary reason for differences in interest rate co-movements across countries.

Does this mean that global banking does exacerbate a policy trilemma? In some cases the answer may be yes, but not conclusively so. Global banks follow customers into many markets, and should be correlated with international trade activity, which is not a separate control in the regressions. At the same time, the transmission of shocks between economies through banks is quite heterogeneous, as are the expected effects for the macro-economy. Some host countries are investment locations for banks, where information-intensity of transactions plays a larger role, while other locations are funding locations. Indeed, recent work also suggests that the complexity of the overall global bank parent organization may influence transmission (Cetorelli and Goldberg 2013b), alongside the health and vulnerabilities of banks (Cetorelli and Goldberg 2011), and that the structure of finance beyond these banks should matter for transmission and macroeconomic consequences. Clearly, more work is needed before a "negative" assessment of the effects of global banks on monetary policy autonomy is levied.

Finally, it is worth noting the distinction between my arguments and those of Rey (2013), who considers the large gross capital flows in international banking and elsewhere

as destabilizing economies and making more difficult the conduct of monetary policy. These gross flows certainly could contribute to the incidence of crises, and the severity of crises as also argued by Obstfeld (2012). However, I view net flows and the specific counterparties involved in these flows as potentially more important for the regular conduct of monetary policy. Indeed, research generally shows that the entry of global banks into economies, especially emerging market ones, has reduced rather than enhanced these crisis vulnerabilities.

The next section proceeds by presenting trends in global banking over recent decades. The third section presents key lessons from the literature that examines the roles of global banks in international shock transmission and business cycle co-movement. The forth section turns to evidence on the international macroeconomic policy trilemma, and the last section concludes with a discussion of some outstanding challenges.

Trends in banking globalization and international flows

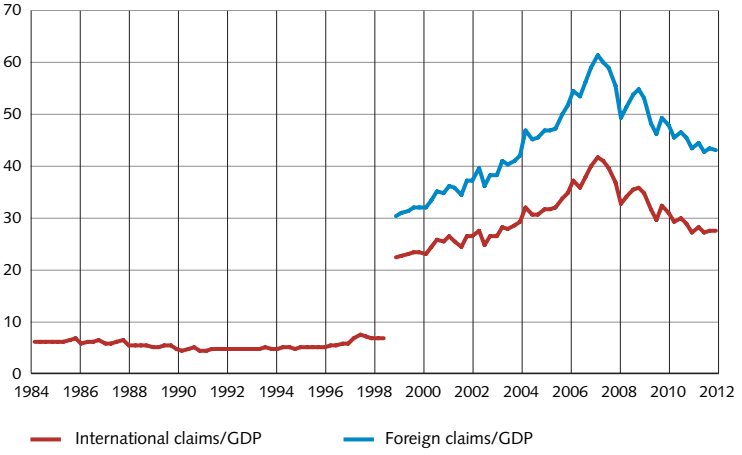
To provide perspective for understanding the macroeconomic consequences of global banks, this section presents facts on the scale and composition of international banking activity. Consider first the international banking flows by approximately thirty countries that report consolidated, national data at a quarterly frequency to the Bank for International Settlements (BIS). These data reflect banks' "on-balance sheet" financial claims vis-à-vis the rest of the world, aggregated across all banks within each reporting country. They cover contractual lending by the head office, its branches, and subsidiaries on a worldwide consolidated basis, i.e. net of inter-office accounts. Intermediation activity includes the extension of credit by a bank headquartered in a particular country to residents of another country, and can occur via: (i) cross-border lending; (ii) local lending by affiliates established in the foreign country, or (iii) lending booked by an affiliate established in a third country (e.g. an international financial center). The underlying financial instruments could be loans, deposits, or securities, as well as derivatives contracts and contingent facilities.[2]

Figure 1 shows an informative trajectory in international banking growth (as a share of world GDP). While growth during the mid-1980s and 1990s was gradual, the early 2000s saw a significant acceleration until the start of the financial crisis of 2007. This was followed by a significant retrenchment during the crisis, with international capital flows through banks dropping nearly 25 percent through 2012. Cross-border flows drive much of the dynamics (in red). These patterns can be compared with the growth in international trade activity (Figure 2). The early rise in international banking tightly mirrored the growth of international trade, in accord with the view that early internationalization of banking was associated with financial multinationals following the production conglomerates and

2 The types of claims reported to the BIS are described as international claims and foreign claims. International claims encompass the cross-border lending and local claims extended by foreign affiliates of the parent bank that are denominated in foreign currency. Foreign claims are broader than international claims, in that they also capture local claims denominated in local currency terms. The data do not cover asset management services. Parts of this section update evidence provided in BIS CGFS No. 41 (2010) on long term trends in international banking.

real resource firms abroad. The sharper liftoff in global banking flows through the 2000s occurred as the activities and customer bases of global banks broadened.

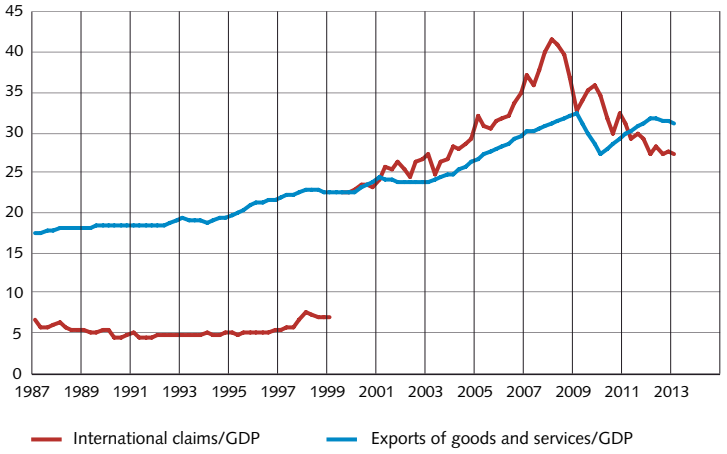
Figure 1. Ratio of bank international and foreign claims to global GDP
Per cent



Note. The series are based on current exchange rates vis-à-vis the US dollar. International claims comprise cross-border claims and local claims in foreign currencies. Foreign claims comprise cross-border claims and local claims in all currencies. Interoffice accounts are excluded. BIS International Claims show a 4 Trillion USD increase in 1999 due to the inclusion of reporting countries as vis-à-vis countries (see http://www.bis.org/statistics/breakstablescons.pdf).

Sources: IMF World Economic Outlook Database for Global GDP; BIS Consolidated Banking Statistics. Reproduced from CGFS No. 41 (2010).

Figure 2. Ratio of international trade and bank international claims to global GDP
Per cent

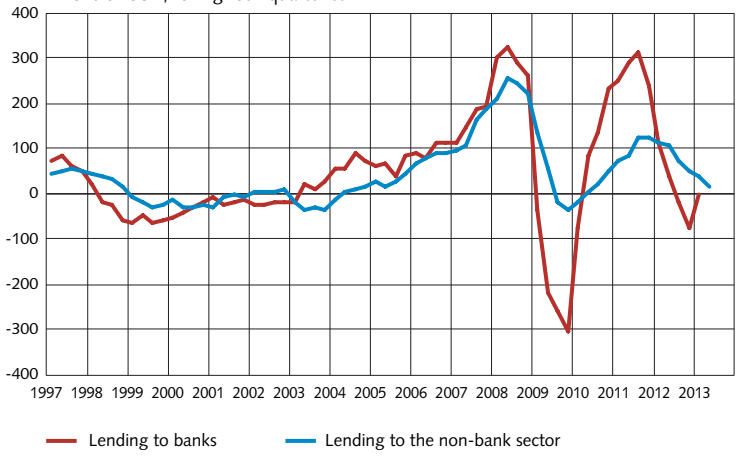


Note. The series are based on current exchange rates vis-à-vis the US dollar. Foreign claims comprise cross-border claims and local claims in all currencies. Interoffice accounts are excluded. BIS International Claims show a 4 Trillion USD increase in 1999 due to the inclusion of BIS reporting countries as vis-a-vis countries (see http://www.bis.org/statistics/breakstablescons.pdf)

Sources: IMF World Economic Outlook Database for World GDP; BIS Consolidated Banking statistics. Reproduced from CGFS No. 41 (2010).

As globalization of banks and opportunities for claims through affiliates increased, cross-border and interbank flows could have tilted toward transactions that are more risky and volatile.[3] For example, international capital flows to unaffiliated banks in emerging markets are more volatile than lending flows to the non-bank sector (Figure 3). The claims extended through affiliates could be the more information intensive ones, and expanded activity in local markets could be with counterparties that have harder information available. The volatility of flows is not purely a story of shortened maturity of funding extended by global banks. Between the 1990s and the 2000s, the share of short-term flows in international claims (Figure 4), which includes both cross-border and foreign currency denominated local claims, declined.

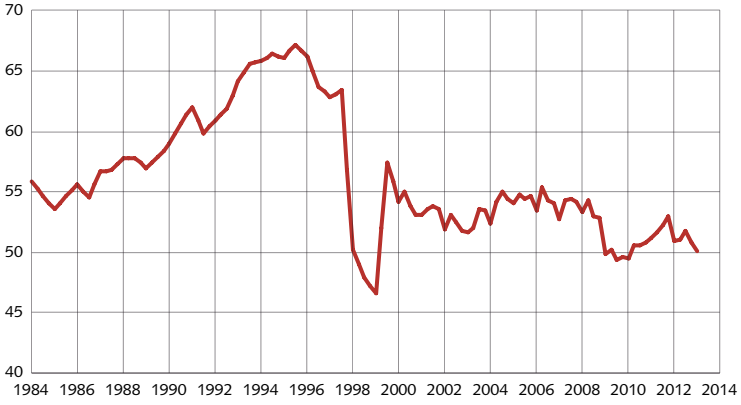
Figure 3. Cross-border lending to banks and non-banks in emerging markets, 1997-2013
Billions of USD, rolling four-quarter sum



Source: BIS Locational Statistics. Figures are adjusted for exchange rate effects.

3 Some of these flows may respond more to stress events, leading to greater volatility in bank financing than in foreign direct investment, portfolio equity, and net international debt securities.

Figure 4. Short term flows (up to 1 year maturity) as share of total international claims
Per cent

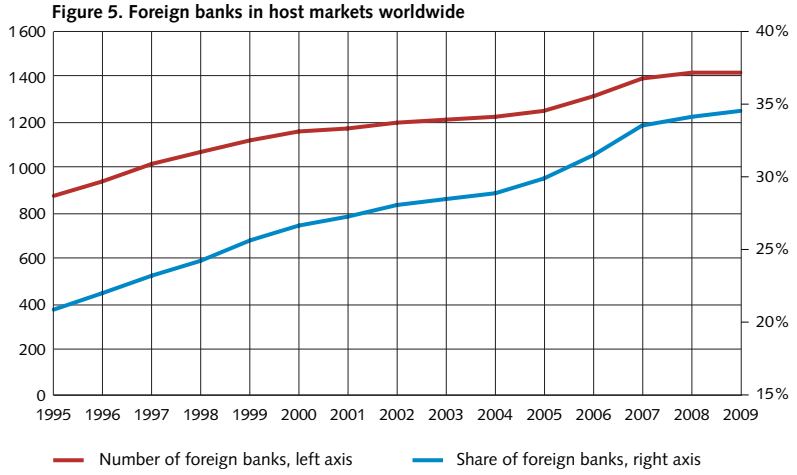


Source: BIS Consolidated Banking Statistics, immediate borrower basis.

The opportunity to shift activities from being cross-border to locally-based arose with the establishment of branches and affiliates of global banks in host markets. As carefully documented by Claessens and van Horen (2013), the numbers and shares of banks operating internationally with local affiliates exhibit their strongest growth in the late 1990s and early 2000s, and again in 2006 to 2007 (Figure 5).[4] In some countries, particularly in emerging markets, the foreign-owned bank shares in local activity grew to dominate shares by domestically-owned banks. The volume of credit issuance originating from foreign-owned banks within local markets also grew rapidly, although not homogeneously, across countries.

4 Various studies explore the entry decisions by these banks, including Buch (2003, 2005), Focarelli and Pozzolo (2006) and Lehner (2009). Niepmann (2013) provides a model where more efficient banks are able to absorb fixed costs of entry into foreign markets, and therefore access these markets through local affiliates instead of cross-border flows, monitoring customers and absorbing higher costs then domestic banks. Empirical evidence by Buch, Koch, and Koetter (2012) provide support for size and efficiency arguments. Cerutti, Dell'Ariccia and Peria (2007) explore the decision over form of entry through branches or subsidiaries.

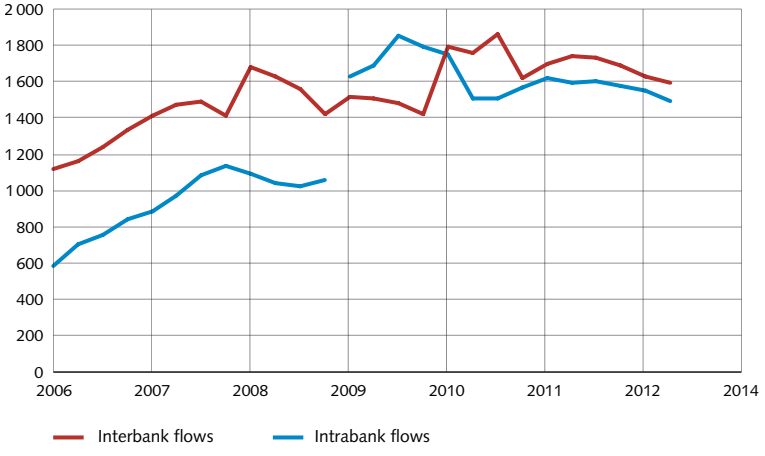
Figure 5. Foreign banks in host markets worldwide



Source: Claessens and van Horen (2013), Figure 1.

As part of the growing number of global banks with centralized decision-making and liquidity management practices, flows between affiliated banks through internal capital markets also reached significant levels. These intra-affiliate flows, in gross terms, are almost as large as interbank transactions (Figure 6).[5]

Figure 6. Intra-bank and interbank flows of US banks
Millions of USD



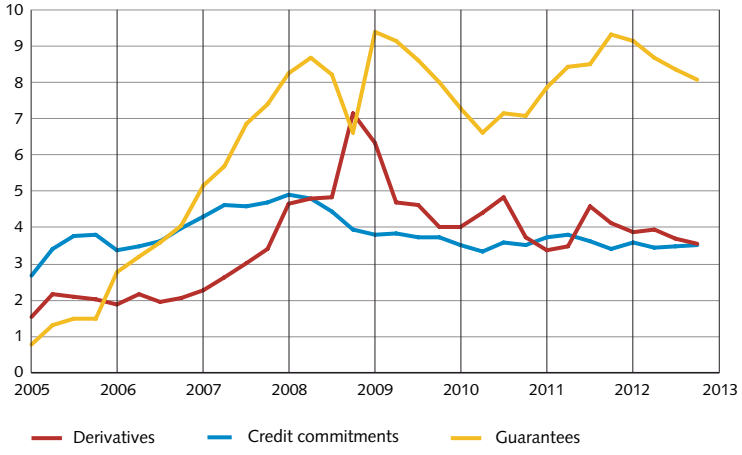
Note. Intra-bank flows are computed as the sum of net due to (from) of affiliates (in absolute value), from FFIEC 009. From the BIS Consolidated Banking Statistics, interbank flows are computed as the sum of foreign claims of the U.S. reporting banks vis-à-vis rest of world and of rest of world reporting banks vis-à-vis the U.S. A break appears in the Intrabank Flows in 2009 due to the inclusion of the Goldman Sachs Group, Morgan Stanley, Barclays Group US, CIT Group, American Express, and Ally Financial into the FFIEC 009 reporting panel.

Sources: FFIEC 009 and BIS Consolidated Banking Statistics.

5 Examples of studies providing direct evidence are Cetorelli and Goldberg (2012 a,b,c) and Duwell (2013).

The 2000s were also a period of expanded off-balance sheet exposures, flows to offshore financial centers, and enhanced organizational complexity. Off-balance sheet transactions, which include derivatives positions, credit commitments, and guarantees[6], had growth (Figure 7) that outpaced that of local claims and cross-border claims. US banks were responsible for the largest growth in guarantees extended and credit commitments, while UK banks accounted for the growth in derivatives contracts (BIS CGFS No. 41 2010). At the same time, global bank flows channeled through offshore financial centers (OFCs) increased three-fold over this period (Figure 8). The economic rationale behind use of OFCs and the economic consequences of this activity are the subject of ongoing analyses (for example, Rose and Spiegel 2007).

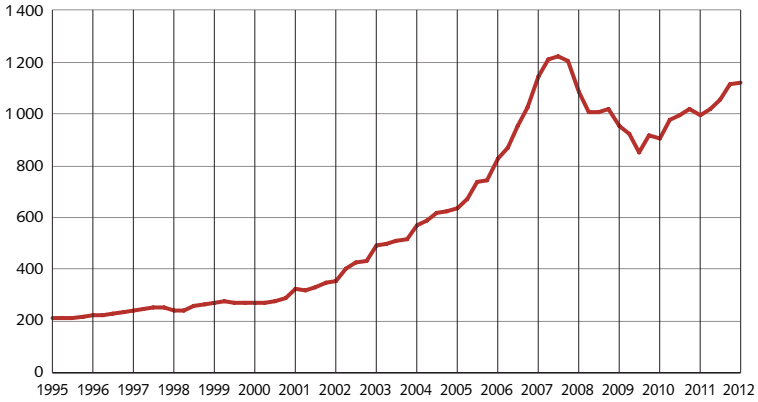
Figure 7. International banking: derivatives, credit commitments, and guarantees
Trillions of USD



Source: BIS Consolidated Banking Statistics, ultimate risk basis.

6 These positions of international banks are captured by BIS banking statistics for the period since 2005 and fall under "other exposures". The derivative positions are the "net value of derivatives", including derivatives used to hedge balance sheet positions, but not derivatives used for proprietary trading.

Figure 8. Global bank deposits in offshore financial centers
Billions of USD



Note. Based on current exchange rates vis-à-vis the US dollar. Vis-à-vis countries are Aruba, Bahrain, the Bahamas, Belize, Barbados, Costa Rica, Cyprus, Dominica, Grenada, Hong Kong SAR, Ireland, the Isle of Man, Lebanon, Luxembourg, Macao SAR, Malta, Mauritius, Panama, St Vincent and the Grenadines, Samoa, the Seychelles, Singapore, Switzerland and Vanuatu.

Source: BIS Locational Banking Statistics.

The growth in global banking activity is accompanied by a large increase in the complexity of these organizations, as measured by the number and industrial classifications of their affiliates (Cetorelli and Goldberg 2013a). There is a widespread perception that the size of organizations is closely mapped to the complexity of organizations. While higher value organizations do tend to have greater numbers of affiliates, especially when considering the largest of financial institutions, this tight link is absent when geographic and business line complexity are considered. Still to be determined are reasons for such complexity: whether due to a search for production efficiency, tax avoidance, information obfuscation, or other explanations. Many global bank affiliates are found within the parent organization's borders, but other affiliates are scattered worldwide. Complexity may be intertwined with the role of global banks in international shock transmission. Cetorelli and Goldberg (2013b) posit that the US branches of foreign banks may play a larger role in liquidity provision and insurance when they are part of more complex global organizations.

Global banks and international shock transmission

Ultimately I ask the question of whether banking globalization, distinct from other forms of international financial integration, undermines the ability of countries to conduct autonomous monetary policy. Before turning to empirical tests related to that proposition, in this section I review evidence on global banks and international shock transmission. I begin with evidence that financial integration strengthens international co-movement of business cycles and the transmission of shocks across markets, and then turn to addressing the roles of global banks in this context.

FINANCIAL GLOBALIZATION AND BUSINESS CYCLE CO-MOVEMENTS.

Alternative theoretical frameworks use two-country models to understand the role of financial globalization in the international propagation of shocks originating in one country and leading to more synchronized business cycles. Calibrated models introduce financial frictions and international business cycles[7]. Specific mechanisms differ across studies, for example when leverage-constrained investors with internationally diversified portfolios are responsible for reallocating capital in response to shocks. Alternatively, investors equalizing returns across internationally traded assets transmit shocks that hit their respective net worth, leading to enhanced co-movements of business cycles.[8]

VAR studies have explored the responses of shocks to GDP across the United States, Euro Area, Japan, and an aggregate of small industrialized countries - with the goal of identifying the major international channels through which shocks are propagated (Bayoumi and Swiston 2009). The largest contributions to spillovers almost universally come from financial variables, as opposed to from trade flows or through commodity prices. World interest rates are also found to be important for emerging market business cycles (Neumeyer and Perri 2005), and U.S. shocks are clearly transmitted to Latin American countries (Canova 2005). Financial integration raises business cycle synchronization among a sample of industrialized countries, even though these countries also tend to be more specialized (Imbs 2004).

The financial integration that is viewed as enhancing business cycle co-movement is not purely a story about international risk sharing. Empirical evaluations of risk sharing patterns among countries exhibiting differing degrees of international financial integration find it is at best modest, and certainly nowhere near the levels predicted by theory (Terrones et al. 2007). In addition, only industrial countries have attained better outcomes during the recent period of globalization. Developing countries have been partly shut out of the risk-sharing benefit because portfolio debt, which has dominated the external liability stocks of most emerging markets until recently, is less conducive to risk sharing.

DIRECT EVIDENCE ON GLOBAL BANKS AND INTERNATIONAL SHOCK TRANSMISSION

What is the specific role of global banks in business cycle co-movements? The diversification benefits of risk-sharing in banking are illustrated in basic macro-banking models where integration tends to dampen the effect of bank capital shocks within borders, but amplifies the effect of bank-specific shocks across borders (Morgan, Strahan,

7 For example, see Devereux and Yetman (2010), Kollman, Enders and Muller (2011), Dedola and Lombardo (2012), and Meier (2013).

8 Adrian and Shin (2010) argue that financial intermediaries – and more generally the suppliers of credit - drive the business cycle through their role in driving the price of risk, and argue (in a one country setting) that balance sheet aggregates such as total assets and leverage are the relevant financial intermediary aggregates to consider in macroeconomic analysis. In their context, with data on the United States, the quantitative discussion considers both the banking and shadow banking system or more market-based intermediaries such as broker-dealers (and which are dependent on more volatile external finance). The institutional structure of intermediation is stressed. In principle, these arguments should extend to the international environment and the location of sensitivities to changes in risk and leverage.

and Rime 2004). In the international setting, the dampening of local shocks starts with a basic observation that the availability of loanable funds via the home deposit base contributes to the pro-cyclicality of lending and the real economy. If foreign-owned bank entrants are less reliant on host-country funding sources and more dependent on foreign sources than their domestically-owned counterparts are, the pro-cyclicality in their supply of loanable funds may be lower.

By now it is well-established that global banks are agents for international shock transmission and generate more integrated international lending activity. Japanese banks transmitted the shocks from Japanese stock price movements that hit their own capital bases into the U.S. real estate market through their bank branches operating in the United States (Peek and Rosengren 1997, 2000).[9] Liquidity shocks transmitted through individual U.S. global banks weakened the bank lending channel within the United States and increased transmission into markets where U.S. banks have overseas affiliates (Cetorelli and Goldberg 2012a). Internal capital markets within global banks work alongside cross-border flows as paths for this transmission, with intra-bank borrowing and lending less volatile but still adjusting to liquidity shocks in crisis and non-crisis times (Cetorelli and Goldberg 2012b,c). Cross border funds and traditional interbank transactions are more volatile than local claims (Cetorelli and Goldberg 2006, 2011, Schnabl 2012, Correa, Sapriza, and Zlate 2012). Syndicated lending activity is a form of cross-border flows shown to be highly responsive to balance sheet conditions and responsible for international transmission (de Haas and van Horen 2012, Giannetti and Laeven 2012).

These observations also point to the importance of being very clear about the form of international banking flows in studies of the effects of banking globalization. Global bank intermediation, along with related internal capital market flows to international affiliated banks or branches, may reduce the financial frictions in international capital markets, and potentially lead to more rapid adjustments of positions. At the same time, there can instead be reduced volatility in international capital flows as counter-party risk declines with the shift away from long distance relationships between borrowers and lenders. The transition from cross-border connections to those through local claims of affiliated banks can both ease the potential for international capital movements and reduce the flightiness of those flows; and the incidence of crises in local markets has declined. Such observations can be consistent with the message of Kalemli-Ozcan, Papaioannou, and Peydro (2012) on reduced crisis transmission amid the presence of global banks.

Moreover, business model differences across and within banks should drive their consequences for international shock transmission and business cycle co-movements, implying heterogeneity in international transmission. While shocks to both the parent organization and local markets are smoothed through capital reallocations, not all affiliate markets are similarly treated by parents. In US bank external flows, a pecking order

9 In the Malaysian case, banks with sufficient international diversification played a stabilizing role in host credit markets during the Asian crisis, while foreign banks that had a narrower focus on Asia behaved similarly to domestic banks (Detragiache and Gupta 2004).

approach to the affiliates applies, instead of the alternative where there is an organizational hierarchy supporting the parent at the uniform expense of the affiliates (Cetorelli and Goldberg 2012c). The real effects and form of shock transmission is not expected to be uniform across locations. Duwel (2013) shows the German parent banks likewise used internal capital markets to reallocate funding within their organizations, with different dynamics of protections to branches and subsidiaries as the funding pressures evolved.

Nonetheless, from a macroeconomic perspective, the role of global banks in enhanced business cycle co-movements may be exaggerated. Kalemli-Ozcan, Papaioannou, and Peydro (2012) explore business cycle co-movement within more than 150 bilateral pairs of advanced economies between 1970 and 2006. The cross-section of country pairs confirms the significant positive correlation between banking integration and output synchronization, but the panel estimates show that within country pairs, increases in cross-border banking and more legislative/ regulatory harmonization in financial services inside the EU has been followed by less synchronized, more divergent output fluctuations. Moreover, aggregate credit effects depend on the potential for local borrowers to substitute credit through bond markets and shadow banking (Adrian, Colla, and Shin 2012), which can differ widely across countries.

FINANCIAL GLOBALIZATION AND CRISES

Oddly, another reason for enhanced business cycle co-movements across countries could be because banking globalization is associated with a reduced incidence of (idiosyncratic) financial crises in emerging market economies, and thereby with fewer sharp output contractions that accompany such crises (Calvo and Reinhart 2000). In a wide sample of countries, the share of bank assets held by foreign owners is negatively correlated with the probability of a crisis (Beck, Demirguc-Kunt, Levine 2003). Foreign bank presence was found to have a negative and statistically significant coefficient in cross-country regressions on crisis probability (Demirguc-Kunt, Levine, and Min 1998). More recent work using data from a sample of 20 developed countries between 1978 and 2009 compared the bilateral linkages and crisis probabilities in periods with and without financial crises (Kalemli-Ozcan, Papaioannou, and Perri 2012). In periods without financial crises, increases in bilateral banking linkages are associated with more divergent output cycles. This relation is significantly weaker and turned positive during financial turmoil periods, suggesting that financial crises induce co-movement among more financially integrated countries and more generally that the type of shock matters for the direction of business cycle co-movement.

Interest rate co-movements and the macroeconomic policy trilemma

The consequences of financial globalization generally, and banking globalization specifically, for the monetary autonomy of countries has been explored in many studies through the lens of interest rate co-movements.[10] Bilateral studies of the economic news effect provide one set of perspectives, though without explicitly considering magnitudes of the financial or banking integration of countries. Consistent with increasing globalization, impacts of U.S. shocks on euro area interest rates have grown larger over time (Ehrmann and Fratzscher 2005), although other studies find more mixed results depending on the particular period studied.[11] These long term structural changes are not the only factors behind changing interest rate co-movements. Similarities in perceived central bank policy reaction functions matter (Goldberg and Klein 2011). Risk conditions also matter: uncertainty alters the information content of news announcements, the interaction of monetary policy and financial stability objectives of central banks, and the effect of economic news announcements on risk premia (Goldberg and Grisse 2013).

In a cross-country setting, exchange rate regimes, controls on financial flows, and economic inter-linkages are tied to interest rate co-movements. Countries with *de jure* or *de facto* currency pegs with respect to the U.S. dollar have their interest rates and monetary stances move largely in step with U.S. interest rates, tying the broader business cycles more closely together (di Giovanni and Shambaugh 2008, and Frankel, Schmukler and Serven 2004). Forbes and Chinn (2004) find that the response of bond yields in smaller economies to those of the world's largest economies depends more on trade than financial linkages, whereas Hausman and Wongswan (2011) find that both types of linkages are important to the response of bond yields to U.S. monetary shocks.

The macroeconomic policy trilemma facing countries is that only two of the following three options might be achieved: exchange rate fixity, monetary autonomy, and international financial openness. Extensive cross-country and time series tests by Obstfeld, Taylor and Shambaugh (2005, 2010) provide evidence that is broadly supportive of the trilemma, particular with respect to less monetary autonomy observed for countries with fixed exchange rates, and more interest rate independence for countries under flexible exchange rate systems. Klein and Shambaugh (2013) demonstrate that countries with extensive capital controls or floating exchange rates retain more monetary autonomy. However, partial capital controls and limited exchange rate flexibility did not lead countries to have more monetary autonomy than in situations with open capital accounts and fixed exchange rates. The trilemma policy mix of countries also feeds back into their output volatility and inflation performance, as Aizenman, Chinn, and Ito (2010) document for developing countries.

10 Kamin (2010) provides a comprehensive review of a number of distinct literatures on asset price co-movements and international shock transmission.

11 Faust, Rogers, Wang, and Wright (2007) find that surprises in U.S. macro announcements affect both short- and longer term interest rates in Europe, but find little evidence that these effects grew stronger over the 1987-2002 period. Contrary to that finding, Ehrmann and Fratzscher (2005) find that the effect of U.S. macro announcements on euro area interest rates rose from before to after 1998.

UNDERPINNINGS FOR GLOBAL BANK EFFECTS ON THE MACROECONOMIC POLICY TRILEMMA

Within this context, why might banking globalization per se matter for monetary autonomy? Banking globalization, especially through the establishment of branches and affiliates in host countries, can be viewed from the lens of reducing financial frictions in international capital markets.[12] These frictions are largely informational, and can be captured under a broad heading of counterparty risk. The increased global bank entry into many economies is accompanied by an expansion of local lending through these banks. This lending is presumably more information intensive than the previous arms-length cross border flows that would have occurred through these same banks. At the same time, there has been an increased use of internal capital markets by these global banks. The presumption here is that the reduced "distance" between the lending source (the global bank) and the client – when this global bank operates through its local branch or subsidiary – increases information intensity. While the costs of moving credit across countries may be reduced when operating within an organization, the information content of the flows associated with lending may be higher, enhancing rather than reducing the stability of loans relative to a cross-border relationship.[13] Indeed, in a systemic crisis or stress situation, such flows may continue to a greater degree than other flows with more counterparty risk. While relevant for the branches and subsidiaries that operate lending operations in countries, information as a stabilizing factor to net lending flows may be less important in economies that some global banks use mainly as locations for raising local funds and offering other portfolio services.

Thus, in addition to the looser restrictions on international capital market access that can enhance the policy trilemma for countries (particularly those without fully flexible exchange rates), I consider whether the presence of global banks also alters the strength of the trilemma.[14] The empirical exercise below examines whether measures of global bank participation within countries and over time add explanatory power to existing studies of interest rate co-movements across countries and the policy trilemma.

The main empirical specification from Obstfeld, Shambaugh and Taylor (2005, 2010) is

$$(1) \qquad \Delta r_{it} = \alpha + \beta \Delta r_{bit} + \mu_{it}$$

12 For thinking about financial frictions, a broad macroeconomic literature considers a type of financial friction and its effects on lending activity. The early literature takes a closed economy view and models frictions as related to credit constraints related to borrower collateral. Gertler and Kiyotaki (2010) instead places borrowing constraints on the lender (the bank), still within a closed economy framework. Other frictions arise from access to external finance when liquidity conditions adjust, a phenomenon argued by Kashyap and Stein (2000) to explain differential bank lending channel effects of monetary policy on loan supply by large versus small banks in the United States, or Cornett, McNutt, Strahan, and Tehranian (2011) on their responses to liquidity risk.

13 For example, see Degryse and Ongena (2005) and Buch (2005).

14 As discussed further below, the metric for foreign bank penetration – relative counts of banks – used in our first tests is one indicator, but certainly is unlikely to capture the extent of integration. It also does not reflect the relationships between the operations in the host markets and the entire parent operations, factors that Cetorelli and Goldberg (2012c) identify as important for the use of internal capital markets and transmission into lending supply in the host markets.

where changes Δ at time t in the nominal local interest rate r of country i move in step with changes in the interest rate r of a dominant or base currency b, which is the currency of the nation to which country i has some degree of *de facto* or *de jure* exchange rate pegs. Most tests use short-term rates for both country i and the base country. Many variants on this basic test have been derived and tested in prior studies. I follow the trilemma literature, in which tests introduce non-structural functional forms for β, capturing the intuition that co-movements of interest rates should be higher for countries with currency peg relationships and with more open capital accounts, captured in variable vector X. Specifically,

$$(2) \qquad \beta = \beta_0 + \beta_1 X_{it}$$

High values of β are interpreted as indicating less monetary autonomy for country i. This interpretation is certainly subject to objections, as tight interest rate co-movements can arise for other reasons, including tight inter-linkages of economies through trade, production integration, or similar industry structures (eg. Stockman and Tesar 1995, and Burstein, Kurz, and Tesar 2008). Interestingly, specification results of (1) with broader controls introduced for these other country linkages still generate robust conclusions about the roles of exchange rate regimes and capital controls (Shambaugh 2004). My contribution to this literature is to explore whether interest rates co-move more tightly across countries when we introduce controls for the presence of global banks. This result might especially arise under fixed exchange rate regimes, but also might be present under flexible exchange rate regimes. If I find indication of a significant role of global bank participation, more analysis would be needed to parse if this role exists independently or exists because these banks are in markets that otherwise have more correlated trade and business cycles.[15]

DATA

I adopt the exchange rate regime metrics of Shambaugh (2004), where a currency is treated as in a "peg" if its exchange rate is within a 2 percent band over the course of a year against a base currency. For example, pegs against the U.S. dollar would have the base interest rate be that of the United States. In addition, I use the "soft pegs" definition of Obstfeld et al. (2010), where the exchange rate bands are between +/-2 percent and +/- 5 percent per year.

I capture restrictions on international capital flows by adopting the Chinn and Ito (2006) capital account openness measure. This metric allows for a variety of capital controls, including covering current account transactions, capital account transactions, and multiple exchange rates. The measure is highest when these restrictions are few, and takes a low or negative value when extensive restrictions on international capital movements are in

15 Spiegel (2009) considers whether financial globalization disciplines local monetary policy implementation in the sense of reducing the returns from using monetary policy to stabilize output. Using a financial remoteness variable, he finds a negative relationship between median inflation and financial globalization, but not a robust relationship.

place.[16] These capital control metrics are intended to reflect de jure impediments or frictions in international movements of capital. My regression specifications introduce the Chinn-Ito metrics, which are continuous variables that range between -1.86 and 2.45 in our sample, or introduce discrete categories of capital account openness (high, medium or low) based on the continuous Chinn-Ito metric.[17]

Global bank presence in each country (denoted by variable *GlobalBank*) is introduced using two measures of foreign penetration. First, I draw on the Claessens and van Horen (2013) database on foreign bank penetration into local financial systems. One measure, denoted as *count* in the regression tables, is the relative count of foreign banks out of total banks in each economy in each year from 1995 to 2009.[18] These data are then merged with the dataset used in Klein and Shambaugh (2013), resulting in a sample of 113 countries and spanning 15 years of data.[19] I construct a second measure of foreign bank penetration that is based on credit extension, instead of counts of banks. This measure, denoted as *GlobalinCredit* in the regression tables, is the share of foreign bank claims on local residents from the Bank for International Settlements Consolidated Banking Statistics Database, relative to Domestic Credit volumes reported in the International Financial Statistics (IFS) database. The latter are converted into USD using IFS bilateral exchange rates. The resulting variable for foreign local credit share is lagged in regression specifications to deal with simultaneity concerns. The global bank presence measures may be positively correlated with financial openness, but these are not identical concepts.

I use the Chinn-Ito measures to describe capital market openness as high, medium, or low, and using the peg, softpeg, and flexible exchange rate regime indicators. The data observations are well distributed over the alternative capital account openness and exchange rate regimes (Table 1).

Finally, the specifications use times series of nominal short-term interest rates for each country. The specific short-term interest rates and base countries used for each country at each date, along with all other data sources, are described in the data Appendix tables A1 and A2. I use the Klein and Shambaugh assignment of base countries for each peg. While all of the reported specifications use annual interest rates, I have also run specifications with quarterly interest rates and various lag structures. The qualitative and quantitative results are robust to this frequency choice, but more noise is added to interest rates and regression fits decline.[20]

16 Klein (2012) also constructs useful measures to distinguish between long-standing capital controls that extend over a wide range of assets, described as "walls", and controls that are more narrowly targeted over a limited duration, which he describes as "gates". Klein and Shambaugh (2013) introduce both sets of measures into their benchmark set of tests of the policy trilemma for countries.

17 These high, medium, and low categories follow the idea of Klein and Shambaugh (2013), who divide country-year observations into true open, mid-open, and other. While the high openness observations correspond to true open in that study, we broaden the definition of low openness to include some observations that Klein and Shambaugh included as mid-open. The cut-offs for each category are described in the data appendix.

18 An alternative variable, on foreign bank share in total banking system assets, is available only from 2004.

19 I thank both sets of authors for providing the data. The Klein and Shambaugh (2013) study covers 209 countries and data for 1960 to 2011.

20 I do not explicitly focus on the interesting issue of the speed through which the base rate feeds through to domestic rates.

RESULTS FOR GLOBAL BANK EFFECTS ON THE MACROECONOMIC POLICY TRILEMMA

Table 2 reports the results of interest-rate co-movement specifications (1) with various controls introduced. The specifications labeled as baseline replicate the Klein and Shambaugh specifications, although that study spanned a longer time frame, more countries, and included a broader exploration of capital control types. Specifications (1) do not include any capital controls distinctions, specifications (2) do not include any exchange rate regime distinctions, and specifications (3) introduce exchange rate regimes and a division of capital account regimes according to the degree of openness (high, medium, or low). Under each of these are three columns, labeled a, b, and c. Columns b and c separately introduce the two global bank variables (*count* and *GlobalinCredit*), both non-interacted and interacted with the other regression variables. Table 3 follows a similar format, except that instead of using dummy variables for the capital account openness regime, the continuous Chinn-Ito series is used. Tables 4 and 5 parallel each other, but present separate regression analyses for sample observations divided according to exchange rate regime (peg, soft peg, or float).

The baseline specifications show that exchange rate regimes are associated with significant differences across countries in interest rate co-movements relative to base country rates (Table 2, specification 1a). The lack of significance on the base rate (non-interacted) shows that on average, pegged exchange rate countries have the tightest co-movement at 0.57, soft peg countries have a weaker co-movement at 0.49, and flexible exchange rate countries do not display statistically significant co-movements. Table 2, specification 2a demonstrates that those specifications that only distinguish by capital account openness, and not exchange rate regimes, do not measure significant distinctions in interest rate co-movements. When both capital account and exchange rate regimes are simultaneously introduced (Table 2, specification 3a), the coefficients associated with the exchange rate regimes become more pronounced as the coefficient on pegs rises, and the distinction between low and medium capital accounts openness appears to be more prominent. Table 3 results use the continuous Chinn-Ito measures, again showing that both pegged exchange rates and capital account openness are associated with stronger interest rate co-movements. For robustness, we have run regressions without the constant term in addition to other specifications using quarterly interest rates (and various lag structures). The study's findings are robust to these alternative specifications.

These results have a lot in common with the central message from prior studies: pegged exchange rate regimes are associated with higher interest rate co-movements. Specifically, while full pegs have the strongest co-movements, with higher point estimates than soft pegs, soft pegs do not seem to provide much added insulation or "monetary policy autonomy", a result that Klein and Shambaugh confirms in a range of other tests. I find weaker evidence for the role of capital controls in this baseline as compared to prior studies that used earlier sample periods in the empirical analysis. These earlier periods may have had more extreme capital account restrictions in place than those we associate with our

low capital account openness regime.[21] During the period I examine, and for the country sample included, capital controls as captured by the Chinn-Ito measures do not appear to be effective for changing interest rate co-movements.

Results provided in Table 4 baseline specifications correspond to separate specifications for the observations within each exchange rate regime subsample. Only the specification applied to pegged exchange rate regimes (Table 4, specification 1) explains much of the interest rate variation with an adjusted R^2 of 0.18 and with significant roles for the base country interest rate, regardless of discrete capital account categories. Table 5 specifications using the continuous Chinn-Ito measure show that pegged exchange rate countries with greater capital account openness also have their short-term policy rates move more closely with the base currency interest rate.

The other specifications within these tables introduce additional measures to reflect global bank participation by country and date. Specifications (b) across the tables introduce the ratio of foreign banks to total number of banks in each country at each date (*count*). Specifications (c) introduce the share of global banks in the provision of domestic credit (*GlobalinCredit*), corresponding to the lending operations of local affiliates (branches and subsidiaries) of these global banks. In general, these variables add very little explanatory power to the specifications. These metrics of banking globalization do not change the basic message regarding key drivers of monetary autonomy for countries. The exchange rate regimes in place dominate the results. Across the two alternative global bank metrics, a consistent finding is that the number of foreign-owned banks relative to the total number of domestic banks is not correlated with patterns in interest rate co-movements. However, global bank penetration in credit provision can be significant.

Among pegged exchange rate countries (Tables 4 and 5, specification c), high foreign bank shares in credit are associated with some increased co-movements of interest rates. This is especially the case for countries already with a high degree of capital account openness. It is interesting that a role for foreign bank penetration in credit provision also is associated with more interest-rate co-movement among floating exchange rate countries. In some specifications, this type of openness strengthens co-movement of interest rate, dampening the effect of capital account openness per se.

Overall, the regression tables using data from 1995 to 2009 show that the primary distinction across countries in interest rate co-movements arise according to exchange rate regimes, and in particular, if a pegged exchange rate regime is in place. Soft pegs are associated with somewhat lower, but still high and significant interest rate co-movements. Countries that have "fear of floating" (Calvo and Reinhart 2002) and adopt soft pegs still forgo a lot of monetary independence. The broad capital account openness measures of Chinn and Ito (2006) play a distant secondary role in our data and country sample. Instead, there is some evidence that global bank presence in local economies influences co-movements. This evidence does not appear when controls capture the numbers of

21 Our "low" openness regime overlaps with the Klein and Shambaugh "mid-open" categorization.

foreign entrants, but when the unit of observation is the share of the foreign banks in domestic credit provision. For pegged and flexible exchange rate countries, interest rate co-movements are greater as foreign bank credit shares rise, pointing to a specific channel which may offset some of the direct differences across countries that would come from the capital account openness measures.

Despite this statistical significance, it is important to emphasize the low incremental explanatory power that resulted from the inclusion of the global bank variables. I already have stressed that, ex ante, it might be difficult to have a single generalized effect of global banking on interest rate co-movement or "monetary autonomy" across countries and time. Global banks enter markets for different reasons, and perform very different functions within specific localities. The health of the foreign bank is an important consideration for transmission (Dages, Goldberg, and Kinney 2000), as is the pattern of foreign bank vulnerabilities (Cetorelli and Goldberg 2011, 2012b) and organizational complexity (Cetorelli and Goldberg 2013a). For a global bank, the type of shock transmission to any economy should depend on the importance of that economy to the overall business of the parent organization – both as a funding source and an investment location (Cetorelli and Goldberg 2012c). Additionally, the corresponding aggregate credit effects depend on the potential for local borrowers to substitute credit through bond markets and shadow banking. Other data on measures of financial and foreign exchange market development could be usefully added in future studies.

Conclusions

Global banks serve to reduce frictions to international capital flows, especially as they enter local markets through branches and subsidiaries and increase flows with related parties. At the same time, the higher information intensity of transactions with unrelated parties can support more stable funding, compared with cross-border flows. Such developments are consistent with research on the relative cyclicality of alternative flows and the reduced incidence of crises in host markets.

Does this mean that global banking exacerbates a policy trilemma? In some cases the answer may be yes, but not conclusively so. Global banks follow customers into many markets, and should be correlated with international trade activity, which is not a separate control in the regressions.[22] At the same time, studies do clearly show transmission of shocks between economies through banks, although with heterogeneous direct effects through banks, and also into the macro-economy. Some host countries are investment locations for banks, where the information-intensity of transactions plays a larger role, while other locations are funding locations. Indeed, recent work also suggests that the complexity of the overall global bank parent organization may influence transmission (Cetorelli and Goldberg 2013b), alongside the health and vulnerabilities of banks (Cetorelli

22 As the careful work of Kalemli-Ozcan, Papaioannou, and Peydro (2012) cautions, there is a danger of ascribing too much of a role to global banks in studies of business cycle co-movement.

and Goldberg 2011), and the structure of finance beyond these banks should matter for transmission and macroeconomic consequences. Clearly, more work is needed before a "negative" assessment of the effects of global banks on monetary policy autonomy is levied.

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Tables

Table 1. Regression observations across exchange rate regimes (Shambaugh) and categories of capital account openness (Chinn-Ito)

ANNUAL FREQUENCY	PEG	SOFTPEG	FLOAT	**TOTAL**
high open	274	176	162	**612**
medium open	66	133	123	**322**
low open	211	93	132	**436**
TOTAL	**556**	**406**	**419**	**1381**

Table 2. Interest rate co-movement across countries, using discrete capital openness categories (Chinn-Ito)
Annual data 1995-2009

	(1)			**(2)**			**(3)**		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
		GlobalBank			GlobalBank			GlobalBank	
	baseline	count	Global inCredit	baseline	count	Global inCredit	baseline	count	Global inCredit
Δr_{bit}	-0.089	-0.132	-0.350***	0.147	0.012	0.081	-0.267	-0.298	-0.472***
	(0.117)	(0.177)	(0.132)	(0.119)	(0.199)	(0.125)	(0.163)	(0.256)	(0.158)
peg * Δr_{bit}	0.572***	0.685***	0.778***				0.641***	0.631***	0.829***
	(0.131)	(0.204)	(0.158)				(0.139)	(0.201)	(0.166)
softpeg * Δr_{bit}	0.467***	0.551*	0.666***				0.466***	0.460	0.637***
	(0.168)	(0.290)	(0.228)				(0.163)	(0.282)	(0.219)
high open * Δr_{bit}				0.152	0.421*	0.025	0.181	0.304	0.106
				(0.146)	(0.235)	(0.177)	(0.139)	(0.232)	(0.159)
medium open * Δr_{bit}				0.140	0.351	0.193	0.258*	0.298	0.293*
				(0.154)	(0.275)	(0.197)	(0.149)	(0.247)	(0.175)
Δr_{bit} * **GlobalBank**		0.001	1.069***		0.003	0.591**		0.001	1.130***
		(0.005)	(0.211)		(0.004)	(0.270)		(0.006)	(0.198)
peg * Δr_{bit} * **GlobalBank**		-0.003	-0.942**					-0.000	-1.109***
		(0.005)	(0.365)					(0.005)	(0.371)
softpeg * Δr_{bit} * **GlobalBank**		-0.002	-1.026*					0.000	-1.088*
		(0.007)	(0.568)					(0.007)	(0.597)
high open * Δr_{bit} * **GlobalBank**					-0.006	0.058		-0.003	0.188
					(0.005)	(0.380)		(0.005)	(0.396)
medium open * Δr_{bit} * **GlobalBank**					-0.006	-0.913*		-0.001	-0.625
					(0.006)	(0.524)		(0.006)	(0.473)
Constant	-0.37***	-0.37***	-0.43***	-0.34***	-0.34***	-0.40***	-0.37***	-0.37***	-0.44***
	(0.061)	(0.060)	(0.064)	(0.058)	(0.058)	(0.061)	(0.061)	(0.060)	(0.064)
Observations	1,381	1,381	1,195	1,370	1,370	1,193	1,370	1,370	1,193
Adj R-squared	0.032	0.031	0.034	0.015	0.015	0.013	0.034	0.031	0.034

Robust standard errors in parentheses, clustered by country
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Interest rate co-movement across countries, using continuous capital openness (Chinn-Ito)
Annual data 1995-2009

	(1)			(2)			(3)			(4)		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
		GlobalBank			GlobalBank			GlobalBank			GlobalBank	
	baseline	count	Global inCredit	baseline	count	Global inCredit	baseline	count	Global inCredit	baseline	count	Global inCredit
Δr_{bit}	-0.089	-0.132	-0.35***	0.210***	0.205	0.116	-0.153	-0.132	-0.389***	-0.153	-0.231	-0.373***
	(0.117)	(0.177)	(0.132)	(0.071)	(0.126)	(0.083)	(0.120)	(0.181)	(0.130)	(0.132)	(0.204)	(0.132)
peg * Δr_{bit}	0.572***	0.685***	0.778***				0.605***	0.580***	0.809***	0.584***	0.658***	0.798***
	(0.131)	(0.204)	(0.158)				(0.128)	(0.195)	(0.156)	(0.150)	(0.249)	(0.163)
softpeg * Δr_{bit}	0.467***	0.551*	0.666***				0.476***	0.506*	0.678***	0.550***	0.729**	0.768***
	(0.168)	(0.290)	(0.228)				(0.171)	(0.299)	(0.233)	(0.207)	(0.324)	(0.252)
Chinn-Ito * Δr_{bit}				0.058	0.135**	0.045	0.061*	0.107*	0.061	0.060	0.251***	0.092
				(0.038)	(0.062)	(0.046)	(0.036)	(0.060)	(0.041)	(0.077)	(0.093)	(0.084)
peg * Chinn-Ito * Δr_{bit}										0.043	-0.131	-0.016
										(0.085)	(0.115)	(0.098)
softpeg * Chinn-Ito * Δr_{bit}										-0.088	-0.424**	-0.176
										(0.117)	(0.174)	(0.153)
Δr_{bit} * **GlobalBank**		0.001	1.069***		0.000	0.425*		-0.000	1.057***		0.003	1.117***
		(0.005)	(0.211)		(0.003)	(0.234)		(0.005)	(0.218)		(0.005)	(0.217)
peg * Δr_{bit} * **GlobalBank**		-0.003	-0.942**					0.000	-1.052***		-0.003	-1.451***
		(0.005)	(0.365)					(0.005)	(0.372)		(0.006)	(0.358)
softpeg * Δr_{bit} * **GlobalBank**		-0.002	-1.026*					-0.001	-1.152*		-0.007	-2.032*
		(0.007)	(0.568)					(0.007)	(0.645)		(0.009)	(1.174)
Chinn-Ito * Δr_{bit} * **GlobalBank**					-0.002	-0.035		-0.001	-0.008		-0.005*	-0.318**
					(0.001)	(0.115)		(0.001)	(0.109)		(0.002)	(0.135)
peg * Chinn-Ito * Δr_{bit} * **GlobalBank**											0.004*	0.571***
											(0.003)	(0.184)
softpeg * Chinn-Ito * Δr_{bit} * **GlobalBank**											0.009**	0.872
											(0.004)	(0.575)
Constant	-0.37***	-0.37***	-0.43***	-0.34***	-0.34***	-0.41***	-0.37***	-0.37***	-0.44***	-0.37***	-0.37***	-0.44***
	(0.061)	(0.060)	(0.064)	(0.058)	(0.058)	(0.061)	(0.060)	(0.060)	(0.064)	(0.061)	(0.060)	(0.064)
Observations	1,381	1,381	1,195	1,370	1,370	1,193	1,370	1,370	1,193	1,370	1,370	1,193
Adj R-squared	0.032	0.031	0.034	0.017	0.017	0.014	0.035	0.033	0.034	0.035	0.036	0.037

Robust standard errors in parentheses, clustered by country
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Exchange rate regime subsamples, interest rate co-movement across countries, discrete capital openness, 1995-2009

	(1)			(2)			(3)		
	peg			softpeg			float		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
		GlobalBank			GlobalBank			GlobalBank	
	baseline	count	Global inCredit	baseline	count	Global inCredit	baseline	count	Global inCredit
Δr_{bit}	0.327**	0.299	0.375**	0.363	0.443	0.245	-0.232	-0.437	-0.433*
	(0.129)	(0.249)	(0.151)	(0.279)	(0.433)	(0.352)	(0.244)	(0.365)	(0.239)
high open * Δr_{bit}	0.334**	0.386	0.220	-0.159	-0.604	-0.307	0.196	0.825**	0.217
	(0.147)	(0.277)	(0.175)	(0.312)	(0.502)	(0.397)	(0.298)	(0.398)	(0.345)
medium open * Δr_{bit}	0.176	0.313	0.098	0.104	0.152	0.304	0.314	0.150	0.255
	(0.244)	(0.486)	(0.281)	(0.344)	(0.494)	(0.431)	(0.262)	(0.392)	(0.299)
Δr_{bit} * **GlobalBank**		0.001	-0.504		-0.003	0.678		0.006	1.368***
		(0.004)	(0.394)		(0.011)	(2.064)		(0.009)	(0.217)
high open * Δr_{bit} * **GlobalBank**		-0.001	0.883**		0.011	0.127		-0.015	-0.788
		(0.005)	(0.436)		(0.012)	(2.114)		(0.010)	(0.545)
medium open * Δr_{bit} * **GlobalBank**		-0.004	-0.754		-0.004	-1.817		0.005	-0.421
		(0.009)	(1.090)		(0.014)	(2.251)		(0.011)	(0.587)
Constant	-0.287***	-0.286***	-0.265***	-0.743***	-0.729***	-0.853***	-0.102	-0.091	-0.216
	(0.068)	(0.068)	(0.072)	(0.126)	(0.127)	(0.133)	(0.160)	(0.161)	(0.158)
Observations	551	551	470	402	402	356	417	417	367
Adj R-squared	0.179	0.175	0.178	0.020	0.018	0.011	-0.004	-0.002	0.004

Robust standard errors in parentheses, clustered by country
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Exchange rate regime subsamples, interest rate co-movement across countries, continuous capital openness, 1995-2009

	(1)			(2)			(3)		
	peg			softpeg			float		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
		GlobalBank			GlobalBank			GlobalBank	
	baseline	count	Global inCredit	baseline	count	Global inCredit	baseline	count	Global inCredit
Δr_{bit}	0.442***	0.437**	0.444***	0.360**	0.456*	0.327	-0.096	-0.173	-0.318**
	(0.086)	(0.169)	(0.100)	(0.151)	(0.247)	(0.204)	(0.137)	(0.212)	(0.133)
Chinn-Ito * Δr_{bit}	0.102**	0.121	0.072	-0.029	-0.165	-0.069	0.062	0.254***	0.090
	(0.040)	(0.076)	(0.049)	(0.085)	(0.154)	(0.117)	(0.077)	(0.096)	(0.085)
Δr_{bit} * **GlobalBank**		0.000	-0.319		-0.004	-0.597		0.003	1.108***
		(0.003)	(0.285)	(0.007)	(1.238)		(0.005)	(0.222)	(0.299)
Chinn-Ito * Δr_{bit} * **GlobalBank**		-0.000	0.258**		0.004	0.401		-0.005*	-0.315**
		(0.001)	(0.124)	(0.003)	(0.576)		(0.002)	(0.138)	(0.217)
Constant	-0.285***	-0.284***	-0.274***	-0.737***	-0.732***	-0.851***	-0.108	-0.105	-0.221
	(0.067)	(0.067)	(0.072)	(0.123)	(0.123)	(0.131)	(0.160)	(0.160)	(0.158)
Observations	551	551	470	402	402	356	417	417	367
Adj R-squared	0.184	0.181	0.181	0.020	0.018	0.007	-0.003	0.000	0.011

Robust standard errors in parentheses, clustered by country
*** p<0.01, ** p<0.05, * p<0.1

Data appendix

DATA SOURCES:

Claessens – van Horen Bank Ownership Database
(http://www.dnb.nl/en/onderzoek-2/databases/bank.jsp)

BIS Consolidated Banking Statistics Database
(http://www.bis.org/statistics/consstats.htm)

IMF International Financial Statistics
(http://elibrary-data.imf.org/finddatareports.aspx?d=33061&e=169393)

Chinn-Ito Index
(http://web.pdx.edu/~ito/Chinn-Ito_website.htm)

IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)
(http://www.elibrary.imf.org/page/AREAER/www.imfareaer.org)

DATASET DIMENSIONS:

The dataset used in Klein and Shambaugh (2013) covers a panel of 209 countries from 1960 to 2011. After merging foreign bank proxies from the Claessens and van Horen (2013) datasets, this paper's annual frequency analysis covers 113 countries from 1995 to 2009. Additional data are introduced from the IMF International Financial Statistics (IFS) and BIS Consolidated Banking Statistics Database. The Claessens – van Horen Bank Ownership Database provides country-year data on the counts of foreign bank (as a share of total banks) and foreign bank assets as a share of total banking assets in each country. These yield the first set of proxies for foreign bank penetration used in the annual and quarterly regression analyses.

IFS Series for domestic credit (local currencies) are obtained for all countries from 1995-2009 and are converted to USD using IFS exchange rates. Country-quarter BIS series on total cross-border, interbank, and local claims from the rest of the world vis-à-vis each country are used to construct the ratio of BIS Claims on Local Residents to IFS Domestic Credit.

Table A1. Data dictionary

VARIABLE	DEFINITION	DATA SOURCE	FREQUENCIES
Country	Panel variable	Klein-Shambaugh	Annual / Quarterly
Own Rate	The interest rate of the local currency	IMF IFS	Annual / Quarterly
Own Rate Type	The type of interest rate (central bank discount, money market, t-bill, etc) used for the local currency	IMF IFS	Annual / Quarterly
Base Country	The country corresponding to the base currency	Klein-Shambaugh / IMF AREAER	Annual
Base Rate	The interest rate corresponding to the base currency	IMF IFS	Annual / Quarterly
Base Rate Type	The type of interest rate (central bank discount, money market, t-bill, etc) used for the local currency	IMF IFS	Annual / Quarterly
Exchange Rate Controls	The type of exchange rate regime	IMF AREAER	
Domestic Credit (in USD)	Exchange rate converted to USD from IFS Series 32 (local currency) This series consists of all claims of the central bank and depository institutions vis-à-vis all the following: (32an) Central government, and treasury (32b) State and local governments, and public financial institutions (32c) Nonfinancial public enterprises (32d) Private sector (32f) Other Banking Institutions (32g) Nonbank Financial Institutions Excludes the domestic claims of Nonbank Financial Institutions vis-à-vis all counterparty sectors	IMF IFS Series 32	Annual / Quarterly
USD Exchange Rate	Inverted calculation of IFS series AE (provided as Local per USD)	IMF IFS Series AE	Annual / Quarterly
Central Bank Discount Rate	The rate at which the central banks lend or discount eligible paper for deposit money banks	IMF IFS Series 60	Annual / Quarterly
Money Market Rate	The rate on short-term lending between financial institutions (denoted "fedfunds" for US) (mmkt)	IMF IFS Series 60b	Annual / Quarterly
Treasury Bill Rate	The rate at which short-term securities are issued or traded in the market (tbill)	IMF IFS Series 60c	Annual / Quarterly
Chinn-Ito Index	An index measuring a country's degree of capital account openness. It is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This index was first introduced in Chinn, Menzie D. and Hiro Ito (2006). *"What Matters for Financial Development? Capital Controls,Institutions, and Interactions,"* Journal of Development Economics, Volume 81, Issue 1, Pages 163-192 (October).	Chinn-Ito Index	Annual
Open	Binary Discretized version of Chinn-Ito Index: Equals 1 if Chinn-Ito > 0.15	Chinn-Ito Index	Annual
Trueopen	Trinary Discretized version of Chinn-Ito Index: Equals 1 if Chinn-Ito > 1.2	Chinn-Ito Index	Annual
Midopen	Trinary Discretized version of Chinn-Ito Index: Equals 1 if 1.2 > Chinn-Ito > -1.15	Chinn-Ito Index	Annual
Closed	Trinary Discretized version of Chinn-Ito Index: Equals 1 if Chinn-Ito < -1.15	Chinn-Ito Index	Annual
Interbank Claims	The asset claims of: 1) All domestic banks in BIS reporting countries 2) All branches and subsidiaries located in BIS reporting countries whose activities are consolidated in a parent bank institution that is located in another BIS reporting country 3) All banking offices located in BIS reporting countries whose controlling parent bank institution resides in a non-BIS reporting country 4) All branches or subsidiaries located in BIS reporting countries whose activities are not consolidated by a controlling parent bank institution in another BIS reporting country (e.g. banking subsidiary with a nonbank controlling parent) vis-à-vis: All banks in the panel variable country. This excludes central banks and multilateral development banks	BIS Consolidated Banking Statistics	Annual / Quarterly
Claims on Local Residents	The asset claims of all banking offices (that reside in the panel variable country and are owned by a BIS reporting parent) vis-à-vis the residents of the panel variable country.	BIS Consolidated Banking Statistics	Annual / Quarterly
Cross Border Claims	The asset claims of all BIS reporting banks (not located in the panel variable country) vis-à-vis the panel variable country.	BIS Consolidated Banking Statistics	Annual / Quarterly
Number of Foreign Banks	The number of active foreign banks in the country	Claessens - van Horen Bank Ownership Database	Annual
Share of Foreign Banks	The share of foreign banks out of total banks in the country	Claessens - van Horen Bank Ownership Database	Annual
Asset Share of Foreign Banks	The share of foreign bank assets out of total bank assets in the country	Claessens - van Horen Bank Ownership Database	Annual

Table A2. Country list
Presents base country pairings, interest rate types used, and period coverage for the country sample (1995-2009).

COUNTRY	OWN RATE TYPE	OWN RATE COVERAGE	BASE COUNTRY	BASE RATE TYPE	BASE RATE COVERAGE
Albania	tbill	all	Germany	tbill	1995-2007
Algeria	tbill	1998-2009	France	tbill	all
Antigua and Barbuda	tbill	all	United States	tbill	all
Argentina	mmkt	all	United States	fedfunds	all
Armenia, Republic of	tbill	all	United States	tbill	all
Australia	mmkt	all	United States	fedfunds	all
Austria	mmkt	1995-1998	Germany	mmkt	all
Azerbaijan, Republic of	tbill	1997-2009	United States	tbill	all
Bahrain, Kingdom of	mmkt	all	United States	fedfunds	all
Barbados	tbill	all	United States	tbill	all
Belgium	tbill	all	Germany	tbill	1995-2007
Benin	mmkt	all	France	mmkt	all
Bolivia	tbill	all	United States	tbill	all
Brazil	mmkt	all	United States	fedfunds	all
Bulgaria	mmkt	1995	United States	fedfunds	1995
Bulgaria	mmkt	1996-2009	Germany	mmkt	1996-2009
Burkina Faso	mmkt	all	France	mmkt	all
Burundi	tbill	1995-2006	United States	tbill	all
Canada	tbill	all	United States	tbill	all
Chile	mmkt	2000-2009	United States	fedfunds	all
China, P.R.: Hong Kong	mmkt	all	United States	fedfunds	all
Colombia	mmkt	all	United States	fedfunds	all
Congo, Democratic Republic of	?	2007-2009	United States	fedfunds	all
Cote d'Ivoire	mmkt	all	France	mmkt	all
Croatia	mmkt	all	Germany	mmkt	all
Cyprus	tbill	1995-2007	France	tbill	all
Czech Republic	mmkt	all	Germany	mmkt	all
Denmark	mmkt	all	Germany	mmkt	all
Dominican Republic	mmkt	1996-2009	United States	fedfunds	all
Egypt	tbill	1997-2009	United States	tbill	all
El Salvador	mmkt	1997-2008	United States	fedfunds	all
Estonia	mmkt	all	Germany	mmkt	all
Ethiopia	tbill	1995-2008	United States	tbill	all
Finland	mmkt	all	Germany	mmkt	all
France	tbill	all	Germany	tbill	1995-2007
Georgia	mmkt	1996-2009	United States	fedfunds	all
Germany	mmkt	all	United States	fedfunds	all
Ghana	tbill	all	United States	tbill	all
Greece	tbill	all	Germany	tbill	1995-2007
Guatemala	mmkt	1997-2006	United States	fedfunds	all
Hungary	tbill	all	Germany	tbill	1995-2007
Iceland	mmkt	all	Germany	mmkt	all
India	mmkt	all	United States	fedfunds	all
Indonesia	mmkt	all	United States	fedfunds	all
Ireland	mmkt	all	Germany	mmkt	all
Israel	tbill	all	United States	tbill	all
Italy	mmkt	all	Germany	mmkt	all

COUNTRY	OWN RATE TYPE	OWN RATE COVERAGE	BASE COUNTRY	BASE RATE TYPE	BASE RATE COVERAGE
Jamaica	tbill	all	United States	tbill	all
Japan	mmkt	all	United States	fedfunds	all
Jordan	mmkt	1999-2009	United States	fedfunds	all
Kazakhstan	tbill	all	United States	tbill	all
Kenya	tbill	all	United States	tbill	all
Korea, Republic of	mmkt	all	United States	fedfunds	all
Kuwait	mmkt	all	United States	fedfunds	all
Kyrgyz Republic	tbill	all	United States	tbill	all
Latvia	mmkt	1995-2003	United States	fedfunds	1995-2003
Latvia	mmkt	2004-2009	Germany	mmkt	2004-2009
Lebanon	tbill	all	United States	tbill	all
Libya	mmkt	1998-2004	United States	fedfunds	all
Lithuania	mmkt	1995-2001	United States	fedfunds	1995-2001
Lithuania	mmkt	2002-2009	Germany	mmkt	2002-2009
Luxembourg	mmkt	1995-1998	Belgium	mmkt	all
Madagascar	tbill	2001, 2003-2009	France	tbill	all
Malawi	tbill	all	United States	tbill	all
Malaysia	mmkt	all	United States	fedfunds	all
Mali	mmkt	all	France	mmkt	all
Mauritania	tbill	all	United States	tbill	all
Mauritius	mmkt	all	United Kingdom	mmkt	all
Mexico	tbill	all	United States	tbill	all
Moldova	tbill	1996-2009	United States	tbill	all
Mongolia	tbill	2004-2007	United States	tbill	all
Morocco	mmkt	all	France	mmkt	all
Mozambique	mmkt	1999-2009	United States	fedfunds	all
Namibia	tbill	all	South Africa	tbill	all
Netherlands	mmkt	1995-1998	Germany	mmkt	all
New Zealand	mmkt	all	Australia	mmkt	all
Niger	mmkt	all	France	mmkt	all
Nigeria	tbill	all	United States	tbill	all
Norway	mmkt	all	Germany	mmkt	all
Oman	mmkt	2004-2009	United States	fedfunds	all
Pakistan	mmkt	all	United States	fedfunds	all
Panama	mmkt	2001-2009	United States	fedfunds	all
Paraguay	mmkt	all	United States	fedfunds	all
Peru	mmkt	all	United States	fedfunds	all
Philippines	mmkt	all	United States	fedfunds	all
Poland	mmkt	all	Germany	mmkt	all
Portugal	mmkt	1995-1999	Germany	mmkt	all
Qatar	mmkt	2004-2009	United States	fedfunds	all
Romania	mmkt	1995-2002	United States	fedfunds	1995-2002
Romania	mmkt	2003-2009	Germany	mmkt	2003-2009
Russian Federation	mmkt	all	United States	fedfunds	all
Rwanda	mmkt	1998, 2001-2008	United States	fedfunds	all

COUNTRY	OWN RATE TYPE	OWN RATE COVERAGE	BASE COUNTRY	BASE RATE TYPE	BASE RATE COVERAGE
Senegal	mmkt	all	France	mmkt	all
Seychelles	tbill	all	United States	tbill	all
Singapore	mmkt	all	Malaysia	mmkt	all
Slovak Republic	mmkt	2000-2008	Germany	mmkt	all
Slovenia	mmkt	all	Germany	mmkt	all
South Africa	mmkt	all	United States	fedfunds	all
Spain	mmkt	all	Germany	mmkt	all
Sri Lanka	mmkt	all	India	mmkt	all
Swaziland	tbill	all	South Africa	tbill	all
Sweden	mmkt	all	Germany	mmkt	all
Switzerland	mmkt	all	Germany	mmkt	all
Tanzania	tbill	all	United States	tbill	all
Thailand	mmkt	all	United States	fedfunds	all
Togo	mmkt	all	France	mmkt	all
Tunisia	mmkt	all	France	mmkt	all
Turkey	mmkt	all	United States	fedfunds	all
Uganda	tbill	all	United States	tbill	all
Ukraine	mmkt	1997-2009	United States	fedfunds	all
United Kingdom	mmkt	all	Germany	mmkt	all
Uruguay	mmkt	all	United States	fedfunds	all
Venezuela, Republica Bolivariana de	mmkt	1996-2009	United States	fedfunds	all
Vietnam	tbill	2000-2009	United States	tbill	all
Yemen, Republic of	tbill	1996-2009	United States	tbill	all
Zambia	tbill	all	United States	tbill	all
Zimbabwe	mmkt	1995-2004	United States	fedfunds	1995-2008

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