MONETARY POLICY AND FINANCIAL STABILITY

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MONETARY POLICY AND FINANCIAL STABILITY

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EXECUTIVE SUMMARY

The issue of using monetary policy for financial stability purposes is hotly contested. The crisis was a reminder that price stability is not sufficient for financial stability, financial crises are costly, and policy should aim to decrease the likelihood of crises, not only rely on dealing with their repercussions once they occur.

It is clear that well-targeted prudential policies (including micro and macroprudential regulation and supervision) should be pursued actively to attenuate the buildup of financial risks.

The question is whether monetary policy should be altered to contain financial stability risks. Should it lend a hand by temporarily raising interest rates more than warranted by price and output stability objectives? Keeping rates persistently higher is also possible, but more costly.

Based on our current knowledge, and in present circumstances, the answer is generally no. But, the door should remain open as our knowledge of the relationship between monetary policy and financial risks evolves and circumstances change.

In principle, monetary policy should deviate from its traditional response only if costs are smaller than benefits (the principle of doing no harm on net). Costs arise in the short term, from lower output and inflation. Benefits materialize mainly in the medium term, as financial risks are mitigated, though effects are more uncertain. Based on current knowledge, the case for leaning against the wind is limited, as in most circumstances costs outweigh benefits.

However, our current understanding of the channels through which monetary policy affects financial stability domestically, across borders, and over the business cycle is rapidly evolving. More circumstances may be uncovered in which deviations from a traditional policy response are warranted. Future research in this area is a key priority.

In the interim, central banks should monitor and openly discuss financial stability risks, and carefully consider the costs and benefits of potential action.

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Glossary

ADD	Average Distance-to-Default
AEs	Advanced Economies
BIS	Bank for International Settlements
EMs	Emerging Markets
FX	Foreign Exchange
GFSR	Global Financial Stability Report
GMPI	Global Macroprudential Policy Index
UMP	Unconventional Monetary Policies
U.K.	United Kingdom
U.S.	United States
VAR	Vector Auto-Regression

INTRODUCTION AND MOTIVATION

1.   Before the global financial crisis, a widespread consensus supported a strict division of labor between different policy levers. Price stability was the primary—and sometimes sole—mandate of monetary policy. Financial stability was the realm of prudential regulation and supervision (often managed by agencies separate from the central bank). This framework found an intellectual foundation in New Keynesian models, which implied that—under broad conditions—price stability would keep output around its natural level.

2.   As a result, most central banks took a *"benign neglect"* approach to asset price and credit booms. Monetary policy was to react to movements in asset prices and credit aggregates only to the extent that they affected inflation (and output).[1] This was reinforced by a belief that it was too difficult to distinguish fundamental-driven movements from speculative bubbles in real time. And, in any event, the policy rate was too coarse an instrument to address the associated financial risks. If monetary policy had a role, it was to respond to the macroeconomic consequences of financial instability, if and when it materialized. This debate is often summarized by the phrase *"lean versus clean."*[2]

3.   Policy makers recognized the dangers associated with financial imbalances. Indeed, central banks tended to follow the consensus framework with some flexibility. In many emerging markets, concerns about financial imbalances (for instance, large foreign-exchange exposures or fast credit growth) weighed significantly on monetary policy decisions. But in most advanced economies (with Australia, Norway, and Sweden as notable exceptions) preserving financial stability was solely the job of prudential policy. Financial regulation and supervision were, however, predominantly focused on the stability of individual institutions, with relatively little attention to the stability of the financial system as whole, thus leaving an important gap in the overall policy framework. Furthermore, regulation and supervision of individual institutions was deficient.

4.   In the run-up to the crisis, financial stability risks grew, largely undetected, beneath the surface of seemingly close-to-target inflation and output gaps. There was a sharp increase in the ratio of credit to GDP and in real estate prices—two important measures of financial vulnerabilities (Figure 1, where output gaps are estimated based solely on information available before the crisis). Some have argued that central bank policies during this period raised incentives for risk taking, as rewards could be appropriated by individuals, while costs would be alleviated by swift policy reaction and borne by the public.[3]

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[1] See Bernanke and Gertler (2000), as presented at the Federal Reserve Bank of Kansas City Economic Policy Symposium at Jackson Hole.

[2] That being said, central banks should always be ready to "clean" if a crisis materializes.

[3] As emphasized in Farhi and Tirole (2012), and Caballero and Krishnamurthy (2003).

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

Source: World Economic Outlook (September 2007 vintage for the output gap) and Haver Analytics.
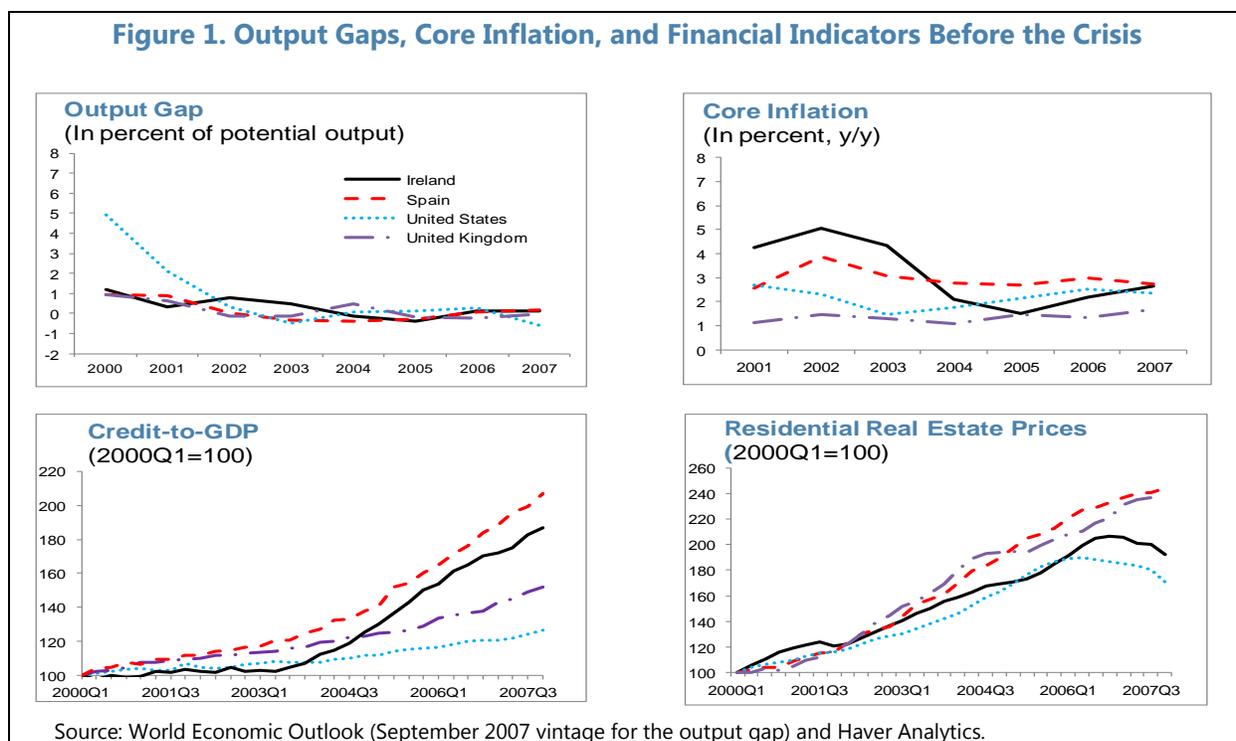
5.   Contrary to pre-crisis beliefs, the costs of cleaning up after the crisis proved to be very large, **especially for those countries where financial imbalances had grown the most.** There was a remarkable correlation between the two measures of financial vulnerabilities just mentioned—pre-crisis credit growth and housing price appreciation—and the drop in GDP and rise in household loan delinquencies in the two years following the global financial crisis (Figure 2). This is consistent with the findings of a large literature outside of mainstream macroeconomics that links financial fragility with poor macroeconomic performance. For instance, there is evidence that financial crises are deeper and more persistent than normal recessions. In advanced and emerging market economies after World War II, financial crises have on average led to negative GDP growth for two years, with a peak loss of GDP per capita of about 1.5 percent. In these crises, GDP has lagged behind its average recovery path after normal recessions by about 4 to 5 percent after five years.[4] Moreover, crises typically undermine countries' fiscal positions, as well as social and political stability and cohesion.

6.   The severity of such crises required extraordinary monetary policy accommodation, all the more so when fiscal policy was constrained by high and rising public debt burdens. In many advanced economies, short-term nominal rates quickly ran into the effective lower bound, and large-scale unconventional monetary policies (UMP) were required. Despite their overall

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[4] These are average numbers; individual crises can lead to larger losses. See, for instance, Allen and Gale (2000), Calvo and Mendoza (1996), Kaminsky and Reinhart (1999), and more recently, Taylor (2015), which suggests that evidence for advanced and emerging market economies is quite similar. Even before the crisis, this work was highly influential in emerging markets, but remained at the periphery of policy making in most advanced economies.

effectiveness, UMP were difficult to fine-tune, and their implications for future financial stability and cross-border spillovers are yet to be fully understood.[5]

Figure 2. Growing Financial Vulnerabilities and Costs of the Crisis

Credit Growth and Depth of Recession

Bubble size shows the level of credit-to-GDP ratio in 2006.

$y = -1.2852x + 12.969$
$R^2 = 0.14$

Linking Booms to Defaults

$y = 1.1159x + 20.457$
$R^2 = 0.5501$

Bubble size shows the percentage point change in the ratio of mortgage credit outstanding to household income from 2000 to 2006.

Sources: IMF International Financial Statistics; IMF staff calculations.
Note: Each data point corresponds to a country, indicated by the three-letter abbreviations.

Sources: Federal Housing Finance Agency, Mortgage Bankers Association, Bureau of Economic Analysis, U.S. Census Bureau.
Note: Each data point corresponds to a U.S. state, indicated by the two-letter abbreviations.

7.   This has rekindled the debate on "*lean versus clean.*" Many policy makers now recognize the need to mitigate crisis risk proactively, rather than only relying on cleaning up after a crisis. On the monetary policy front, price stability is no longer believed to be sufficient to ensure macroeconomic stability. And, on the prudential front, the emphasis has shifted to containing systemic risk by complementing traditional microprudential policies aimed at individual institutions with macroprudential policy frameworks, as recommended in Viñals (2013), and IMF (2013f, and 2014c). Examples of the latter include both cyclical instruments (e.g., countercyclical capital buffers, loan-to-value limits, or dynamic loss provisioning) and permanent measures to strengthen the structural resilience of the financial system. But there is still concern that even the stronger emerging combination of micro- and macroprudential policies may not suffice to contain financial stability risks.[6]

8.   If that were the case, should monetary policy lend a hand—by pursing a financial stability objective in addition to its primary mandate of price stability? This question is central

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[5] These are explored in IMF 2013a,c, Chen, Mancini-Griffoli, and Sahay (2014), and Chen and other (2015). Fiscal space does not have to be limited during crises, if countries build fiscal buffers in good times.

[6] A recent review of empirical work is Galati and Moessner (2014). For a collection of papers, see Claessens and others (2011). And for an extensive treatment, see Freixas, Laeven, and Peydró (2015). Viñals (2013) points to strong inaction bias of macroprudential policies.

to this paper, and the answer potentially affects all countries with developed financial systems (and sufficiently high probabilities of crisis), effective and independent monetary policy, as well as rapidly evolving prudential policies. As such, this paper is more appropriate for advanced and emerging economies with freely floating exchange rates, than low-income countries, or countries with exchange rate pegs or other constraints on monetary policy.[7] The question tackled here has implications for the conduct of monetary policy in normal times, not just in rare crisis periods. And by reopening a debate on established monetary policy frameworks, it raises sensitive political and institutional issues.

9. **Two approaches are possible to using monetary policy.** The first involves responding by keeping nominal interest rates persistently higher than implied by a traditional reaction function focused only on inflation and output stability. In other words, interest rates would be raised a bit more and faster in the upswing, and lowered a bit less and more slowly in the downswing. The second involves responding occasionally by "leaning against the wind" as needed to counter evolving financial risks.[8] The latter could be part of a state contingent rule-based approach; for instance, one in which deviations from a traditional inflation targeting framework were guided by previously identified financial indicators (for example, credit growth, leverage, and others). This paper—as most of the policy debate—focuses on the second approach. The first does not seem especially promising. Higher rates would create persistently lower inflation. This would eventually decrease inflation expectations, and in the end leave real rates—and thus financial risks— unchanged, while aggravating risks of hitting the zero lower bound.[9] The second approach might be difficult to communicate in the light of long and variable lags. However, it is more consistent with the view that financial risks evolve over time, and that in some cases—as discussed later—price and financial stability will require the same policy reaction.

10. **Not surprisingly, given the limited empirical evidence and the lack of an accepted theoretical framework, the question of leaning against the wind is hotly contested.** Influential

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[7] The conceptual framework advanced in this paper remains applicable to all countries. However, the empirical estimates attached to it are more representative of advanced and emerging market economies. In low-income countries, monetary transmission often differs, due to excess liquidity in the banking system, or thin credit and government securities markets. In addition, tradeoffs with prudential policies might differ, given the limited data to motivate and fine-tune such policies.

[8] The concept is sufficiently broad to capture a wide range of policy reactions, including hiking more or cutting less, as well as hiking earlier, than warranted to maintain price stability. Note that leaning against the wind implies a higher rate than would have been adapted to stabilize prices alone. The concept is thus different from what is commonly known as the Taylor principle, which stipulates that interest rates should be raised by more than observed inflation deviations from target, in order to stabilize prices. In the early literature (Clarida, Galia and Gertler, 1999, for instance), the concepts of the Taylor principle and leaning against the wind were taken to be synonymous.

[9] The paper does not dwell on how a policy of leaning against the wind might be codified in the central bank's legislature. Typically, this would entail an amendment to the central bank's mandate, stating that monetary policy is responsible for financial stability in addition to price stability. Establishing the relative priority of these mandates is more difficult; it is not just a matter of making the inflation mandate primary and the financial stability mandate secondary. Leaning against the wind implies sometimes undershooting the inflation mandate so as to support financial stability. As this paper argues, the pursuit of financial stability could preclude the central bank from satisfying its price stability mandate, if benefits of doing so were clearly greater than costs.

economists and policymakers espouse very different views, some praising the virtues of monetary policy to affect lending and potentially risk-taking behavior in all markets, others underscoring the risks and costs of using one instrument for two targets. John Williams, president of the San Francisco Federal Reserve, represents one side of the debate: "monetary policy is poorly suited for dealing with financial stability concerns, even as a last resort." Oystein Olsen, Governor of the Norges Bank—Norway's central bank—epitomizes the other side: "we have been leaning against the wind." As a result, the Norges bank publishes interest rate forecasts that respond to risks of financial imbalances, in its Monetary Policy Report. Janet Yellen, the Chair of the Board of Governors of the U.S. Federal Reserve Board, sees valid arguments on both sides: "Monetary policy faces significant limitations as a tool to promote financial stability… [However,] it may be appropriate to adjust monetary policy to "get in the cracks" that persist in the macroprudential framework."[10]

11.   The Bank for International Settlements (BIS) has also been a prominent contributor to this debate, expressing support for a stronger role for monetary policy in maintaining financial stability: "Financial stability is too large a task for prudential […] frameworks alone. Monetary policy strategies also need to […] lean against the build-up of financial imbalances even if near-term inflation remains low and stable." The BIS argues in favor of higher interest rates for extended periods, as "financial imbalances can build up gradually, over many years […]. If central banks are to counteract such build-ups, they will need longer policy horizons." These, argues the BIS, grow over a "financial cycle," lasting longer than the business cycle (Caruana 2011, and Box 1).

12.   The debate has taken on added urgency in the current economic environment.
Tensions between price and financial stability mandates have emerged in several advanced economies (AEs) that still face considerable slack in the economy and low inflation.[11] Meanwhile, these countries have seen a mix of rising house or other asset prices, and credit growth (Appendix I provides an in-depth survey of various countries' macroeconomic context, financial risks, and current policy debates). In emerging market economies (EMs), these tensions between policy objectives are currently not so marked:

- In Sweden, Switzerland, and the United Kingdom (U.K.), house prices and credit growth are either accelerating or still increasing, sometimes from already elevated levels.

- In Australia and Canada, house prices are rising despite moderate credit growth.

- In the Netherlands and Norway, house prices and credit have decreased, but are recently recovering.

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[10] For full texts of speeches, see Williams (2015), Olsen (2015), and Yellen (2014). A useful overview of the literature on leaning against the wind, along with policy recommendations, is provided in Smets (2014). See also Stein (2014) and Svensson (2015) for particularly articulate discussions of the policy tradeoffs.

[11] Though in some countries inflation has been pushed down by external factors, such as lower oil prices and domestic currency appreciation. In these cases, policy does not necessarily have to be especially accommodative; the tradeoff with financial stability may be less stark than immediately apparent, at least over a temporary period.

- In contrast, in the United States (U.S.), after a sharp correction in house prices and subdued credit growth, a range of asset markets other than housing show signs of stretched valuations.[12]

13.   This paper aims to bring some clarity to these issues. While it cannot provide final answers, it aims to help policymakers assess the value and implications of using monetary policy to support financial stability. It does so in three ways: by providing a framework to conceptualize and clarify the channels of transmission and policy tradeoffs, advancing initial policy guidance based on the most recent empirical findings, and emphasizing the gaps that still need to be filled before more definitive policy advice can be formulated. Put simply, the paper asks: "what do we know and can be quantified, what should we do based on what we know, and how much do we really know?"
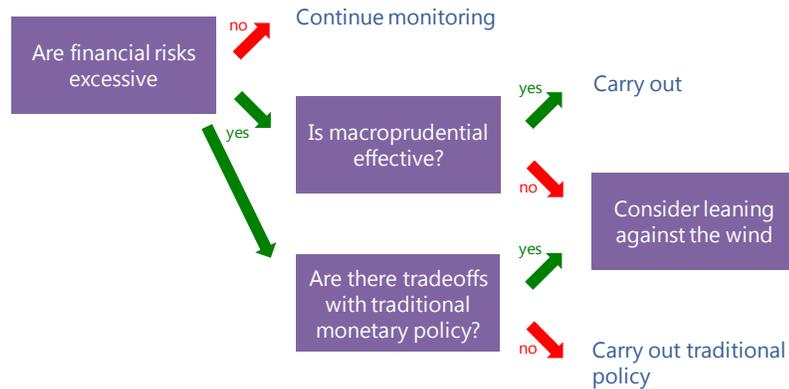
14.   The paper is divided into five sections. The first provides the policy context, conceptual underpinnings and definitions. The second reviews the available empirical estimates of the relationship between interest rates and financial variables, and ultimately with the macroeconomy. The third, discusses tradeoffs between price and financial stability. The fourth builds on these findings by evaluating the welfare implications of using monetary policy to support financial stability. The fifth section provides some additional discussion, including of open economy implications. Finally, the sixth section considers the implementation issues, and the last offers some concluding thoughts.

THE POLICY CONTEXT AND DEFINITIONS

15.   The lesson from recent years is that policy should aim to decrease the likelihood of crises, not only rely on dealing with their repercussions; the question is how to do so. In particular, what is the role for monetary policy? Answering this question leads policy makers to contemplate two dimensions of policy: one is cyclical, the other structural. The first adapts to the conjuncture and may target a specific source of risk. The second remains unchanged over time, aiming to support the resilience of the financial system to a wide set of shocks. Such policies rely on capital and liquidity requirements, as well as limits on exposure to foreign exchange, or redemption risks. Recent work suggests that strong policies aimed at structural stability can materially improve systemic resilience. [13] In these cases, the burden on cyclical policies—including on monetary policy— to support financial stability could be lighter. Given this paper's focus on monetary policy, though, the emphasis here will be on cyclical policies. Setting policy over the cyclical dimension involves answering a series of questions, illustrated in Figure 3 (that offers only a stylized snap-shot of what is actually a repeated decision making process with substantial uncertainty at each node).

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[12] See the IMF's Global Financial Stability Report (GFSR) of October 2014 and April 2015 (IMF 2014b, 2015).

[13] Dagher and others (2015) suggests that 15 percent to 20 percent capital requirements on banks would have avoided 80 percent to 90 percent of financial crises in advanced economies since the 1970s. Other papers investigating the effects of capital and leverage requirements on financial stability include Ratnovski (2013), and Miles and others (2013). Papers providing an overview of policies aimed at the structural dimension include Viñals and others (2013), Boot and Ratnovski (2014), and Laeven and others (2014).

Figure 3. Dealing With Financial Stability Over the Cyclical Dimension: A Decision Tree

Are financial risks excessive
— no → Continue monitoring
— yes → Is macroprudential effective?
— yes → Carry out
— no → Consider leaning against the wind
Are there tradeoffs with traditional monetary policy?
— yes → Consider leaning against the wind
— no → Carry out traditional policy

Source: IMF staff.

16.   The first question is: are financial risks excessive? Financial risks capture the likelihood of large disturbances to future macroeconomic conditions originating in financial variables. Variables such as asset prices can be a direct source of shocks, for instance through a large drop in prices. Other variables, such as leverage or debt of financial firms, household and corporates, tend to amplify other shocks through financial distortions. Such distortions include, for instance, the relationship between asset prices and credit growth, whereby higher asset prices allow borrowers to pledge more collateral and thus increase debt, until a shock forces them to deleverage rapidly, with potential externalities on other debtors.[14] Estimating financial risks is not easy.[15] At the end of the day, determining whether risks are excessive will have to rest on a socially agreed maximum for the probability and severity of large disturbances to macroeconomic conditions. This is similar to defining an inflation target for monetary policy.

17.   The second question is whether other policies—in particular macroprudential policies—can address financial risks, when they are excessive. Macroprudential policies offer the hope of targeting specific sources of vulnerabilities, whether they arise from exuberance in a

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[14] As initially framed in Bernanke, Gertler and Gilchrist (1999). See Brunnermeier, Eisenbach and Sannikov (2012), as well as Leeper and Nason (2014) for a survey of financial frictions. Other distortions than discussed above include: incomplete or asymmetric information, liquidity constraints, funding constraints, moral hazard stemming from policy actions like bailouts, monitoring costs or costly state verification, incentives and principle-agent problems, and regulatory arbitrage.

[15] A major limitation of these endeavors is the data in which crises are rare events. To some extent, stress tests have been designed to gauge the risks built up in a system. Also, a large literature has emerged under the umbrella of "early warning exercises." For instance: Blancher and others (2013) organizes indicators and monitoring tools around key questions on systemic risk; the IMF's Staff Guidance Note on Macroprudential Policy (IMF 2014c), and the IMF Detailed Guidance on Macroprudential Policy Instruments discusses indicators used to activate policy tools related to broad-based, sectoral (households and corporate), and liquidity risks; IMF (2011), Arregui and others (2013), and Borio and Drehmann (2009) combine credit and asset price growth to assess the likelihood of crises; Arsov and others (2013) formulates an operational definition of a systemic stress event and assesses the ability of several popular near-term ("near-coincident") systemic risk measures to provide an early warning of impending financial crisis, such as JPod (Segoviano and Goodhart, 2009), distance-to-default, VIX, and the yield curve.

particular sector, or specific financial distortion affecting multiple sectors. And, as discussed in IMF 2013e and Blanchard, Dell'Ariccia, and Mauro, 2010, the policy burden should fall primarily on these measures, should they prove both well targeted and effective. However, empirical evidence as to their effectiveness remains slim and scattered though is growing quickly.[16] Other policies should also be considered for their effect on financial stability and their interaction with monetary policy. More expansionary fiscal policy, for instance, can lead to the buildup of sovereign risk and counter the impact of higher interest rates targeted at reducing financial stability risks.

18.   **The third question, to be answered in parallel with the second, is whether tighter monetary policy warranted by price stability is also sufficient for financial stability.** Financial risks commonly grow in periods of economic expansion in which inflation pressures build up, and output growth is sustained. In these periods, interest rates should be tightened for price stability regardless of financial stability concerns. However, higher rates may well, as a byproduct, also stabilize the financial system. Cases in which financial stability risks are sufficiently contained as a result of higher rates are said to induce "no tradeoffs" between price and financial stability objectives.[17]

19.   **If there is a tradeoff, and if prudential policy is not sufficiently effective, a final question emerges: should monetary policy lean against the wind?** Tradeoffs can arise starkly when there is no economic expansion yet growing financial risks, but also more subtly when financial risks warrant a greater interest rate hike than necessary to tame prices. The question of leaning against the wind while there are tradeoffs is the main focus of the paper, as it provides a clear test of the issues involved than the (more typical) case where rising financial risks are accompanied by a strong economic expansion. The paper does not explore the tradeoffs and interactions between monetary and prudential policies in details. Instead, the paper assumes that prudential policy, including policy aimed at structural resilience, cannot stabilize the financial sector completely, so some financial risks remain. In principle, to the extent structural policies are able to sufficiently increase resilience of the financial system on their own, there could be less of a role for monetary policy as well as cyclical macroprudential policies. These interactions across different policies—and their welfare implications—are an important area for further study. The focus of this

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[16] See IMF (2014c) for guidance on the use of macroprudential policy; Cerutti, Claessens and Laeven (2015), Akinci and Olmstead-Rumsey (2015), McDonald (2015), Claessens and others (2013), Bakker and others (2012), and Lim and others (2011), for a cross-country study; Zhang and Zoli (2014), as well as Bruno and Shin (2014), for a review of macroprudential policies in Asia; Cerutti and others (2015), Kuttner and Shim (2013), Crowe and others (2011), for a focus on instruments geared towards the real estate market; He (2013) for an overview of Hong Kong's approach to financial stability; Tressel and Zhang (2015) for an assessment of prudential policies and their transmission channels in the euro area; Jacome and Mitra (2015) for a review of DTI and LTV limits; and Camors and Peydro (2014), Aiyar, Calomiris and Wieladek (2013), Jimenez and others (2012), Igan and Kang (2011), Wong, Fong, Li and Choi (2011), and Saurina (2009) for studies based on sectoral or firm-level data. The IMF's Global Macroprudential Policy Index (GMPI) offers a database of macroprudential instruments for research purposes.

[17] The question of tradeoffs is at the heart of the assignment problem often discussed in policy circles: using as many instruments as there are targets is important to avoid costly tradeoffs, to the extent instruments do not have offsetting effects on targets other than their own.
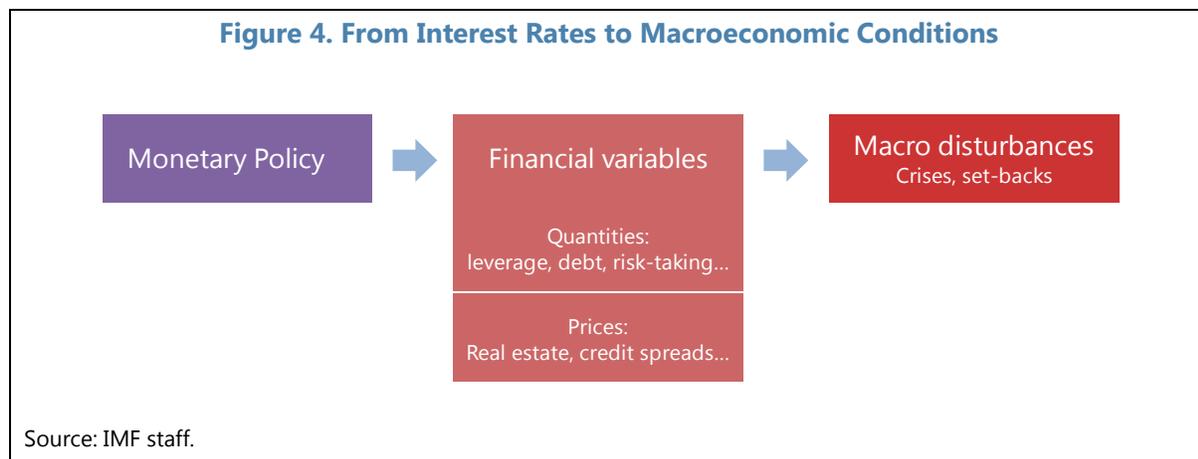
paper remains on documenting and quantifying the link between monetary policy and financial stability.

20.   Evaluating the policy of leaning against the wind requires three broad steps:

- First, the transmission channels need to be described. This involves estimating the links between policy interest rates and financial risks.

- Second, one needs to establish the nature and size of the tradeoff between stabilizing inflation and financial risks. As discussed above, if there is no tradeoff, the argument for leaning against the wind would become trivial, as pursuing price or financial stability would be one and the same.

- Third, the welfare implications of leaning against the wind need to be assessed in the context of a clear framework, allowing for a cost-benefit analysis.

STEP 1: TRANSMISSION

21.   The transmission between monetary policy and financial stability entails two links. The first is between interest rates and key financial variables. And the second is the relation between these financial variables and the probability of large disturbances to macroeconomic conditions. This is as illustrated in Figure 4.

Figure 4. From Interest Rates to Macroeconomic Conditions

Monetary Policy → Financial variables (Quantities: leverage, debt, risk-taking… / Prices: Real estate, credit spreads…) → Macro disturbances (Crises, set-backs)

Source: IMF staff.

A.   Interest Rates and Financial Variables

22.   This paper focuses on five financial variables. The first three measure quantities (leverage of financial firms, household debt, bank risk taking), and the last two prices (of assets—especially real estate—and credit spreads). These variables have received attention in the literature on the relation between monetary policy and financial vulnerabilities, and on crisis prediction. Other variables may also be important, notably loss absorption capacity, liquidity, maturity, and FX balance sheet mismatches, but data are often weak, and the literature not as conclusive.

23.   Interest rates can affect each of these financial variables. Effects change—and can even reverse—depending on the time horizon of the analysis, as well as initial conditions.

- In the short term, before agents are able to adjust their balance sheets, theory suggests that higher interest rates are likely to weaken financial stability. First, by reducing aggregate demand, a monetary tightening reduces household earnings and firms' profitability. Second, it leads to an increase in the interest rate burden, especially if liabilities are at variable rates and have short maturities. Finally, it tends to reduce asset prices and the value of legacy assets held by financial institutions. These effects weaken the financial conditions of households and firms, possibly leading to a temporary increase in delinquencies and defaults especially if balance sheets are weak to begin with.

- In the medium term, however, these effects are likely to reverse as households, firms and financial institutions rebalance their balance sheets and adapt their behavior. In particular, higher borrowing costs should induce households and firms to gradually reduce *leverage* through the conventional intertemporal substitution effect. Tighter monetary conditions are likely to gradually reduce leverage also in the banking sector, as shown in Dell'Ariccia, Laeven and Marquez (2014). The effects on *risk taking* are instead less clear-cut. By reducing search-for-yield motives, higher rates should reduce risk taking by financial intermediaries with fixed long-term liabilities, such as insurers and pension funds. The response of banks is instead ambiguous: higher funding costs that compress intermediation margins should lower the incentive for monitoring, but lower leverage should induce banks to behave more prudently.

24.   Empirical results broadly support these theoretical predictions. The papers discussed below investigate the effects of monetary policy on financial variables. Findings are new and separate from a slightly older literature that investigates the effects of financial variables on the transmission of monetary policy.[18]

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[18] This older literature generally concludes that monetary policy shocks have larger effects on output and inflation in times of financial stress. This probably comes from monetary policy relaxing or tightening financial constraints that are more likely to bind in times of stress.Three approaches have been used to tackle this question. The first is constant parameter VAR models augmented to capture asset prices and credit. The second are Markov-switching VAR models (such as Hubrich and Tetlow, 2015, Hartmann and others, 2015, Kaufmann and Valderrama, 2010, and Eickmeier and others, 2013). The third are Threshold-VAR models that allow for the endogenous determination of high or low financial stress regimes based on the level of specific financial variables, such as credit growth (Balke, 2000, for the U.S., Calza and Sousa, 2006, for the euro area, Li and St-Amant, 2003, for Canada, and Atanasova, 2003, for the U.K.), financial stress indices such as the Chicago Fed's ANFCI index (Zheng, 2013), as well as output growth (Avdjiev and Zeng, 2014). All papers find a significant difference in the impulse response functions of monetary policy shocks between regimes of high and low financial stress. Somewhat different results are discussed in Box 5, in which impulse response functions for some countries cannot be statistically differentiated.

- Real debt levels generally decrease following a temporary monetary policy tightening of 100 basis points, by up to 0.3 percent and 2 percent, after 4 to 16 quarters, depending on the model.[19]

- However, in the short term, real debt to GDP seems to rise.[20] The intuition is that nominal GDP responds faster than nominal debt to an interest rate hike, especially with lengthy loan amortization periods.

- Because real debt and debt servicing costs increase with higher interest rates, default rates rise in the quarters following an interest rate shock (Box 3).[21]

- Banks and nonbanks generally respond to higher interest rates by reducing their leverage, though after 1–2 quarters (Box 4).[22] In the initial quarters, leverage tends to rise across financial firms.

- Higher interest rates seem to induce banks to tighten their lending standards, grant fewer loans to risky firms, and extend less risky new loans.[23] The economic significance of these effects is

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[19] The largest body of literature focuses on the effects on real household debt. Papers usually consider a 100 bps hike, lasting one year or returning to steady state with some persistence. Angeloni and others (2015) is at the bottom of the range, suggesting that debt decreases by 0.7 percent at the peak, after 16 quarters. Robstad (2014) finds effects of similar magnitude, though after 4 quarters. Diaz Kalan, Laseen, Vestin, and Zdzienicka (2015) find that debt decreases by 2 percent, after 10 quarters. Chen and Columba (2015) find similar effects, though reached after 4 quarters already, perhaps a result of relying on a DSGE model estimated on Swedish data, as opposed to the VAR models used in other papers. Riksbank (2014) comes to middle-of-the-road results, showing that debt contracts by 1 percent at the peak, after 8 quarters. Other studies, such as Goodhart and Hofmann (2008), as well as Musso, Neri and Stracca (2011) find similar peak effects, though reached after 10 to 40 quarters. Ananchotikul and Seneviratne (2015) generally corroborate these findings, while exploring further dimensions. Evidence from Asia suggests that higher rates will induce banks to contract their loan portfolio, especially in more financially constrained banks (with higher loan-to-deposit ratios, or lower liquidity ratio). The paper also finds that the presence of foreign banks dampens the effect of monetary policy. In general, focusing on peak effects may overplay the possible effect of monetary policy on credits. As discussed in the paper, credits may or may not return to their steady state following the monetary policy shock; the empirical literature is split on this question, and results regarding longer-term effects on credits are sensitive to specification assumptions.

[20] This is as in Alpandra and Zubairy (2014) and Gelain, Lansing and Natvik (2015).

[21] Effects can be substantial. Box 3 shows that household loan delinquency rates increase by 126 bps for the U.S. and 25 bps for Spain in the first 15 and 7 quarters, respectively, following a 100 bps unexpected hike to interest rates. Effects for the U.S. are estimated on a sample from 1987 to 2014; using the pre-global financial crisis sample delivers smaller—though still significant—effects of monetary policy on default rates.

[22] Cecchetti, Mancini-Griffoli and Narita (2015), for instance, finds that repeated interest rate cuts amounting to 100 bps increase leverage across both banks and nonbanks. Estimated changes in leverage are (full sample medians between 1998 and 2014): 10.7 to 11.2 for banks, 7.0 to 7.3 for insurance companies, and 4.7 to 5.0 for investment banks. Effects are notable, though leverage remains low if it starts from its sample median. Further details are provided in Box 4. Bruno and Shin (2015) find that a 90 bps hike in rates decreases leverage of U.S. broker dealers from 22 to 21.5 (after increasing leverage initially). Agrippino and Rey (2014) find a significant relationship between monetary policy expansions in the U.S. and bank leverage abroad.

[23] Papers include Maddaloni and Peydro (2011), Jimenez and others (2014), Dell'Ariccia and others (2013), De Nicolo and others (2010), Adrian and Shin (2009), Freixas, Martin, and Skeie (2011), Diamond and Rajan (2012), Borio and Zhu (2012), and Acharya and Naqvi (2012).

difficult to quantify as results are based on survey data. One measure is that Sharpe ratios (a measure of riskiness of assets) of financial firms—both banks and nonbanks—decrease somewhat following protracted rate cuts.[24] The implication is that Sharpe ratios would increase (lower financial risks) following interest rate hikes.

- A very different approach confirms that banks (primarily, but also nonbanks to some extent) are perceived to hold a less risky portfolio after an interest rate hike. However, once again, these are medium-term effects. In the short term, banks become riskier. These results follow from tracking banks' distance to default, a market-based measure of expected default based on balance sheet data and equity prices. Some papers find that distance to default eventually rises (lower riskiness), as interest rates are increased. However, in the short term, distance to default decreases (higher riskiness) and can reach levels commensurate with past crises. This is especially true when the rate hike occurs in periods of financial stress, underscoring that effects of monetary policy on risk taking behavior are state-contingent. More details are offered in Box 5.[25]

- Real estate prices decrease on average following a hike in interest rates. The effect is of the order of 2 percent, following a 100 bps interest rate shock, though after a significant lag, of between 10 to 16 quarters.[26]

- Credit spreads tend to increase following an interest rate hike.[27] As discussed in detail later, higher spreads are symptomatic of lower risk-taking behavior and correlated to higher future output growth.

25.   An important caveat emerges: estimates of the effect of interest rates on financial variables may be biased downwards. Relationships among variables are mostly estimated over periods of relative stability. In those years, higher rates were associated with good times, and thus

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[24] In Cecchetti, Mancini-Griffoli and Narita (2015), Sharpe ratios decrease (implying greater volatility or risk of assets) from (full sample medians between 1998 and 2014): 6.1 to 5.4 for banks, 4.0 to 3.5 for insurance companies, and 2.6 to 2.1 for investment banks.

[25] Distance to default is based on Merton (1974); it increases with asset growth, and decreases with leverage and equity price volatility. Altunbas, Gambacorta and Marques-Ibanez (2010), as well as Gambacorta (2009) show that distance to default increases in a sample of 600 U.S. and euro area banks as interest rates are raised above those indicated by a Taylor rule. Estimates in Box 5 instead investigates the short-term impact of higher rates using a threshold-VAR (TVAR) method that splits the sample into periods of high and low financial stress (corresponding to periods of low and high distance to default). After a positive interest rate shock (taken to be a flattening of the yield curve), distance to default decreases on impact, especially in periods of high financial stress. It then rises again, though only back to levels existing before the interest rate shock. More details are provided in Box 5.

[26] See Box 3, Walentin (2014), Diaz Kalan and others (2015). Results are generally supported by Jorda, Schularick and Taylor (2015), as well as Iacoviello and Minetti (2007).

[27] This is established in Gertler and Karadi (2013), in which a surprise decrease in one-year bond yields by 20 bps reduces the non-default component of corporate bond credit spreads by about 8 bps for eight months, a move they describe as relatively large. Gilchrist and others (2014), echoed in Lopez-Salido, Stein and Zakrajsek (2015), find similar results. Rey (2015) finds a significant relationship between U.S. monetary policy and international credit spreads.

mostly growing financial vulnerabilities. The relationship between the two variables, despite attempts to carefully isolate monetary policy shocks, will therefore appear weak. Moreover, the analysis to date emphasized costs to unemployment. But other costs also exist, to inflation, public finances, as well as social and political stability and cohesion.

B. Financial Variables and Macroeconomic Conditions

26.   **Estimating how changes in financial variables affect the risk of future macroeconomic disturbances is tricky.** First, two types of disturbances can be distinguished: crises and "setbacks." Crises imply infrequent, but very substantial drops in output and increases in unemployment. Setbacks affect the economy more frequently, but are smaller, akin to a mild recession with financial roots.[28] The emphasis in this paper will initially be on crises, taken to be the primary concern of financial stability policy, though setbacks will also be discussed.

27.   **The second complication stems from crises being rare events.** Taylor (2015) reports on crises in advanced and emerging market economies since 1800, finding that while crises have not occurred uniformly over time (the postwar years, for instance, saw a period of relative calm until the 1970s), they have on average struck every 15 to 20 years. And crises are difficult to predict, with little agreement on how to gauge potentially rising risks.

28.   **This paper initially focuses on the relationship between bank credit and crises.** This particular link seems to be the clearest among the variables discussed above. Using annual data from 1870 to 2008 for 14 advanced economies, Schularick and Taylor (2012) document that faster credit growth over the previous five years is associated with a higher probability of a financial crisis. Staff obtained similar results using a larger set of 35 advanced countries and quarterly data post 1960. While both the probability and severity of crises should be a concern to policy makers, analysis focuses on the first link which seems more robust.[29]

29.   **According to the evidence, higher interest rates reduce the probability of crises over the medium term.**[30] The above reduced form estimates, when taken together, suggest that the probability of crises first increases, then decreases to its trough after 3 to 5 years.[31] At that point, the

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[28] If a crisis might involve unemployment that is higher by 5 percentage points for 3–4 years, the corresponding numbers for a set-back might be 1–2 percentage points for 1–2 years.

[29] Flodén (2014) shows that a 1 percentage point lower DTI ratio might, all else equal, result in only a small gain in the rise in the unemployment rate associated with a crisis of 0.02 percentage points.

[30] Provided the borrowers are sufficiently robust, and the financial system sufficiently well capitalized and liquid, to withstand the initial interest rate shock.

[31] Interestingly, some papers have found apparently contradictory evidence of interest rates on the probability of crises. Melecky and Podpiera (2015) as well as Frankel and Saravelos (2012) associate higher interest rates with lower incidence of crises. In contrast, Demirgüç-Kunt and Detragiache (1998, 2005) find that exposure to high real interest rates, which intensifies credit risk and negatively affects bank profits, was a source of bank fragility during 1980–2002. The findings reported in this paper can help elucidate this apparent contradiction; papers focused on short-term responses will find that crisis probability tends to increase, while those focused on the long-term will uncover lower probabilities.

probability is reduced by 0.04 to 0.3 percentage points following a 100 basis point interest rate hike for a year, given the range of effects found in the literature. Panel 1 of Figure 5 illustrates this effect for a middle-of-the-road response, in which real credit growth decreases by one percentage point for one year, from its historical average of 5.4 percent.

30.   There are various caveats to these findings:

- The average reduction in probability of crisis is lower than the maximum effect (at the trough). This is because crisis risk initially spikes following an interest rate hike, due to the stock effects discussed earlier.[32]

- The path taken by the probability of crisis depends strongly on the behavior of credit. If the level of credit is assumed to return to steady state, after the temporary interest rate hike, credit growth has to increase substantially after reaching its trough to catch up for periods when credit was growing slowly. In this case, the probability of crisis can overshoot the initial point (Panel 1 of Figure 5 in red). However, if credit is assumed to stabilize at a lower steady state after the interest rate hike, credit growth does not need to overshoot its steady state. As a result, the probability of crisis returns to its initial level in a smoother fashion (Panel 1 of Figure 5 in blue).[33]

- An interest rate hike would reduce the probability of crisis more if it occurred during a credit boom. Indeed, Panel 2 of Figure 5 shows that the probability of a crisis increases non-linearly as credit growth reaches very high rates.[34]
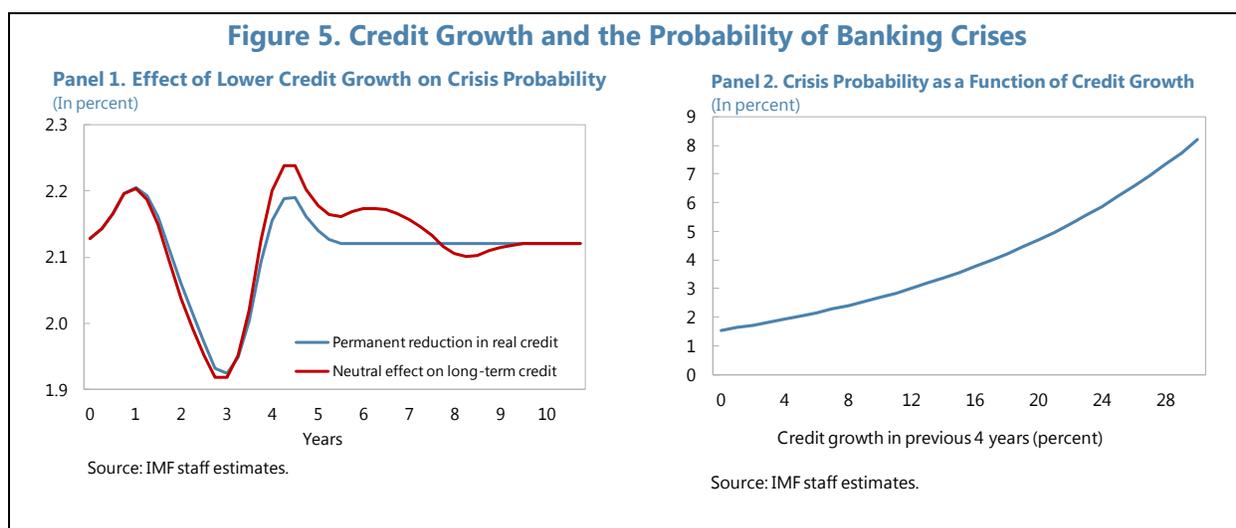
31.   Other approaches, including that underpinning vulnerability analysis at the Fund, indicates that other financial variables can also explain crisis risk. Two approaches are used (Box 6). The first is drawn from the literature on early warning indicators. It determines the signal to noise ratio of each variable by measuring its ability to accurately sort the sample into crisis and non-crisis periods minimizing both type I and II errors. The second is the more standard logit regression discussed in the paper. Crises are explained by the growth of financial variables as well as their deviation from trend. The results suggest that a range of indicators, including equity and house prices, credit growth, and even simply the output gap, may be worth monitoring when forming judgments about stability risks and the scope for monetary policy action.

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[32] The average probability reduction per year across the full set of models over the first four years ranges from 0 to 0.05 percentage points. Put differently, the reduction in the probability of crisis cumulates to 0 to 0.2 percentage points over the four years following the initial interest rate hike.

[33] These assumptions are not innocuous. The first follows from standard monetary neutrality. The second entails hysteresis (and thus may better capture the effects of substantial interest rate hikes or the effect of monetary policy on behavior, such as by putting an end to exuberant borrowing or lending behavior, or changing the structure of the banking industry—these effects would likely stem from large and persistent interest rate hikes).

[34] For example, if credit growth were to decline for one year from 20 to 19 percent, the probability of a crisis would decline by about 0.4 percent after three years, about twice as much as the effect shown in Panel 1 of Figure 4. Nevertheless, effects remain relatively small.
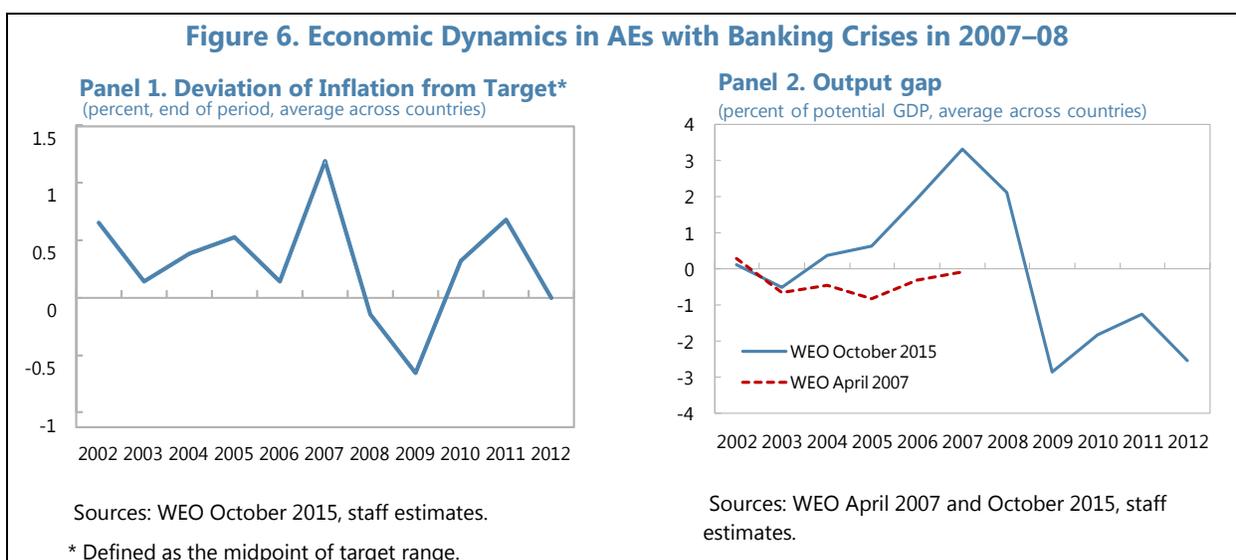
32.   Indeed, the effect of interest rates on the probability of crises may be stronger if links through other financial variables are also taken into account. The earlier analysis focused on the link between interest rates and crisis probability, as intermediated by real credit growth. The link through other financial variables, though developed at the IMF (see above), has not been quantified as precisely, nor have links through specific variables been sufficiently separated from one another. However, as discussed above, interest rates have significant effects on more than just real household credits: on leverage of financial firms, risk-taking behavior, asset prices, and credit spreads. Changes in these variables are likely to entail financial vulnerabilities through different and, at least partly, independent channels to those related to household credit. To the extent these are relevant, the effect of higher interest rates on lowering crisis probability should likely be revised up, at least somewhat.

Figure 5. Credit Growth and the Probability of Banking Crises

Panel 1. Effect of Lower Credit Growth on Crisis Probability
(In percent)

Panel 2. Crisis Probability as a Function of Credit Growth
(In percent)

Source: IMF staff estimates.

Source: IMF staff estimates.

STEP 2: TRADEOFFS

33.   Tradeoffs between stabilizing inflation (or output) and financial risks should be evaluated on the basis of magnitude and direction of effects. The first thing to establish is whether the periods when interest rates have to be tightened for price stability purposes often coincide with periods when financial stability concerns also call for higher rates such that rates would be raised for both reasons. The second question regards the size of interest rate changes; should interest rates be hiked by the same degree to ensure that both objectives are met? The earlier analysis suggests this will often not be the case. A 100 basis point rise in interest rates is large for price stability purposes (at least in AEs in tranquil times)—central banks rarely lift rates by more than 25 or 50 basis points at most on any given announcement date (though on a cumulative basis the U.S. Federal Reserve, for instance, raised rates by about 200 basis points per year in the 2004–06 tightening cycle). Meanwhile, the earlier analysis suggested that a 100 basis point increase in rates is associated with a small decrease in the probability of a crisis.

34. **However, tradeoffs may not always be severe, at least on the basis of the direction of effects, and with hindsight.** Often, financial risks develop in periods of economic expansion, which also warrant higher interest rates for the purpose of price stability. Figure 6 shows inflation and output gaps in the advanced economies that experienced systemic banking crises in 2007–08.[35] Panel 1 shows that inflation was running slightly above target prior to the crisis, thus calling for a somewhat tighter monetary stance from a pure inflation-targeting perspective. The deviation from target did remain moderate, but a possible lesson from the crisis is that, given the flattening of the Phillips curve, policy makers may need to react more promptly as inflation deviates from target. Panel 2 considers the evolution of output gaps. Real-time estimates from the April 2007 WEO show no sign of economic overheating in the run-up to the crisis. However, revised estimates from April 2015, based on revised data and the realization of the crisis, reveal large positive output gaps that would have warranted considerable monetary tightening. In these cases, tradeoffs may have been small on the basis of both sign and size of interest rate responses. The analysis underscores a well-known point: policy makers should seek to improve real-time estimates of potential output, possibly using financial variables, as well as external balances—this remains a key and difficult challenge.[36] Box 2 offers a similar analysis based on comparing output gaps with financial gaps—a measure of financial stability risks—and also suggests that tradeoffs between stabilizing inflation and financial risks may not always be severe.

Figure 6. Economic Dynamics in AEs with Banking Crises in 2007–08

Panel 1. Deviation of Inflation from Target*
(percent, end of period, average across countries)

Sources: WEO October 2015, staff estimates.

* Defined as the midpoint of target range.

Panel 2. Output gap
(percent of potential GDP, average across countries)

WEO October 2015
WEO April 2007

Sources: WEO April 2007 and October 2015, staff estimates.

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[35] Banking crises are from Leaven and Valencia (2012); 11 "systemic banking crisis" (Austria, Belgium, Denmark, Germany, Greece, Ireland, Luxembourg, Netherlands, Spain, United Kingdom, United States) and 5 "borderline systemic cases" (France, Italy, Portugal, Sweden, Switzerland).

[36] Measures of output gaps may be biased downwards, as the growth of credit may fuel consumption and non-productive investment beyond what is sustainable in the long-run. See, for instance, Berger and others (2015), Borio and others (2014), Rabanal and Taheri Sanjani (2015), and Furlanetto, Gelain and Taheri Sanjani (2015).

STEP 3: WELFARE IMPLICATIONS

35.   Ideally, implications of leaning against the wind should be taken in a fully specified model. Empirical relationships estimated on past data only go so far. Importantly, they are rooted in a period during which monetary policy did not lean against the wind. Had it done so, agents might have adapted their behavior by taking fewer risks in the first place, or by cutting back on risk more aggressively following interest rate hikes. Only models can account for the endogenous response of households and firms to a structural change in policy, such as the decision to lean against the wind. To do so, though, models need to fully take into account the structural relationships between agents' risk-taking behavior, and financial and macro variables (the so-called micro-foundations).

36.   Indeed, a new class of models suggests that leaning against the wind, absent other tools, can be welfare improving. These models take into account some financial distortions, as well as heterogeneous agents.[37] However, these models do not as yet generate crises of major proportions as considered in this paper. The buildup of financial imbalances and the subsequent crises are modeled as small fluctuations around the economy's steady state growth path. Hence, they exclude large nonlinearities—associated for example with default states—that could meaningfully impact the welfare considerations. It remains for now that reacting systematically to swings in financial variables (asset prices, leverage, and risk premia) reduces inefficient fluctuations in output.[38]
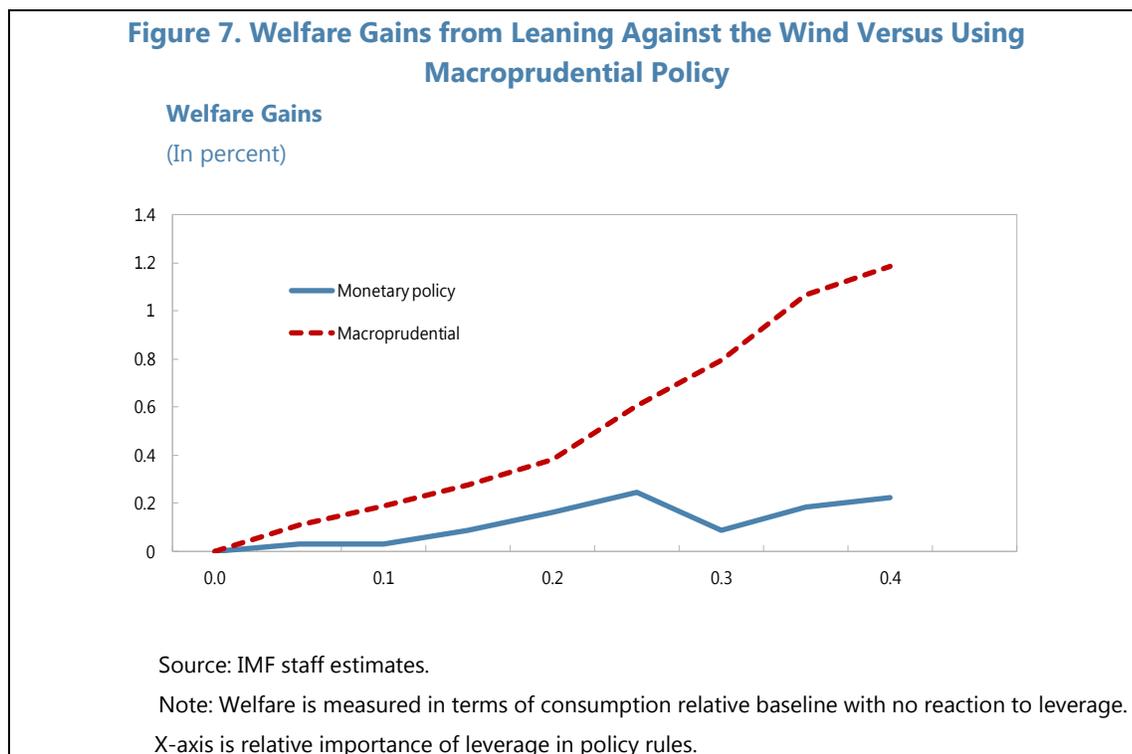
37.   The welfare improvements in many current models are generally fairly small and state (or shock) dependent. Hence, simple rules that react to observable variables may lead to policy mistakes—emphasizing the need for judgment in actual policy decisions.[39] Also, welfare gains of leaning against the wind in these models are small relative to complete macroprudential policies that are able to more directly target financial frictions (Figure 7). In these models, though, macroprudential policy remains highly stylized (a reduced form means of affecting lending rates that is completely effective) and cannot be attributed to a specific real-world instrument.

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[37] See Carlstrom and others (2010), Curdia and Woodford (2009, 2010), Quint and Rabanal (2014), Leduc and Natal (2015) which tackles the issue of optimal monetary policy, Laseen, Pescatori and Turunen (2015), Unsal (2015), Lambertini, Mendicino and Punzi (2013), Gambacorta and Signoretti (2013) and Woodford, (2012).

[38] A systematic response, nonetheless, does not mean that leaning against the wind is done in a mechanistic fashion, by keeping interest rates always higher than they would otherwise have been. A systematic response merely implies reacting to the dynamics of financial variables in an expected fashion, and may well imply only temporary deviations from the interest rate path consistent with price stability (a policy rule could call for the central bank to respond only to excessive levels of financial variables). The concept of leaning against the wind therefore remains unchanged relative to earlier sections of the paper. The main difference is that in a model setting, markets expect the central bank to lean against the wind, and adjust their behavior correspondingly.

[39] For instance, if the source of a credit boom is a productivity shock, and the monetary authority reacts mechanically to a credit variable (rather than to the effects of the shock) by tightening policy, welfare would decrease, in part due to a strong undershooting of inflation driven by higher productivity and tighter policy. See Christiano, Ilut, Motto and Rostagno (2010), Quint and Rabanal (2014), or Unsal (2015).

38.   While useful for informing policy intuition, the new models remain very stylized and more work is needed. They have not yet fully captured the foundations of financial distortions and the specific dynamics of risk-taking behavior. It is not clear how much monetary policy can affect the root cause of these distortions, such as incentive structures, or funding liquidity constraints due to asymmetric information or balance sheet mismatches. Also, in the real world, distortions are multiple, interrelated, and time varying. They may include a mix of frictions, each with a different effect on the risk-taking behavior of different actors. Models, for instance, might consider effects of higher rates on the leverage of financial intermediaries, but not on household loan delinquencies. Moreover, crises are mostly modeled as small fluctuations around the economy's steady state growth path. Multiple equilibria where one pole captures a state of massive defaults, debt overhang and asset price spirals, are mostly excluded. This seems at odds with the observation that crises follow extended departures from steady state followed by sharp deviations. This indicates the need for a richer analysis of non-linearities that could have sizable implications for the role of monetary policy.

Figure 7. Welfare Gains from Leaning Against the Wind Versus Using Macroprudential Policy

Welfare Gains
(In percent)

Source: IMF staff estimates.
Note: Welfare is measured in terms of consumption relative baseline with no reaction to leverage.
X-axis is relative importance of leverage in policy rules.

39.   In the meantime, a simpler framework for cost-benefit analysis can be used as a rough guide for policy deliberations. The framework, inspired by Svensson (2014), is useful to build intuition, highlight interactions among variables, and explore rough magnitudes. Leaning against the wind involves paying a short-term cost—lower output or higher unemployment—in exchange for a

medium-term benefit in the form of lower expected costs from a financial crisis.[40] There is less of an inter-temporal tradeoff (illustrated in Figure 8) with respect to the role of monetary policy in stabilizing inflation, because of the strong correlation between inflation and output over shorter horizons, where bringing inflation to target typically also implies bringing output towards its target.[41]

Figure 8. To Lean or not to Lean, Such are the Tradeoffs

Source: IMF staff.
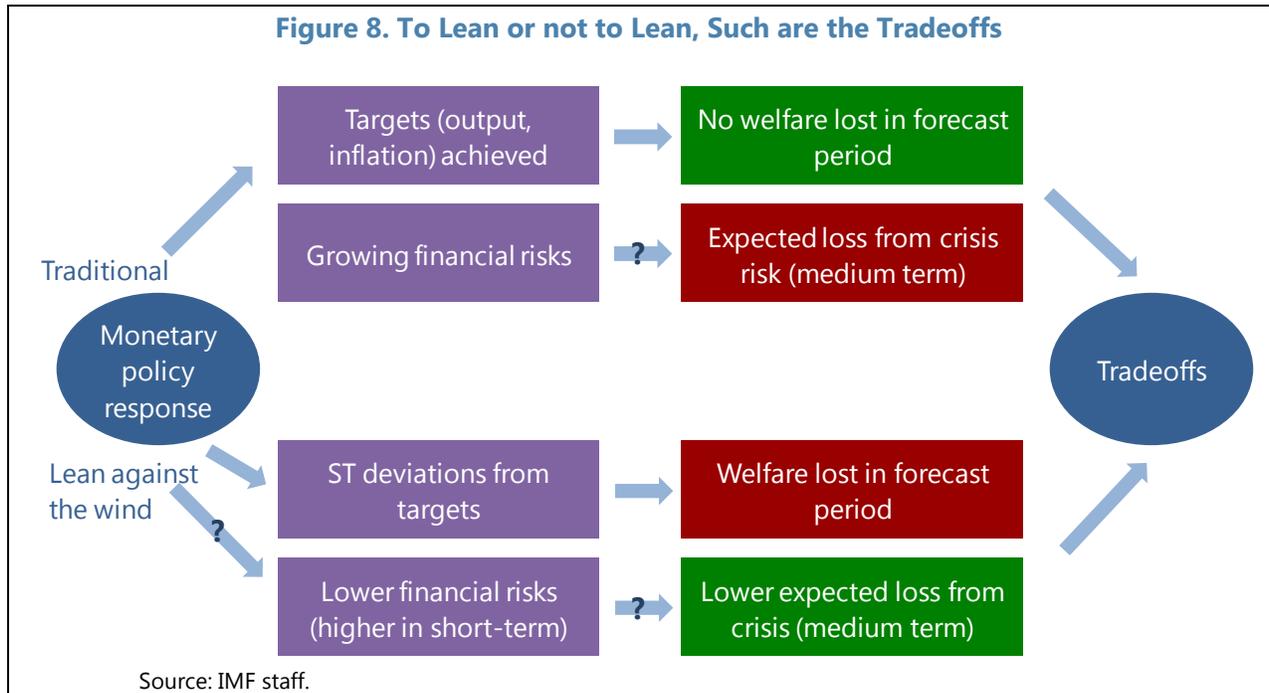
40.   One important parameter in the illustrative cost-benefit analysis is the unemployment loss from higher interest rates in the short run. This loss can be approximated by using any standard DSGE model used for policy analysis. The IMF's GIMF model, which is also used by many central banks, implies that unemployment would rise by somewhat less than ½ percentage point as a result of a 100 basis point increase in short-term interest rates for a year.[42] This estimate is broadly

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[40] The calculation is similar to that considered in Svensson (2015). In the first period, the central bank raises interest rates and incurs higher unemployment for 3–4 years, while reducing financial vulnerabilities. Once unemployment is back to steady state, the second period begins with a roll of the dice, determining whether the economy is hit by a crisis. That probability is lower if rates were raised in the first period. In the case of a crisis, unemployment increases by a significant amount, for a period equal to, or longer than, the first period. In the end, welfare is approximated by squaring unemployment over both periods (technically, squaring the deviations of unemployment from the natural rate, which can be assumed to be zero to simply computations).

[41] Blanchard and Gali (2007) referred to the fact that in many models bringing inflation to target meant also bringing output to target as "the divine coincidence." Since, most models have exhibited some—though not very substantial—tradeoffs, by introducing wage rigidities or cost-push shocks (see Blanchard, 2006 for a discussion, or Goodfriend, 2004). Signs that the tradeoff may be weakening are discussed in Bayoumi and others (2014).

[42] Effects peak after 1 to 2 years, and unemployment returns to steady state after 3 to 4 years. This result is based on averaging two model variants, one capturing a large, mostly closed economy, and the other a small open economy.

consistent with those obtained using vector auto-regression (VAR) models to estimate the transmission of monetary policy.[43]

41.   The costs of leaning against the wind appear greater than benefits, unless a severe crisis is foreseen. The cost-benefit analysis is highly sensitive to the strength of the linkages between the policy rate and crisis risk, and the assumed severity of the crisis. In order to justify leaning against the wind these parameters need to be close to the upper range of existing empirical estimates. Note, however, that such calculations focus on the benefits of avoiding major crises, but do not consider additional benefits of reducing smaller economic setbacks (a topic discussed further below).Three scenarios among many are illustrated in Table 1.[44]

- The first is based on the average decrease in crisis probability computed earlier, as a result of a 100 basis point increase in short-term interest rates. In this scenario, the crisis is assumed to increase unemployment by 5 percentage points and last 4 ½ to 6 years.

- The second scenario assumes the crisis probability can be reduced by 0.3 percentage points— the maximum effect found in the literature surveyed earlier.

- In the third scenario, the crisis is assumed to be acute (an event further in the tail), with unemployment increasing by 7 percentage points for 6 to 8 years.

- In the first two scenarios, the costs of leaning against the wind are notably higher than benefits. Only in the third scenario does leaning against the wind seem to pay off.

42.   A more detailed alternative approach comes to similar conclusions and provides various refinements.[45] The first is that the above illustration draws on earlier results that represent broad averages; tradeoffs will be different depending on specific country circumstances. In some cases, benefits can rise above costs, but only somewhat and in the medium to long term. Costs of leaning against the wind are apparent in the short run, whereas benefits materialize more slowly and with uncertainty. In addition, benefits are sensitive to various assumptions, one of which is the return

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[43] See Altavilla and Ciccarelli (2009) for a survey. Other models, more tailored to small open economies, also exist and are used widely by central banks; each has its own particular features. In the "Ramses" model used by the Swedish Riksbank, for instance, unemployment reacts more sluggishly to monetary policy shocks.

[44] The first line of the table captures the decrease of the probability of crisis. The second and third lines represent the severity of the crisis, if it occurs: its duration in years, and the unemployment rate (in deviations from the natural rate that is assumed to be zero to simplify computations). Benefits of leaning against the wind are therefore composed of the first three lines: a lower probability of a bad outcome. A numerical estimate of benefits is reported in line five, as the product of the lower probability, the crisis duration ratio, and the unemployment rate squared (assuming squared utility). The crisis duration ratio expresses the duration of the crisis in years (line 2) in relation to the duration of the initial period with higher unemployment resulting from the rate hike. The ratio is 1.5 for the first two scenarios, and 2 for the last scenario. Costs, reported in line six, are more straightforward; they are the square of the increase in unemployment following the interest rate hike (expressed in line four, as a rough average of the various models discussed above in the text).

[45] A Bayesian VAR analysis, based on data from six countries, takes into account the full evolution of the probability of crisis over time (Box 7).

of real credits to steady state, as discussed earlier. Initial conditions are also important, and the case for leaning against the wind improves as initial unemployment is close to target, and unemployment gets squared in the welfare calculations.[46] Any potential policy response must therefore be state contingent, and is thus more complicated than adding a variable with a fixed coefficient to a Taylor rule.

	Table 1. Illustrative Scenarios		
Building blocks	Average Probability	High (Peak) Probability	High (Peak) Probability, Severe Crisis
Lower crisis probability, pp	0.02	0.3	0.3
Duration of crisis, years	4.5-6	4.5-6	6-8
Unemployment gap in crisis, %	5	5	7
Higher unemployment, pp	0.5	0.5	0.5
Benefits	0.008	0.113	0.294
Costs	0.25	0.25	0.25
Ratio (B:C)	**0.03**	**0.45**	**1.18**

Source: IMF staff estimates.

FURTHER CONSIDERATIONS

43.   Three considerations are relevant: the impact of leaning against the wind on the probability of set-backs, in addition to crises, effects on central bank credibility, and open economy implications.

44.   A fruitful area for further research is the case for leaning against the wind in cases other than a full-fledged crisis. In the analysis above, we rely on a "zero-one" definition of crisis. The methodology implicitly assumes that the only positive impact of leaning against the wind is reducing the probability of a full-fledged crisis. However, it is possible that higher interest rates may also reduce the severity and incidence of "non-crisis" recessions stemming from financial imbalances. Then, if one used a more continuous definition of financial instability and, hence, included less severe economic set-backs with financial roots, the expected benefits from leaning against the wind might increase. This is tantamount to considering the effect of leaning against the wind on the entire distribution of future unemployment, not just its (crisis) tail. The same cost-benefit framework sketched out earlier would apply equally well to this setting.

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[46] This is as in the simple exercise above in which unemployment is taken to start at its steady state value. Benefits would be lower under different assumptions; in particular, if the crisis occurred while unemployment was still recovering from the initial interest rate hike. Thus, in countries in which unemployment responds sluggishly to interest rates, the case for leaning against the wind will be harder to make.

45.   But empirical results capturing this additional benefit are still scarce and inconclusive.
Some work shows that credit spreads are mean reverting and correlated to economic activity.
Spreads that are compressed by buoyant sentiment today often forecast a widening of spreads in
the future, lower credit supply especially to lower credit-quality firms, and an economic contraction.
To the extent that expansionary monetary policy contributes to tighter spreads, it may also increase
the risk of a reversal in credit markets and corresponding drag on output.[47] As discussed earlier, the
link from monetary policy to setbacks could also occur through other variables. Credit growth, for
instance, leads to a future expansion and then contraction of GDP, according to staff estimates.
However, GDP never substantially falls back below its initial level. There is therefore no clear case to
lean against credit growth from the stand-point of containing risks of setback. More work in this
area is clearly warranted, as also argued by the authors active in this nascent field.

**46.   Leaning against the wind might undermine the credibility of the central bank, and the
effectiveness of monetary policy, including a de-anchoring of inflation expectations.**
Credibility and policy effectiveness largely stem from transparency, predictability, and observable
success, which are key underpinnings of the standard inflation-targeting framework. Leaning against
the wind, by contrast, requires policy action to be justified on the basis of distant events that are
difficult to forecast, or even to define precisely. It also involves using one instrument for two targets.
Transparency and predictability could suffer, making communication more complicated.[48] Credibility
may also suffer because crises will most likely occur despite leaning against the wind, and because
the central bank will under deliver on inflation, at least at times, which could destabilize inflation
expectations.[49] Moreover if central banks under-delivered on their inflation mandates, real debt and

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[47] Gilchrist and Zakrajsek (2012) show that the non-default component of corporate credit spreads has substantial
predictive power for economic activity. An increase of 100 basis points in spreads predicts a drop in real GDP growth
of more than 1.5 percentage points over the subsequent 4 quarters. Other papers documenting the link between
credit spreads and economic activity are Gilchrist and others (2009), and Faust and others (2013). Lopez-Salido, Stein,
and Zakrajsek (2015) suggest that lower spreads seem to be mean reverting and predict a surprisingly strong
economic contraction. A 30-basis point increase in the sentiment-driven component of credit spreads, corresponding
to a jump from the 25th to the 75th percentile of its historical distribution, tends to decrease real GDP per capita by
4.2 percentage points over the subsequent two years. Other papers have also documented a correlation between
shocks to financial stress indices and output, both domestic and foreign; see, for instance, Metiu and others (2014),
and Alessandri and Mumtaz (2014). The link between monetary policy and credit spreads is mixed. While various
papers discussed earlier find that lower interest rates increases banks' willingness to take credit risk, and Gertler and
Karadi (2013) find the easier monetary policy reduces spreads, Gilchrist and others (2015) do not find any impact of
monetary policy on credit spreads.

[48] That being said, communication would become easier as the central bank learns more about the transmission
mechanism to financial stability, and refines its models to forecast crisis probability. The fact that communication is
currently difficult also applies to setting prudential policy. For now, this points to the value of separating the
monetary policy and prudential policy-setting functions of central banks (to the extent both are housed under the
same roof), so that as the second improves through trial and error, the credibility of the first is not damaged.

[49] Central banks that are responsible for financial stability, though also have control of macroprudential policy, shield
the independence and credibility of monetary policy by separating the decision-making bodies responsible for
financial stability and price stability within the central bank. Central banks benefitting from strong credibility might be
able to under-shoot their inflation target without unsettling inflation expectations, but only for some time. Credibility
is not exogenous, and depends on consistently satisfying one's target. If this is not the case, credibility can quickly be
lost. Williams (2015) points to evidence in this respect from Norway and Sweden, where inflation expectations

(continued)

real interest payments on debt would increase, thereby undermining financial stability. Nonetheless, it is also the case that not responding to risks and so allowing crises to emerge could undermine the credibility of the policy framework.

47.   For large economies with strong cross-border financial links, both benefits and costs of leaning against the wind may be larger, once spillovers are taken into account. The analysis in this paper measured the costs of crises in terms of domestic effects. However, financial crises in large countries can have strong spillover effects across borders due to financial linkages, as discussed in past editions of the IMF Spillover Report (IMF 2013d, 2014a and 2015, for instance). Thus, if monetary policy in a large country were to decrease the probability of crisis, it would avoid higher domestic, but also international costs. From a global welfare perspective, this would tip the cost-benefit analysis of the earlier simple framework towards leaning against the wind, everything else equal. However, higher interest rates in the large country could also have negative effects on smaller countries through trade linkages (more sluggish demand from the large country, compensated in part by a stronger currency). In addition, in practice, central banks will first and foremost take policy decisions to satisfy their domestic mandates, unless spillover effects on foreign countries could spillback to the domestic economy or if mitigating cross-border spillovers would not affect achieving the domestic objectives.[50]

48.   However, for small open economies, the case for leaning against the wind may be weaker. First, in such economies, financial stability concerns often stem from strong capital inflows that drive up asset prices and compress credit spreads (see Sahay and others, 2014). In this case, increasing domestic interest rates (or cutting rates by less than warranted to stabilize prices) may be counterproductive, and exacerbate instability by attracting further capital inflows.[51] Second, whatever the source of financial vulnerability, higher rates would tend to appreciate the domestic currency, and thus strengthen balance sheets for those with debts in foreign currency (the IMF's October 2015 Global Financial Stability Report (GFSR) highlights the extent to which firms in emerging markets are exposed to foreign currency debt; IMF 2015). In fact, higher rates could even increase the share of foreign currency debt, a common problem in highly dollarized economies. As a result, debt levels may actually increase, instead of decrease.[52] Other policies may be more appropriate to manage financial stability risks stemming from capital inflows.[53]

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dropped below target when their central banks were highlighting financial stability worries, though other factors may have contributed to a decline in both headline and expected inflation in this period.

[50] Despite underscoring the existence and importance of spillover effects, the U.S. Federal Reserve's Vice-Chairman, Stanley Fischer, recently emphasized that "our mandate, like that of virtually all central banks, focuses on domestic objectives." (Fischer, 2015)

[51] See Ahmed and Zlate (2013), Forbes and Warnock (2011), Fratzscher (2011), and Ghosh and others (2012) for a discussion of how interest rate differentials drive capital flows.

[52] This dynamic is pointed out in Unsal and Ozkan (2015), who examine the costs and benefits of leaning against the wind in a DSGE model of a small open economy.

[53] Countries should consider the complete policy mix (monetary, fiscal, and exchange rate policies) taking into account the country's economic cycle, reserve adequacy, and exchange rate valuation. According to IMF (2012), there

IMPLEMENTATION ISSUES

49.   Whatever guidance the cost-benefit analysis may provide, implementation is also crucial; three issues arise:

- *First, when to act.* If action comes when financial vulnerabilities are already very large, leaning against the wind could bring about a crisis: the immediate effect of higher interest rates is to worsen, not improve, vulnerabilities. Decisions on leaning against the wind must thus take account of the resilience of the financial system. Similarly, as was pointed out earlier, leaning against the wind should not be done after a crisis, when unemployment is already very high. Leaning against the wind should thus be done early in the development of financial vulnerabilities; but this raises new questions as discussed below.

- *Second, how to detect vulnerabilities and predict crises in real time.* It is precisely in the initial phases of economic expansion and recovery that central banks would find it most difficult to justify leaning against the wind. In this phase, it is difficult to distinguish between credit expansions that are good (driven by productivity) and bad (driven by consumption and expectations of capital gains), and crises appear distant and unlikely events. The difficulty of policy making under uncertainty is augmented relative to price stability, given the longer horizons over which crises must be forecasted. It is instructive, for instance, to go back to the U.S. experience in 2002, when house prices and household debt were beginning to grow especially rapidly (see, for instance, Jorda, Schularick, and Taylor, 2015). Had policy-makers expected a large increase in crisis probability and severity (a rise in the unemployment rate of 4 percent on average for 6 years, starting in 2007), they may well have decided to lean against the wind.[54] However, in 2002, even the most pessimistic forecasts of U.S. growth did not foresee such a dramatic surge in unemployment coming just five years later. The IMF's 2002 WEO, for instance, focused on immediate downside risks stemming from equity prices, investment spending and the exchange rate, but does not discuss risks further out on the horizon. The hope is that today policy makers can benefit from better frameworks to judge the impact of interest rates on financial stability, and better estimates to consider the link between the dynamics of financial variables and crisis probability. In the end, judgment will always need to be applied when indicators on balance suggest some gain from a monetary response.

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is scope to temporarily resort to capital flow management measures, as well as exchange rate interventions, to address systemic financial risks stemming from inflows, provided they accompany needed macroeconomic policy adjustment and financial sector regulations. Such measures can also be useful in managing large inflows in certain circumstances, such as when macroeconomic conditions are highly uncertain, the room for macroeconomic policy adjustment is limited, or appropriate policies require time to take effect. More work is needed to better understand the interplay between all policies available in how they affect financial stability.

[54] The rise in unemployment was about half as large as the third stylized scenario presented earlier; however these scenarios remain a simple benchmark and judgment could have convinced policy makers to act nonetheless.

- *Third, combining monetary and prudential policies.* The analysis in this paper has focused on the role that monetary policy can play in supporting financial stability, everything else equal. But this is not sufficient to provide policy guidance: in the end, monetary and prudential policies must be considered together.[55] To begin with, well targeted macroprudential (and micro-) policies should shoulder most of the burden to contain financial instabilities. Further, macroprudential and monetary policy seem to be strongly complementary. For example, if an early interest rate hike could contain a possible spike in asset prices (due to non-linearities), it would facilitate the job of prudential policies down the road. Moreover, monetary and prudential policies must be systematically compared on three counts: their relative uncertainty (both policies could potentially have the same expected effects, but the effects of one could be more uncertain than those of the other), expected effects, and expected costs (prudential policies too give rise to distortions even as they correct others).[56] Ultimately, the mix of prudential and monetary policy to support financial stability would need to be determined by a joint maximization of social welfare. In doing so, the practical constraints on each policy should be compared, to see if one policy may or may not be able to overcome the hurdles facing the other. For instance, if political pressures are the main hurdle to prudential policy, they will also hinder a potential focus of monetary policy on financial stability.

CONCLUDING THOUGHTS

50.   On balance, based on current understanding and circumstances, the case for leaning against the wind is limited. With substantial slack in the macroeconomy, transmission from interest rates to financial risks seems weak, costs often appear greater than benefits, and implementation hurdles are substantial. Macroprudential policies, including both cyclical and structural measures, will remain a key element of the defense against financial instability. Indeed, these measures, when well targeted and effective, can target imbalances and market imperfections much closer to their source than monetary policy does. Also, they could allow monetary policy to focus on its price stability mandate, thereby simplifying communication and enhancing accountability.

51.   Further research is warranted. First, our understanding of the transmission mechanism from monetary policy to financial stability is limited. New evidence and analysis could identify new channels of transmission and strengthen the case for leaning against the wind. Second, even based on current knowledge (and the analysis in this paper), benefits can plausibly outweigh costs in particular, albeit relatively unlikely, circumstances. These circumstances can reflect a confluence of initial conditions pertinent to the conjunctural cycle and structural conditions characteristic of specific countries. For example:

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[55] For an initial discussion, see IMF (2013e).

[56] IMF (2014c) offers an overview of recent papers estimating the costs of macroprudential policies; in many cases, these are found to be relatively small.

- *Initial conditions. B*enefits relative to costs can be boosted by: low unemployment (when rate hikes could lead to smaller macroeconomic costs); rapid credit growth (when rate hikes could have a stronger effect on credit growth and crisis probability by discouraging exuberant, self-fulfilling behavior); and when borrower and bank balance sheets are strong (and hence can withstand the initial interest rate shock).

- *Structural conditions. B*enefits also rise relative to costs when: crises are likely to be particularly severe (due to a large and interconnected financial system and the absence of well-targeted macro-prudential measures); financial spillovers could be large (as for systemically important countries with open capital accounts); and if future financial risks can be reliably identified early (so that early increases in interest rates may be able to avoid a large buildup of risks).

Box 1. Cycles in Financial Variables: Concepts and Measurement[1]

The term "financial cycle" is widely used. It has regained particular prominence in recent BIS analysis where it is said to denote "self-reinforcing interactions between perceptions of value and risk, attitudes towards risk and financing constraints, which translate into booms followed by busts (Borio 2014)." The term loosely refers to booms and busts in financial markets, whose fluctuations can amplify swings in business cycles. Financial cycles are generally considered to include credit and property cycles, given the relatively high synchronization between the two and their more direct effect on the real economy through wealth effects (Schularick & Taylor, 2009). Recently, another strand of analysis has focused on the common factors that drive global financial cycles, spurred by large cross-border capital flows and financial integration (Adrian & Shin, 2012; Rey, 2015).

The interaction of financial and real shocks and their dynamic properties is being explored. A large literature focuses on the role of credit on growth, including the impact of "credit crunches" or "creditless recoveries" (Abiad, Dell'Ariccia, and Li, 2011). Others focus on the impact of shocks to balance sheets—changes in asset prices or economic prospects, amplified through "financial accelerators"—on macroeconomic fluctuations (Bernanke and Gertler, 1989; Bernanke et al. 1996; Kiyotaki and Moore 1997). Still others focus on endogenous leverage cycles—fluctuations in leverage driven by changes in assets prices, or uncertainly about their revenue distribution—that can produce large changes in collateral requirements and hence credit conditions (Geanakoplos 2010; Adrian and Shin 2012). Overall, there is a sense that shocks may propagate differently to financial indicators versus real variables, leading them to exhibit different cyclical properties. BIS staff in particular argue that peaks in financial cycles—filtered by them at very low frequencies—exhibit a close association with systemic banking crises; thus longer financial cycles offer greater insight into the interaction between financial and business cycles. In this vein, the deviations between financial and business cycles can be large and long-lasting (Borio, 2014). But this notion, much like the definition of "financial cycle" itself, has yet to find consensus.

Measurement. One typical approach to measure financial cycles is to rely on a commonly used algorithm for business cycle identification that locates peaks and troughs (Claessens et al. 2011; Drehmann et al., 2012; BIS, 2014; ECB, 2014), which is used also in this paper. Trends and gaps are then identified as in Borio and Drehmann (2009) and Cervantes and Krznar (2014).[2] Credit cycles tend to be highly correlated with GDP, with similar durations of about five years, while property cycles tend to be shorter.

Policy relevance. The key concern that underlies this research agenda is the impact of financial variables on the economy. There is a wide range of views on channels, impacts, and timing. But the definition of "financial cycle" must consider the policy objective and analytical focus—i.e., crisis prediction, propagation channels, or others. The exact empirical features and stability of financial cycles are not yet established. Against such uncertainty, a prudent approach is to consider a range of indicators and be alert to early signs of a pickup in trends of and widening gaps in financial variables.

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[1] The authors of this box are Sally Chen, Katsiaryna Svirydzenka, Edouard Vidon, and Aleksandra Zdzienicka.
[2] The turning point algorithm (Harding and Pagan, 2002) is first used to estimate the average length of cycles in financial variables across countries and a band-pass filter (Christiano and Fitzgerald, 1999) is then applied to estimate gaps (deviations from trend).

Box 2. How Severe are the Tradeoffs Between Economic and Financial Stabilization?[1]

This box considers the extent to which policy makers may confront tradeoffs between economic and financial stability. *Figure 2.1 shows the evolution of economic and financial variables in the advanced economies that, according to Leaven and Valencia (2012), experienced a systemic banking crisis in 2007 and 2008. Data are quarterly and each dot indicates the beginning of the crisis. The vertical axis shows a measure of economic gap, given by the simple average of the output gap and the inflation deviation from target. The horizontal axis shows a measure of financial gap obtained as the simple average of the deviations in credit-to-GDP and real house prices from their historical trends.*

Economic and financial gaps are estimated with the benefit of hindsight. In particular, potential output and the trends of financial variables are constructed with two-sided HP filters, respectively with smoothing parameter of 1.600 and 400.000 as used by the BIS. This perspective is helpful to analyze the true possible tradeoffs between economic and financial stability, even though real-time estimates may convey a different impression because of imprecise estimates of potential output, as for example illustrated in panel 2 of Figure 6.[2]

The tradeoffs between economic and financial stability may not be particularly strong. The figure shows that in the three years prior to a banking crisis, both economic and financial variables tend on average to grow above normal values. Monetary tightening would thus be warranted on the simple grounds of economic stabilization. Once a crisis begins, economic conditions tend to deteriorate quickly, while financial conditions adjust more gradually. This may lead to a period with negative economic gaps and positive financial gaps. However this constellation does not seem to justify monetary tightening since financial conditions tend to correct over time. The analysis calls for improving the quality of real-time estimates of potential output, possibly using financial variables, to better guide monetary policy.

Figure 2.1 Economic and Financial Gaps Around Banking Crisis

(AEs, global financial crisis, quarterly data)
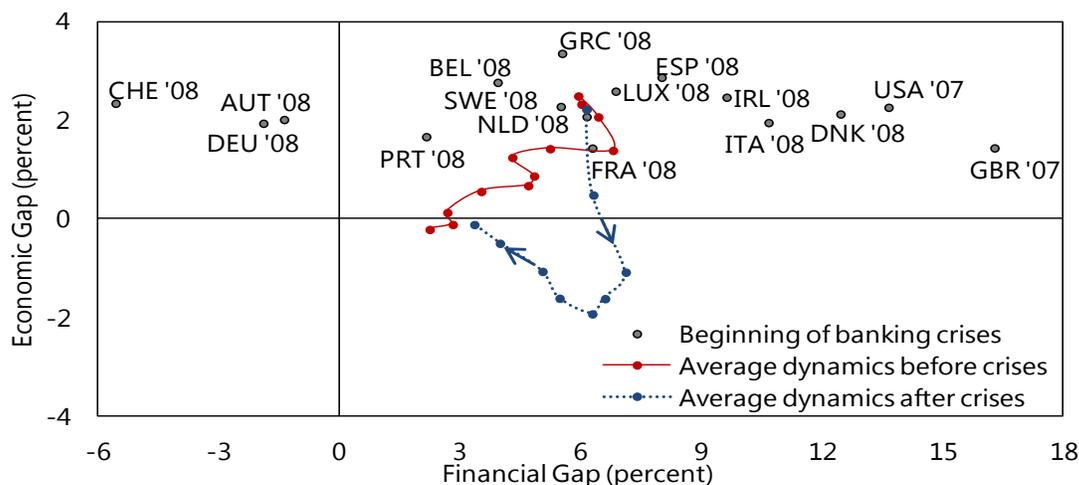
Sources: BIS, WEO, and IMF staff estimates.

[1] The author of this box is Damiano Sandri (RES) with assistance from Paola Ganum (RES).

[2] Country data points in Figure 2.1 do not provide an accurate basis for cross-country comparison of financial resilience because the HP filter does not account for country-specific features.

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Box 3. The Effect of Monetary Policy on Default Rates[1]

This box investigates the effects of monetary policy on loan delinquencies. There are two advantages to this approach. Delinquencies capture an alternative measure of households' debt servicing capacity, but also of the effects of leaning against the wind. Loan delinquencies may represent a direct cost of increasing rates in the short-term, but also longer-term benefits if households curtail their credit and leverage to the point where defaults are less likely in the future. This approach differs from that in the paper, in which the relevance of a change in a financial variable—such as real household credit—only matters indirectly to the extent it contributes to the probability of a crisis.

The main takeaway is that higher interest rates have a negative effect on financial stability in the short run, but may have positive effects in the long run. In the U.S. and Spain, loan delinquencies first increase; this is consistent with lower economic activity, lower house prices and higher interest payments after a monetary contraction. Household leverage ratios eventually improve after several quarters. This reduces default rates (only in the U.S. but not in Spain) and enhances financial stability in the long run.[2]

Short vs. long-term tradeoffs are evident in the U.S. A standard VAR model is estimated with real GDP, core PCE, the Federal Funds Rate, real house prices, household leverage and delinquency rates, including four lags, for the period 1988Q1 to 2015Q1. The monetary policy shock is identified with a standard Cholesky ordering. After a monetary policy shock, real GDP and real house prices decline and the response of core PCE is not significant. Initially, default rates on residential loans slowly increase, peaking at 0.37 percent after 14 quarters (Figure 3.1). However, they decline over the long-term to 0.31 percent after 36 quarters. The reaction of household leverage (measured from the Flow of Funds data) is not significantly different from zero for the first 25 quarters, and becomes negative afterwards.[3]

In Spain, an increase in the 12-month EURIBOR leads to an increase in residential loan default rates.[4] Household leverage first increase and then declines significantly. Residential nonperforming loans (NPLs) increase much faster but the response is smaller than in the U.S., peaking after 6 quarters at 0.08 percent (Figure 3.2). The differences between the two countries could be due to: (i) a larger share of variable-rate mortgages in Spain, such that the transmission of interest rate shocks is faster; and (ii) widespread use of non-recourse mortgages, reducing the incentive to default. A recent paper by González-Aguado and Suárez (2014) finds that the response to interest-rate changes is asymmetric and heterogeneously distributed across firms. Interest-rate rises tend to produce a temporary rise in default rates, while lower interest rates may also lead to higher leverage, making some firms riskier.

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[1]The author of this box is Pau Rabanal (RES).

[2] Loan delinquency rates for the U.S. are obtained from the Federal Financial Institutions Examination Council, FRB Call Report, Board of Governors of the Federal Reserve System. Delinquent loans include those past due 30 days or more and still accruing interest, as well as those on nonaccrual status. Spanish data are doubtful (nonperforming) loans over total loans for house purchase and renovation, from the Banco de España.

[3] Similar results are obtained when using commercial and industrial loans delinquency rates. These results are robust to different orderings of the variables in the VAR, especially for the response of default rates. The results are robust to estimating the VAR with Bayesian methods and a Minnesota prior. In order to address issues related to the effective lower bound of interest rates and the deployment of unconventional monetary policies, the two-year rate was used instead of the Federal Funds rate in the VAR. The results are robust as well.

A standard VAR model is estimated with real GDP, HICP, the 12-month EURIBOR rate, real house prices, household leverage and delinquency rates, including one lag, for the period 1999Q1 to 2014Q4.
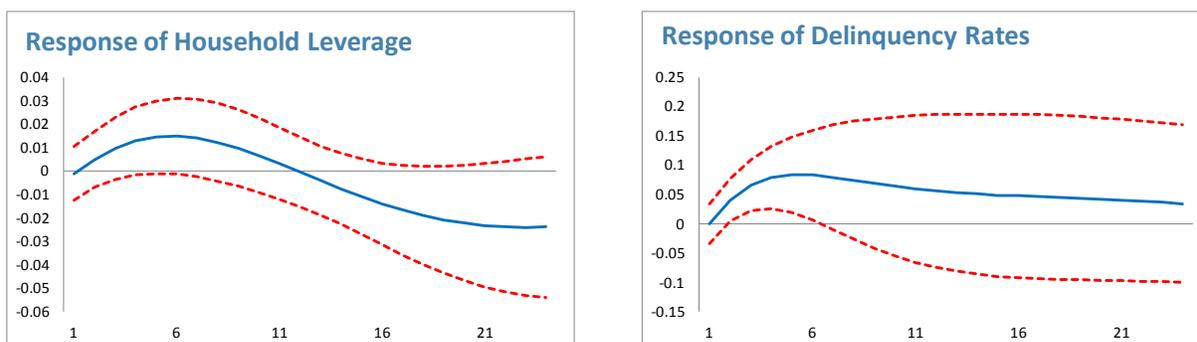
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Box 3. The Effect of Monetary Policy on Default Rates (concluded)

Figure 3.1. Effects of a Monetary Policy Shock, U.S.

Response of Household Leverage

Response of Delinquency Rates
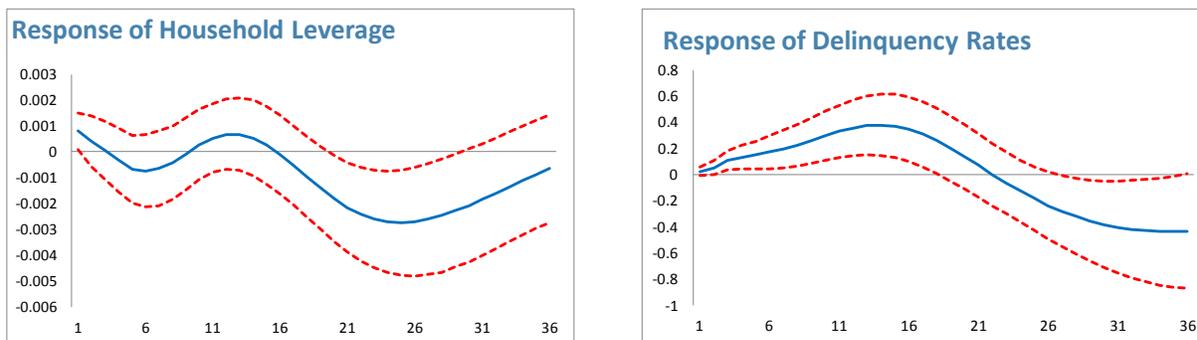
Sources: BEA, Federal Reserve, OECD, and IMF staff estimates.

Figure 3.2 Effect of an Interest Rate Shock, Spain

Response of Household Leverage

Response of Delinquency Rates

Sources: EROSTAT, Banco de España, and IMF staff estimates.

Box 4. Effects of Prolonged Monetary Policy Accommodation on Financial Stability[1]

This box investigates whether prolonged periods of monetary policy accommodation undermine financial stability. Two measures of financial vulnerability are considered: the leverage (assets to equity; higher leverage implies higher vulnerability) and the Sharpe ratio (returns on equity divided by its volatility; a lower ratio implies higher vulnerability). Data are from 22 countries from 1998 Q1 to 2014 Q2.

This study extends the traditional focus in the literature in two ways. First, it covers nonbanks (insurance companies, investment banks, asset managers, real estates, and others) in addition to banks. Second, it considers multiple measures of prolonged monetary policy accommodation: consecutive quarters of cuts (in the overnight, 2-year and 10-year rates, as well as term spread), and of policy rates below a benchmark rate (the neutral rate, and rates implied by different Taylor rule specifications).

Unconditional correlations suggest a possible link between policy accommodation and financial stability risks. Leverage increased, and the Sharpe ratio decreased, during periods of accommodative monetary policy (Figure 4.1).[2]

Figure 4.1. Leverage Ratio in Periods of Monetary Policy Accommodation (Median)
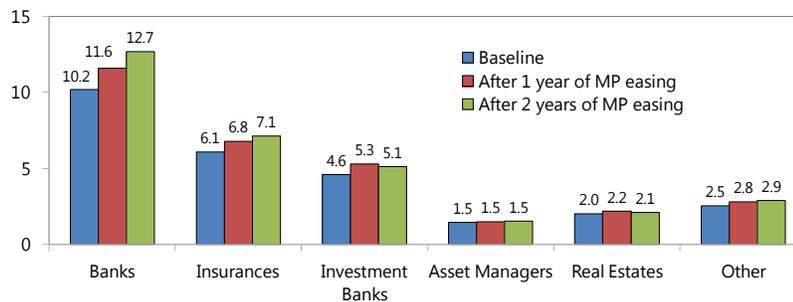
Source: Bloomberg, Datastream, Worldscope, and IMF staff estimates.

Estimation results reinforce these correlations. The effect of prolonged monetary policy accommodation is estimated using a panel regression analysis.[3] Leverage (Sharpe ratio) increases (decreases) the longer monetary policy remains accommodative (Figure 4.2 and 4.3). This is an expected part of the monetary policy transmission mechanism.

Effects are significant for banks, as well as nonbanks. These include insurance companies and investment banks, and to some extent asset managers. Results are consistent with the "searching for yield" hypothesis (Rajan 2005, and Feroli and others 2014). This is somewhat different from Herman and others (2015), which suggests that U.S. interest rate shocks shift intermediation from banks to nonbanks.

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[1] The author of this box is Machiko Narita, with assistance from Zohair Alam (both MCM), based on Cecchetti, Mancini-Griffoli, and Narita (2015, forthcoming).

[2] Leverage, though, tends to be negatively correlated with real growth. This is true across sectors, and likely due to the fact that equity valuations increase more than debt with higher growth, as in Andres and Gulan (2015), Adrian and Shin (2013), and Christiano and Ikeda (2013).

[3] $\ln(Y_{ikt}) = \alpha_0 + \alpha_1 D_{kt} + \beta X_{k,t-1} + c_{ki} + \varepsilon_{ikt}$
is estimated for each industry (i: firm, k: country, and t: time). Y_{ikt} is the financial vulnerability indicator, D_{kt} is the duration of monetary policy accommodation, $X_{k,t-1}$ are controls (real GDP growth, stock price growth, a volatility index, and a sovereign bond rating), c_{ki} is fixed effects, and ε_{ikt} is the error term.
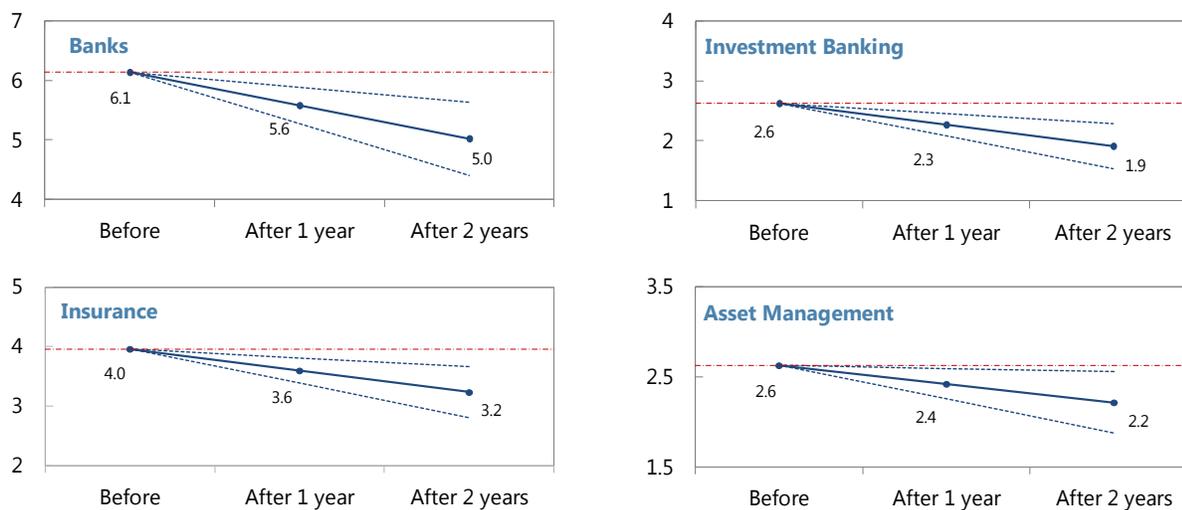
Box 4. Effects of Prolonged Monetary Policy Accommodation on Financial Stability (continued)

Figure 4.2. Estimated Effects on Leverage
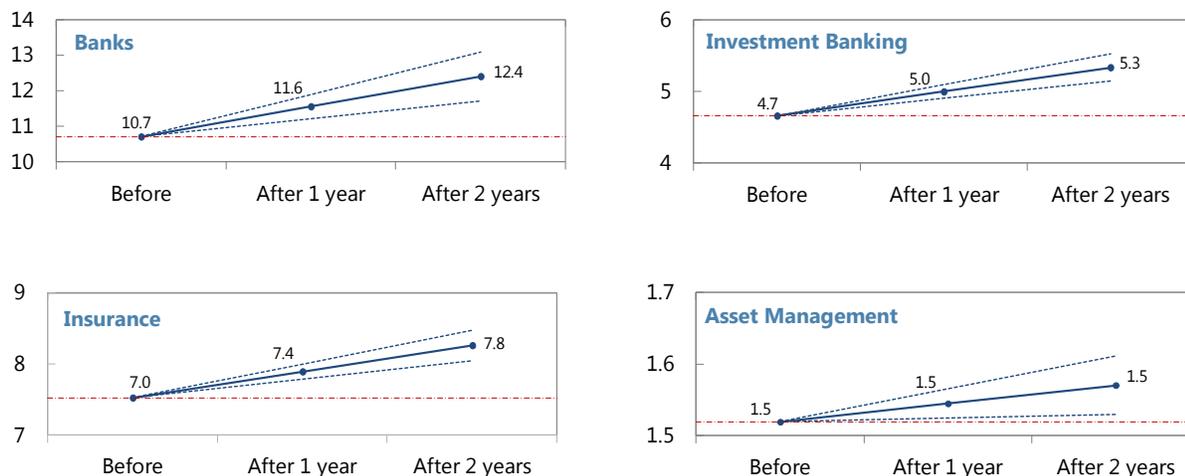
Sources: Bloomberg, Datastream, WEO, Worldscope, and IMF staff estimates.

Figure 4.3. Estimated Effects on Sharpe Ratios

Sources: Bloomberg, Datastream, WEO, Worldscope, and IMF staff estimates.

Financial vulnerabilities seem most correlated to consecutive cuts in two-year bond yields. Other measures of policy accommodation exhibit less significant results (the two year yield has the additional advantage of capturing policy surprises even at the effective lower bound—see Swanson and Williams, 2014). Cuts in both actual and expected future policy rates seem to be important drivers of risk-taking behavior.

Further research is needed to assess the macroeconomic significance of results. Effects on both leverage and Sharpe ratios are notable, and could have repercussions on the probability of crises.

Box 5. Non-Linear Interaction Between Monetary Policy on Financial Stress[1]

This box investigates two questions: *the effect of financial stress on the transmission of monetary policy to output, and the effect of monetary policy on financial stress.*

The approach allows for non-linear effects. These may vary with the state of the financial system. When stress is high, monetary policy may have a stronger effect on output, as discussed in the paper. Likewise, tighter policy could undermine financial stability in the short-term, especially if the system is already under stress.

Financial stress is measured using a market-based stress indicator. The main variable of interest is Average Distance to Default (ADD) of the largest and most liquid publicly traded banks and insurance companies (in the U.K. and U.S., Canada and Australia, between January 1984 and October 2014). Distance-to-default, as discussed in the paper, is computed on the basis of balance sheet and equity price data, following Merton (1974). A lower ADD signals higher financial stress.

A Bayesian Threshold-VAR model determines two regimes. These are associated with periods of high and low financial stress. The TVAR includes four endogenous variables: output growth, inflation, ADD, and the term spread of government bonds (the difference between the 10-year and the 3-month yields). The term spread captures monetary policy; in most cases a lower spread means tighter policy (except at the effective lower bound; results are robust to excluding the ZLB period).

The effects of financial stress on the transmission of monetary policy to output growth differ across countries. A related literature, surveyed in the paper, instead finds more conclusive evidence of stronger effects in periods of financial stress. In the U.S., for instance, the effects on output growth of a 100 bps decrease in the term spread are not statistically distinguishable between regimes (Figure 5.1). Mean dynamics are similar to those found in other econometric studies of the U.S. economy (such as the IMF's GIMF model mentioned in the paper).

Figure 5.1. Effects of a 100 bps Decrease in the Term Spread on GDP Growth
USA
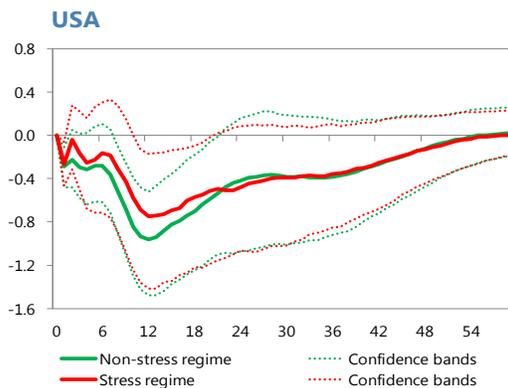
Source: IMF staff estimates.

Figure 5.2. Effects of a 100 bps Decrease in the Term Spread on ADD
USA

Source: IMF statff estimates.

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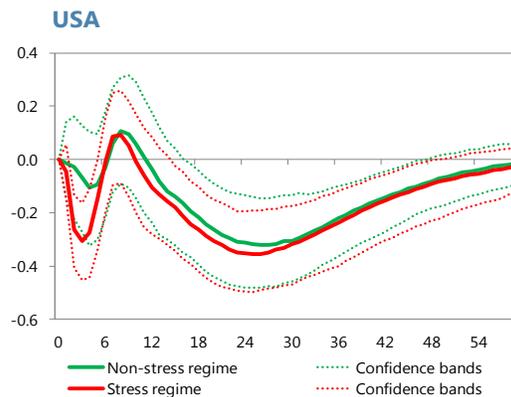
[1]The author of this box is Martin Saldias, with assistance from Zohair Alam (both MCM), based on Saldias (2015, forthcoming).

Box 5. Non-Linear Interaction Between Monetary Policy on Financial Stress (concluded)

A lower term spread increases financial stress in the short-term. This echoes findings mentioned in the paper. Higher rates typically reduce net worth, increase real debt, leverage, and debt servicing costs in the short-term, thereby lowering Distance-to-Default. In the U.S., ADD drops significantly in the 6 months following the monetary policy shock (Figure 5.2).

These effects are mostly felt in times of high financial stress. This again supports the intuition developed in the paper. When banks are weak, higher rates—and associated increases in real debt and debt servicing costs of both banks and their customers—are more painful. In these circumstances, higher rates bring ADD near levels commensurate with those of past crises, such as the 1987 crash, or the 1998 Russian and Long-Term Capital Management crises, and the 1999 bursting of the dot-com bubble.

Box 6. Predicting Crises[1]

This box reviews alternative approaches to predicting financial crises. The paper focuses on the role of real household debt, in a regression (logit) model. This box instead considers more variables and methods.

Two types of variables are considered. Financial variables include bank credit (real and as a percent of GDP), equity and property prices, and leverage (loan to deposit ratios of banks). Real variables include output and inflation.[2]

Variables enter in growth rates, or as gaps. Gaps are computed using one and two sided band-pass filters,[3] where the smoothing parameter is set to extract cycles of frequencies equal to the observed lag between peak and trough of the original series.[4] The distinction is fundamental. A two sided filter uses known future data to compute gaps at any given time. It can therefore extract important dynamics, but does not offer a practical tool to inform policy. In real time, the one-sided filter is more appropriate.

Two broad methods are used to predict crises. The first is drawn from the literature on early warning indicators.[5] It determines the signal to noise ratio of each variable by measuring its ability to accurately sort the sample into crisis and non-crisis periods.[6] The second is the more standard logit regression discussed in the paper.

Results from the early warning method underscore the difficulty of predicting crises. Two sided gaps emerge as much better predictors of crises than real time indictors. Since no one variable distinguishes itself as a solid predictor with a constant lag across methods, policy makers should consider a range of indicators to assess overheating in the financial system.

Equity price and output (two-sided) gaps predict crises best, up to two years ahead. Property price, inflation and credit gaps are also acceptable predictors one year before the crisis (Figure 6.1)

However, predictive power deteriorates significantly in real time. When variables are taken in growth rates, equity prices appear to be the best predictor one–two years ahead. Credits and leverage instead do better than others, one and two years ahead respectively, when applying one-sided filters (Figures 6.2 and 6.3).

Logit regressions confirm these results. Output and inflation gaps are nearly always significant predictors of crises, though lags vary according to specifications. Credit gaps loose significance when output and inflation gaps are also used. However, property price, equity and leverage gaps have predictive power. When taken as two sided gaps, these variables predict crises over relatively short horizons—typically around a year. The horizon extends to four years in some cases, when gaps are computed with one-sided filters. However, lags vary over sub-samples and across variables, making real-time prediction uncertain.

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[1] The authors of this box are Sally Chen, Katya Svirydzenka, and Aleksandra Zdzienicka (SPR).
[2] Data cover 34 advanced economies from 1960 to 2014.
[3] Christiano and Fitzgerald (2003).
[4] Harding and Pagan (2002).
[5] IMF SM/07/328, 7/17/2007, and Kaminsky, Lizondo, and Reinhart (1998).
[6] By minimizing the percent of crises missed and misclassified (type 1 and type 2 errors).

Box 6. Predicting Crises (concluded)

Figure 6.1 Signal to Noise Ratios

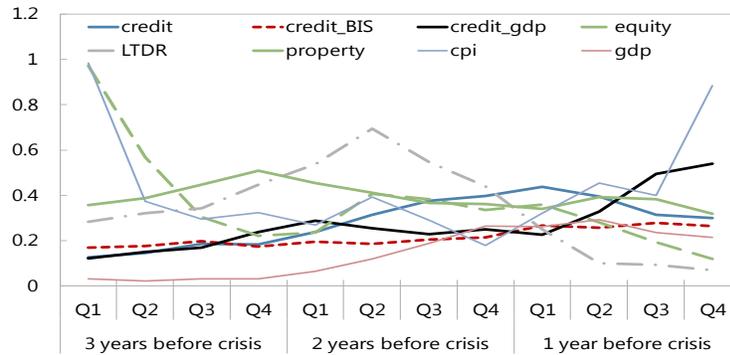**Signal to Noise Ratio: 2-Sided Filters**
(1-T1-T2)/(T1-T2)
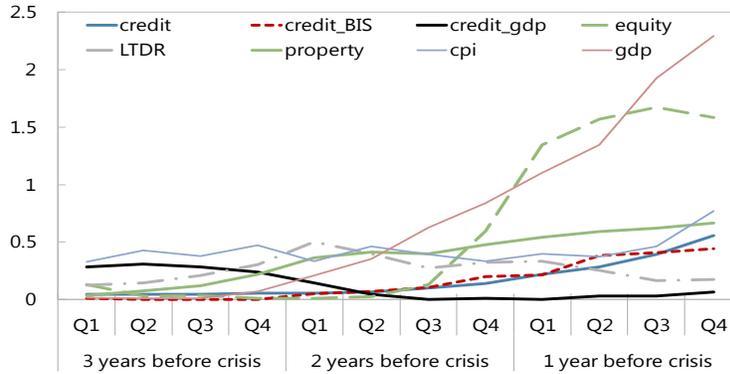
Source: IMF staff calculations.
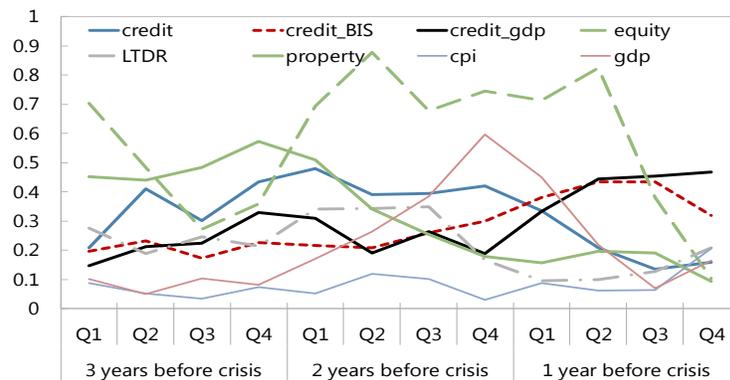
Signal to Noise Ratio: 1-Sided Filters
(1-T1-T2)/(T1-T2)

Source: Staff calculations.

Signal to Noise Ratio: Growth Rates
(1-T1-T2)/(T1-T2)


Source: Staff calculations.

Box 7. Leaning Against the Wind in a Extended Inflation Targeting Framework[1]

This box evaluates the possible benefits and costs of leaning against the wind, using a VAR model estimated across countries. The model extends the approach of Riksbank (2013) and Svensson (2014, 2015), to estimate the effects of monetary policy shocks on inflation and unemployment, as well as on household debt, in six advanced inflation targeting countries[2] using a standard Bayesian VAR method. The effect on unemployment and inflation directly captures the short-term costs of higher rates. Benefits instead stem from the medium term response of household debt, and its effect on the probability of a crisis. This last link is estimated based on results in Schularick and Taylor (2014).

The basic findings are that costs are more immediate than benefits, which appear with considerable lags. On net, costs are larger than benefits in all countries in the years following the monetary policy shock. After 4–5 years, benefits grow slightly larger than costs in some countries. These results hinge on the assumption that real household debt does not return to its pre-shock levels. As discussed in the text, this implies that monetary policy is not neutral, and that credit growth, along with the associated probability of a crisis, return to their original levels without overshooting them. Moreover, the costs of a crisis have to be substantial for the benefits to be large. The initial conditions also need to be close to, and not below, long run sustainable levels. Finally, credit growth needs to be persistently affected by monetary policy.

Detailed results are presented in Figure 7.1. Interest rates are hiked by 100 basis points during one year. The peak positive effect[3] occurs after three to five years and implies that the probability of a crisis is around 0.04 percentage points lower per quarter. Although effects seem small, their persistence entails a larger cumulative impact. These help reduce the probability of a crisis that is assumed to be substantial (5 percentage point higher unemployment rate and 2 percentage points lower inflation for four years).

Figure 7.1. Effects of an Interest Rate Hike
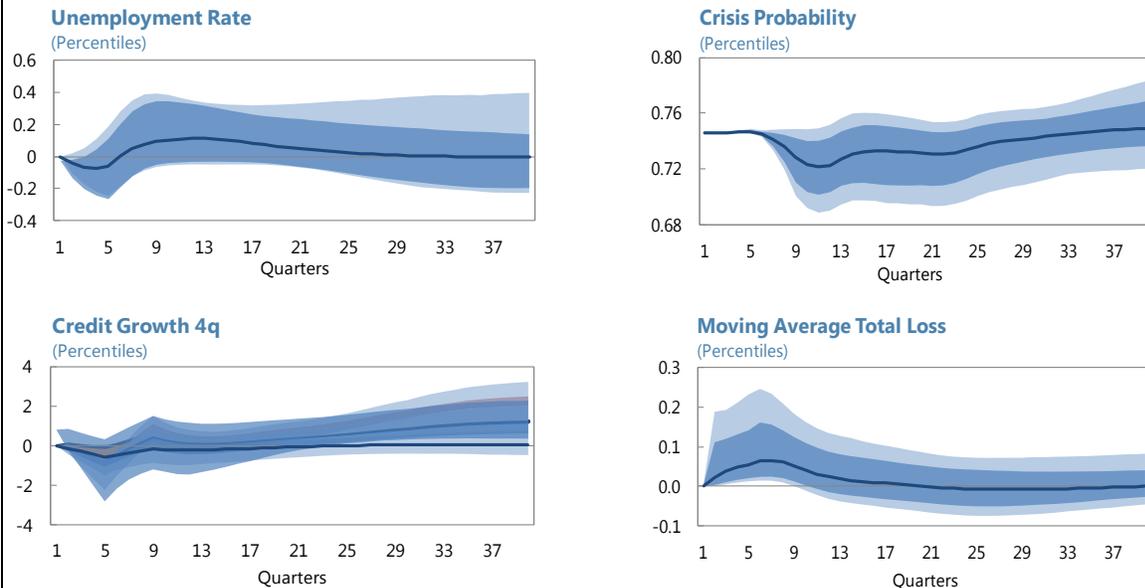
Sources: IMF, BIS, OECD, national sources through Haver Analytics, and IMF staff estimates.

[1] The authors of this box are Stefan Laseen and Aleksandra Zdzienicka, with assistance from Federico Diaz Kalan.

[2] Australia, Canada, Norway, Sweden, the U.K., and the U.S.

[3] The cost is expressed as the cumulative mean of the sum of squared deviations of inflation from target and the unemployment rate from long run sustainable level. The benefit is the product of the probability of a crisis in the next period times the cost conditional on a crisis occurring.

Box 8. Cross-Border Spillovers from Monetary Policy on Financial Stability [1]

Spillover effects of U.S. monetary policy on foreign asset prices and capital flows have been widely documented. Changes in U.S. monetary policy have significant effects on financial conditions abroad (Glick and Leduc, 2013; Rogers et al., 2014), with the impact varying with country-specific conditions (Basu et al., 2014; Chen et al., 2014).

This box investigates the effects of U.S. monetary policy on financial stability abroad. To capture risks to financial stability, this box focuses on real credit growth. Data cover 20 economies—both advanced and emerging—between 1969Q3 and 2008Q4.

Two specifications are used to investigate this issue. The first assesses the effect of U.S. monetary policy shocks on foreign real credit growth, and the second whether country-specific characteristics affect this relationship.[2]

Results suggest that U.S. monetary policy shocks affect credit dynamics in other countries. In particular, an exogenous increase of 100 basis points in the U.S. monetary policy rate typically contracts the level of real credit by about 1 percent after 12 quarters (Figure 8, top panel). The effect varies across countries (Figure 8, bottom panel), and is larger for emerging market economies (about 1.3 percent) than for advanced economies (about 0.8 percent).

Results also suggest that spillover effects are larger for countries with certain characteristics: Countries with fixed exchange rate regimes (1 percent) than for countries with flexible exchange rates (0.4 percent), and countries with higher capital account openness (0.8 percent). In contrast, the impact of U.S. monetary policy shocks on real credit is similar and not statistically different across countries with different degree of market capitalization.

Much more needs to be done to understand the nature and consequences of spillovers from monetary policy. Two pressing questions are: to what extent do spillovers depend on the underlying drivers of policy normalization (better growth prospects vs. financial stability concerns), and how do financial risks, and financial stress propagate across borders.

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[1] The author of this box is Aleksandra Zdzienicka (SPR) with assistance from Federico Diaz Kalan (SPR).

[2] The first specification is: $\Delta c_{it} = \alpha i \ + \delta(L)m_t + \varepsilon_t$ where c is the (log of) real credit in country i, m are U.S exogenous monetary policy shocks identified by Coibion (2012), and α_i are country fixed-effects. In the second specification, monetary policy shocks are interacted with country characteristics, as in Auerbach and Gorodnichecnko (2013).

Box 8. Cross-Border Spillovers from Monetary Policy on Financial Stability (concluded)

Figure 8.1. Spillovers

Spillovers from Monetary Policy to Real Credit
(All countries, percent change)
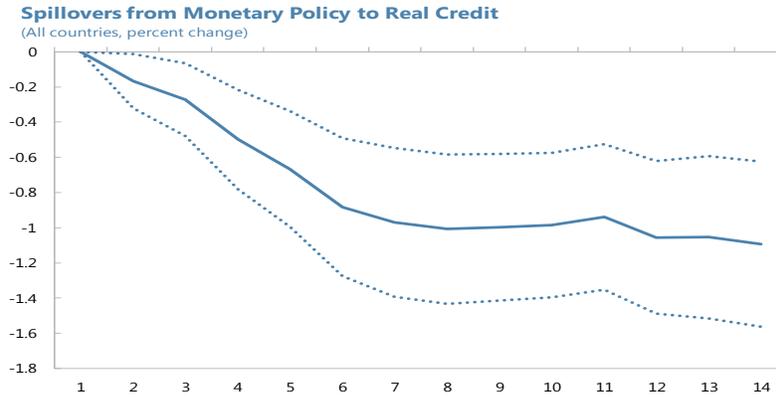
Source: IMF staff estimates.

Note: The y-axis shows the impact of monetary policy shocks on the log level of real credit—The coefficients in δ Equation. The x-axis indicates quarters after the shock in t = 0. Dashed lines indicate the 90-percent confidence bars.
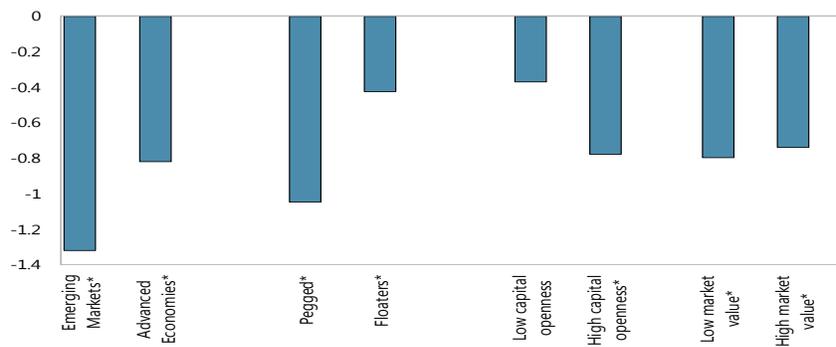
Spillovers from Monetary Policy to Real Credit Depending on Country Characteristics
(percent change)

Source: IMF staff estimates.

Appendix I. Past Policy Advice

52.   This appendix examines the Fund's recent policy advice on monetary and macroprudential policies. In terms of the institutional background, almost all advanced country monetary policy regimes focus on price stability as the primary mandate with financial stability often defined as a secondary objective. For example, some central banks have the responsibility to "promote" financial stability (as in Australia, New Zealand, Sweden, and the U.S.) or—somewhat weaker—"contribute to" financial stability (as in Canada, Euro Area, Japan, Switzerland). An exception is the U.K., where financial stability is defined as an explicit legal objective of the Bank of England. In practice, many of these central banks do already incorporate financial stability considerations in their monetary policy frameworks. Generally, in all these country cases, macroprudential measures are seen as a first-best option to mitigate systemic risks, provided that tools are available and effective. However, recognizing the limitations of macroprudential measures, some central banks have been using monetary policy to lean against the wind (Norway), or leave the door open to doing so (e.g., Australia, Canada, and Sweden, as well as the U.S.).[57]

53.   The Fund's monetary policy advice has varied depending on specific circumstances. This partly reflects differences in relative cyclical positions (Tables 1 and 3), as well as in the institutional framework for monetary and macroprudential policies and the structure of financial system across AEs. More specifically (Table 2):

- While macroprudential measures were seen as a first line of defense in the policy advice for Sweden—especially since monetary policy has turned expansionary to contain deflation risk[58]—staff has stressed that monetary policy may eventually have to "lean against the wind" if macroprudential policies failed to serve their purpose. Staff stressed that this would require careful consideration of the tradeoffs between the impact on growth and the cost of rising financial vulnerabilities, and reinforced the urgency of implementing a comprehensive set of macroprudential measures to contain household credit demand.

- The policy advice for Canada, Norway, and the U.K. also considered a role for monetary policy tightening should Macroprudential measures to deal with financial stability risks prove

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[57] In Sweden, for instance, the Riksbank further eased monetary policy to bring inflation back to target despite its concerns regarding the impact on indebtedness and associated risks. At the same time, it is concerned about the FSA lacking a sufficiently clear mandate or clearly-defined tools to take macroprudential measures, which is delaying and hindering the introduction of necessary measures (Riksbank, Financial Stability Report 2015:1).

[58] Policy rate hikes in 2010 in response to resurgent growth and inflation were also in part motivated by the risk of imbalances building up as household debt growth outpaced income growth (Riksbank, Material for Assessing Monetary Policy 2010). While the extent to which the Riksbank was actually leaning against the wind is debatable, during 2010, the majority of the Riksbank's Executive Board members wished to include risks linked to household indebtedness in their deliberations on monetary policy. At the beginning of 2011, the majority of the Riksbank's Executive Board included these risks in their monetary policy deliberations (Riksbank, Material for Assessing Monetary Policy 2011).

ineffective.[59] Canada and the U.K. have been pro-active in implementing some Macroprudential measures—albeit of varying impact—and the Fund's policy advice is to stand ready to take further measures as needed.

- Financial stability risks are largely left to microprudential policies in the U.S. policy discussions, with the Fund pointing to the need to strengthen the Macroprudential framework. That said, monetary policy advice was not only conditional on the inflation and growth outlook, but also on financial stability risks.

- In contrast, monetary policy advice for Australia and Switzerland did not raise the issue of monetary tightening for financial stability purposes, which is left to Macroprudential measures. While not explicitly ruling out this option, the monetary policy advice for Australia focused on near-term aggregate demand management. Staff recommends use of the supervisory framework to mitigate house price risks. Tightening for financial stability purposes was not considered for Switzerland in view of significant inflation undershooting. As in the case of Sweden, staff recommends to further strengthen Macroprudential measures.

- The different approaches to Macroprudential policies in these countries not only reflect differences in financial conditions, but also in financial systems, with the effectiveness of such policies likely to be more limited where non-bank intermediation is more prevalent. Furthermore, it should be acknowledged that there is a large degree of uncertainty regarding the effectiveness of such policies in general.

54.   Discussions around financial stability objectives are also emerging in a few emerging markets (EMs), although less apparent in general than in AEs. Slower growth, tighter financial conditions, and lower commodity prices have helped to reduce inflationary pressures in EMs since 2014, allowing some countries to ease monetary policy. At the same time, and despite the deceleration in credit growth, financial stability risks remain in some EMs reflecting vulnerabilities built during the past rapid credit expansion fueled in part by buoyant capital inflows. China is a notable example, with Thailand and Peru among other cases facing somewhat similar tensions:

- *China.* While output growth and inflation have moderated, and credit growth (including shadow banking) has slowed considerably, Fund advice has stressed the need to maintain a neutral monetary stance. This advice partly reflects the structural nature of the growth slowdown, but also highlights the need for deleveraging to bring the credit-to-GDP and private leverage ratios to more comfortable levels.

- *Peru experienced a sharp output growth slowdown in 2014–15, with the negative output gap expected to close only in 2018.* Credit growth has decelerated and inflation expectations are well anchored. However, financial dollarization remains a major vulnerability and constrains the room

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[59] The U.K. Staff Report emphasized however that the BoE should carefully weigh the costs of tightening and hurting output growth versus that of not tightening and risking problems in the banking sector.

for further monetary easing given the pressure in the FX market in the context of the anticipated U.S. monetary policy normalization. The Fund has emphasized that exchange rate flexibility should be the main line of defense, with de-dollarization measures, including prudential requirements, aimed at reducing currency-liquidity-maturity mismatches.

- *Thailand is seeing a tentative growth recovery following political uncertainties during 2013–14, but the sizeable negative output gap is expected to close gradually, and headline inflation has turned negative.* While the Fund does not see the recent monetary easing as exacerbating financial stability risks, it has called for strengthened regulation of non-commercial banks, including specialized financial institutions and credit cooperatives, which are heavily exposed to the highly-indebted household sector.

Moreover, spillovers from advanced economy monetary policy have been a complicating factor also from a financial stability perspective for smaller open economies, including many EMs (Box 8).

Table 1. Select Advanced Economies: Economic and Financial Indicators and Policy Advice

	Output Gap 1/			Inflation Rate 1/			Δ Credit 2/			Δ House Prices 2/			Policy Rate 3/				Staff Report
	t-1	t	t+1	t-1	t	t+1	t-2	t-1	t	t-2	t-1	t	t-2	t-1	t	t	Monetary Policy Advice
Australia	-0.2	-0.2	-0.2	2.3	2.1	2.3	5.5	6.9	6.7	8.1	10.0	10.8	3.18	2.50	2.50	Jan-14	remain accommodative
Canada	-0.7	-0.3	0.0	2.0	1.1	1.9	6.4	5.9	n.a.	5.4	5.5	n.a.	1.25	1.25	n.a.	Jan-15	remain accommodative
Czech Republic	-1.9	-0.5	-0.1	0.6	1.9	2.0	2.7	n.a.	n.a.	3.7	n.a.	n.a.	0.05	0.05	n.a.	Jun-15	remain accommodative
Euro Area	-2.7	-2.2	-1.5	0.4	0.2	1.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.25	0.05	n.a.	Jul-15	remain accommodative
Japan	-1.7	-1.3	-0.5	2.7	0.7	0.6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.30	0.30	n.a.	Jul-15	further easing
Korea	-0.3	-0.3	-0.2	1.3	1.2	2.3	4.9	6.7	n.a.	1.8	2.1	2.2	2.50	2.00	n.a.	Feb-15	remain accommodative
Sweden	-0.8	-0.5	0.3	0.0	0.1	1.4	4.9	4.4	5.0	8.0	8.7	10.3	1.14	0.75	0.00	Jul-14	remain accommodative 4/
Switzerland	-0.2	-0.9	-0.9	0.0	-1.1	-0.4	2.7	n.a.	n.a.	1.2	2.2	n.a.	0.25	0.25	n.a.	May-15	remain accommodative
United Kingdom	-2.7	-1.3	-0.6	2.1	1.9	2.0	-3.6	-2.3	-2.6	5.5	7.9	10.2	0.50	0.50	0.50	Jun-14	remain accommodative
United States	-2.0	-1.6	-0.7	0.6	0.0	1.7	4.1	n.a.	n.a.	4.5	n.a.	n.a.	0.13	0.13	n.a.	Jun-15	remain accommodative 5/

Sources: Staff Reports for Article IV Consultation; credit growth and house price growth based on BIS data.

1/ In percent, with t measured in years (t referring to the year in which the Article IV Consultation took place).

2/ Annual percent change (4Q y/y), with t measured in quarters (t referring to the quarter in which the Article IV Consultation took place).

3/ In percent, with t measured in years (t referring to the year in which the Article IV Consultation took place).

4/ Provided that financial stability risks can be contained, otherwise monetary policy may have to "lean against the wind."

5/ Any move to normalize monetary policy, needs to be approached cautiously.

Table 2. Selected Advanced Economies: Detailed Policy Advice

	Monetary	Macroprudential
Australia	*"Monetary policy should remain accommodative ..."* and *"... act as the primary macroeconomic tool for managing aggregate demand in the near term ."*	*"The authorities' intensive supervisory framework should allow for a targeted response if house price inflation becomes a risk, and there are features of the Australian regulatory and supervisory approach to property lending which would limit the impact of a sharp decline in house prices on the financial system. "*
Canada	*"Monetary policy can remain accommodative for now given that inflation expectations are well-anchored (...) and housing markets are expected to cool ."*	*"Further macro-prudential policy action may be needed to guard against risks to financial stability if household balance sheet vulnerabilities resume rising . ... strengthening macro-prudential and crisis management frameworks will reinforce the resilience of Canada's financial system ."*
Czech Republic	*"...given the only gradual closing of the output gap and asymmetric risks at the zero lower bound, monetary policy will likely need to remain supportive for some time even after the abolishment of the exchange rate floor and return to a floating exchange rate."*	*"...proactive supervisison remains necessary along with further gradual improvements in the supervisory architecture..."*
Euro Area	*"Given still important risks from low inflation, fully implementing QE and looking through temporary periods of market volatility are critical to meeting the inflation objetive, and the program should be extended if there not a sustained adjustment in inflation consistent with meeting the medium-term price stabiolity objective."*	*"Potential financial stability risks should be addressed through macroprudential and other policies. Close monitoring remains appropriate, and macroprudential policies should be used as a first line of defense."*
Japan	*"With a persistent difference between market expectations and the BoJ's inflation target and timeframe as well as still low inflation, the BoJ needs to stand ready for further easing, provide stronger guidance to markets through enhanced communication, and put greater emphasis on achieving the 2 percent inflation target in a stable manner."*	n.a.
Korea	*"There is scope for monetary policy to take pre-emptive action against downside risks. In an environment where households and firms hold excess cash and postpone spending on the self-reinforcing expectation that wages, prices, and house price growth may continue to be weak, policy rate cuts can help shift incentives away from cash hoarding toward more consumption and investment. The longer expectations become entrenched however, the more policy rates would need to be cut to break this dynamic. With the space to cut limited by the zero lower bound, waiting to see if additional rate cuts are called for runs the risk of reducing their effectiveness if ultimately needed. Concerns about their short run impact on household debt ratios may be counterproductive if withholding monetary stimulus results in weaker nominal income growth, and are better addressed by the government's macro-prudential policy tools for mortgage lending standards."*	*"Staff urged progress in addressing the high priority recommendations of the FSAP to (...) reform the institutional framework to separate macroprudential policy making from crisis management with the aim of increasing transparency and accountability among the various agencies responsible for economic and financial market policies and ensuring greater political independence."*

Table 2. Selected Advanced Economies: Detailed Policy Advice (concluded)

Norway	*"The current monetary policy stance is appropriately supportive. Inflation has been stable and close to the target. Lower wage growth this year is likely to reduce the risk of imported prices spilling over to higher domestic inflation. If growth turns out significantly weaker than currently projected, monetary policy needs to be the first line of defense against economic weakness, provided that inflation expectations are well anchored."*	*"Financial stability concerns need to be addressed primarily through macroprudential policy as a single policy rate cannot achieve multiple objectives. However, Norway's inflation targeting framework contains an element of mitigating the risk of a buildup of financial imbalances, and monetary policy could take financial stability into account if macroprudential policies are slow to be implemented or have limited effect."*
Sweden	*"Monetary policy is balancing financial stability risks and concerns about low inflation. Absent decisive action to reduce financial vulnerabilities, monetary policy may have to "lean against the wind" and follow a less supportive policy course than warranted by short-term macroeconomic conditions alone. The large policy rate cut in July should help address low inflation, but adds to the urgency of quickly implementing effective macroprudential measures."*	*"The Riksbank still has to balance financial stability and low-inflation concerns. Effective macroprudential policy should be the first line of defense and would allow the Riksbank to pursue its inflation target with less concern about financial risks." and "... there is little evidence that mortgage credit or house price growth is slowing in the current low-interest rate environment. This will require macroprudential measures directly targeting credit demand."*
Switzerland	*"The SNB could also further enhance communication and the articulation of its monetary policy framework. ... More specifically, it may be useful to indicate a preference for moving inflation back near the upper end of the target range (i.e., closer to 2 percent) over the medium term, given the benefits to re-anchoring inflation expectations at higher levels to avoid the complications of operating monetary policy at low levels of inflation."*	*"It is thus important to continue monitoring housing and mortgage-related risks closely and to fully enforce existing regulations and minimum standards, especially given recent interest rate cuts for SNB sight deposits, which could re-ignite mortgage demand. If risks are not reduced or re-accelerate, tighter and more binding prudential measures, such as explicit limits on the percent of new mortgages that can exceed a given debt-service-to-income and/or debt-toincome ratio should be adopted."*
United Kingdom	*"Accommodative monetary policy is appropriate for now, given weak inflation pressures, but policy might need to be adjusted quickly if inflation takes off. Interest rate increases may also need to be considered if macroprudential tools are insufficient to deal with financial stability risks from the housing market."*	*"(Authorities) should stand ready to tighten (macroprudential measures in limiting the share of high loan-to-income mortgages lenders can issue) should current settings prove ineffective in reining in those risks."*
United States	*"The FOMC should remain data dependent and defer its first increase in policy rates until there are more tangible signs of wage or price inflation than are currently evident... At this stage, policy rates should not be used in an effort to either reduce leverage or dampen financial stability risks."*	*"Pockets of financial stability risks are emerging, putting a premium on improving the resilience of the financial system. Regulatory reforms remain incomplete and the structure of oversight has scope to be strengthened along a number of dimensions."*

Sources: Staff Reports for 2015 Article IV Consultation, except Australia, Canada, Sweden, and the United Kingdom (2014 Article IV Consultation Staff Reports).

Table 3. G20 Emerging Markets: Economic and Financial Indicators and Policy Advice

	Output Gap 1/			Inflation Rate 1/			Δ Credit 2/			Δ House Prices 2/			Policy Rate 3/				Staff Report
	t-1	t	t+1	t-1	t	t+1	t-2	t-1	t	t-2	t-1	t	t-2	t-1	t	t	Monetary Policy Advice
China	-1.5	-1.0	-0.6	2.0	1.5	1.8	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	6.00	6.00	4.85	Jul-15	Monetary policy stance consistent with achieving macroeconomic outcomes
Brazil	0.2	-2.0	-2.0	6.4	7.0	5.4	11.5	n.a.	n.a.	7.3	n.a.	n.a.	8.00	11.00	13.75	May-15	Further tightening
India	-0.3	-0.2	-0.2	6.7	6.3	6.0	9.1	9.0	n.a.	11.9	14.1	n.a.	7.50	8.00	7.50	Mar-15	Remain tight
Indonesia	-0.1	-0.5	-0.9	5.8	4.8	4.8	15.4	13.2	n.a.	6.5	6.3	n.a.	5.75	7.50	7.50	Mar-15	Monetary policy tightness and exchange rate flexibility
Mexico	-0.7	-1.1	-0.4	3.8	3.9	3.5	12.4	11.0	11.5	3.4	4.1	5.1	4.50	3.50	3.00	Nov-14	Remain accommodative but closely monitor inflationary risks
Russia	0.7	-1.0	-0.9	11.4	12.5	7.8	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	6.00	8.00	11.50	Jul-15	Gradual normalization (rate cut)
Saudi Arabia	0.0	0.0	0.0	2.7	2.0	2.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.00	2.00	2.00	Jul-15	Monetary policy settings appropriate under the peg
South Africa	-1.3	-1.6	-1.5	5.8	6.1	5.2	7.7	8.9	7.1	9.3	9.9	9.6	5.00	5.00	5.75	Dec-14	Remain accommodative
Turkey	0.7	0.2	-0.2	7.5	9.0	7.1	21.7	19.7	18.5	13.7	15.2	15.8	5.50	4.50	8.25	Dec-14	Further tightening

Source: Staff Reports for Article IV Consultation and WEO; credit growth and house price growth based on BIS data.

1/ In percent, with t measured in years (t referring to the year in which the Article IV Consultation took place).

2/ Annual percent change (4Q y/y), with t measured in quarters (t referring to the quarter in which the Article IV Consultation took place).

3/ In percent, with t measured in years (t referring to the year in which the Article IV Consultation took place).

4/ Provided that financial stability risks can be contained, otherwise monetary policy may have to "lean against the wind."

Table 4. G20 Emerging Markets: Detailed Policy Advice

	Monetary	Macroprudential
China	*"With growth this year on track [to fall within targeted] range and the inflation outlook benign, monetary policy should take a wait-and-see approach, especially as significant easing would risk exacerbating the credit and investment vulnerabilities. Further cuts in required reserve ratio, however, are warranted not as an easing measure but as part of effective liquidity management."*	*"[Establish] macroprudential framework to measure and manage systemic risk, which should include increased resources at the PBC and the regulatory agencies and their improved ability to monitor financial stability and regularly carry out stress tests."*
Brazil	*"Monetary policy should remain tight to bring inflation to target. Strengthening the inflation targeting framework would improve the effectiveness of monetary policy. Exchange rate should remain the main shock absorber with interventions limited to episodes of excessive volatility."*	*"Macroprudential policies have been tightened, though more recently slightly eased." "The relaxation of macroprudential measures includes, inter alia, (i) reducing the risk weights on vehicle and personal loans; (ii)increasing the fraction of reserve requirements on time deposits that can be met by extending loans or purchasing loan portfolios from other banks; and (iii) allowing banks to use part of their reserve requirements to increase working capital loans."*
India	*"Monetary policy needs to remain tight to reduce inflation and inflation expectations on a durable basis." "Continued progress is needed to further strengthen the monetary policy framework and move towards flexible inflation targeting. [This will require]: increasing the operational autonomy of the RBI; institutionalization and setting the target zone for headline CPI inflation; and establishment of a Monetary Policy Committee and accountability framework."*	*"The RBI should further strengthen regulation for banks' credit quality classification and require increased provisioning to strengthen financial stability... Given the increased unhedged FX exposures of large corporates, strengthened monitoring of the extent of corporate vulnerabilities is warranted."*
Indonesia	*"Monetary policy needs to remain focused on anchoring inflation expectations and facilitating external adjustment, supported by continued exchange rate and bond yield flexibility. (...) The authorities were also urged to remove the deposit rate caps to improve the signaling effects of monetary policy and strengthen policy transmission.(...) Staff recommended moving to reserve requirement averaging, easing supervisory stigma tied to accessing BI's lending facility, and conducting rupiah and FX market operations consistent with reducing excess reserves. Progress on making legacy government securities on BI's balance sheet marketable would also help. Staff suggested that market deepening focus on building a benchmark yield curve and also welcomed the authorities' effort to develop a global MRA for the repo market."*	*"Financial stability is expected to be preserved through enhanced risk assessment and effective prudential measures, anchored by a strong crisis management framework."*
Mexico	*"The [ease] stance of monetary policy remains appropriate."* and *"Staff noted that risks to the inflation outlook are mostly on the upside."*	n.a.
Russia	*"Monetary policy normalization should continue at a prudent pace, commensurate with the decline in underlying inflation and inflation expectations." "[Also], the easing of policy rates should be conditional on a reduction in external and financial stability risks."*	*"Prompt elimination of [anti-crisis] forbearance [measures], along with the implementation of the capital support program, to avoid the emergence of additional financial stability risks in the medium term."*
Saudi Arabia	*"Monetary policy settings and the peg to the U.S. dollar remain appropriate for the Saudi economy."*	*"Formalizing the macroprudential framework to clearly establish responsibilities and the way countercyclical policy tools will be used would further enhance policy implementation."*
South Africa	*"With the recent large drop in oil prices and the announced fiscal consolidation, the SARB may be able to afford to stay accommodative for longer, though an increase in rates will ultimately be needed." and "In case of materialization of risks to inflation or inflation expectations, or significantly tighter external funding conditions, policy rate hikes may become necessary sooner to bolster the SARB's credibility and facilitate external funding."*	*"Regular stress testing on a system-wide basis is important to strengthen macroprudential supervision."*
Turkey	*"Staff called for an increase in the policy interest rate to reach a positive real level, which should be sustained to bring both inflation and expectations to target. The rate increase would serve as an important signal that the central bank prioritizes inflation, and would aid in the resumption of the de-dollarization trend of the economy." and "staff called for full normalization of the monetary policy framework."*	*"Staff complimented the authorities on the implementation of measures to slow consumer credit growth and strengthening of stress tests." "To preserve financial stability, additional macroprudential measures targeting banks' wholesale external FX financing could be considered." and "In addition, the mission suggested other possible measures to reduce incentives for the non-financial corporate sector to take on exchange rate risk."*

Sources: Staff Reports for 2015 Article IV Consultation, except for Mexico, South Africa and Turkey (2014 Article IV Consultation Staff Reports).

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