

IMF STAFF DISCUSSION NOTE

# Monetary Policy in the New Normal

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**Monetary Policy in the New Normal**

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## EXECUTIVE SUMMARY

The global financial crisis challenged the existing monetary policy paradigm. Before the crisis, dangerous financial imbalances grew under stable output gaps and low inflation. After the bust, a massive stimulus mitigated the downturn, but could not prevent the deepest recession since the Great Depression, as policy rates rapidly hit the zero lower bound (ZLB), and large swings in capital flows complicated macroeconomic management in small open economies. This has led to an intense discussion about what shape monetary policy should take once economic conditions have settled down into the post-crisis “new normal.”

This paper reviews the current state of the debate to extract common policy conclusions where possible, and lays out the unresolved issues where extracting such conclusions is not possible. In doing so, the paper raises more questions than it provides answers:

*Should there be new objectives for monetary policy?* Long-term price stability must remain a primary objective of monetary policy. But the crisis showed that it is not a sufficient condition for macro stability. Going forward, additional intermediate objectives (such as financial and external stability) may play a greater role than in the past. When possible, these should be targeted with new or rethought instruments (macroprudential tools, capital flow management, foreign exchange intervention). But should these prove insufficient, interest-rate policy might have to play a role.

*Should current policy decision rules be reconsidered?* The crisis also highlighted that there is much we do not know about some of the monetary transmission channels (for instance, the effect of low policy rates on bank risk-taking) and about some relationships among important macro variables (for instance, the weakening of the relationship between inflation and unemployment after the crisis). This calls for a reconsideration of model-based policy-response rules and, in the interim, for an approach to policy decision-making involving “more art and less science” than before the crisis.

*Should there be greater international policy cooperation?* The crisis spread rapidly across countries and asset classes, often in relatively unforeseen ways. And the ensuing policy response at the center caused major spillovers at the periphery. This greater-than-expected interconnectedness led to calls for stronger monetary policy cooperation. Yet, while the benefits (especially with regard to avoiding tail risks) are relatively evident, whether and how cooperation can be achieved remains open.

*Should unconventional policy tools become conventional?* During the crisis, central banks employed unconventional tools (such as bond purchases and forward guidance) to provide economic stimulus as the policy rate approached zero, and to ensure transmission despite disrupted financial markets. This raises the question of whether unconventional tools should also be used in tranquil times. We conclude that with the exception of forward guidance, the costs seem to exceed the benefits. A related—and still unsettled—question is how one can avoid hitting the ZLB again in the future.

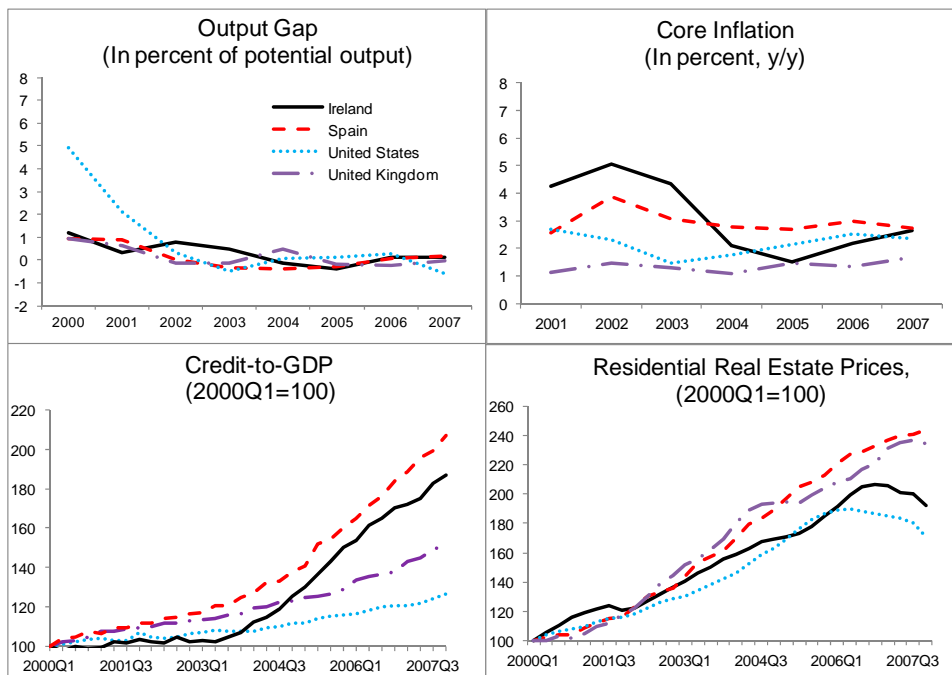
*What are the new challenges for central bank independence?* Independence is clearly still desirable with regard to price stability. But it may prove politically difficult under expanded central bank mandates. It will then be critical to protect the independence of the role of central banks in protecting price stability, while allowing adequate government oversight over their new responsibilities for financial stability.

*What is the optimal arrangement for monetary, macro-prudential, and micro-prudential policy?* Prudential policy needs to acquire a new macro dimension. But this presents governance challenges in its relationship with monetary policy on one side and traditional prudential policy on the other. The best arrangement will depend on what distortions are the most important to address for each country. But within those contours, institutional design will have to balance the need for coordination and information sharing with building safeguards that preserve credibility and protect independence.

## I. INTRODUCTION

The global financial crisis challenged important elements of the view that monetary policy had one overriding objective, price stability, and one instrument, usually a short-term policy interest rate. This view had increasingly guided monetary policy over the previous 20 years in many advanced and some emerging market economies. In particular, the crisis showed that dangerous and macro-relevant imbalances could grow under low inflation and stable output gaps (Figure 1). This, together with the degree of post-bust financial disruption, the depth of the recession (stimulus notwithstanding), and the cross-country reach of the crisis, has led to an intense discussion about what shape monetary policy should take once economic and financial conditions have settled down into the post-crisis “new normal.”

**Figure 1. Output Gap, Core Inflation, and Financial Indicators Before the Crisis**



Source: World Economic Outlook (September 2007 vintage for the output gap) and Haver Analytics.

It is important to notice at the outset that several elements of the pre-crisis consensus remain valid today. Among them are the focus on long-term price stability, clear mandates and the associated accountability, transparency of policy actions, and central bank independence. Obviously, these should be preserved going forward. Other elements, however, may have to be rethought.

A consensus on the contours of a new policy framework has not yet been reached. But important progress at the empirical and theoretical levels offers new perspectives and ways to reshape older ideas to meet new challenges. This paper reviews and extends the current state of the debate (and is part of a broad agenda on monetary policy at the IMF, including chapters in the *World Economic Outlook*, *Global Financial Stability Report*, Board papers, and Staff Discussion Notes). Its main contribution is to bring together different sides of the debate to extract common policy conclusions where possible, and to lay out the unresolved issues where extracting such

conclusions is not possible. Country characteristics matter, and thus the challenges are different for advanced, emerging, and low-income economies, for larger and smaller economies, and for more open and more closed economies. In our analysis, we try to distinguish the implications for each category of countries.

We organize the discussion around three main themes. First, what should the intermediate objectives of monetary policy (and central banks in general) be? And in that context, what are the benefits and challenges of cross-country policy cooperation? Second, in view of the experience during the crisis, what steps (if any) should monetary policy take during normal times to avoid hitting the ZLB? And, what are the merits of using unconventional policy tools during normal times? Third, what are the challenges for central bank independence under an expanded mandate, and what is the optimal governance structure for macro-prudential, micro-prudential and monetary policy?

## **II. MONETARY POLICY OBJECTIVES**

First, it is important to state the obvious: the baby should not be thrown out with the bathwater. Long-term price stability must remain a primary objective of monetary policy. Indeed, one of the lessons from the crisis is the importance of well-anchored inflation expectations, which may have contributed to avoiding deflation spirals during the crisis (see next section). That said, the crisis did challenge the notion that price stability is sufficient for macro (output) stability and raised the question of whether other objectives should enter the mandate of monetary policy and, more generally, central banks.

### **A. Should Financial Stability Be a Goal of Monetary Policy?**

Over the two decades preceding the crisis, a widespread consensus identified low and stable inflation as the primary (sometimes sole) mandate of monetary policy. New Keynesian models (with nominal rigidities as the main, or only, friction) provided the intellectual foundation for this approach (Woodford, 2003). In these largely closed-economy models, stable inflation kept output around its efficient level; the so-called “divine coincidence” (Blanchard and Gali, 2007). And, since low inflation led to low price dispersion and volatility, inflation had to be not only stable, but also very low.

In practice, central banks followed these prescriptions with a degree of flexibility (accommodating supply shocks and allowing for temporary deviations from target inflation), especially in emerging markets. Indeed, the divine coincidence broke down in the presence of distortions other than nominal rigidities, including the effects of financial frictions. And a trade-off emerged between stabilizing output around its efficient level and stabilizing inflation (Woodford, 2003). Yet, the emphasis remained on inflation stabilization. In particular, the effects of financial distortions (for instance, variable credit constraints associated with balance-sheet shocks), while deemed theoretically relevant, were considered quantitatively too small to sway the conduct of monetary policy, especially in advanced economies.

Policymakers recognized the dangers associated with financial imbalances (for instance, credit and asset-price booms). Empirical evidence and theoretical models, outside mainstream macro frameworks, abounded that linked financial fragility with painful economic contractions,

including because of policy shocks originating abroad (for instance, Allen and Gale, 2000; Calvo and Mendoza, 1996; Kaminsky and Reinhart, 1999). And there were calls for monetary policy to “lean against the wind” (for instance, Blanchard, 2000; Borio and Lowe, 2002; Borio and White, 2003; Cecchetti and others, 2000, 2002; and Dupor, 2005). But work that directly linked monetary policy conditions and bank risk-taking was limited before the crisis (Jimenez and others, forthcoming; Angeloni and others, 2013; Dell’Ariccia and others, 2014; Valencia, 2011, and references therein).

That said, in some emerging markets, the concern for financial imbalances (for instance, large foreign-exchange exposures or fast credit growth) already weighed significantly on monetary policy decisions before the crisis. In most advanced economies, however, the prevalent view was that preserving financial stability was the job of financial regulation and supervision. Monetary policy had to react to asset-price movements only to the extent that they affected inflation (and output). This *benign neglect* approach was reinforced by the belief that monetary policy could effectively “clean up” the mess if and when a bubble burst. And it was thought that bubbles are difficult to identify and potentially dangerous to prick *ex ante* (as in Japan in 1989 and in the United States in the 1920).

Indeed, monetary easing after a financial shock had always been less controversial, and was often implemented. Monetary easing and lender-of-last-resort actions alleviate balance-sheet stress and the output contractions associated with market freezes and liquidity shortages. However, this one-sided response (dubbed the “Greenspan put” before the crisis) can cause moral hazard and exacerbate risk-taking *ex ante*, as aggressive post-bust measures disproportionately favor less prudent agents (Farhi and Tirole, 2012; Caballero and Krishnamurthy, 2003).

The crisis made it clear that a more symmetric response is needed. Yet, while a consensus is emerging that macroeconomic policy needs to concern itself with financial stability, whether this is a job for monetary policy is far from settled (many of the arguments for the benign neglect view still stand). And, should the answer be in the affirmative, questions arise as to what parameters should guide the action of monetary authorities in protecting financial stability. Note that this issue is separate from (although related to) the question of whether this responsibility should rest with central banks, as recently was decided in several jurisdictions. Indeed, at least in principle, a single institution could pursue multiple objectives, as long as it had multiple instruments at its disposal (more on this later).

Monetary policy (the policy rate) is not well suited to preventing the kind of imbalances that led to the crisis. It reaches all corners of the economy and is difficult to circumvent. But this same broad reach makes it a costly tool to deal with sector-specific imbalances, especially if speculative behavior is relatively inelastic to interest rate changes. Moreover, conflicts may arise with the use of interest rate policy to achieve price and output stability. Thus, the consequences of financial distortions may be better addressed with more targeted tools. Macroprudential measures (for example, LTV/DTI limits, dynamic provisioning, reserve requirements, and countercyclical capital buffers) can reduce incentives for risk-taking and build up buffers *ex ante*, and financial restructuring can deal with damaged balance sheets *ex post*.

However, macroprudential tools are new and relatively untested, especially in advanced economies.<sup>2</sup> Like capital controls, they are prone to circumvention and political economy problems (IMF, 2013a) and, in some countries' institutional settings, may prove difficult to adjust with sufficient speed. Concerns about these limitations have rekindled interest in monetary policy leaning against the wind (Gerlach and others, 2009; Mishkin, 2010; Bernanke, 2011; King 2012).

New Keynesian models with financial frictions support the view that, absent other tools, monetary policy should adopt financial stability as a new intermediate target (Curdia and Woodford, 2009; Carlstrom and others, 2010; Woodford, 2012). But these linearized models find that the deviations from more standard (inflation/output gap) decision rules would be small. Frameworks that took into account the highly nonlinear effects associated with more severe forms of financial instability (multiple equilibria, market freezes, and cascading bankruptcies; see Annex 1) would deliver quantitatively larger effects. Indeed, one feature of the crisis was a breakdown in financial intermediation in major advanced economies, and it is not yet clear how the many regulatory changes that have taken place since will influence the future shape of intermediation, and hence the transmission of monetary policy and its role in financial stability.

If one were to conclude that monetary policy should help protect financial stability, two distinct approaches could be followed. One approach would be to do so in the context of a flexible inflation-targeting regime with a lengthened horizon. In such a framework, central banks would react to financial imbalances to the extent that they represented a threat to long-term price stability. So, for instance, during booms, the policy rate would be kept higher than suggested by a standard policy rule, to the extent that emerging financial imbalances could lead to a bust and the associated immediate deflation pressures (possibly followed down the road by inflation pressures if the fiscal costs of the crisis undermined public finances). An alternative approach would be to introduce financial stability as an additional target independent from, but interconnected with, price stability. Even though the central bank would take into account implications of financial stability for output stability, and thus inflation pressures, under this approach, it would be expected to react to imbalances even if they did not represent a threat to price stability.

That said, little is known at this stage about how all this would work in practice. First, unlike for price stability, there are multiple dimensions to financial stability and its spillovers, and many potential indicators and targets for policy, including leverage, credit growth, and asset prices (more on this in Section III). Second, since bubbles are difficult to identify in real time, policy may have to strike a balance between allowing dangerous imbalances to grow and smothering healthy financial activity. This suggests that focusing on the more dangerous imbalances, such as credit-driven booms, may be a sensible start (Mishkin, 2010 and White, 2009). Finally, the effects of these policy actions on the behavior of financial markets may be difficult to predict and capture in the highly calibrated quantitative models that have so far provided guidance for monetary policy. If so, "suggestions" from much rougher qualitative models (such as those developed in the banking and corporate finance literature) will have to be taken into account

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<sup>2</sup> Some of these tools, such as reserve requirements, have long been used countercyclically in emerging and developing countries (Federico and others, 2012), albeit often not within a systematic policy framework.

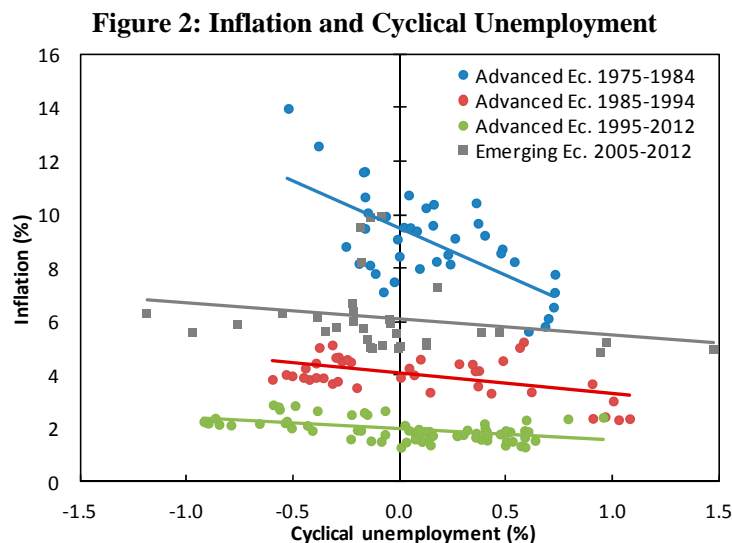


(Caballero, 2010). Until these issues are better understood, monetary policy will involve more art and less science than before the crisis.

## B. Should Central Banks Assign Larger Weights to Output Stability?

Contrary to what many expected based on pre-crisis experience, inflation remained stable amidst sharp output contractions and unemployment increases.<sup>3</sup> The relationship between inflation and unemployment (the Phillips curve) appears to have weakened (IMF, 2013b), especially in advanced economies (Figure 2). This raises the question of whether monetary policy should continue to put the same emphasis on inflation stabilization in its reaction function. The answer lies largely with what is behind the apparent flattening of the Phillips curve—the crisis or more structural factors (see Annex 2).

A structurally flatter Phillips curve would strengthen the case for flexible inflation targeting versus strict inflation targeting. With inflation stabilization requiring greater output and unemployment volatility, central banks may want to wait longer before reacting to inflation pressures to understand better whether these are temporary or permanent (Iakova, 2007). Moreover, if inflation is less responsive to domestic cyclical conditions, it is relatively more affected by temporary cost-push shocks linked, for example, to exchange-rate or commodity-price movements. For given weights on output and inflation in the monetary policy reaction function, a flatter Phillips curve implies responding more often to cost-push shocks and thus inducing undesirable fluctuations in output and unemployment (Wren-Lewis, 2013).



Each observation represents median inflation and cyclical unemployment rates across countries by quarter. For AEs, we use core inflation and cyclical unemployment is the difference from the NAIRU (from the OECD). For EMs, due to data issues, we use headline inflation and compute cyclical unemployment with the HP filter. Source: IMF World Economic Outlook, Organization for Economic Cooperation and Development, and staff calculations.

<sup>3</sup> Ball and Mazumder (2011) show that based on a pre-crisis US Phillips curve, in 2010, U.S. core inflation should have fallen to about -4 percent rather than remaining close to 0.5 percent.

The issue is, however, much less clear if the flattening of the Phillips curve is conditional on policy. Notably, if greater central bank credibility is at the core of the observed flattening in recent decades, a change in the monetary policy reaction function may unanchor inflation expectations, again steepening the Phillips curve (Levin and others, 2004; Gürkaynak and others, 2010). Indeed, the data suggest that prolonged periods of inflation above target may feed into higher long-run inflation expectations, as for example was observed in the United Kingdom in 2011-2012.

The discussion above does not by itself undermine the case for flexible inflation targeting. Further work is needed to better understand the sources of Phillips curve flattening. And, until this uncertainty is reduced, the balance of risks argues against giving much greater weight to output stability. Work on this topic should be a matter of high priority.

### **C. Should Monetary Policy Be Concerned with External Stability?**

The crisis has once again highlighted the dangers associated with the ebb and flow of international capital, and with cross-border financial linkages more broadly. Problems arose not just in small open economies, but also in large advanced economies with deep financial systems (for instance, dollar-liquidity shortages disrupted European interbank markets). This has rekindled long-standing questions on what role monetary policy should play with respect to the external sector and about the benefits from international monetary policy cooperation.

Capital-flow and exchange-rate volatility can adversely affect macroeconomic stability through both real- and financial-sector channels, especially in small open economies. When the exchange rate strengthens on the back of strong inflows, firms in the tradable sector may become uncompetitive. This may lead to a resource reallocation that may be costly to undo, should the appreciation turn out to be temporary. Strong inflows can also fuel domestic credit booms and, when they induce greater use of foreign-denominated liabilities, may lead to balance sheet structures that are vulnerable to reversals (Caballero and Lorenzoni, 2009; Caballero and Krishnamurthy, 2003; and Korinek, 2010). Further, large foreign-exchange liabilities can limit the central bank's ability to act as the lender of last resort.

These problems have rekindled the debate on “capital flow management tools” (see for instance, Ostry and others, 2010, 2011, and 2012); and have led the IMF to issue a revised institutional view on the management and liberalization of capital flows (IMF, 2010, 2011a and b, and 2012a and b). However, these measures may not be effective enough, even in combination with macroprudential policy, and, perhaps even more than in the case of financial stability, monetary policy may have to help (Blanchard and others, 2013).

That said, except under unrealistic conditions, a monetary stance aimed at stabilizing domestic inflation will not at the same time guarantee external stability.<sup>4</sup> Then, a new objective—such as managing the exchange rate in the face of volatile capital flows—means either a new instrument or accepting a trade-off between the new external target and the traditional domestic objective.

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<sup>4</sup> Under frictionless asset markets and producer prices sticky in domestic currency (Corsetti and Pesenti, 2005; Devereux and Engel, 2003), a sort of external-sector divine coincidence emerges: stable inflation (and output gaps) leads to stable international relative prices (Clarida and others, 2002; Gali and Monacelli, 2005).

In economies where financial frictions make foreign and domestic assets relatively imperfect substitutes, central banks can use a mix of interest rate policy and sterilized exchange intervention to target both inflation and exchange rate stability (exploiting the portfolio rebalancing channel (see Disyatat and Galati, 2005, for a survey; see also Ostry and others, 2012, and Benes and others, 2013).<sup>5</sup> Sterilized intervention is less likely to be effective in countries with highly integrated financial systems (such as small open advanced economies) and very deep asset markets (where intervention would need to take place on a massive scale in order to have non-negligible effects on the relative supply of financial assets).

Foreign exchange (FX) intervention can, however, also affect the exchange rate through a signaling channel that changes market expectations about future fundamentals, including the stance of monetary policy. Unlike the portfolio rebalancing channel, it is not clear whether this channel would be stronger in emerging market or advanced economies (in principle, it should be weaker among inflation targeters, where expectations about the policy rate are primarily driven by the inflation objective). The successful Swiss experience with large-scale intervention may be read in this light. On September 6, 2011, the Swiss National Bank announced that it was “prepared to buy foreign currency in unlimited quantities” (Swiss National Bank Annual Report, 2011, p. 38) to keep the franc-euro exchange rate from falling below SF1.20 per euro. Since then, the Swiss National Bank has successfully maintained its exchange-rate floor against the euro, often through heavy nonsterilized purchases of foreign exchange (Swiss National Bank Annual Report, 2012, p. 34).

As for desirability, intervention should typically not aim to resist trend appreciations driven by changes in fundamentals. Rather, it would aim at smoothing temporary exchange-rate fluctuations. Obviously, one operational challenge is to establish whether capital-flow pressures are temporary or permanent. In addition, there is a gray area when it comes to dealing with possibly long-lasting exchange rate fluctuations, such as those associated with monetary policy cycles in reserve currency countries.

Matters are complicated further by the inherent asymmetry in FX interventions. As capital flows in, and setting the costs of sterilization aside, FX intervention can be unlimited, but as capital flows out, reserves are finite. Even more importantly, heavy use of FX intervention may increase a country’s vulnerability to exchange rate movements, if expectations of intervention encourage larger unhedged private sector foreign exchange positions.

More granular advice requires further work. The effectiveness of capital flow management measures (CFMs) and foreign-exchange interventions has to be better understood, also in light of specific country characteristics. Moreover, we do not yet have a solid handle on the complementarities and substitutability of FX interventions, CFMs, and macroprudential policy. The negative side effects (including from a multilateral standpoint) of each policy response have

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<sup>5</sup> Under imperfect asset substitutability, intervention works: for a given interest rate differential, the exchange rate adjusts as investors demand compensation to shift their portfolio holdings away from the asset that has become relatively scarcer.

to be better understood. A careful study of the most recent episodes of interventions and CFMs in light of large capital inflows and outflows may shed further light on these complex questions.

#### **D. Is There a Case for International Monetary Policy Cooperation?**

Changes in monetary policy in reserve currency countries can induce investors to rebalance international portfolios in response to changes in risk perception or in expected rate-of-return differentials, generating capital flows into or out of a country. And even within small open economies, policy actions in one country can divert flows to another.<sup>6</sup>

In the presence of financial distortions, these spillovers are relevant (Korinek, 2014). A case in point is the sharp increase in U.S. policy rates associated with the Volcker disinflation, which contributed to several crises in Latin America. More recent, albeit less dramatic, examples are the swings in capital flows associated with changes in U.S. liquidity conditions in the run-up to the crisis and later those associated with quantitative easing (Shin, 2012; Eichengreen and others, 2011; Cetorelli and Goldberg, 2012; IMF 2013c, 2013d). The question is then whether greater monetary policy cooperation would secure more efficient outcomes than unilateral actions through CFMs or foreign exchange interventions.

In crisis times, the potential gains from cooperation are significant. Cooperation reduces the risk of tail events with large international feedback effects, and in those circumstances, central banks have been willing to cooperate. Examples include the swap arrangements between the Federal Reserve and other central banks (although this did not involve any trade-offs with domestic objectives), the Louvre and Plaza accords, and the April 2009 G-20 agreement on expanding IMF resources and providing a coordinated fiscal stimulus. An abiding issue, however, is that there is insufficient clarity on the size of the welfare gains from monetary policy cooperation in normal times.

Some estimates suggest these gains are relatively small (comparable to those from trade liberalization).<sup>7</sup> Others that take into account global financial co-movements suggest that they may be larger. Over the last two decades, debt-creating flows to emerging markets were typically much higher when advanced country interest rates and volatility were low (“easy” financial conditions) than when they were high (Figure 3).<sup>8</sup> Since the policy stance in reserve currency countries is not necessarily in synch with the business cycle in recipient countries, this can pose dilemmas for monetary policy, even in flexible exchange rate regimes (Rey, 2013; Farhi and

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<sup>6</sup> There is some evidence that capital controls in Brazil caused investors to increase the share of their portfolios allocated to other Latin American countries (Forbes, 2012). But whether these effects are economically important is inconclusive (IMF, 2011b).

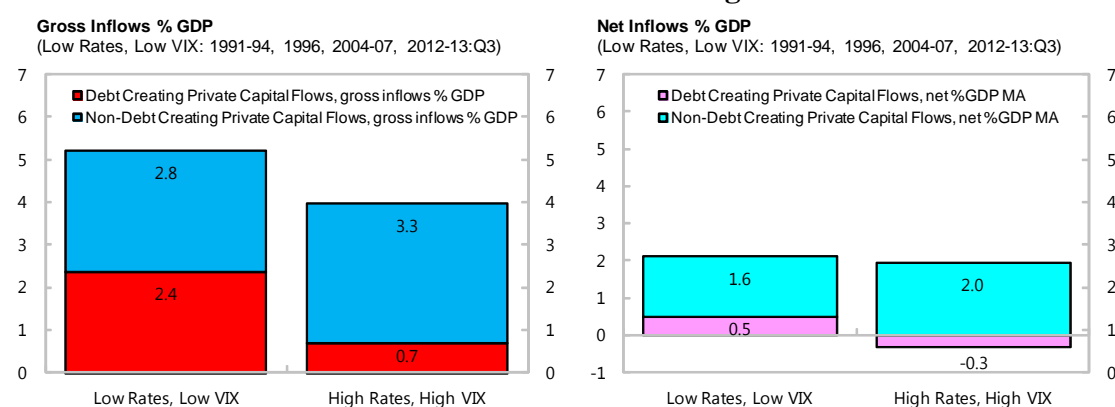
<sup>7</sup> DSGE models suggest gains from close to zero with complete markets (Obstfeld and Rogoff, 2002) to 3 percent of steady-state consumption, with market imperfections. Openness is critical, with a larger import/GDP ratio leading to significantly greater gains from coordination (Coenen and others, 2007).

<sup>8</sup> Financial flows to emerging markets are also correlated with measures of risk, such as the VIX, which, in turn, co-moves inversely with the U.S. policy rate (Bekaert and others, 2013; Miranda-Agrippino and Rey, 2012; and Rey, 2013). And their impact may become stronger as financial systems in emerging markets develop (Mondino and others, 2014).

Werning, 2013; Rajan, 2013). For example, a country may need to raise interest rates for domestic reasons, but doing so could attract even greater inflows. Monetary policy cooperation could then in theory help bring about more consistent conditions across countries.

Given this high degree of uncertainty, why would policymakers cooperate? One answer is that even if the gains are small, they are permanent and hence their present value is large. An alternative, however, is that cooperation should be driven less by the desire for marginal gains and more by avoiding risks of large and potentially cascading losses from a loss in trust. In this interpretation, cooperation in trade—for example—reflects the deleterious effects of the collapse in trade over the Great Depression (Bayoumi, 2013).

**Figure 3. Gross and Net Private Flows to Emerging Markets under Alternative Financing Conditions**



Source: Balance of Payment Statistics and IMF staff calculations.

How far monetary policy cooperation should go and what exactly it would entail also remains unclear. There is consensus that the externalities associated with capital flows can be important. However, coordination of monetary policy may be unnecessary if there is coordination of macroprudential and CFM policies (Jeanne, 2013), given that these tools are first best in dealing with the externalities associated with capital inflows.

Monetary policy coordination might prove difficult to achieve even if there were demonstrable welfare gains. The most significant obstacles are asymmetries in country size, disagreement about the economic situation and cross-border transmission effects of policies, and often policymakers' failure to recognize that they face important trade-offs across various objectives (Ostry and Ghosh, 2013).

Several proposals have been made to address these concerns. One is the establishment of a neutral assessor whose role would be to bridge the divergent views of national policymakers, provided of course that the credibility and neutrality of the assessor were accepted by all parties (Ostry and Ghosh, 2013). Others call for the creation of an international monetary policy committee composed of delegates from national central banks, who would report to world leaders on the aggregate consequences of individual central bank policies (Eichengreen and others 2011).

The Integrated Surveillance Decision, recently adopted by the IMF membership, encourages countries to consider policies that engender less adverse spillovers, while still achieving their domestic objectives. The logic of such guideposts is clear although the specifics remain uncertain (Ostry and Ghosh, 2013).

The enforcement of policy coordination also remains an open issue. The key to better outcomes is to encourage central banks in large countries to internalize the global spillovers of their policies. This may prove challenging, especially when the outcomes of international monetary policy coordination may be at odds with central banks' domestic mandates. Large countries' central banks would need to acknowledge this tension, while seeking to mitigate the negative impact of competing policy objectives and complex schemes. However, they lack incentives to do so, since it may be difficult to measure and communicate convincingly the domestic risks from potential instability elsewhere.

### III. MONETARY POLICY INSTRUMENTS

The one-target-one-instrument simplicity of pre-crisis monetary frameworks evaporated as policy rates approached the zero lower bound (ZLB) and financial disruptions prevented a smooth transmission of the monetary policy stance across asset classes. Many central banks had to improvise and expand their toolkit to provide economic stimulus beyond the ZLB and ensure its transmission despite disrupted financial markets (IMF 2013c). In doing so, they broke with convention on two fronts: they intervened on safe sovereign bond markets at much longer maturities than those typically targeted by the policy rate; and they directly purchased risky private-sector assets.

Sound theoretical arguments and recent empirical evidence support the use of these unconventional instruments during the crisis (as discussed in IMF, 2013c). Going forward, however, this experience raises two questions. What steps (if any) should monetary policy take during normal times to reduce the likelihood of hitting the ZLB? And, setting the ZLB aside, are there merits in using these unconventional tools during normal times?

#### A. How Should Central Banks Deal With the Risk of the Zero Lower Bound?

Any policy framework relying on a policy rate assumes that there is an interest-rate level that allows the central bank to hit its target. Even before the crisis, it was well known that the ZLB could pose challenges for monetary policy implementation.<sup>9</sup> Yet, Japan's experience notwithstanding, the ZLB was seen as a theoretical curiosity and was not taken seriously until 2008 (with notable exceptions, see Bernanke and others, 2004), when the severity of the crisis led many advanced economies' central banks to cut their policy rates to near zero.

Whether central banks need to modify their monetary policy framework in normal times to account for the risk of hitting the ZLB hinges on how serious this risk is and whether hitting the ZLB has negative welfare consequences. The latter, in turn, depends on whether or not the policy

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<sup>9</sup> Negative interest rates on bank reserves would offer only limited relief as they also face a lower bound determined by the costs associated with physical cash holdings.

tools available at the ZLB (dubbed “unconventional monetary policy” or UMP) are effective substitutes for conventional interest rate policy (CMP). We consider these questions in turn, but recognize at the outset that hard and fast answers are not available at this time.

Start from what determines the likelihood of hitting the ZLB. Monetary policy is stimulative as long as the real policy rate is below the natural rate of interest (the real interest rate consistent with a zero output gap). Then, lower natural rates make hitting the ZLB more likely, since smaller shocks suffice to push the optimal policy rate to negative levels. This makes the ZLB an unlikely immediate issue in emerging markets with their higher inflation and natural rates (although it may become more relevant as these economies mature). And, it is certainly not a pressing problem for low-income countries where monetary policy challenges are mostly related to structural and institutional issues (Annex 3). Advanced economies, however, with their lower natural rates (Laubach and Williams, 2003) may face the ZLB more frequently: the crisis may be an indication that large shocks are more likely than previously thought and the natural rate may be on a secular downward trend. On this occasion, the ZLB was hit in the context of a major financial crisis, and a more resilient financial sector might have prevented the problem. However, at least in principle, there could be recessions deep enough to push the policy rate to zero without a concomitant financial crisis.

The ZLB would not be a significant constraint on monetary policy if unconventional tools were as effective as the short-term policy rate. At the ZLB, central banks would simply switch from a short-rate intermediate target to UMP tools (such as bond purchases and forward guidance) directly aimed at longer-term rates. The available evidence suggests that UMP was effective in lowering long-term bond yields, with effects comparable to those under CMP (Annex 4). However, these results draw primarily on periods of severe financial distress, and UMP might prove less effective if an economy reached the ZLB in the absence of major financial disruption. There are also other concerns about UMP, including difficulties with calibration (although these could be overcome with greater experience), complexities related to exit, and potential diminishing returns. These cannot be properly quantified at this time, but are backed by valid theoretical arguments (IMF 2013c; Bayoumi, 2014).

If UMP proves less efficient than CMP, the question is how large the welfare losses are, conditional on the ZLB being hit, and how long and frequent such episodes are. As to the latter, three elements led pre-crisis research to understate both: (i) large shocks were considered unlikely (using observations from the Great Moderation) and calibrations assumed a relatively high natural rate (a legacy of the 1980s); (ii) parameter uncertainty was disregarded, especially on the shock processes, with tail events essentially ignored; and (iii) the structural models and the solution methods adopted were not apt to generate prolonged spells at the ZLB (Reifschneider and Williams, 2000; Schmitt-Grohe and Uribe, 2007). A spell of more than three years at the ZLB was considered to be impossible for all intents and purposes. Recent studies pay greater attention to nonlinearities and attach higher probabilities to large shocks.<sup>10</sup> However, most of

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<sup>10</sup> With the ZLB, monetary policy’s optimal reaction function is nonlinear. And this nonlinearity extends to consumers’ and investors’ optimal choices. This makes ZLB spells of up to 10 years not unlikely (Fernandez-Villaverde and others, 2013). And other factors such as time-varying macro volatility or more persistent changes to risk premia make these spells even more likely (Chung and others, 2010; Coibion and others, 2012).

these models do not take into account the role UMP can play in stimulating the economy while at the ZLB. In addition, the apparent flattening of the Phillips curve and the associated reduced risk of deflation spirals may have decreased the costs associated with hitting the ZLB. Further research is needed to get a complete picture.

At least four strategies have been proposed to reduce the probability of hitting the ZLB or to increase resilience if it is hit: (i) raising the inflation target (Summers 1991; Krugman, 1998; Blanchard and others, 2010); (ii) using forward guidance; (iii) adopting a history-dependent monetary rule such as price level targeting (Eggertson and Woodford 2003; Carlstrom and Pescatori, 2009) or nominal GDP targeting (Woodford 2012); and (iv) acting more preemptively “embracing” the ZLB (Williams 2009). We discuss these in turn below.

*Higher targets:* In tranquil times, a higher inflation rate and the associated higher nominal interest rates would provide greater room to ease in the face of negative shocks. In theory, this seems like an easy fix for the issue of a low natural rate. There are, however, two important shortcomings: the costs associated with a permanently higher inflation rate, and the difficulty of credibly transitioning to a higher inflation target.

The costs of higher inflation include distortions in cash holdings; overinvestment in the financial sector; greater uncertainty about relative prices and the aggregate price level; distortions of the tax system; redistribution of wealth; and difficulties in financial planning (Mishkin, 2011). Further, higher inflation tends to be more volatile, thus raising the term premium and nominal and real long-term interest rates. There is little agreement, however, on the quantitative importance of these costs. A few estimates suggest they can be substantial (Feldstein, 1997 and 1999), but most find much more limited effects (Ball, 2013). And, while recent theoretical studies find that the optimal inflation rate is rarely above 3 percent, and often between 1 and 2 percent (Coibion and others, 2012; Billi 2011), there is no consensus in the empirical literature on the values of key parameters underlying the results, notably the risk of hitting the ZLB and the cost of inflation.

The concern for central bank credibility is that raising the inflation target once may generate expectations that it will be raised again and again (Bernanke, 2010; Woodford; 2009; and Mishkin, 2011). In practice, it is difficult to evaluate these concerns, as targets in advanced economies have rarely been changed in tranquil times—although the case of New Zealand, which over time modified its inflation-target band from 0-2 percent to 1-3 percent, is somewhat reassuring (Brash, 1998). The timing of the transition is also important, as a credible increase in inflation targets would lead to an immediate increase in long-term nominal interest rates. These risks make changing the target a difficult option for advanced economies. There may be a case, however, for emerging markets and developing countries to maintain their relatively higher inflation targets: if they were to lower them, it might be difficult to raise them again later.

*Forward guidance:* An alternative to higher targets ex ante is to engineer a temporarily higher expected inflation rate once the ZLB is reached. This could be achieved through forward guidance or a policy framework that exhibits history dependence (see below). At the ZLB, forward guidance can reduce real long-term interest rates if it can convince agents that future interest rates will be lower than those consistent with the reaction function in normal times



(Eggertsson and Woodford, 2003; Eggertsson and Ostry, 2005; Woodford, 2012). This could entail a time inconsistency in that, once away from the ZLB, a central bank may be tempted to revert to its normal reaction function sooner than promised. This problem may be mitigated if the central bank is sufficiently concerned about its long-term reputation. Therefore, this type of forward guidance will be more effective when the central bank has strong credibility, or when a commitment device supports its announcements (such as large purchases of long-term assets).

During the crisis, the Bank of Canada, U.S. Federal Reserve, Bank of Japan, Bank of England, and the European Central Bank (ECB) all used forward guidance effectively (IMF 2013c). Going forward, the question is whether forward guidance is needed and what form it should take. In normal times, forward guidance is in principle redundant, if a central bank releases its economic forecast and its reaction function is common knowledge. (However, if it is difficult to fully specify the reaction function, forward guidance can be a useful supplementary communications tool even in normal times.) At the ZLB, the issue is how to best and credibly communicate future deviations from the reaction function followed in normal times. From this standpoint, conditioning future behavior on the state of the economy seems superior to calendar-based announcements (which might be interpreted as just a forecast). But recent experience in the United States and United Kingdom suggests that conditioning on the state of the economy can lead the public to interpret those conditions as triggers, which can be a problem if the economy deviates from its expected path. Better communication could reduce this problem, but uncertainty about the transmission channel will make this a challenge.

*Path-dependent monetary rules:* These proposals include price-level and nominal-GDP level targeting. Under these frameworks, a central bank seeks to keep nominal GDP or the price level on a certain path. If the ZLB prevents the central bank from avoiding a sustained shortfall, the rule implies that policy will remain accommodative until nominal GDP or the price levels are back to that target path. This means higher-than-average nominal GDP growth or inflation at some point in the future. Relative to a standard inflation targeting regime, path-dependent rules keep inflation deliberately above its long-run average for some time to compensate for past deflation.

Like forward guidance, history-dependent policy tells markets the conditions under which monetary policy will remain highly expansionary, but unlike forward guidance, the thresholds are determined automatically by the target path of nominal GDP (or of the price level), and thus will not be perceived as ad hoc (Carney 2012; Woodford 2013). This framework also entails a built-in stabilization mechanism. Agents would automatically expect higher inflation or faster nominal GDP growth when the central bank undershoots its target. This lowers real interest rates and contains the initial shortfall.

In theory, path-dependent rules represent the optimal policy framework in the presence of the ZLB (Eggertsson and Woodford 2003; Billi and Kahn, 2008; Coibion and others, 2012). However, there are practical problems with no clear solution. In particular, a commitment to price-level targeting by design faces a time consistency problem. A central bank may be tempted to renege on its promises of higher inflation once the economy is out of the ZLB. At the same time, it is unclear how market expectations will react to a central bank that is at times extremely dovish (when it needs to make up for past deflation) and at others extremely hawkish (when it

needs to make up for past inflation). Also, it may be politically difficult to bring down the price level (deflating the economy) after a period of above-average inflation.

Similar concerns arise about nominal GDP targeting. This policy regime faces the additional complication of having to explain to the public how the target path for nominal GDP is adjusted because of changes in potential output or data revisions. These complications may make it difficult to determine in real time to what extent the policy objective has been met, and may make it more difficult to keep inflation expectations well anchored.

*Preemptive loosening:* When deflation risks arise, the central bank should aggressively cut interest rates, more than what a standard interest rate rule would have predicted, the opposite of “keeping your powder dry.” Such a policy helps mitigate the contractionary effect of private sector expectations on current output and prices when the probability of falling into a liquidity trap is high. The overall effect is to increase the frequency of episodes at the ZLB but mitigate their severity and duration. Notably, this strategy would not require a change in the inflation-targeting regime, but only a modification in the central bank reaction to fluctuations in inflation.

Related to the above strategy is the notion of leaning against the wind to prevent excessive financial imbalances in upturns. During booms, this would lead to higher interest rates than warranted by a standard policy rule, which, in turn, would strengthen the financial system and allow more room to cut interest rates when the economy turns around, hence reducing the likelihood of hitting the ZLB.

While further work is unlikely to demonstrate that CMP and UMP are perfect substitutes, it is as yet unclear how far one is from the other. In this context, a clearer answer on how to deal with the ZLB requires settling the debate on what the optimal level of inflation is and how to overcome the practical concerns about path-dependent monetary policy frameworks.

## **B. Should Unconventional Tools Become Conventional?**

If UMP is powerful in dealing with extreme economic circumstances, are there merits in using it in tranquil times? Two main considerations lead to this question. First, if long-term rates are more relevant for spending decisions, targeting them directly may be desirable. Second, financial distortions are not only present in crisis times or when the economy hits the ZLB. It may then be desirable to act on different asset classes or points of the yield curve.

### ***Should Central Banks Target Long-Term Interest Rates?***

In a relatively distant past, several central banks intervened on long-term bond markets. Latin American central banks fixed interest rates at different maturities (some well into the 1990s) on a mandate to foster economic development. Between 1942 and 1951, the U.S. Federal Reserve maintained a ceiling on long-term rates; and between 1942 and 1947, there were also targets for yields on 90-day bills and one-year notes. During this period, market yields on the targeted securities remained stable and around the targeted levels. This policy ended in 1951 with the Treasury/Federal Reserve Accord, which ended the Fed’s obligation to support the government

bond market and laid the institutional foundation for the independent conduct of monetary policy in the postwar era (Federal Reserve Bulletin 1951, p. 267; see also Lacker, 2001).

In contrast, over the past 20 years, intervening at the low end of the yield curve has become the general practice. The rationale was that intervention at the low end minimizes credit risk, and avoids the problems associated with central bank purchases of sovereign bonds. Moreover, well-functioning financial markets would assure a smooth transmission of policy actions across the yield curve. Indeed, there is considerable evidence that the short-term rate is a powerful tool to influence aggregate spending (including through its effect on long-term rates).

However, the experience during the crisis and the apparent stickiness of U.S. long-term rates in the mid-2000s have renewed the debate on whether monetary policy should go back to targeting long-term yields more directly. Three arguments support targeting long-term rates: it would shield the economy from shocks to the term premium (Carlstrom and others, 2014), it would focus on the rates typically seen as most relevant for spending decisions, and it would diminish the risk of hitting the ZLB.

Long-term yields reflect the expected future path of short-term interest rates and a time-varying maturity premium (Gürkaynak and Wright, 2012). Studies have linked this premium to uncertainty about future inflation (Rudebusch and Swanson, 2008; Wright, 2011) and to financial market segmentation driven by differences in preferences over alternative assets (Vayanos and Vila, 2009). And, since variations in the premium can influence aggregate demand (although probably less than changes in expected future short-rates),<sup>11</sup> they may muddle the transmission of the short-term policy rate stance to the real economy. In addition, they may create large cross-border spillovers (Bayoumi and Vitek, 2013).

If the term premium moved predictably in the same direction as short-term rates, monetary policy could easily adjust the latter to provide the economy with the appropriate level of long-term rates. However, this is not always the case. For instance, between June 2004 and June 2005, the federal funds rate target was increased by 2 percentage points, but the yield on the 10-year bond decreased by almost one percentage point (the “Greenspan conundrum”). Another example took place in the early fall of 2008, when the Federal Open Markets Committee (FOMC) cut the federal funds rate aggressively, but long-term rates were instead increasing. Targeting long-term rates would keep them at the level desired by the monetary authority, term-premium variations notwithstanding.

More stable long-term rates, however, would come at the cost of greater volatility at the short end. The return on an overnight deposit and the one-day return on a long-term bond, whose yield would be targeted by the central bank, would tend to be equalized through arbitrage. If a change in the monetary policy rate became expected between policy meetings, arbitrage would lead to large swings in the overnight rate (Woodford, 2005).<sup>12</sup> For instance, in the United Kingdom,

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<sup>11</sup> See Fuhrer and Moore, (1995), Hamilton and Kim, (2002), Fuhrer and Rudebusch, (2004), and Kiley, (2012).

<sup>12</sup> For instance, suppose that the day before a monetary policy meeting, agents expect a decrease of only 1 basis point on a 10-year bond with a 5 percent coupon. The price of such a bond would increase on that day by 0.08 percent (over 30 percent in annual terms). To eliminate the arbitrage opportunity between an overnight investment and buying a 10-year bond, overnight rates would have to increase to over 30 percent.

extreme fluctuations in ultra-short interest rates occurred when the Bank of England targeted a two-week repo as the official rate (Tucker, 2004). Smaller, open economies could also face increased exchange rate volatility due to such policies.

This “excessive” volatility may become welfare-relevant in the presence of financial distortions. For instance, hikes in overnight rates may adversely affect financial institutions that rely heavily on the wholesale deposit market. Further, there continues to be significant uncertainty on the empirical relevance of various transmission channels (given the relative importance of short- and long-term rates for aggregate demand). Hence, undesired movements in short-term rates may be more detrimental to output stability than changes in the term premium. That said, in principle, monetary policy might reduce this problem, including by paying more attention to interest rate smoothing. And, presumably, markets and institutions would anticipate this issue and change their funding structure.

An additional concern with central banks targeting long-term rates is the risk of fiscal dominance. Markets may perceive the open promise of buying bonds at a certain price as dangerously close to subordinating monetary policy to ensuring cheap financing for the treasury. If a public debt overhang is an issue, markets may gain the impression, justified or not, that the central bank is facing political pressures to keep sovereign rates low and to reduce the real value of public debt. That said, targeting short-term rates does not necessarily protect policy from fiscal dominance, as a central bank could erode the real value of public debt by allowing inflation to rise (although this effect could be mitigated by higher market yields for long-term bonds).

It is indeed possible to make arguments for switching to a long-term rate as an instrument. But, at present, there is insufficient theoretical or empirical work to conclude that the benefits outweigh the costs and that the operational hurdles can be overcome.

### ***Should Central Banks Attempt to Manage the Slope of the Yield Curve?***

The previous subsection considered whether the central bank should target a long-term rate rather than a short-term rate. But is there a case for going further, and also influencing the slope of the yield curve? It was noted earlier in this paper that monetary policy may need to play a more active role in preserving financial stability when macroprudential policies are constrained. Among the proposals explaining how monetary policy may pursue this goal explicitly, some focus on reducing liquidity risk stemming from excessive borrowing at short horizons by financial institutions. Under one approach, the overnight rate would be determined by two components: the interest on reserves, and a premium determined by the cost of issuing short-term debt (Kashyap and Stein, 2012; and Stein 2012). Changes to the overnight rate would be implemented by changing the interest rate on reserves, or by changing the premium by allowing financial intermediaries to issue more or less short-term debt. Another approach is to manage the slope of the yield curve so as to influence the incentives for maturity transformation (borrowing at short maturities and lending at longer maturities) by controlling short-term rates with interest on reserves and long-term rates through bond purchases (Gagnon and Sack, 2014). To conclude whether this is the right direction, further work is needed to understand the gains from managing the yield curve for financial stability purposes, relative to using macroprudential policies. Also,

more work is needed to clarify the potential welfare costs associated with conflicting objectives when the desired yield curve slope for financial stability purposes differs from what is justified by conventional monetary policy goals.

### ***Should the Broadening of Eligible Collateral and Counterparty Lists Be Made Permanent?***

Liquidity shocks during the crisis have demonstrated (to both regulators and banks) the importance for the banking system of holding a sufficient buffer of reserve balances and liquid assets. Likewise, the crisis highlighted the advantages of central bank engagement with a larger number of counterparties (including nonbanks) in coping with market fragmentation and supporting financial stability (for instance, the broad range of collateral accepted and banks participating in the ECB open market operations was a clear advantage at the onset of the crisis; see Cheun and others, 2009). And since some degree of fragmentation may remain even in normal times, and demand for high-quality collateral will increase with new financial regulation, there may be a case for making some of these changes permanent. Providing certain types of nonbanks with direct access to central bank facilities may create a more level playing field and support a more diversified and less bank-centric financial system.

Central banks also broadened eligible collateral lists to provide liquidity to the banking system once traditional collateral was exhausted. Continuing to accept a broader set of assets as collateral (with appropriate haircuts) could increase market depth and liquidity, and would free up high-quality liquid assets to meet regulatory requirements (new Basel liquidity requirements, margin and collateral requirements in derivatives transactions). The broadening of collateral to include foreign-currency-denominated assets may also be particularly important in the context of greater globalization of financial activities of banks.

Against these benefits, there are a number of risks. More generous collateral policies might lead banks to hold less liquid portfolios, as they would expect to tap central bank liquidity when in difficulty (whether this is undesirable moral hazard or the efficient use of the sovereign deep pockets is a matter of debate), although this could be corrected with regulation. Expanding the list of central bank counterparties to include nonbanks could have unanticipated consequences for the structure and operation of the financial system. By undercutting the privileged position of banks, it could reduce their profitability and resilience to shocks, and could lead to an expansion of financial activities that are less well regulated and monitored (although this could be counteracted by new regulation). Similarly, some forms of collateral may be difficult to price correctly, with higher than expected market or credit risk. And there can be a move toward more asset encumbrance undermining the unsecured interbank market. To deal in part with these risks, central banks would have to substantially enhance their internal risk management frameworks to deal with a riskier asset composition.

To gain clarity on whether broadening collateral and counterparty eligibility is beneficial in normal times, more work is needed to understand the welfare consequences of the risks highlighted above, the effectiveness of possible regulatory actions to address them, and the likely change in behavior by financial institutions should those changes become permanent.

### *Should Central Banks Continue Using Credit Easing?*

During the crisis, credit easing (central banks' purchases of private assets) helped to restore financial intermediation and arbitrage in market segments that had become dysfunctional (IMF, 2013c). Should this practice continue in normal times when financial frictions still exist but are far less disruptive?

In theory, direct purchases or sales of private assets could reduce real fluctuations by containing asset price cycles. For instance, a well-known amplification mechanism arises from changes in asset prices that lead to changes in collateral values and in the strength of borrowers' and lenders' balance sheets (Kiyotaki and Moore, 1997; Brunnermeier and Sannikov, 2014; Valencia, forthcoming; Curdia and Woodford, 2011; Gertler and Karadi, 2011; Sandri and Valencia, 2013). In these circumstances, containing swings in asset prices would reduce fluctuations in aggregate demand.

In practice, however, this strategy reduces some distortions, but may create others, including by inhibiting price discovery. In crisis times, one can be more confident that the net balance is positive because financial distortions are more acute and time is of the essence. This is much less the case in normal times. One concern is whether such policies should not be conducted by the fiscal authorities rather than the central bank. Many countries have programs (mainly through state-owned or state-sponsored banks) that provide direct loans or loan guarantees to small and medium enterprises (SMEs) and households, or offer subsidies and tax incentives to support lending (IMF, 2013e). Given their redistributive and political aspects, these programs are probably best under the control of the fiscal authorities. Moreover, if under the control of the central bank, these actions would almost surely affect central bank credibility (would the policy rate be changed to benefit borrowers or lenders supported through asset purchases?) and increase the risk of political interference.

## **IV. INSTITUTIONAL DESIGN**

In an earlier section, we considered whether central banks should have a broader mandate, for instance, including financial and external stability. If so, central banks will need a broader set of instruments that would include most notably macroprudential policies and CFMs, in addition to foreign exchange intervention. This leads to questions about institutional design: how to match instruments to objectives, how to govern these now more complex institutions, and how to preserve policy credibility in a multi-mandate framework.

### **A. What Are the Risks to Central Bank Independence?**

Before the crisis, a broad consensus supported central bank (instrument) independence. Since the crisis, there has been a renewed debate about the desirability and feasibility of independence as central banks' mandates and powers expand. Two central questions emerge in particular. First, are the foundations of central bank independence still valid? And second, does a broader mandate undermine independence? A third issue is the greater risk of fiscal dominance, given the state of public finances in many advanced economies and the risks this poses to price stability.

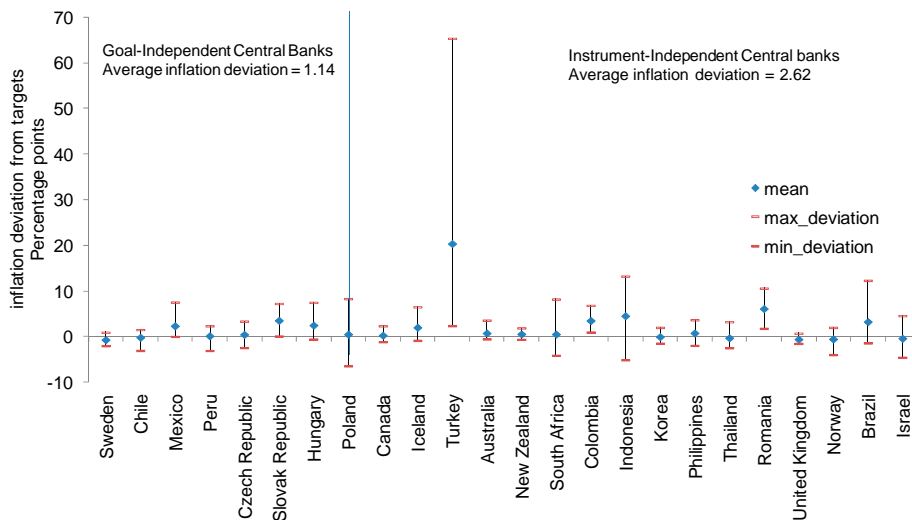
This issue is not discussed in depth here. But, obviously, it contributes to heightened concerns about the potential loss of independence associated with a central bank’s expanded mandate.

### *Foundations of Central Bank Independence Revisited*

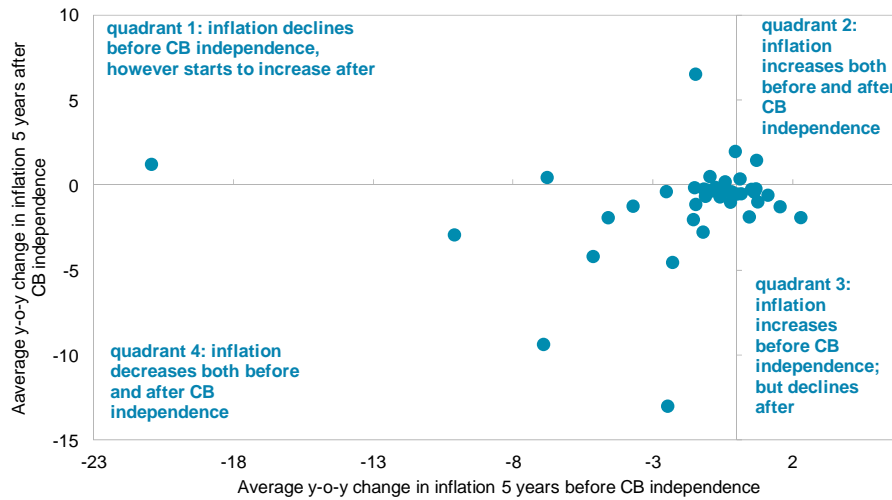
The main theoretical argument for independence is that it can be beneficial for governments to tie their hands to resist short-term temptations to use inflation to relax fiscal constraints (Kydland and Prescott, 1977; Barro and Gordon, 1983; Rogoff, 1985). In practice, things are more complicated. Relinquishing a significant amount of sovereign power to an agency run by unelected officials takes substantial confidence (Stiglitz, 1998). The public and government officials need to have faith in the central bank’s ability to carry out its mandate, and in the resulting welfare gains.

The simplicity and measurability of the current one-mandate-one-instrument framework has allowed interested parties such as the public or the government to monitor the actions of the central bank, and, importantly, evaluate the central bank’s success in meeting its objective. Central banks also frequently report to governments on their decisions and progress towards achieving their objective. Central banks typically give up “goal independence,” but maintain “instrument independence:” they are given a target, but can freely define and manage their policy instruments (this distinction does not seem to affect their performance, see Figure 4; see also Debelle and Fischer, 1994; and Fischer, 1995).

**Figure 4. Instrument Independence and Goal Independence**



Note: Average deviations from inflation targets since central bank introduced inflation targeting or became more independent until 2006Q4. Central bank are classified as in Hammond (2012) and Roger (2009). Difference in means is not statistically significant. Source: Central Banks’ websites, Haver Analytics, and staff calculations.

**Figure 5. Inflation Performance Before and After Central Bank Independence**

Source: Central Banks' websites, Haver Analytics, and staff calculations.

Central bank independence appears to have been associated with lower inflation.<sup>13</sup> But because independence is often a component of a large package of reforms, establishing causality has been challenging. Inflation was often on a declining trend when central bank independence was legally introduced (Figure 5). Nevertheless, once in place, central bank independence typically contributed to cementing this trend.

### *Will a Broader Mandate Undermine Central Bank Independence?*

The crisis has given us no reasons to believe that independence is no longer desirable with regard to price stability. As discussed above, the intellectual foundations for central bank independence are solid. Inflation is generally an inferior tool for dealing with fiscal constraints and the public is better served by an independent agency with a well-defined mandate. But a greatly expanded central bank mandate and powers raise several concerns. Can the political consensus discussed above be replicated? More critically, is independence desirable once the mandate moves beyond price stability? And, what would be the consequences for inflation, should some hard-fought independence be lost?

As for the first question, financial stability is murkier and more difficult to measure than price stability. First, there is no consensus (yet) on what variables to target (credit growth, leverage, asset price growth, etc.). Second, there is the question of understanding the relationship between the policy levers (namely the policy rate, CFM, or macroprudential tools) and their targets,

<sup>13</sup> Evidence from advanced economies suggests a negative correlation between legal central bank independence and average inflation (Alesina 1988; Grilli and others, 1991; Cukierman, 1992; Cukierman and others 1992; and Alesina and Summers, 1993). More recent studies find a similar correlation for developing countries (Arnone and others, 2007; Crowe and Meade, 2008; Jácome and Vázquez, 2008; De Haan and Kooi, 2000; and Dreher and others, 2008) using measures of de facto independence. This correlation persists after controlling for other economic policies such as fiscal performance and economic reforms that may be contemporaneous to central bank reform (Loungani and Sheets, 1997; Cukierman, Miller, and Neyapti, 2002).

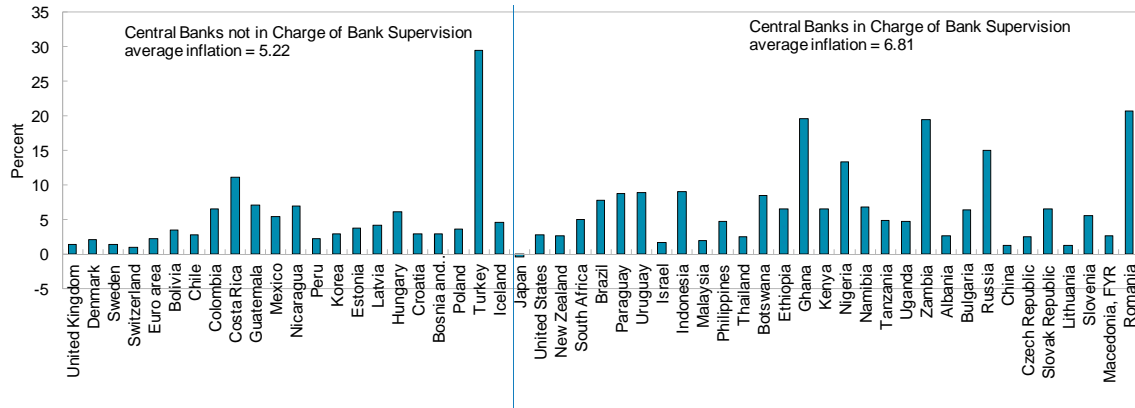


assuming a stable relationship exists. Third (and perhaps most critically), financial stability is difficult to measure, but crises are evident. This means that policy failures would be observable, but successes would not. Central banks would find it difficult (even ex post) to defend potentially unpopular measures, precisely because they succeeded in maintaining financial stability. Fourth, the fact that several of the proposed tools would have more targeted effects (with clearer winners and losers) than interest-rate policy complicates the issue further. Finally, communication may be complicated when one tool—the policy rate, for instance—is used to target both price and financial stability.

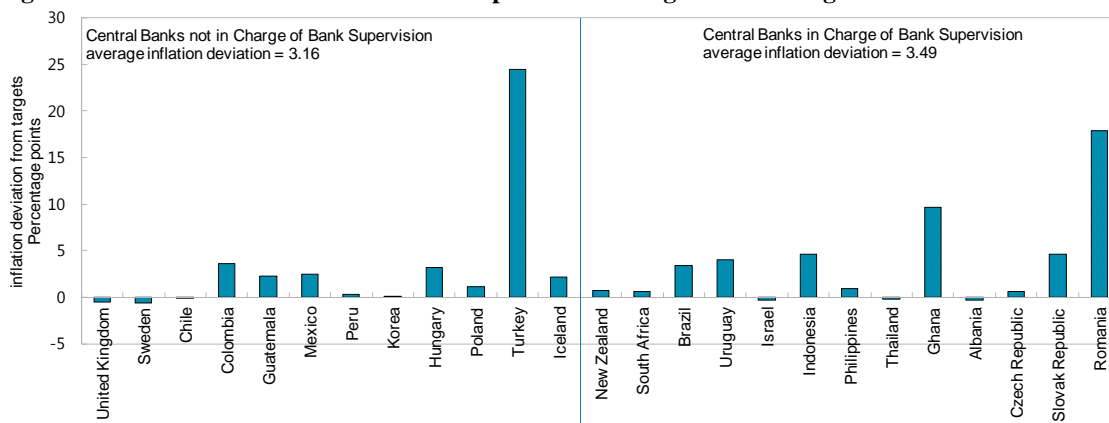
Whether independence is desirable with regard to financial stability has been less studied. But there are arguments analogous to those for price stability. Governments may be tempted to use regulation to distort incentives for banks to finance the treasury and may be reluctant to tighten macroprudential regulation if this is politically costly. Yet, there can be legitimate concerns about a democratic deficit if a central bank is endowed with powers ranging from setting interest rates to credit allocation and financial regulation.

As for the potential consequences of a broader mandate, evidence so far suggests that average inflation is somewhat higher in countries where central banks are responsible for bank supervision and/or regulation in addition to price stability (Figure 6). But the difference in inflation performance is less pronounced when the sample is confined to inflation-targeting countries (Figure 7), possibly because financial stability so far has meant being responsible for microprudential regulation, which may have little effect on the ability of inflation targeters to achieve their objectives. The outcome might be different once macroprudential policies are added. These trade-offs may become more acute in those emerging and low-income countries without well-established central bank credibility.

**Figure 6. Inflation Performance and Bank Supervision**



Note: Average inflation rates between 2000 and 2006. Central banks are classified as having a single or dual mandates according to BIS website and countries' legislation. Difference in means is not statistically significant.  
Source: Central Banks' websites, Haver Analytics, and staff calculations.

**Figure 7. Inflation Performance and Bank Supervision among Inflation Targeters**

Note: Average inflation deviation from the target since the central bank introduced inflation targeting until 2006Q4. Difference in means is not statistically significant.

Source: Central Banks' websites, Haver Analytics, and staff calculations.

The critical issue may thus be how to protect the independence of monetary policy decisions (narrowly defined) if the government chooses to exercise greater oversight on new central bank responsibilities, notably in the financial stability arena. Some of the answers will come in the flavor of particular institutional arrangements, some of which are currently being tested by countries around the world.

### **B. What Are the Optimal Institutional Arrangements for Microprudential Policies, Macroprudential Policies, and Monetary Policy?**

One unambiguous lesson of the crisis is that financial supervision needs to acquire a new “macro” or “systemic” dimension. The central issue is how these new macroprudential tools interact with monetary policy on one side and with traditional microprudential policy on the other. For instance, macroprudential policies to constrain leverage may also affect spending and, hence, inflation. And there is increasing evidence that interest rate policy affects banks’ risk-taking behavior (Dell’Ariccia and others, 2013; Valencia, 2011, Jimenez and others, forthcoming, and references therein). If these policies worked perfectly, these “spillovers” would not pose significant challenges: each instrument could be allocated to one objective and who controls each lever would not matter as long as each authority took into account what the other did (IMF 2013a).

In practice, however, this is unlikely, and one policy will have to contribute to the mandate of the other. As discussed above, monetary policy may have to lean against the wind, should macroprudential tools prove ineffective. And macroprudential policy may have to contribute to cyclical management when monetary policy is constrained (such as under a peg or a currency union). In these circumstances, institutional arrangements are expected to matter. When two separate authorities (say a central bank and a macroprudential regulator) are in charge of different levers, each policymaker will likely care primarily about his or her own objective. The resulting uncoordinated policy mix will often be dominated by a coordinated solution. In contrast, a consolidated agency could improve policy coordination, but may find it difficult to establish credibility when one mandate conflicts with the other (Ueda and Valencia,

forthcoming). Furthermore, as discussed above, multiple mandates complicate accountability and leave the agency more exposed to outside interference.

These considerations lead to conclusions that are analogous to those obtained in the well-studied monetary-fiscal interactions. When fiscal policy is distortionary and has overlapping objectives with monetary policy, joint decision-making between fiscal and monetary policy can be optimal (Dixit and Lambertini, 2003), but when political interests are taken into account, separation is preferable (Barro and Gordon, 1983). The problem becomes more complicated when one considers the relationships with other policies. For instance, there may be strong arguments to keep microprudential and macroprudential policies under the same roof (measures aimed at shoring up the stability of individual banks, say, the dismissal of certain assets, may be detrimental to systemic stability). But this means that if the desirable framework is one in which macroprudential regulation is housed at the central bank, microprudential regulation would need to be housed at the central bank as well. A discussion of these additional challenges is presented in Osinski and others (2013) and IMF (2013f).

The bottom line is that the optimal arrangement will depend on the specific distortions that need to be addressed in each country. Yet, within those contours, it is possible to design institutions that enhance sharing of information and expertise when macroprudential regulation is housed outside the central bank. And, similarly, it is possible to build safeguards that improve credibility and reduce the exposure of monetary policy to political interference when both mandates are consolidated under one roof.

In countries that keep monetary policy separate from macroprudential policy, interagency financial stability committees are increasingly common. These arrangements (where the central bank participates or takes the lead) facilitate information-sharing and policy coordination across agencies. In Australia, the Council of Financial Regulators (CFR), which includes the central bank and the Treasury, is the primary coordinating body (Annex 5). In New Zealand, the Reserve Bank of New Zealand (RBNZ) signed a memorandum of understanding with the Ministry of Finance in 2013 regarding the use of macroprudential policies, although the RBNZ deals with both monetary and macroprudential policies. In Brazil, the national monetary council (CMN) and the central bank of Brazil (BCB) assume a de facto financial stability mandate and are accountable for timely prudential actions. The CMN, chaired by the Minister of Finance and comprised of the Governor of the BCB and the Minister of Planning, Budget, and Management, is the highest council with broad powers relative to financial sector policies and prudential measures. Other examples in Latin America are Chile, Mexico, and Uruguay. In all three, the committee is presided over by the Minister of Finance and other members are the heads of the financial supervisory agencies and the central bank (except in Chile, where the governor is invited to participate but is not formally a member of the Council) (Jácome and others, 2012). The Financial Stability Oversight Council (FSOC) in the United States has a similar function.

In countries where the central bank is mandated with both price and financial stability, safeguards can be put in place to minimize the risks to monetary policy credibility and independence. These include separate decision-making structures (such as separate policy committees, as in the United Kingdom and the ECB) and measures to improve accountability and communication (such as separate reports to the legislature) (IMF, 2011c; Nier and others,

2011). In theory, these “firewalls” can accommodate situations where the central bank remains solely responsible and independent with regards to price stability, but is less so with regard to financial stability. The responsibility for the latter is shared with the microprudential regulator and resolution agencies. In Singapore, for instance, the committees responsible for monetary policy and macroprudential regulation are both under the Monetary Authority of Singapore (MAS) and coordination takes place at this level. But MAS also collaborates with other agencies, including the Ministry of Finance, on housing policies (Annex 5).

Delineating the contours of the optimal institutional arrangement is a work in progress and clearly a complex issue. And while there is no clear-cut answer at this juncture, the optimal arrangement is likely to depend on the particular set of distortions and political economy constraints that need to be addressed in any given country.

## V. CONCLUSIONS

The simplicity of “one target and one tool” that characterized monetary policy in many countries during the Great Moderation was challenged by the global financial crisis and ensuing Great Recession. This has led to an intense discussion about what shape monetary policy should take in a future steady state that will be the post-crisis “new normal.”

This paper has explored several open questions. On a few, it reaches tentative policy conclusions; on others, it identifies areas where theoretical and empirical advances are needed (including how to interpret the lessons from the crisis) before the debate even starts settling.

In many ways, the monetary policy framework should stay the same. Long-term price stability remains a primary objective and central bank independence a critical ingredient to achieve it. In other ways, however, the framework may need to change. Other intermediate objectives (such as financial and external stability) may have to play a greater role than in the past to guarantee macroeconomic stability. And, this expanded mandate requires either new tools or the acceptance of new trade-offs. An expanded mandate also complicates accountability and presents challenges for central bank independence. The issue is thus how to protect the independence of monetary policy decisions (narrowly defined), should greater oversight over new central bank responsibilities (notably financial stability) prove desirable or unavoidable.

The use of unconventional policies proved that monetary policy was not powerless at the zero lower bound. Nevertheless, resilience of monetary policy frameworks to the risk of the zero lower bound is desirable. The debate on how to achieve this goal remains unsettled. What is clearer, at least based on present knowledge, is that there are no evident gains, at least for now, in turning unconventional policy tools (with the exception of forward guidance) into conventional ones.

International monetary policy cooperation has proven highly useful during the crisis and will grow more beneficial as economies become more interconnected. Yet, there is little agreement on the quantitative relevance on these benefits (especially in tranquil times). It is also unclear how cooperation would work in practice and, in particular, how the daunting political economy obstacles can be overcome.

## ANNEX 1. FINANCIAL DISTORTIONS AND MONETARY POLICY

Financial distortions evolve endogenously over the business cycle in response to macroeconomic and financial developments, including monetary policy. This annex reviews how monetary policy interacts with different financial distortions discussed in the literature.

### *Financial Frictions*

Financial market imperfections affect the allocation of resources in the economy and amplify and prolong the effect of shocks. These imperfections take several forms, including lenders that are unable to distinguish ex ante good from bad borrowers (Stiglitz and Weiss, 1981), contracts that are not fully enforceable (Hart and Moore, 1994), or project outcomes that are not observable without cost (Townsend, 1979). Monetary policy can change the intensity of these frictions. The shape of this relationship, however, depends on the specific type of friction and how it is modeled. For instance, the lower interest rates associated with monetary policy easing reduce borrower moral hazard and adverse selection (and thus risk-taking) in models with limited liability (Stiglitz and Weiss, 1981) and can relax borrowing constraints and increase leverage through their effect on asset prices (Kiyotaki and Moore, 1997). It can reduce the expected bankruptcy costs component in the cost of external finance (Carlstrom and Fuerst, 1997; Bernanke and others, 1999).

### *Excessive Risk-taking ex ante and Asset-price Externalities Ex post*

Financial frictions can make pecuniary externalities welfare-relevant and lead to excessive risk-taking ex ante and volatility in asset prices and output ex post. Agents may not internalize the impact of their actions on asset prices, ex ante, and under insure against future shocks by taking too much debt (Korinek, 2011; Lorenzoni, 2008; Mendoza, 2010; Bianchi, 2010; and Adrian and Shin, 2012 for the case of banks), excessive liquidity risk (Stein, 2012) or excessive borrowing in foreign currency (Caballero and Krishnamurthy, 2003, 2004; and Korinek, 2010). Lax monetary policy can be the initial shock that stimulates over-borrowing or encourages excessive risk-taking ex ante (Dell’Ariccia and others, 2013; Valencia, 2011; Jimenez and others, forthcoming). Further, expectations of an aggressive post-bust monetary policy response can lead to excessive risk-taking (Farhi and Tirole, 2012). Similarly, monetary tightening may be the shock that leads to defaults and asset fire-sales.

### *Counterparty Risk, Market Freezes, and Financial Panics*

Maturity mismatches between assets and liabilities can give rise to self-fulfilling runs and panics. Creditors of a financial institution can behave similarly to what happens in deposit runs (Diamond and Dybvig, 1983) in the wake of a change in margin requirements on bank liabilities (Krishnamurthy, 2010). And the propagation of shocks in a financial network can cause run-like behavior at the system level when financial institutions are interconnected (Allen and Gale, 2000). Liquidity hoarding and a credit crunch ensues, which worsens with uncertainty about the nature of interconnections (Caballero and Krishnamurthy, 2008; Caballero and Simsek, forthcoming) or asset values (Brunnermeier and Pedersen, 2009). As in the previous type of distortions, a monetary tightening can cause losses in portfolio holdings that then cascade throughout the system because of interconnections.

## ANNEX 2. POSSIBLE EXPLANATIONS FOR THE FLATTENING OF THE PHILLIPS CURVE

### *Mismeasurement*

Standard estimates of unemployment may fail to capture the cyclical component of unemployment increases during the global financial crisis. For example, the crisis saw an unusual increase in long-term unemployment, which tends to put less downward pressure on wages and prices (Kocherlakota, 2010). However, alternative measures of output gap, capacity utilization, and short-term unemployment all point to sizable slack in most advanced economies (IMF, 2013b). The smaller-than expected reduction of inflation remains thus puzzling.

### *Globalization*

Inflation may have become less sensitive to domestic conditions as producers face greater international competition and are thus less inclined to adjust prices in relation to domestic demand (Loungani and others, 2001; Bean 2007). Inflation could have then become more sensitive to international conditions (Borio and Filardo, 2007). However, this hypothesis does not explain why inflation has remained remarkably stable during the crisis despite the worldwide demand contraction. It is also difficult to reconcile with the predictions of an open economy version of standard New Keynesian models in which increased openness may steepen the Phillips curve (Woodford, 2007).

### *Low Level of Inflation*

Historically low inflation rates in advanced economies may have made downward nominal rigidities more binding. For example, the absence of deflation in advanced economies during the crisis could be due to workers' resistance to nominal wage cuts (Yellen, 2012). Furthermore, as documented in Klenow and Malin (2010), low levels of inflation may reduce the frequency of price changes, possibly because of the presence of adjustment costs (Ball, Mankiw, and Romer, 1988). However, inflation seems little responsive to cyclical unemployment even in emerging economies where its level is considerably higher than in advanced economies.

### *Credibility*

Over the last two decades, greater central bank credibility has made inflation expectations much less responsive to changes in actual inflation. This implies that temporary deviations of inflation from target are now less likely to be amplified by movements in expectations; inflationary or deflationary spirals are less likely.

### ANNEX 3. LESSONS FROM THE GLOBAL FINANCIAL CRISIS FOR MONETARY POLICY IN LOW-INCOME COUNTRIES

The global financial crisis confronted policymakers in low-income countries (LICs) with sizable external shocks: declines in their terms of trade and export demand, and changes in the risk appetite of international investors and domestic banks. The consequences were capital flow volatility, increases in country-risk premia, declines in credit, and deterioration of balance sheets in the financial sector. Unlike in advanced countries, the overall effect was not calamitous, and LIC economies bounced back faster. Yet, the crisis and its aftermath have yielded a number of useful lessons for monetary policy, which we summarize here.

Sounder and more credible pre-crisis monetary policy frameworks allowed many countries to loosen monetary policy considerably. This helped cushion the impact on domestic demand and support the nominal and real depreciation required for external adjustment. Unlike in previous crises, the large nominal depreciations experienced during the crisis did not result in the unanchoring of inflation expectations. Instead, inflation decreased considerably, partly as a result of the contraction in aggregate demand, but also due to the decline in international food and fuel prices. This state of affairs reflected in part previous stabilization efforts, which, by improving external and fiscal accounts, curtailing fiscal dominance, and reducing inflation, improved the environment in which monetary policy operated. It also reflected a more active policy response to domestic and external shocks.

The policy responses during and after the crisis have revealed limitations in current monetary policy regimes in LICs, however. Most *de jure* regimes are based on reserve and broad money targets, which do not provide a clear framework for formulating and interpreting the policy response to shocks. For instance, in Zambia, concerns with money targets resulted in excessively tight monetary policy at a time when domestic banking systems were under stress (Baldini and others, 2012). These policies were later reversed, but it can be argued that the policy framework amplified the initial impact of the crisis.

Following the crisis, inflation increased again in several countries during 2010–11, both because short-term interest rates were kept low for extended periods and because of subsequent increases in international commodity prices.<sup>14</sup> In some cases part of the prolonged policy accommodation was due to excessively optimistic targets for broad money and credit growth, reflecting pre-crisis trends, but also lack of concern for the interest rate level. Policymakers were then forced to reverse course somewhat abruptly, adding to the macroeconomic volatility.

The experiences during and after the crisis, as well as with the food and commodity shocks, have led central banks to modernize their policy frameworks, that is, strengthen and clarify both monetary policy formulation and implementation, and enhance policy credibility and accountability, all of which requires changes at the institutional level. Some countries, such as Uganda, have announced their intention to formally adopt inflation targeting. Others are not planning to formally adopt inflation targeting but are interested in adopting elements of modern

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<sup>14</sup> See Andrie and others (2013a and 2013b), and Berg and others (2013) for the cases of Kenya, Uganda, Tanzania, and Rwanda.

policymaking. These include communication strategies centered on the inflation outlook, improved liquidity management, greater reliance on the price (interest rate) channel of transmission, and the development of in-house forecasting and policy analysis capacity, among other reasons, to avoid falling behind the curve. As in other regions that went through similar transitions, the role of money targets going forward has been the source of much debate.

Much remains to be learned about the implications for LICs of some of the recent policy debates in advanced and emerging economies, though some basic lessons can be drawn. Unlike in advanced economies, the zero lower bound is less likely to be a concern for policymakers in countries with higher average inflation as in LICs, which implies nominal interest rates are higher, which gives greater room in case policy accommodation is needed. In addition, given incipient policy credibility, a persistent downturn is more likely to result in the unanchoring of inflation, making the zero lower bound constraint moot.

As in emerging markets, foreign interventions are and will remain an important tool of central bank policy in LICs. Sterilized interventions are likely to be more effective in LICs, given shallow foreign exchange markets and imperfect substitutability between domestic and foreign assets, which supports greater use of this tool to offset temporary external shocks. It is important however that recourse to interventions, and possible concerns with exchange rate fluctuations, do not override inflation stabilization objectives and incipient policy modernization efforts. Also, as in emerging markets, interventions policies that lean against the wind are preferred to policies that target the exchange rate level.<sup>15</sup>

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<sup>15</sup> See Ostry, Ghosh, and Chamon (2012) and Benes and others (2013).



#### **ANNEX 4. HOW CLOSE OF A SUBSTITUTE IS UNCONVENTIONAL MONETARY POLICY FOR CONVENTIONAL INTEREST RATE POLICY?**

Answering this question means exploring the relative effectiveness of unconventional monetary policy (UMP) and conventional interest rate policy (CMP) in affecting asset prices and the real economy (including whether UMP is subject to diminishing returns), and whether some aspects of UMP make it less attractive than CMP.

The evidence so far (typically from event studies focusing on the early phase of the crisis) suggests that UMP successfully decreased longer-term interest rates. Mortgage-backed security yields in the United States decreased by around 150 basis points (bps) over the first Large Scale Asset Purchase Program (LSAP 1), and Treasury yields by between 90 and 200 bps (Gagnon and others, 2011; Krishnamurthy and Vissing-Jorgensen, 2011; Hancock and Passmore, 2011; and IMF, 2013c). In the United Kingdom, cumulative effects on government bond yields range from 45 to 160 bps (Joyce and others, 2011; and IMF 2013c). Markets also seem to have reacted quantitatively similarly to UMP and CMP announcements, based on the surprise component measured using two-year futures on the three-month local currency LIBOR rates (Chen, Mancini-Griffoli and Mondino, 2014).

However, the impact of UMP on aggregate demand is less clear. One empirically relevant channel through which UMP affects long rates is through reductions in the term premia (IMF, 2013c). But there is empirical evidence showing that a drop in term premia may have lower effects on output than a decrease in risk-neutral expected future short rates, which is mostly how CMP affects long-term rates (Hamilton and Kim, 2002; Kiley, 2012; and Chen, Mancini-Griffoli and Saadi Sedik, 2014).

UMP may also face diminishing returns. As longer-term rates reach their own zero lower bound, central banks will have to stretch their credibility to convince markets that monetary conditions will remain expansionary farther and farther into the future. There is, however, no evidence so far that marginal returns decreased as central banks' balance sheets expanded, or the size of surprises diminished (Chen, Mancini-Griffoli, and Mondino, 2014).

UMP may also have undesirable features. There is the issue of calibration. In principle, central banks could announce a target for long-term bond rates (as they now do for short-term policy rates) and stand ready to buy/sell the necessary quantities to ensure the target is reached. In practice, however, unlike with short-term instruments, this would leave their balance sheet exposed to significant interest-rate (and possibly credit) risk. And they have been reluctant to do so, opting instead for a quantity-based strategy. This, however, suffers from the shortcoming that it is unclear what stock of bonds needs to be purchased in order to get the desired effect on longer-term bond rates and spending. Exit could also be complicated (IMF, 2013c, d). And real or perceived political costs associated with the risk of fiscal dominance and the selection of private assets to purchase and redistribution issues, in the case of credit easing, may be nontrivial.

## ANNEX 5. CASE STUDIES—INSTITUTIONAL ARRANGEMENTS FOR MACROPRUDENTIAL AND OTHER FINANCIAL POLICIES

### *Singapore—Leading Role of the Central Bank*

The Monetary Authority of Singapore (MAS), with a mandate for financial stability, supervision, and monetary policy, is the unique macroprudential authority. Its chairman presides over the Board-level Chairman’s Meeting (CM), which is vested with responsibilities for both microprudential and macroprudential policies. Under the CM, the Management Financial Stability Committee (MFSC) is responsible for macroprudential policy and is chaired by the Managing Director of MAS and includes other MAS senior managers. At the same level as the MFSC, there is the Monetary and Investment Policy Meeting (MIPM), the forum responsible for monetary policy. Coordination of policies aimed at preserving price and financial stability take place between the MFSC and the MIPM.

MAS also coordinates, at the level of an inter-agency task force, with relevant external agencies—for example, the Urban Redevelopment Authority (URA), the Housing Development Board (HDB), and the Ministry of Finance (MOF)—on housing-related policies such as the imposition of stamp duties on house purchases or sales, and increased land sales for residential property developments. MAS plays a central role in crisis management and resolution and holds regular meetings with the MOF to discuss emerging macroeconomic and financial stability risks. However, the MOF’s involvement in bank resolution and crisis management is limited to cases with no viable private sector solution for dealing with the failure of systemically important financial institutions, or when public resources are at risk.

### *Australia—Coordination of Multiple Agencies by a Committee*

The Reserve Bank of Australia (RBA) performs traditional central banking functions, including monetary policy and payment system oversight and lender of last resort, while the Australian Prudential Regulation Authority (APRA) is the prudential supervisor and resolution authority and administers the deposit insurance guarantee (the financial claims scheme—FCS). The Council of Financial Regulators (CFR) is the primary coordinating body for macroprudential policy and crisis management and is comprised of the RBA, APRA, the Australian Securities and Investments Commission (ASIC), and the Treasury.

Each agency shares the responsibility to mitigate systemic risks, and the CFR provides a forum to discuss risks from all sectors. The Treasury can advise the government on financial stability issues and on the legislative framework underpinning financial system infrastructure. But APRA has responsibility for the main macroprudential tools. The CFR is chaired by the Governor of the RBA, leveraging on its central role in monitoring financial system soundness and warning of potential risks.

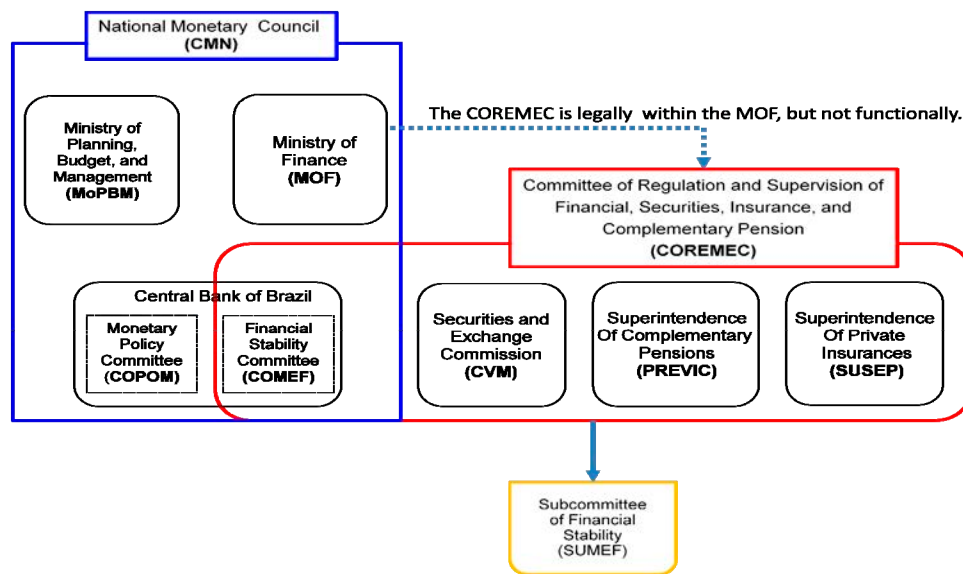
### *Brazil—Diffuse Arrangements*

In Brazil, the legal framework does not assign explicit macroprudential responsibility to any agency. The national monetary council (CMN) and the central bank of Brazil (BCB) assume a de

facto financial stability mandate and accountability for timely prudential actions. The CMN, chaired by the Minister of Finance and comprised of the Governor of the BCB and the Minister of Planning, Budget, and Management, is the highest council with broad powers relative to financial sector policies and prudential measures. Based on guidelines set by the CMN, the BCB implements monetary policy and supervises the banking sector, and the CVM regulates and monitors the securities and foreign exchange markets.<sup>16</sup>

The Committee of Regulation and Supervision of Financial, Securities, Insurance, and Complementary Pension (COREMEC) was designed to overcome coordination challenges, but so far, it has a purely advisory role with no “comply or explain” mechanism. The COREMEC is not tasked with the role of crisis management. The BCB is in charge of identifying and analyzing banking sector systemic risk, and can execute macroprudential actions for banks, as well as assume the lead role in bank resolution. But systemic risk arising from nonbank sources is not covered by the BCB.

### Current Institutional Arrangements in Brazil



Source: IMF (2013g).

<sup>16</sup> On the other hand, the CMN does not directly coordinate policies for insurance companies and pension funds, which are respectively supervised by other agencies.

## REFERENCES

- Adrian, Tobias, and Hyun Shin, 2012, "Procyclical Leverage and Value-at-Risk," Federal Reserve Bank of New York Staff Report 338. <http://www.newyorkfed.org/research/staff-reports/sr338.html>
- Alesina, A., 1988, "Macroeconomics and Politics," National Bureau of Economic Research, *Macroeconomics Annual* Vol. 3, Pages 13-52.
- Alesina, A., and L. Summers, 1993, "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence," *Journal of Money Credit and Banking*, Vol. 25, No. 2 (May), pp. 151-62.
- Allen, Franklin, and Douglas Gale, 2000, "Bubbles and Crises," *Economic Journal*, Vol. 110, pp. 236-55.
- Andrle, M., A. Berg, R. Morales, R. Portillo, and J. Vlcek, 2013a, "Forecasting and Policy Analysis in Low-Income Countries: Food and non-food Inflation in Kenya," IMF Working Paper 13/61 (Washington: International Monetary Fund).
- Andrle, M., A. Berg, E. Berkes, R. Morales, R. Portillo, and J. Vlcek, 2013b, "Money Targeting in a Modern Forecasting and Policy Analysis System: an Application to Kenya," IMF Working Paper 13/239 (Washington: International Monetary Fund).
- Angeloni, Ignazio, Exter Faia, and Marco Lo Duca, 2013, "Monetary Policy and Risk Taking", SACE Working Paper No. 8.
- Arnone, M., B. Laurens, J-F. Segalotto, and M. Sommer, 2007, "Central Bank Autonomy: Lessons from Global Trends," IMF Working Paper 07/88 (Washington: International Monetary Fund).
- Baldini, A., Benes, J., Berg, A., Dao, M. C., Portillo, R., 2012, "Monetary Policy in Low-income Countries in the Face of the Global Crisis: The Case of Zambia," IMF Working Paper 12/94 (Washington: International Monetary Fund).
- Ball, Laurence, 2013, "The Case for Four Percent Inflation," Johns Hopkins University. Unpublished.
- Ball, Laurence, and Sandeep Mazumder, 2011. "Inflation Dynamics and the Great Recession," Brookings Papers on Economic Activity, Spring, pp. 337-78.
- Ball, Laurence, N. Gregory Mankiw, and David Romer, 1988, "The New Keynesian Economics and the Output-Inflation Trade-off," Brookings Papers on Economic Activity: 1, pp. 1-82
- Barro, Robert, and David B Gordon, 1983, "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy*, Vol. 91, No. 4 (August), pp. 589-610.

- Bayoumi, Tamim, 2013, “After the Fall: Lessons for Policy Cooperation from the Crisis” paper presented at a Chatham House/IMF Workshop New Directions in Policy Coordination, held in Washington, September 12.
- , 2014, “Notes on Policy Dilemmas for Emerging and Developing Countries From Advanced Economy Monetary and Regulatory Policies,” paper presented at a high level roundtable in Oxford on Monetary and Regulatory Spillovers: Implications for Emerging Markets and Developing Countries, February 12.
- Bayoumi, Tamim, and Francis Vitek (2013) “Macroeconomic Model Spillovers and their Discontents,” IMF WP/13/4 (Washington: International Monetary Fund).
- Bean, Charles, 2007, “Globalisation and Inflation,” *World Economics*, Vol.8, No. 1, pp. 57-73.
- Bekaert, Geert, and Marie Hoerova, and Marco Lo Duca, 2013, “Risk, Uncertainty and Monetary Policy,” *Journal of Monetary Economics*, Elsevier, Vol. 60, No. 7, pp. 771-88.
- Benes, J., A. Berg, R. Portillo, and D. Vavra, 2013, “Modeling Sterilized Interventions and Balance-Sheet Effects of Monetary Policy in a new-Keynesian Framework,” IMF Working Paper 13/11 (Washington: International Monetary Fund).
- Berg, A., L. Charry, R. Portillo, and J. Vlcek, 2013, “The Monetary Transmission Mechanism in the Tropics: A Narrative Approach,” IMF Working Paper 13/197 (Washington: International Monetary Fund)..
- Bernanke, Ben. S., 2010, Testimony before the Joint Economic Committee of Congress, April 14.
- , 2011, “The Effects of the Great Recession on Central Bank Doctrine and Practice,” Keynote address at the Federal Reserve Bank of Boston 56th Economic Conference “Long Term Effects of the Great Recession,” Boston, October 18–19.
- Bernanke, Ben, Mark Gertler, and Simon Gilchrist, 1999, “The Financial Accelerator in a Quantitative Business Cycle Framework,” in John B. Taylor and Michael Woodford, eds., *Handbook of Macroeconomics*, Vol. 1C. Amsterdam: Elsevier Science, North-Holland, pp. 1341–393.
- Bernanke, Ben. S., Vincent R. Reinhart, and Brian P. Sack, 2004, “Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment,” *Brookings Papers on Economic Activity*, Vol. 2.
- Bianchi, Javier, 2010, “Credit Externalities: Macroeconomic Effects and Policy Implications,” *American Economic Review*, Vol. 100, No. 2, pp. 398-402.
- Billi, Roberto M., 2011, “Optimal Inflation for the US Economy,” *American Economic Journal, Macroeconomics*, Vol. 3, No. 3, pp. 29-52.

- Billi, Roberto M., and George A. Kahn, 2008, "What Is the Optimal Inflation Rate?" *Federal Reserve Bank of Kansas City Economic Review*, Second Quarter.
- Blanchard, Olivier, 2000, "Bubbles, Liquidity Traps, and Monetary Policy," in *Japan's Financial Crisis and its Parallels to the US Experience*, Ryoichi Mikitani and Adam Posen (eds.), Institute for International Economics Special Report 13.
- Blanchard, Olivier, and Jordi Galí, 2007, "Real Wage Rigidities and the New Keynesian Model," *Journal of Money, Credit, and Banking*, Vol. 39, No. 1, pp. 36–65.
- Blanchard, Olivier, Giovanni Dell'Ariccia, and Paolo Mauro, 2010, "Rethinking Macroeconomic Policy," *Journal of Money, Credit and Banking*, Supplement to Vol. 42, No. 6 (September).
- Blanchard, Olivier, Giovanni Dell'Ariccia, and Paolo Mauro, 2013, "Rethinking Macroeconomic Policy II: Getting Granular," IMF Staff Discussion Note SDN/13/03 (Washington: International Monetary Fund).
- Borio, Claudio, and Andrew Filardo, 2007, "Globalisation and Inflation: New Cross-Country Evidence on the Global Determinants of Domestic Inflation," BIS Working Paper No. 227, Bank for International Settlements.
- Borio, Claudio, and Philip Lowe, 2002, "Asset Prices, Financial and Monetary Stability: Exploring the Nexus," BIS Working Paper 114, Bank for International Settlements.
- Borio, Claudio, and William White, 2003, "Whither Monetary and Financial Stability? The Implications of Evolving Policy Regimes," in *Monetary Policy and Uncertainty: Adapting to a Changing Economy: Proceedings of Federal Reserve Bank of Kansas City Economic Symposium at Jackson Hole* (Kansas City: Federal Reserve Bank).
- Brash, Donald, 1998, "Inflation Targeting in New Zealand: Experience and Practice," Institute for International Economics Studies, Stockholm University, Seminal Paper No. 641.
- Brunnermeier, Markus K., and Lasse Pedersen, 2009, "Market Liquidity and Funding Liquidity," *Review of Financial Studies*, Vol. 22, pp. 2201-38.
- Brunnermeier, Marcus K., and Yuliy Sannikov, 2014, "A Macroeconomic Model with a Financial Sector," *American Economic Review*, Vol. 104, No. 2, pp. 379-421.
- Caballero, Ricardo, 2010, "Macroeconomics after the Crisis: Time to Deal with the Pretense-of-Knowledge Syndrome," *Journal of Economic Perspectives*, Vol. 24, No. 4, pp. 85–102.
- Caballero, Ricardo, and Arvind Krishnamurthy, 2003, "Inflation Targeting and Sudden Stops," NBER Working Paper 9599 (Cambridge, Massachusetts: National Bureau of Economic Research).

- , 2004, “Smoothing Sudden Stops,” *Journal of Economic Theory*, Vol. 119, No. 1, pp. 104-27.
- , 2008, “Collective Risk Management in a Flight to Quality Episode,” *Journal of Finance*, Vol. 63, No. 5, pp. 2195-230, October.
- Caballero, Ricardo, and Guido Lorenzoni, 2009, “Persistent Appreciations and Overshooting: A Normative Analysis,” MIT, mimeo.
- Caballero, Ricardo, and Alp Simsek, “Fire Sales in a Model of Complexity,” *Journal of Finance*, forthcoming.
- Calvo, Guillermo, and Enrique Mendoza, 1996, “Reflections on Mexico’s Balance of Payments Crisis: A Chronicle of Death Foretold,” *Journal of International Economics*, Vol. 41, pp. 235-64.
- Carlstrom, Charles, and Timothy Fuerst, 1997, “Agency Costs, Net Worth, and Business Fluctuations: A Computable General Equilibrium Analysis,” *American Economic Review*, Vol. 87, No. 5, pp. 893–910.
- Carlstrom, Charles, and Andrea Pescatori, 2009, “Conducting Monetary Policy When Interest Rates are near Zero,” Federal Reserve Bank of Cleveland, Economic Commentary.
- Carlstrom, Charles, Timothy Fuerst, and Matthias Paustian, 2010, “Optimal Monetary Policy in a Model with Agency Costs,” *Journal of Money, Credit and Banking*, Vol. 42, pp. 37-70.
- , 2014, “Targeting Long Rates in a Model with Segmented Markets,” Federal Reserve Bank of Cleveland, mimeo.
- Carney, Mark, 2012, “Guidance,” Remarks at the CFA Society in Toronto.
- Cecchetti, Stephen, Hans Genberg, and Sushil Wadhvani, 2002, “Asset Prices in a Flexible Inflation Targeting Framework,” NBER Working Paper 8970 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Cecchetti, Stephen, Hans Genberg, John Lipsky, and Sushil Wadhvani, 2000, “Asset Prices and Central Bank Policy,” Geneva Reports on the World Economy No. 2 (London: Centre for Economic Policy Research, July).
- Cetorelli, Nicola, and Linda Goldberg, 2012, “Follow the Money: Quantifying Domestic Effects of Foreign Bank Shocks in the Great Recession,” *American Economic Review*, Vol. 102, No. 3, pp. 213-18.
- Chen, Jiaqian, Tommaso Mancini-Griffoli, and Tomas Mondino, 2014, “Is the Zero Lower Bound a Constraint? A Study of Unconventional Monetary Policies,” IMF, mimeo.

- Chen, Jiaqian, Tommaso Mancini-Griffoli, and Tahsin Saadi Sedik, 2014, “Macroeconomic Effects of Large Scale Asset Purchase: Do Channels of Transmission Matter?” IMF Working Paper, forthcoming.
- Cheun, Samuel, Isabel von Köppen-Mertes, and Benedict Weller, 2009, “The Collateral Frameworks of the Eurosystem, the Federal Reserve System, and the Bank of England and the Financial Turmoil. ECB Occasional Paper Series No. 107
- Chung, Hess, Jean-Philippe Laforte, David Reifschneider, and John C. Williams, 2010, “Have We Underestimated the Probability of Hitting the Zero Lower Bound?” Paper presented at the conference, Revisiting Monetary Policy in a Low Inflation Environment, Federal Reserve Bank of Boston, October, Vol. 13.
- Clarida, Richard, Jordi Galí, and Mark Gertler, 2002, “A Simple Framework for International Policy Analysis,” *Journal of Monetary Economics*, Vol. 49, pp. 879-904.
- Coenen, Günter, Giovanni Lombardo, Frank Smets, and Roland Straub, 2007, “International Transmission and Monetary Policy Cooperation,” NBER Chapters, in *International Dimensions of Monetary Policy*, National Bureau of Economic Research., pp. 157-92.
- Coibion, Olivier, Y. Gorodnichenko, and J. Wieland, 2012, “The Optimal Inflation Rate in New Keynesian Models: Should Central Banks Raise Their Inflation Targets in Light of the ZLB?” *The Review of Economic Studies*, Vol. 79, No. 4, pp. 1371-406.
- Corsetti, Giancarlo, and Paolo Pesenti, 2005, “International Dimensions of Optimal Monetary Policy,” *Journal of Monetary Economics*, Vol. 52, pp. 281-305.
- Crowe, C., and E.E. Meade, 2008, “Central Bank Independence and Transparency: Evolution and Effectiveness,” *European Journal of Political Economy*, Vol. 24, No. 4, pp. 763-77 (December).
- Cukierman, A., 1992, *Central Bank Strategy, Credibility, and Independence: Theory and Evidence* (Cambridge, Mass.: The MIT Press).
- Cukierman, P. Miller, and B. Neyapti, 2002, “Central Bank Reform, Liberalization, and Inflation in Transition Economies—An International Perspective,” *Journal of Monetary Economics*, Vol. 49, pp. 237-64.
- Cukierman, S. Webb, and B. Neyapti, 1992, “Measuring the Independence of Central Banks and Its Effect on Policy Outcomes,” *The World Bank Economic Review*, Vol. 6 (September), pp. 352-98.
- Curdia, Vasco, and Michael Woodford, 2009, “Credit Frictions and Optimal Monetary Policy,” Bank for International Settlements Working Paper No. 278.



- , 2011, “The Central-Bank Balance Sheet as an Instrument of Monetary Policy,” *Journal of Monetary Economics*, Vol. 58. No. 1, pp. 54-79.
- De Haan, J. and W. Kooi, 2000, “Does Central Bank Independence Really Matter? New Evidence for Developing Countries Using a New Indicator,” *Journal of Banking and Finance*, 24, pp. 643-64.
- Debelle, G., and S. Fischer, 1994, “How Independent Should a Central Bank be? In *Goals, Guidelines, and Constraints Facing Monetary Policymakers*, J. Fuhrer (ed.), Federal Reserve Bank of Boston (Conference Proceedings).
- Dell’Ariccia, Giovanni, Luc Laeven, and Gustavo Suarez, 2013, “Bank Leverage and Monetary Policy’s Risk-taking Channel: Evidence from the United States,” IMF Working Paper 13/143 (Washington: International Monetary Fund).
- Dell’Ariccia, Giovanni, Luc Laeven, and Robert Marquez, 2014, “Real Interest Rates, Leverage, and Bank Risk-taking,” *Journal of Economic Theory*, Vol. 149, pp. 65–99.
- Devereux, Michael B., and Charles Engel, 2003, “Monetary Policy in the Open Economic Revisited: Price Setting and Exchange Rate Flexibility,” *Review of Economic Studies*, Vol. 70, pages pp. 765-83.
- Diamond, D. and Dybvig, P. 1983. Bank Runs, Deposit Insurance and Liquidity,” *Journal of Political Economy* Vol. 91, pp. 401–19.
- Disyatat, Piti, and Gabriele Galati, 2005, “The Effectiveness of Foreign Exchange Intervention in Emerging Market Countries,” in *Foreign Exchange Market Intervention in Emerging Markets*, BIS Paper No. 24, pp. 97–113.
- Dixit, Avinash, and Luisa Lambertini, 2003, “Interactions of Commitment and Discretion in Monetary and Fiscal Policies,” *American Economic Review*, Vol. 93, No. 5, pp. 1522-542.
- Dreher, A., J. Egbert, and J. de Haan, 2008, “Does High Inflation Cause Central Bankers to Lose their Job? Evidence Based on a New Data Set,” *European Journal of Political Economy*, Vol. 24. No. 4, pp. 778-87 (December).
- Dupor, Bill, 2005, “Stabilizing Non-fundamental Asset Price Movements under Discretion and Limited Information,” *Journal of Monetary Economics*, Vol. 52 (May), pp. 727-47.
- Eggertsson, G. B., and M. Woodford, 2003, “The Zero Bound on Interest Rates and Optimal Monetary Policy,” *Brookings Papers on Economic Activity*, Vol. 1, pp. 139-233.
- Eggertsson, Gauti, and Jonathan D. Ostry, 2005, “Does Excess Liquidity Pose a Threat in Japan?” IMF Policy Discussion Paper 5/05 (Washington: International Monetary Fund).

- Eichengreen, Barry, Mohamed El-Erian, Arminio Fraga, Takatoshi Ito, Jean Pisani-Ferry, Eswar Prasad, Raghuram Rajan, Maria Ramos, Carmen Reinhart, Helene Rey, Dani Rodrik, Kenneth Rogoff, Hyun Song Shin, Andres Velasco, Beatrice Weder di Mauro, and Yongding Yu, 2011, "Rethinking Central Banking," Brookings Institution, Washington.
- Farhi, Emmanuel, and Iván Werning, 2013, "Dilemma not Trilemma? Capital Controls and Exchange Rates with Volatile Capital Flows," paper presented Jacques Polak Annual Research Conference, International Monetary Fund.
- Farhi, Emmanuel, and Jean Tirole, 2012, "Collective Moral Hazard, Maturity Mismatch and Systemic Bailouts," *American Economic Review*, February, Vol. 102, No. 1.
- Federal Reserve Bulletin, 1951, Board of Governors of the Federal Reserve System, Washington.
- Federico, Pablo, Carlos Vegh, and Guillermo Vuletin, 2012, "Reserve Requirement Policy Over the Business Cycle," mimeo, University of Maryland.
- Feldstein, Martin S., 1997. "The Costs and Benefits of Going from Low Inflation to Price Stability," in *Reducing Inflation: Motivation and Strategy*, pp. 123-66. NBER.
- , 1999. *Costs and Benefits of Achieving Price Stability* (Chicago: University of Chicago Press).
- Fernández-Villaverde, Jesús, Grey Gordon, Pablo A. Guerrón-Quintana, and Juan Rubio-Ramírez, 2013, "Nonlinear Adventures at the Zero Lower Bound," NBER Working Paper No. 18058 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Fischer, S., 1995, "Central-Bank Independence Revisited," *American Economic Review*, Papers and Proceedings, Vol. 85, No. 2 (May), pp. 201-206.
- Forbes, Kristin, 2012, "The 'Big C': Identifying Contagion," NBER Working Paper 18465 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Fuhrer, Jeffrey, and George Moore, 1995, "Monetary Policy Trade-offs and the Correlation between Nominal Interest Rates and Real Output," *American Economic Review*, Vol. 85, No. 1, pp. 219-39.
- Fuhrer, Jeffrey, and Glenn Rudebusch, 2004, "Estimating the Euler Equation for Output," *Journal of Monetary Economics*, Vol. 51, September, pp. 1133-153.
- Gagnon, Joseph, and Brian Sack, 2014, "Monetary Policy with Abundant Liquidity: A New Operating Framework for the Fed," Policy Briefs PB14-4, Peterson Institute for International Economics.

- Gagnon, Joseph, Matthew Raskin, Julie Remache, and Brian Sack, 2011, "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases," *International Journal of Central Banking*, Vol. 7, No. 1, pp. 3–43.
- Galí, Jordi, and Tommaso Monacelli, 2005, "Monetary Policy and Exchange Rate Volatility in a Small Open Economy," *Review of Economic Studies*, Vol. 72, pp. 707-34.
- Gerlach, Stefan, Alberto Giovannini, Cédric Tille, José Viñals, 2009, "Are the Golden Years of Central Banking Over? The Crisis and the Challenges," Geneva Reports on the World Economy 10.
- Gertler, Mark, and Peter Karadi, 2011, "A Model of Unconventional Monetary Policy," *Journal of Monetary Economics*, Vol. 58, pp. 17-34.
- Grilli, V., D. Masciandaro, and G. Tabellini, 1991, "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries," *Economic Policy: A European Forum*, Vol. 6 (October), pp. 342-91.
- Gürkaynak, Refet, and Jonathan Wright, 2012, "Macroeconomics and the Term Structure," *Journal of Economic Literature*, Vol. 50, pp. 331-67. Swiss National Bank Annual Report, 2011, p. 38
- Gürkaynak, Refet, Andrew Levin, and Eric Swanson, 2010, "Does Inflation Targeting Anchor Long-Run Inflation Expectations? Evidence from the U.S., UK, and Sweden," *Journal of the European Economic Association*, Vol. 8, no. 6, pp. 1208-1242.
- Hamilton, James, and Dong Heon Kim, 2002, "A Reexamination of the Predictability of Economic Activity Using the Yield Spread," *Journal of Money, Credit, and Banking*, Vol. 34, No. 2, pp. 340-60.
- Hammond, Gill, 2012, "State of the Art of Inflation Targeting – 2012" Central for Central Banking Studies Handbook no. 29, Bank of England.
- Hancock, Diana, and Wayne Passmore, 2011, "Did the Federal Reserve's MBS Purchase Program Lower Mortgage Rates?" *Journal of Monetary Economics*, Vol. 58, No. 5, pp. 498–514.
- Hart, Oliver, and John Moore, 1994, "A Theory of Debt Based on the Inalienability of Human Capital," *Quarterly Journal of Economics*, Vol. 109, No. 4, pp 841-79.
- Iakova, Dora, 2007, "Flattening of the Phillips Curve: Implications for Monetary Policy," IMF Working Paper No.07/76 (Washington: International Monetary Fund).
- IMF, 2010, "The Fund's Role Regarding Cross-border Capital Flows," IMF Policy Papers.

- , 2011a, *Recent Experiences in Managing Capital Inflows—Cross-Cutting Themes and Possible Guidelines* (Washington: International Monetary Fund).
- , 2011b, *The Multilateral Aspects of Policies Affecting Capital Flows* (Washington: International Monetary Fund).
- , 2011c, “Macprudential Policy: An Organizing Framework,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2012a, “The Liberalization and Management of Capital Flows: An Institutional View,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2012b, “Liberalizing Capital Flows and Managing Outflows,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2013a, “The Interaction of Monetary and Macprudential Policies,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2013b, “The Dog that Didn’t Bark: Has Inflation Been Muzzled or Was It Just Sleeping?” *World Economic Outlook*, chapter 3, April, pp.79-95.
- , 2013c, “Unconventional Monetary Policy: Recent Experiences and Prospects,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2013d, “Global Impact and Challenges of Unconventional Monetary Policies,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2013e, “Assessing Policies to Revive Credit Markets,” *Global Financial Stability Report*, Chapter 2, October (Washington: International Monetary Fund).
- , 2013f, “Key Aspects of Macprudential Policy,” IMF Policy Paper (Washington: International Monetary Fund).
- , 2013g, “Brazil: Technical Note on Macprudential Policy Framework,” Financial Sector Assessment Program. IMF Country Report 13/148.
- Jácome, L.I., and F. Vázquez, 2008, “Is there Any Link between Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean,” *European Journal of Political Economy*, Vol. 24, No. 4, pp. 788-801 (December).
- Jácome, Luis I., Erlend W. Nier, and Patrick A. Imam, 2012, “Building Blocks for Effective Macprudential Policies in Latin America: Institutional Considerations,” IMF Working Paper 12/183 (Washington: International Monetary Fund).
- Jeanne, Olivier, 2013, “Macprudential Policies in a Global Perspective,” Johns Hopkins University mimeo.

- Jimenez, Gabriel, Steven Ongena, José Luis Peydro-Alcalde, and Jesús Saurina, forthcoming, “Hazardous Times for Monetary Policy: What do Twenty-three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk-taking?” *Econometrica*.
- Joyce, Michael, Ana Lasaosa, Ibrahim Stevens, and Matthew Tong, 2011, “The Financial Market Impact of Quantitative Easing in the United Kingdom,” *International Journal of Central Banking*, 2011, Vol. 7, N. 3, pp. 113–61.
- Kaminsky, Graciela, and Carmen Reinhart, 1999, “The Twin Crises: The Causes of Banking and Balance-of-Payments Problems,” *American Economic Review*, Vol. 89, pp. 473-500.
- Kashyap, Anil, and Jeremy Stein, 2012, “Optimal Conduct of Monetary Policy with Interest on Reserves,” *American Economic Journal: Macroeconomics*, Vol. 4, No. 1, pp. 266-82.
- Kiley, Michael, 2012, “The Aggregate Demand Effects of Short- and Long-Term Interest Rates,” Federal Reserve Board Working Paper N. 54.
- King, Mervyn, 2012, “Twenty Years of Inflation Targeting,” Text of the Stamp Memorial Lecture at London School of Economics, London, October 9.
- Kiyotaki, Nobuhiro, and John Moore, 1997. “Credit Cycles,” *Journal of Political Economy*, Vol. 105, pp. 211-48.
- Klenow, Peter J., and Benjamin A. Malin, 2010, “Microeconomic Evidence on Price-Setting,” NBER Working Paper No. 15826 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Kocherlakota, Narayana, 2010, “Inside the FOMC,” speech delivered in Marquette, Michigan, August 17.
- Korinek, Anton, 2010, “Regulating Capital Flows to Emerging Markets: An Externality View,” University of Maryland mimeo.
- , 2011, “Systemic Risk-Taking: Amplification Effects, Externalities, and Regulatory Responses,” European Central Bank Working Paper No. 1345.
- , 2014, “Global Cooperation or Currency Wars?” Johns Hopkins University mimeo.
- Krishnamurthy, Arvind, 2010, “Amplification Mechanisms in Liquidity Crises.” *American Economic Journal: Macroeconomics*, Vol. 2, No. 3, pp. 1-30.
- Krishnamurthy, Arvind, and Vissing-Jorgensen, 2011, “The Effects of Quantitative Easing on Long-term Interest Rates,” *Brookings Papers on Economic Activity*, (Fall), pp. 215-256.

- Krugman, Paul R., 1998, "It's Baaack: Japan's Slump and the Return of the Liquidity Trap," *Brookings Papers on Economic Activity*, 1998, Vol. 2, pp. 137-205.
- Kydland, Finn, and Edward Prescott, 1977, "Rules Rather than Discretion," *The Journal of Political Economy*, Vol. 85, Issue 3, pp. 473-92.
- Lacker, Jeffrey, 2001, "Introduction to Special Issues on the 50th anniversary of the Treasury/Fed Accord," *Federal Reserve Bank of Richmond Economic Quarterly* Vol. 87, No. 1, pp. 1-6.
- Laubach, Thomas, and John Williams, 2003, "Measuring the Natural Rate of Interest," *The Review of Economics and Statistics*, Vol. 85, No. 4, pp. 1063-070.
- Levin, Andrew T., Fabio M. Natalucci, and Jeremy M. Piger, 2004, "Explicit Inflation Objectives and Macroeconomic Outcomes," Working Paper Series 383. European Central Bank.
- Lorenzoni, Guido, 2008, "Inefficient Credit Booms," *Review of Economic Studies*, Vol. 75, No. 3, pp. 809-33.
- Loungani P., and N. Sheets, 1997, "Central Bank Independence, Inflation, and Growth in Transition Economies," *Journal of Money, Credit, and Banking*, Vol. 29, No. 3, (August), pp. 381-99.
- Loungani, Prakash, Assaf Razin, and Chi-Wa Yuen, 2001, "Capital Mobility and the Output-Inflation Tradeoff," *Journal of Development Economics*, Vol.64, pp. 255-74.
- Mendoza, Enrique, 2010, "Sudden Stops, Financial Crises, and Leverage," *American Economic Review*, Vol. 100, No. 5, pp. 1941-66.
- Miranda-Agrippino, Silvia, Rey, Hélène, 2012, "World Asset Markets and Global Liquidity," presented at the Frankfurt ECB BIS Conference, February, mimeo, London Business School.
- Mishkin, Frederic, 2010, "Monetary Policy Flexibility, Risk Management, and Financial Disruptions," *Journal of Asian Economics* Vol. 23 (June), pp. 242-46.
- , 2011, "Monetary Policy Strategy: Lessons from the Crisis," NBER Working Paper No. 16755 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Mondino, Nier, and Saadi Sedik, 2014, "Determinants of Capital Flows: Can the Global Financial Cycle Be Tamed?" IMF Working Paper, forthcoming.
- Nier, Erlend, Luis Jácome, Jacek Osinski, Pamela Madrid, 2011, "Institutional Models for Macroprudential Policy," IMF Staff Discussion Note 11/18 (Washington: International Monetary Fund).

- Obstfeld, Maurice, and Kenneth Rogoff, 2002, “Global Implications of Self-Oriented National Monetary Policy Rules,” *Quarterly Journal of Economics*, Vol. 117, pp. 503–35.
- Osinski, Jacek, Katharine Seal, and Lex Hoogduin, 2013, “Macroprudential and Microprudential Policies: Toward Cohabitation.” IMF Staff Discussion Note 13/5 (Washington: International Monetary Fund).
- Ostry, Jonathan D., and Atish R. Ghosh, 2013, “Obstacles to International Policy Coordination, and How to Overcome Them,” IMF Staff Discussion Note No. 13/11 (Washington: International Monetary Fund).
- Ostry, Jonathan D., Atish R. Ghosh, and Marcos Chamon, 2012, “Two Targets, Two Instruments: Monetary and Exchange Rate Policies in Emerging Market Economies,” IMF Staff Discussion Note SDN/12/01 (Washington: International Monetary Fund).
- Ostry, Jonathan D., A. Ghosh, K. Habermeier, M. Chamon, M. Qureshi, and D. Reinhardt, 2010, “Capital Inflows: The Role of Controls,” IMF Staff Position Note 10/04 (Washington: International Monetary Fund).
- Ostry, Jonathan D., Atish R. Ghosh, Karl Habermeier, Luc Laeven, Marcos Chamon, Mahvash S. Qureshi, and Annamaria Kokenyne, 2011, “Managing Capital Inflows: What Tools to Use?” IMF Staff Discussion Notes 11/06 (Washington: International Monetary Fund).
- Rajan, Raghuram, 2013, “A Step in the Dark: Unconventional Monetary Policy after the Crisis,” Andrew Crockett Memorial Lecture, Lecture delivered at the BIS on 23 June.
- Reifschneider, David, and John C. Williams, 2000, “Three Lessons for Monetary Policy in a Low-Inflation Era,” *Journal of Money, Credit, and Banking*, 32 (4), 936-966.
- Rey, Helene, 2013, “Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence,” paper presented at “Global Dimensions of Unconventional Monetary Policy,” a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, August 22–24, [www.kansascityfed.org/publicat/sympos/2013/2013Rey.pdf](http://www.kansascityfed.org/publicat/sympos/2013/2013Rey.pdf).
- Roger, Scott, 2009, “Inflation Targeting at 20: Achievements and Challenges” IMF Working Paper No. 09/236 (Washington: International Monetary Fund).
- Rogoff, Kenneth, 1985, “The Optimal Degree of Commitment to an Intermediate Monetary Target.” *Quarterly Journal of Economics*, Vol. 100, pp. 1169-189.
- Rudebusch, Glenn D., and Eric T. Swanson. 2008. “Examining the Bond Premium Puzzle with a DSGE Model,” *Journal of Monetary Economics*, Vol. 55, pp. S111–26.

- Sandri, Damiano and Fabián Valencia, 2013. “Financial Crises and Recapitalizations,” *Journal of Money, Credit, and Banking*, Vol. 45s, No. 8, pp. 59-86.
- Schmitt-Grohe, Stephanie, and Martin Uribe, 2007, “Optimal Inflation Stabilization in a Medium-Scale Macroeconomic Model” in *Monetary Policy Under Inflation Targeting*, Klaus Schmidt-Hebbel and Rick Mishkin (eds.), Central Bank of Chile, Santiago, Chile, 2007, p. 125-86.
- Shin, Hyun Song, 2012, “Global Banking Glut and Loan Risk Premium,” *IMF Economic Review*, Vol. 60, No. 2, pp. 155-92.
- Stein, Jeremy, 2012, “Monetary Policy as Financial Stability Regulation,” *Quarterly Journal of Economics*, Vol. 127, No. 1, pp. 57-95.
- Stiglitz, Joseph, 1998, “Central Banking in a Democratic Society,” *De Economist* (Netherlands), 146(2), 1998, pp. 199-226.
- Stiglitz, Joseph, and Andrew Weiss, 1981, “Credit Rationing in Markets with Imperfect Information,” *American Economic Review*, Vo. 71, No.3, pp. 393-410.
- Summers, Lawrence, 1991. “Price Stability: How Should Long-Term Monetary Policy Be Determined?” *Journal of Money, Credit and Banking*, Vol. 23, No.3, pp. 625-31.
- Townsend, Robert, 1979, “Optimal Contracts and Competitive Markets with Costly State Verification,” *Journal of Economic Theory*, Vol. 21, No. 2, pp. 265-935.
- Tucker, Paul, 2004, “Managing the Central Bank’s Balance Sheet: Where Monetary Policy Meets Financial Stability,” lecture given in London on July 28, available at [www.bankofengland.co.uk](http://www.bankofengland.co.uk).
- Ueda, Kenichi, and Fabián Valencia, forthcoming, “Central Bank Independence and Macroprudential Regulation,” *Economic Letters*.
- Valencia, Fabián, 2011, “Monetary Policy, Bank Leverage, and Financial Stability,” IMF Working Paper 11/244 (Washington: International Monetary Fund).
- , forthcoming, “Banks’ Precautionary Capital and Credit Crunches,” *Macroeconomic Dynamics*.
- Vayanos, Dimitri, and Jean-Luc Vila, 2009, “A Preferred-Habitat Model of the Term Structure of Interest Rates,” London School of Economics, Paul Woolley Centre Working Paper 6.
- White, William, 2009, “Should Monetary Policy ‘Lean or Clean’?” Federal Reserve Bank of Dallas Working Paper No. 34.
- Williams, John C., 2009, “Heeding Daedalus: Optimal Inflation and the Zero Lower Bound,” *Brookings Papers on Economic Activity*, 2009, Vol. 2, pp. 1-45.



- Woodford, Michael, 2003, *Interest and Prices* (Princeton, NJ: Princeton University Press).
- , 2005, “Comment on ‘Using a Long-Term Interest Rate as the Monetary Policy Instrument,’” Columbia University, mimeo.
- , 2007, “Globalization and Monetary Control,” in J. Gali and M. Gertler (eds.), *International Dimensions of Monetary Policy* (Chicago: University of Chicago Press).
- , 2009, “Comment on Williams,” *Brookings Papers on Economic Activity*, Vol. 2, pp. 38-49.
- , 2012, “Methods of Policy Accommodation at the Interest-Rate Lower Bound,” presented at the Jackson Hole Symposium.
- , 2013, “Monetary Policy Targets After the Crisis,” presented at the conference “Rethinking Macro Policy II,” IMF, April 16-17.
- Wren-Lewis, Simon, 2013, “Written Evidence on the Appointment of Dr. Mark Careny as Governor of the Bank of England,” House of Commons Treasury Committee, pp. 3-6.
- Wright, Jonathan, 2011, “Term Premia and Inflation Uncertainty: Empirical Evidence from an International Panel Dataset,” *American Economic Review*, Vol. 101, pp. 1514-534.
- Yellen, Janet L., 2012, “Perspectives on Monetary Policy,” speech at the Boston Economic Club, June 6.