
Have We Learned Anything? Crafting a Monetary Policy for All Seasons

Consider the statement, “It is raining.” That statement is true or false depending on whether it is, in fact, raining. Now consider the statement, “This is a revolutionary moment.” That statement is reflexive, and its truth value depends on the impact it makes.

—George Soros¹

Monetary policy entered 2007 ready to fight inflation and cautioning about financial bubbles. A decade later it discovered that lifting inflation is difficult, that the travails of the BoJ over the last 20 years were not caused by a lack of understanding of economics. The monetary policy apparatus was ready to deal with excessive risk taking, not with a prolonged period of risk aversion and deleveraging. Its fair-weather framework was designed for shocks that did not shake the economy much.

What is needed is an all-weather monetary policy framework that can handle big shocks—a monetary policy for all seasons.

There is no room for complacency. Changes are needed because without them, trust in the ability of policymakers to respond to shocks will diminish—and without that trust, economic recoveries will be weaker, as households and businesses internalize that diminished ability of policymakers to react. The key reason why monetary policy may have been more effective during the Great Moderation is that, as economies went into recession, economic agents “knew” that interest rate cuts would restore the economy to the steady state. The interest rate-sensitive sectors of the economy—investment and housing—therefore responded to the decline in interest rates, assumed that demand would materialize, and pushed the economy back to trend.

1. George Soros, “Soros: General Theory of Reflexivity,” *Financial Times*, October 26, 2009, www.ft.com/cms/s/2/0ca06172-bfe9-11de-aed2-00144feab49a.html#axzz4I0ciYklo (accessed on March 30, 2017).

If that trust in the future fails, the present will fail as well. A vision of a gloomier future will lead to a weaker present and make the gloomier future a reality.² When economies suffer large shocks, reflexivity becomes a critical driver of the recovery. The principle of reflexivity implies that economic agents always have a partial and imperfect view of the world and that these imperfect views can influence outcomes, by leading to actions that seem individually optimal but are socially inefficient. If everyone believes that monetary policy will be ineffective, their belief will end up becoming reality, and growth and inflation will fail to increase.³ As George Soros explains, a revolution is only a revolution if everybody believes it is. If markets and economic agents do not believe that governments and central bankers are ready to do whatever it takes, to take enough risk to solve the problems, they will remain risk averse and the economic outlook will be riskier. It is the paradox of risk.

Nothing in life is certain. The future is stochastic, large shocks can happen, the Great Moderation may never return, short-term interest rates could be at zero for decades to come. Monetary policy may never again be boring.

Fortunately, the last decade has provided a real-life experiment, much richer than anything that could have been designed in a laboratory or in the minds of PhD economists. Previous chapters describe the multiple and multidimensional actions undertaken by central banks, their impact, and side effects. This chapter draws lessons and provides suggestions for crafting a monetary policy for all seasons.

A critical step in building such a monetary policy is to eliminate the concept of “unconventional” policies. Policies operate along different channels to affect long-term rates, asset prices, and risk aversion. Central banks always operate by changing the size and composition of their balance sheets. Changing short-term interest rates is just a subset of this framework. Calling some policies “unconventional” introduces an unnecessary stigma that dents their effectiveness and leads to less policy easing than is necessary.

This point cannot be emphasized enough. To be effective, central banks must counteract the widespread moral judgment that low rates are bad because they hurt savers. Savers do not have the economic moral high ground. At times more saving is needed, at times more borrowing is needed; interest rates must be adjusted accordingly. Central banks must be prepared to use all their tools at all times. They should explain in detail to

2. Kozlowski, Veldkamp, and Venkateswaran (2015) argue that when economies suffer a shock never seen before (and no one therefore knows the true underlying distribution of shocks), a transitory shock can have very persistent effects.

3. See Soros (1987) on the development of reflexivity applied to economics and finance.

the public that there is no difference between “conventional” and “unconventional” policies, that all are legal and within their mandates. They should strengthen the institutional settings to be able to operate free from political interference.

The experience since 2007 suggests that changes are required to the four main elements of central banking articulated in chapter 3: goals, tools, strategies, and communication. In addition, the realization that monetary policy may have to modulate risk aversion has implications for institutional design.

Goals: A Program of Opportunistic Reflation

Central bankers choose 2 percent as the inflation targets mostly by accident. The consensus was heavily determined by the size of the shocks of the Great Moderation. As the consensus moved away from pure price stability (zero inflation) to building some buffer against deflation, the debate shifted toward the cost-benefit analysis of positive inflation. How much inflation was too much?

The costs included (1) the confusion inflation creates between nominal and real variables, (2) the “shoe-leather effect” (the cost in time and effort of holding less cash and having to go the bank), and (3) the “menu effect” (the cost of having to change prices more often). The main benefits included (1) the “grease effect” (providing more room for real wages to adjust when there is downside nominal rigidity), (2) the reduction in the probability of deflation, and (3) the creation of more room to cut real interest rates to cushion a recession.

The view in the late 1990s, when this debate took place, was that, taking as a reference the shocks experienced in the postwar period, the zero-bound constraint would be hit only very rarely and that most of the problems would be avoided at rates of inflation as low as 2 percent.⁴ Most of these results assumed not only small shocks but also positive equilibrium real interest rates—in the 1.5–4.5 percent range (Haldane 1997, Viñals 2001). Viñals (2001) uses simulation exercises to argue that the probability of hitting the zero bound was below 5 percent for the United States and below 1 percent for the euro area for equilibrium real rates as low as 1.5 percent and inflation rates as low as 1 percent.

Similar exercises were the basis for establishing 2 percent inflation targets. The evidence was not conclusive, though. Based on empirical evidence, Charles Wyplosz (2001) argued that inflation of 0–2 percent in the

4. See, for example, Fuhrer and Madigan (1997), Orphanides and Wieland (1998), and Reifschneider and Williams (1999) for the United States and Viñals (2001) for the euro area.

euro area would raise the NAIRU by about 2–4 percentage points, because it would reduce the grease effect of inflation on the price and wage process.⁵ He argued that an inflation rate of 4 percent would greatly eliminate this effect. In hindsight he was right.

Fast forward to today, and it seems clear that if 2 percent was the right number during the Great Moderation, it has to be too low today. History has shown that the size of the shocks to consider must be higher, and the equilibrium real interest rate possibly lower, which makes the zero-bound constraint more structural (see, for example, Chung et al. 2011). The precrisis expectation was that with 2 percent inflation the US economy would spend just 5 percent of the time at the EZLB. In fact, it has been closer to 25 percent of the time since inflation stabilized around 2 percent in the early 1990s. Model simulations suggest that with an inflation target of 2 percent and neutral real interest rates of 1 percent, the economy could be at the EZLB close to 40 percent of the time (Kiley and Roberts 2017).

A higher inflation target allows for a bigger decline in real interest rates during a recession. If the EZLB is binding, and inflation is at target before a recession starts, the real interest rate could be cut to at most –2 percent (0 nominal minus 2 percent inflation) assuming that inflation does not fall during the recession, not a very realistic assumption. A more realistic estimate would be that the floor for real interest rates is closer to –1 percent, the level of short-term real interest rates in the developed world today. English, López-Salido, and Tetlow (2013) simulate the impact for the United States of a credible increase in the inflation target to 3 percent while at the EZLB. The results show a materially faster decline in unemployment, thanks to the decline in real interest rates generated by the higher inflation target.

With this in mind, Blanchard, Dell’Ariccia, and Mauro (2010); Ball (2014); and Ball et al. (2016) argue in favor of a higher inflation target, of up to 4 percent, in order to create enough room for real interest rates to be cut and cushion the negative impact of shocks. If inflation is at 2 percent or lower when the next recession hits, there will probably not be enough room to cut real interest rates as much as needed. Haldane compares the statistical probability of recession over the next 10 years versus the market-priced probability that short-term interest rates will have reached at least 3 percent, the lower bound of the average size of rate cuts in easing cycles.⁶ He concludes that over the next 10 years, the probability of a recession is

5. The proponents of the grease effect argue that for various reasons (including efficiency wages, fairness, nominal downward rigidity, and information costs), a moderate level of inflation provides some “grease” to the price- and wage-setting process. Such a source of real wage flexibility durably reduces the natural, or long-run, rate of unemployment.

6. Andrew Haldane, “Stuck,” speech at the Open University, London, June 30, 2015.

twice as large as the probability of interest rates reaching 3 percent. Paul De Grauwe and Yuemei Ji (2016) show that with inflation targets below 3 percent, the distribution of output gaps is negative. Because monetary policy cannot respond enough to shocks, the economy spends more time below than above potential. Michael Kiley and John Roberts (2017) show that with an inflation target of 2 percent and neutral interest rates below 2 percent, economic growth would be about 1 percent below potential on average. A few regional Fed presidents, including Eric Rosengren⁷ and John Williams (2016), have made similar points about the need for a higher inflation target, at least in theory.

The average rate-cutting cycle has been about 400–500 basis points. It is very likely that central banks will reach the EZLB again in the next easing cycle, possibly very quickly. Then what? David Reifschneider (2016) simulates the impact of a recession in the United States in which the unemployment rate increases from 5 percent to 10 percent. Assuming short-term rates at 3 percent and long-term rates at 4 percent when the recession hits, he argues that in a best-case scenario a combination of rate cuts to zero, large asset purchases, and aggressive threshold-based forward guidance might be enough to cushion the recession. However, it is a best-case scenario. It seems unlikely that interest rates will be as high as he assumes by the time the next recession hits, and the evidence shows that balance sheet policies are rarely used to the extent necessary.

A higher inflation target is needed to provide more room to cut real interest rates. Targeting higher inflation would also provide the added benefit of giving the central bank more leeway to deviate from the target temporarily—for example, choosing to return to the target in a more gradual way in order to address financial stability issues—with a much smaller risk of falling into deflation if policy remained too tight for too long.

If a Higher Inflation Target Is the Obvious Thing to Do, Why Isn't It Happening?

Beyond political pressures, the main economic argument against a higher inflation target is inertia. All changes imply costs, and the cost of shifting to a higher inflation target is seen as high and unpredictable. Ben Bernanke argues that inflation volatility would increase and inflation expectations become more unstable.⁸ English, López-Salido, and Tetlow (2013) argue

7. Sam Fleming, “Inflation Goal May Be Too Low, Says Rosengren,” *Financial Times*, April 20, 2015, www.ft.com/content/6e9815ae-e776-11e4-8e3f-00144feab7de (accessed on March 30, 2017).

8. Ben S. Bernanke, “The Economic Outlook and Monetary Policy,” speech at the Federal Reserve Bank of Kansas City’s Annual Economic Symposium, Jackson Hole, WY, August 27, 2010.

that if the increase in the inflation target is not credible, economic performance will worsen, because economic agents may react to the expected increase in inflation by reducing their real income expectations and curtailing spending. Others argue that higher inflation might lead to higher volatility and dispersion of individual prices. However, some recent research, such as the paper by Emi Nakamura et al. (2016), shows that price dispersion did not increase during the higher inflation of the 1970s and that this cost may therefore have been exaggerated.

One of the main fears about increasing inflation targets is that it could lead to “accelerated” and more volatile inflation: If the central bank raises the target once, what prevents markets from assuming that it may do so again?

The experiences of two central banks should allay this concern. The first is the Reserve Bank of New Zealand, a pioneer in inflation targeting. Since its establishment, in 1990, it has gradually increased its inflation target from the initial 0–2 percent to 0–3 percent (in 1996) to the current 1–3 percent (in 2002), with no credibility cost (Reserve Bank of New Zealand 2002).

The second is the BoJ. It was initially very reluctant to move from the zero inflation target directly to a 2 percent inflation target, because it worried about inflation expectations becoming unhinged after such a long period of deflation. As a result, it moved in small steps, first targeting 1 percent inflation, then 2 percent inflation. The outcome was a very gradual upward shift in inflation expectations that has, for now, underperformed the target.

At the end of the day, the stability of inflation expectations will depend on the credibility of the actions implemented to achieve them, regardless of the level. In the current environment, the main problem would not be excessive inflation but rather lack of credibility regarding the desire to hit the new target.

A change to a higher inflation target requires a shift in the policy stance, as the BoJ experience has shown, and likely an explicit coordination of monetary and fiscal policy to achieve it. Right now it would require a new round of policy easing (or a longer period of policy on hold), which policymakers seem loath to consider. In fact, it seems that the strong desire to exit from the EZLB as soon as possible rather than the desire to reach the policy goals and maximize economic welfare has driven the monetary policy setting.

This strong desire to exit the EZLB can be seen in the reluctance to even consider a transitory period of above-target inflation. Despite the fact that both inflation and inflation expectations are below target, the Fed and the ECB have adopted a policy stance that reverts inflation to the target only from below, thus refusing to achieve a faster economic recovery that

would be compatible with price stability. The BoE has been more tolerant of transitory overshoots in inflation, but until the Brexit shock, it also refused to contemplate a policy stance that would entail some temporary overshooting of the inflation target. Its stance changed, however, with the easing package of August 2016, which assumes an explicit and persistent overshooting of the inflation target (the BoE easing strategy following the Brexit referendum is discussed in the next chapter).

This reluctance to adopt a policy that generates a period of above-target inflation is suboptimal. Reluctant to take some risks, central banks are making the recovery riskier—the paradox of risk. If this reluctance generates an anchoring of inflation expectations at a lower level or a reduction in the credibility of the inflation target, it will also reduce the flexibility of monetary policy to react to shocks.

Ironically, the very central banks that refuse to temporarily overshoot the inflation target seem to agree that doing so would be a good idea. Janet Yellen shows simulations comparing the interest rate path compatible with the FOMC projections and the interest rate of “optimal control”—the policy that would maximize the welfare of the economy in terms of the combination of inflation, unemployment, and growth.⁹ They show that, as of January 2012, the optimal control path involved raising rates about a year later than the FOMC January 2012 *Summary of Economic Projections* suggested and pursuing a path of inflation that pushed core personal consumption expenditure inflation a bit above 2 percent for a few years to then converge to 2 percent by 2018, generating a faster decline in unemployment. English, López-Salido, and Tetlow (2013) update this exercise with data up to September 2013. They find a similar pattern, with the optimal policy implying a later liftoff than suggested by the FOMC dots and inflation overshooting the target for a couple of years to then converge to 2 percent from above.

The concept of overshooting is simple. If monetary policy is not (or cannot be) eased enough, it should compensate by delaying the tightening once the economy recovers, even if doing so implies transitorily higher inflation. Kiley and Roberts (2017) call the idea that policy must be more accommodative than in normal times in order to make up for the inability to ease enough in bad times “risk adjustment.” One could take this a step farther and commit to track the “shadow interest rate” (the rate that would have existed had the EZLB not been binding). In some sense, shadow interest rate tracking implies calculating the “deficit” of forgone rate cuts

9. Janet Yellen, Revolution and Evolution in Central Bank Communications, speech at the Haas School of Business, University of California, Berkeley, November 13, 2012, www.federalreserve.gov/newsevents/speech/yellen20121113a.htm.

and not raising rates until the deficit has been erased. Charles Evans et al. (2015) use this concept to argue that policymakers should remove accommodation only once inflation has overshoot its objective—only then can central bankers safely declare mission accomplished.

In the event, even if the Fed never projected an overshooting of inflation, it significantly delayed the beginning of the tightening cycle; by early 2017 interest rates were below what would be recommended by the optimal control rule. Whether this strategy will lead to an eventual overshooting of inflation, time will tell.

The better anchoring of inflation expectations in the United Kingdom than in the United States or the euro area is likely related to the fact that the BoE allowed a temporary overshooting of its inflation target during 2010–12, as shown in the previous chapter. If it works, why not do it?

Adding a Dual Mandate to Protect against Hysteresis

The reluctance to increase the inflation target—or at least aim for a period of above-target inflation that compensates the long period of below-target inflation—is even more suboptimal for economies suffering from hysteresis effects. DeLong and Summers (2012); Blanchard, Cerutti, and Summers (2015); and Fatás and Summers (2015) argue that a prolonged period of weak growth dents potential growth and that a transitory recession can therefore have a permanent negative impact on growth. According to this view, monetary policy can affect potential growth. By running the economy “hot” during periods of insufficient demand, especially insufficient investment, it can help prevent a deterioration of potential growth. Demand would create its own supply. Fed chair Yellen has argued that addressing this concern should be a major avenue of economic research.¹⁰

An additional factor to consider is the flatness of the Phillips curve. The Phillips curve relates the evolution of inflation to the evolution of the labor market and inflation expectations. In principle, a stronger labor market or an increase in inflation expectations should increase the probability that inflation increases later on. This relationship has changed over the decades. Blanchard (2016), IMF (2016a) and Miles et al. (2017) present evidence that the Phillips curve has become flatter in most advanced economies—that is, the response of inflation to changes in the unemployment rate has declined—and more responsive to inflation expectations. Blanchard (2016) shows that the variance of the error term in the Phillips curve is very large

10. Janet L. Yellen, “Macroeconomic Research After the Crisis,” speech at conference on the “Elusive ‘Great’ Recovery: Causes and Implications for Future Business Cycle Dynamics,” 60th annual economic conference sponsored by the Federal Reserve Bank of Boston, October 14, 2016.

and similar in magnitude to the level of inflation—meaning that the ability of the Phillips curve to forecast inflation is very weak. In addition, inflation expectations have become more adaptive—they have become more dependent on past inflation. A long period of very low inflation could thus push inflation expectations lower and (because the impact of the labor market on inflation has declined) anchor inflation at a lower level. These results imply that a period of economic expansion that leads to inflation above target does not require a period of recession to stabilize inflation at target, all it needs is for the economy to return to the steady state. This finding reinforces the desirability of aiming for a period of above-target inflation to compensate for the recent period of below-target inflation.

The combination of very flat Phillips curves and likely hysteresis in the labor market implies that the “divine coincidence”—the fact that, assuming no real wage rigidities, output reaches its potential level once inflation is stabilized (Blanchard and Galí 2005)—no longer holds. The divine coincidence was one of the bases for adopting single price-stability mandates, as stabilizing inflation delivers maximum growth. If it fails, then it will be optimal for monetary policy to have a dual mandate that seeks both price stability and maximum employment on an equal basis.

If the divine coincidence no longer holds and fluctuations in unemployment have small effects on wage and price inflation, then monetary policy that focuses only on inflation risks tolerating excessive weakness in unemployment and growth. In this environment the failure of monetary policy to react strongly enough to a large increase in unemployment (or a deep recession) because it observes that inflation is not reacting as much as expected would risk leaving the economy at a permanently higher level of unemployment. Interestingly, when, in the mid-1990s, the Fed was debating whether to set a target for inflation, Janet Yellen, then a member of the Federal Reserve Board of Governors, opposed it, because of the potentially negative impact on employment (Mallaby 2016).

The dual mandate explains one of the main differences in the policy actions of the Fed versus the ECB. Because inflation did not initially react much to the sharp increase in unemployment, the ECB interpreted most of the decline as an increase in the NAIRU (wrongly, in hindsight) and did not feel the need to ease aggressively to minimize the increase in unemployment. In contrast, the Fed had the obligation to meet the employment part of its mandate and eased policy more aggressively, even if it also (wrongly in hindsight) interpreted part of the increase in unemployment as an increase in the NAIRU. A dual mandate reduces the scope for errors.

The adoption of a dual mandate would facilitate the reaction to a large shock, as it would allow the central bank to adopt a more balanced approach and take more time to move inflation toward its target. The

change in the BoE's remit in 2013 provided the BoE with maximum flexibility to react to a shock. The BoE made use of this flexibility in its reaction to the Brexit shock by adopting a policy stance that projects persistent overshooting of inflation, as discussed in the next chapter.

A dual mandate would also facilitate communication with the public at times of sharp recessions. A central bank talking only about inflation while the unemployment rate skyrockets risks losing political support and compromising its independence. Central banks are political institutions and must continuously earn their independence. The BoE's introduction of the unemployment threshold in 2013 was driven, in part, by its desire to reinforce the democratic legitimacy of the inflation-targeting regime.¹¹ At times of financial crisis, when central banks have to engage in financial rescues (which are usually unpopular), inserting the real economy into the conversation will strengthen the independence of the central bank.

At the same time, with a dual mandate it is important that it remain clear that when unemployment is near the NAIRU, the binding constraint is price stability; the unemployment level is just an intermediate target. A dual mandate should be interpreted as maximum employment subject to price stability.

Starting a Process of Opportunistic Reflation

How do central banks get from here to there? They should start a process of “opportunistic reflation,” mirroring the process of opportunistic disinflation that led to the convergence toward 2 percent inflation rates since the 1980s (Orphanides and Wilcox 2002). The BoJ has shown the way. As it felt more confident that inflation was picking up, it moved the inflation target in small steps, from zero to 1 percent and then 2 percent. The BoJ is already engaging in opportunistic reflation. If it can be done from 0 to 2 percent inflation, it can be done from 2 to 4 percent inflation. The other central banks should do the same. As inflation approaches 2 percent, they should aim for a temporary overshooting of inflation to first consolidate the current target and then settle on a higher one. This may involve taking advantage of exogenous inflationary shocks to achieve the increase in inflation, possibly over a few business cycles, while aggressively resisting disinflationary forces. Such a move is not as heretical as some might think. Kiley and Roberts (2017) argue in favor of a policy rule that targets inflation at 3 percent when interest rates are positive, so that inflation can average 2 percent over the medium term (under the assumption that monetary

11. See Spencer Dale, “Inflation Targeting and the Monetary Policy Committee’s Forward Guidance,” speech at the International Journal of Central Banking Annual Conference, Warsaw, September 6, 2013.

policy will not be able to avoid a decline of inflation toward 1 percent during recessions, because the low neutral interest rate will preclude the central bank from easing policy enough).

The recent underperformance of inflation despite the large increase in central banks' balance sheets should create a more benign environment for a gradual transition toward a higher inflation target. Introducing regular reviews of the policy framework—as Canada does—would help overcome the inertia inherent to this process. Recent experience suggests that an inflation target of at least 3 percent, preferably 4 percent, would be advisable.

Tools: Be Ready to Use All the Tools at All Times

Even if central banks were to decide to increase their inflation targets, the probability of reaching the EZLB in the next recession remains high, as the target would change only over time. Therefore, central banks should be ready to use their full arsenal of tools, including cutting interest rates to the EZLB, buying assets in large amounts, and actively deploying forward guidance. If needed, they should use balance sheet policies at all times, not just when interest rates are zero. Once central banks recognize that financial frictions are a feature of financial markets, relying only on short-term interest rates will likely be suboptimal.

The size and composition of the balance sheet provides central banks with a finer degree of precision than the short-term interest rate. The interest rate on excess reserves (IOER) allows central banks to run monetary policy with a larger balance sheet. A financial system with excess reserves is likely to be more stable. It is true that introducing multiple tools could generate some additional uncertainty about specific asset prices, but it is a cost worth assuming in exchange for the greater ability to manage the economic cycle. Some central banks have decided to hold the assets purchased to maturity, others have decided to delay the sales of bonds at least until short-term interest rates have reached a positive level.

Active use of the balance sheet allows central banks to fine-tune their management of the yield curve and address specific risk premia in more direct ways, depending on the needs of the economy. Doing so is especially useful in an environment of large and persistent changes to financial regulation that may alter the demand for different assets and the ability of the financial sector to arbitrage and intermediate them. Of course, active use of the balance sheet must be symmetric. At times of excessive risk taking in certain segments of the markets, the central bank should be willing to use its balance sheet and lending policies to modulate excesses—by, for example, changing margin calls or shifting schedules of asset sales. If, say,

the housing market is looking particularly frothy because of speculative demand, the central bank could sell mortgage assets to cool it down while keeping the main interest rate unchanged.

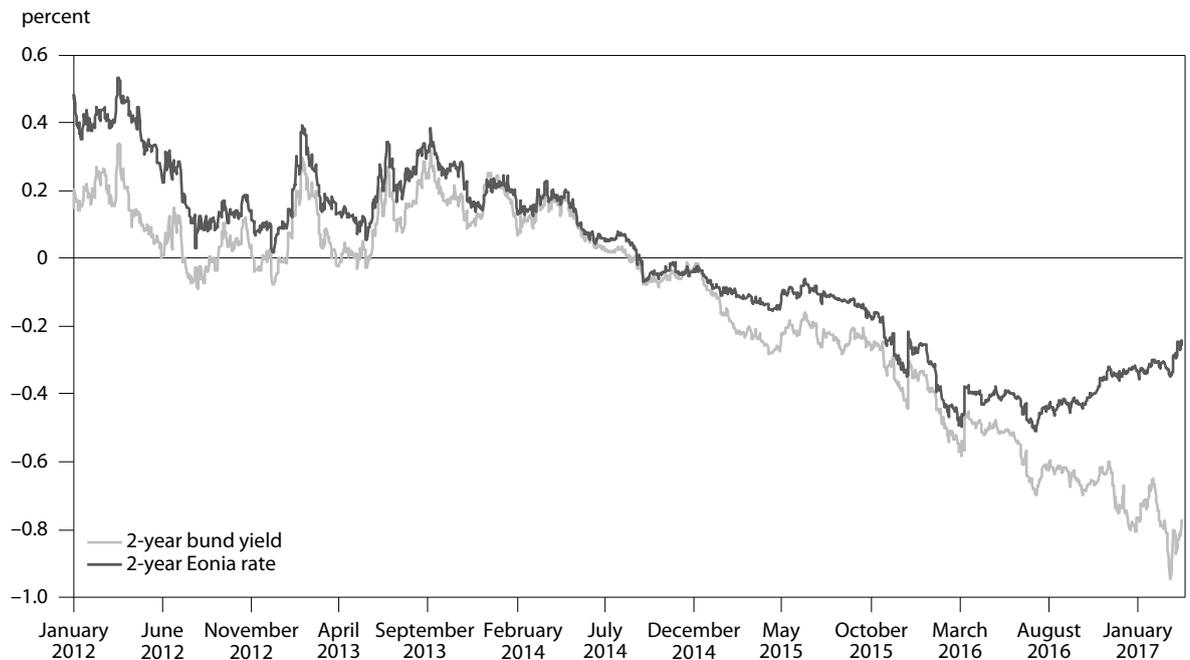
In addition to being willing to actively use their balance sheets, central banks should be open-minded regarding the range of assets they are willing to purchase. One reason some central banks may have eased less than optimally in the last few years is that they were reaching the limits of their purchases in the asset class they were purchasing and reluctant to move into other asset classes, a point made forcefully by Ball et al. (2016). The Fed, for example, was very mindful of market-functioning constraints when designing the flow rate of purchases in QE3.

These restrictions applied especially to the ECB and the BoJ. The ECB set up several rules—including purchases based on the ECB's capital key instead of market weights, and limits on purchases as a percent of issue and issuer—that constrained the availability of bonds for purchase. These rules were driven mostly by political concerns, at the expense of economic effectiveness. They created very severe dislocations in the market for German bunds during 2016–17, with the private sector competing with the ECB for ownership of scarce bunds. The size of this dislocation can be seen by the opening up of a wide spread between the two-year Eonia (money market) rate and the two-year bund rate, which reached record levels in early 2017 (figure 5.1). In fact, while Eonia rates were increasing, reflecting the improving performance of the euro area economy and the shift in stance of ECB policy, bund yields were declining. As a result, they fell to record negative levels, denting the profitability of financial institutions—and, along the way, providing an important subsidy to the German budget (because the lower rates reduced the interest rate cost of German government borrowing).

The BoJ's limits to purchases were not self-imposed but driven by the sheer size of its program. At the pace of purchases of ¥80 trillion a year and given the expected issuance of government bonds, the BoJ could reach the limits of possible purchases some time in 2018, under the assumption that banks, pension funds, and insurance companies will want to hold minimum amounts of government bonds. Holdings of Japanese government bonds by the banking sector are projected to fall to 5 percent of total assets by 2018, for example, when the BoJ would be holding more than half of all Japanese government bonds (Arslanalp and Botman 2015).

One obvious alternative is to expand the menu of eligible assets for purchase. The ECB has been very active in a variety of asset markets, including corporate bonds and asset-backed commercial paper. The BoJ has also ventured into private sector assets, including ETFs and REITS, but even there it is approaching capacity limits (e.g., its holdings of ETFs are approaching 50 percent of total ETF assets). This limit is not binding, as

Figure 5.1 Two-year bund yields and Eonia rates, 2012–17



Eonia = euro overnight index average

Source: Bloomberg.

the supply of ETFs grows endogenously with demand. The binding limit would be the share of all stocks owned by the BoJ, which is still very low, at about 2 percent.

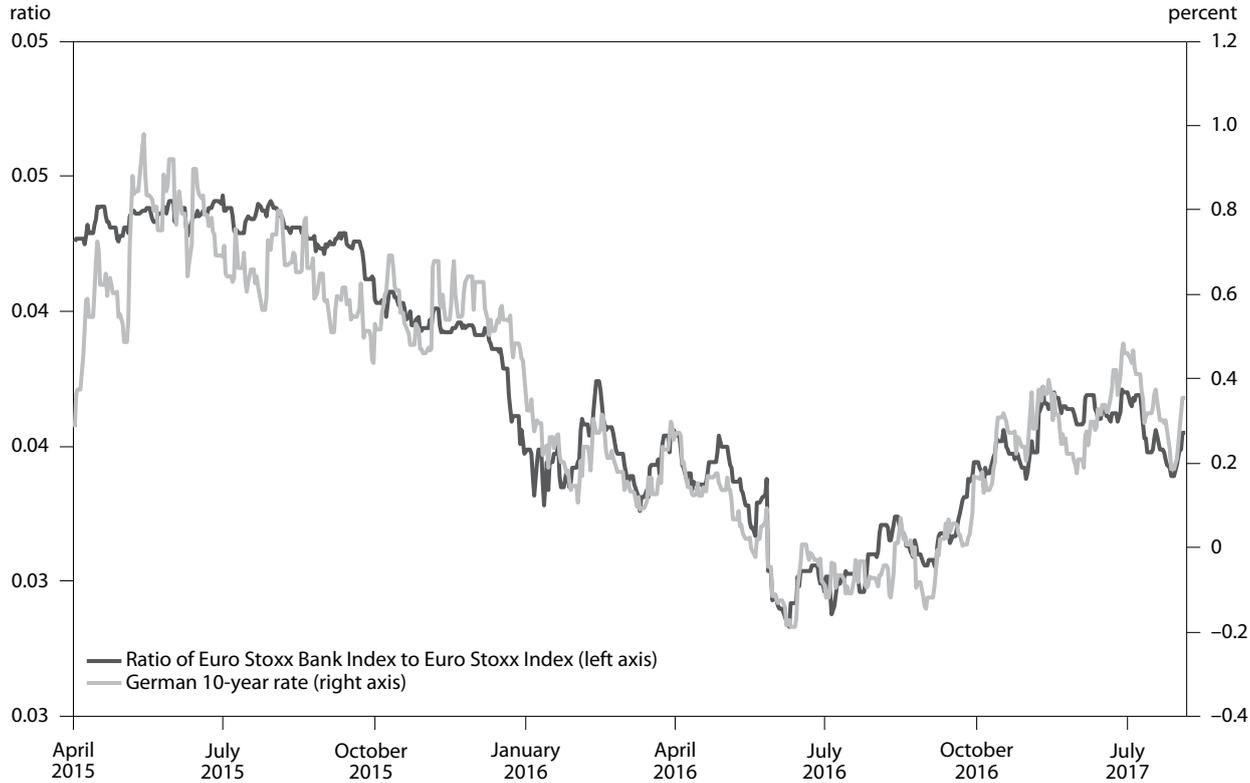
The BoE and the Fed limited their QE purchases to sovereign bonds (BoE) and government-guaranteed bonds, such as agency bonds (the Fed), although the BoE expanded into corporate bonds in the post-Brexit easing package. The lesson is that central banks should be able to buy all kinds of assets in a nondisruptive way. The Fed is severely handicapped, in comparison with the other main central banks, by its inability to buy private assets. The US market is the deepest and most liquid, yet the Fed cannot participate in it to ease policy. The Fed should be allowed to buy corporate bonds or equities.

Balance sheet policies seek to generate portfolio rebalancing. They want to increase the total purchases of risky assets of the economy to increase asset prices and reduce risk premia. Buying bonds is a way to do so in an indirect and, by definition, uncertain way. In some instances, it can backfire: The more bonds the central bank wants to buy, the more bonds the private sector wants to buy, creating at times severe dislocations. Buying equities, indices, or REITs would be a way to rebalance directly and more effectively.

Buying private assets would offer several advantages. First, it would reach sectors of the economy that are at a disadvantage when the banking sector is weak, such as small and medium-size enterprises (SMEs), by having central banks purchase the asset-backed securities of SME loans, for example. Second, it would probably reduce the amount of assets that need to be purchased to achieve the desired change in financial conditions, because it directly reduces risk premia and would not depend on the portfolio-rebalancing effect. Third, it would palliate the problem of the shortage of risk-free assets that large-scale purchases of bonds generates, which can create a self-fulfilling prophecy of ever lower interest rates.¹² A case in point is the acute shortage of German bunds generated by the ECB's purchases during 2016–17. The sharp decline in interest rates created a perverse dynamic for the European banking sector, as markets became gloomier about the sector's profitability (lower interest rates compress interest rate margins) and therefore reduced the valuation of European bank shares. For most of 2015–17, the relative performance of European bank shares just mimicked the evolution of German bund yields (figure 5.2). The ECB would have been more effective buying fewer German bunds and buying equities via ETFs,

12. Caballero and Fahri (2017) describe the related phenomenon of the “safety trap,” where a shortage of risk-free assets depresses asset prices. They argue that the safety trap can be alleviated by increasing the relative supply of risk-free assets, either via issuance of government bonds or purchases of risky assets.

Figure 5.2 Performance of European bank shares and German 10-year rates, 2015–17



Source: Data from Bloomberg.

which would have contributed more to lowering the elevated equity risk premium in the euro area. Fourth, buying private assets would reduce the incentive for corporate buybacks and the associated increase in corporate debt.¹³

This listing of advantages is not blind to the potential distortions that asset purchases introduce in markets, especially regarding eligibility constraints (e.g., the spreads on corporate bonds eligible for ECB purchases are narrower than the spreads on bonds that are not eligible, regardless of the intrinsic risk of the issuers). Overall, however, the weight of the evidence is in favor of purchases of private assets.

Widening the range of assets would also apply to lending operations. Central banks should be ready to lend against any collateral, properly priced and discounted. Bagehot's principle (lend against "good" collateral) should be updated. With the prevalence of market financing, central banks should be ready to accept all types of collateral. The definition of "good" collateral is, after all, arbitrary, as it is a function of the evolution of the economy. It is also endogenous, as it depends, to a large extent, on the actions of the central bank. The key issue is the pricing of that collateral. At the right price, all collateral is good, in the sense that the central bank is not expected *ex ante* to incur a loss. During times of stress, the solvency of firms could depend on judgments about the creditworthiness of assets; the central bank should therefore be very careful not to trigger a self-fulfilling crisis by not accepting certain types of collateral.

Establishing a Target Zone for Yields When the Assets Run Out

What if the central bank starts running out of assets to buy? A critical limit to the extent of asset purchases is the potential distortions to market functioning. It is possible that certain market participants would want to hold a minimum amount of certain classes of assets, such as government bonds, for regulatory reasons or because they do not want to face the possibility of principal losses. It is also possible that the extent of the easing program is such that the central bank ends up being the main owner of an asset class. For example, as part of its QQE program, the BoJ owns more than half of the ETFs on the Nikkei 225 and is one of the top five owners of almost half of the stocks on the Nikkei 225. This high level of ownership is not a problem in itself, as the BoJ does not own the shares directly but rather via its ETF holdings. It could increase the volatility of stocks with low free float (shares available for trading), however, and raise governance

13. A potential disadvantage is that equities are infinite-duration assets, and therefore at some point they would have to be sold. But this problem is not necessarily bigger than having to sell bonds—the key is to do it at the right time and in a gradual and transparent fashion.

questions if it were to continue for an extended period and the BoJ were to become majority shareholder.

The possibility of running out of assets to buy is a strong argument in favor of being as aggressive as needed when an asset purchase program starts. The BoJ has been buying equities for a few years, but always in token quantities and with a clear focus on not interfering with the price-formation mechanism. Limiting the quantities is understandable—the BoJ would not want to be accused of manipulating the stock market—but at the same time, the purpose of the purchases has to be to reduce the equity risk premium. If the quantity purchased is too small, the central bank could end up in a situation in which it already owns a large amount of assets but the impact has been minimal.

When the central bank starts running out of space to buy assets, an alternative would be to shift back from quantity targets to price targets. For example, in the case of government bonds, the central bank could adopt a strategy of target zones for the yield curve. It would have to be willing to buy all the bonds necessary to achieve the desired yield curve, but if the target is properly chosen, it may not have to buy many bonds. In an environment in which market participants become ever more reluctant to sell their government bonds and long-term yields have probably declined too much, the central bank could maintain the target zone with little intervention. The target zone would allow some price discovery to take place around point estimates of the neutral yield curve and avoid some of the rigidities of a yield target while keeping rates low enough.¹⁴ As the economy improves, these target zones could be widened—and eventually eliminated.

The issuance of Eurobonds would allow the ECB to apply this system of target zones for the euro area yield curve. In an environment of acute scarcity of risk-free assets, which may be a key factor behind the decline in neutral interest rates, the issuance of Eurobonds would also contribute to increasing neutral interest rates in the euro area—yet another manifestation of the paradox of risk. Skeptics oppose Eurobonds because they see them as increasing the risk for core countries, ignoring the fact that the issuance of Eurobonds, by allowing better sharing of risks and increasing the supply of risk-free assets, would reduce the risk for the euro area as a whole and for each of its members (see Ubide 2015b).

A target zone for yields would complete the toolkit of central banks at the zero lower bound. When yields are high and central bank holdings are

14. Imakubo, Kojima, and Nakajima (2015) provide a thorough discussion of the concept of the neutral yield curve, and the extension of the concept of the neutral interest rate to the shape of the yield curve.

low, central banks would purchase assets. When yields are already very low and central bank asset holdings high, they should set target yield zones.

Raising Capital to Protect the Central Bank from Potential Losses

Central banks should try to minimize macroeconomic risks, not the risks to their balance sheet. But central banks do not operate in a political vacuum, and potential central bank losses can have political implications. The story of the crisis shows that reluctance to incur eventual losses from asset purchases and foreign exchange intervention deterred central banks from being as aggressive as they should have been. Therefore, for central banks to be able to use their complete set of tools they need to strengthen their loss-absorption capacity.

Potential losses can look big, but they need to be looked at in context. For example, Seth Carpenter et al. (2013) show that a 100 basis point increase in long-term rates would lead to mark-to-market losses for the Fed of about \$300 billion, which is higher than its current loss-absorption capacity (about \$230 billion). In addition, an increase in the interest paid on reserves would reduce its profits from normal central bank operations to the point that the Fed could incur operational losses. These potential operational losses need to be set against profits, however, which generated more than \$400 billion in remittances to the Treasury during 2009–15, an amount several times greater than the precrisis level. In fact, under all their scenarios, even some that generate years of negative remittances, Carpenter et al. project cumulative remittances for 2009–25 of \$800–\$1,000 billion. The profit and loss assessment has to be made over the cycle—and over the cycle central banks are profitable most of the time.

In the case of the ECB, the distribution of potential losses became a thorny issue during the debate on the design of the QE program. The ECB operates under a risk-sharing framework for monetary policy operations. However, it adopted a special framework for QE in which most of the losses, if they were to occur, would remain with the national central banks (see Ubide 2015a). The issue is political, not economic, as valuation changes would become relevant only if the ECB were to sell the bonds (because they are valued at amortized cost and thus not subject to marking-to-market) or a country were to default. The BoE adopted a more explicit policy of full coverage for any potential losses by requesting an indemnity from the Treasury for each portion of its asset purchases.

Focusing on central banks' capital, and their profit and losses, is to a very large extent irrelevant. Central banks are not commercial banks. Their goal is to maximize national welfare, not their profits. Central banks can always create money to earn seigniorage and pay their bills, and they

cannot be declared bankrupt by a court. They do not need capital to cover startup costs or buttress their credibility to borrow in markets (unless they have to borrow in foreign exchange). In abstract, central banks do not need capital to operate.

If central bank profits are irrelevant, why the worry? Empirical evidence, mostly on less developed countries, shows a negative correlation between inflation performance and the financial strength of central banks. However, causation and the exact nature of the relationship have remained vague (see Stella 1997, Ize 2005, Stella and Lönnberg 2008, and Schobert 2008).

In its simplest form, a central bank earns a return on its monetary policy operations, its assets, and its issuance of base money (banknotes and reserves) and incurs operational costs. In principle, it steadily generates profits as long as people are willing to hold its liabilities at no interest and base money grows at least as quickly as operating expenses. A temporary shock that creates enough losses to deplete the central bank's capital would thus always be reversed in the medium run, except (a) when the economy falls into a persistent deflationary trap and the growth rate of banknotes falls below the growth rate of operating costs and (b) when the growth rate of the demand for banknotes falls short of nominal interest rates (Bindseil, Manzanares, and Weller 2004).

But even a negative long-term profitability outlook should not necessarily lead to failure to conduct monetary policy in an effective way.¹⁵ For that failure to happen, a relationship between central bank capital and other institutional factors, such as credibility or independence, is needed. From a conceptual standpoint, a better concept than capital for assessing the soundness of a central bank would be net worth (or financial strength). Net worth takes into account the central bank's "franchise value" (its monopoly over the issuance of money and the right to impose reserve requirements on commercial banks) and its off-balance sheet obligations (such as the potential need to bail out banks during crises or defend an exchange rate regime). Net worth depends on the functions for which the central bank has independent responsibility, and it varies over time. Therefore, the optimal size of a central bank's capital varies across countries. It depends on the bank's risk exposure (including currency, interest rate, and credit risks); profit-sharing and accounting arrangements; institutional strength; and crisis management responsibilities. The higher the risk exposure and crisis management responsibilities and the weaker the institutional strength and profit-sharing arrangements, the greater the capital buffers the central bank should build during good times.

15. For example, the Central Bank of Chile incurred significant losses during the 1990s from sterilization and bank recapitalization activities. It recorded negative net worth as late as 1997.

Central banks can be run with persistently negative capital, but doing so could create perverse incentives over time. A loss-making central bank may attempt to restore profitability by easing monetary policy in order to accelerate the demand for banknotes—which could be incompatible with its price-stability objective (Stella and Lönnberg 2008 define this problem as “policy insolvency”). For its part, the government may be tempted to put conditions on the recapitalization that could jeopardize the credibility and independence of monetary policy, leading to fiscal dominance.

Thus a condition for a credible central bank is to have positive net worth (its future stream of profits), regardless of whether current profits and capital are positive. Recapitalization arrangements must focus on the rapid rebuilding of equity. Most modern central bank laws require that in case of negative capital, the government issue to the central bank interest-bearing securities at market rates to restore capital levels and provide a level of core earnings that covers operating expenses, thus reducing the scope for further operational losses. A fully automated and fully credible rule of recapitalization by the government of the central bank in case of losses can be regarded as a substitute for positive capital.

Because such rules are difficult to implement in practice, however, positive capital levels remain a key tool to ensure that independent central bankers always concentrate on achieving their mandate.

This link between net worth and credibility is even more critical when central banks have to deploy tools that are highly dependent on the ability to do whatever it takes for as long as it takes, such as QE or foreign exchange intervention. If market participants doubt the resolve of the central bank because of its reluctance to incur losses (as happened recently in the case of the Swiss National Bank and its exchange rate floor), the policy may fail.

Therefore, a critical condition for the ability to use balance sheet tools effectively is a higher level of capital and loss-absorption abilities. For example, central banks should build reserves during good times to be able to deploy them in bad times, as the ECB has done. The government’s commitment to recapitalize the central bank in case of losses could become part of an agreement to be ratified every, say, three years. Such a scheme would increase the democratic oversight of balance sheet operations, which are, *de facto*, quasi-fiscal activities but are needed to maximize economic welfare.

Strategies: Adopt Cyclically Adjusted Forward Guidance

The successes and failures of forward guidance in the last several years have raised three main issues: Should forward guidance be explicit or implicit, should it focus on the baseline forecast or on alternative scenarios, and should it be adjusted depending on the cyclical position of the economy?

The debate on the specific form of forward guidance is as long as the debate on inflation targeting. No two central banks have adopted a similar strategy.

Explicit or Implicit Guidance?

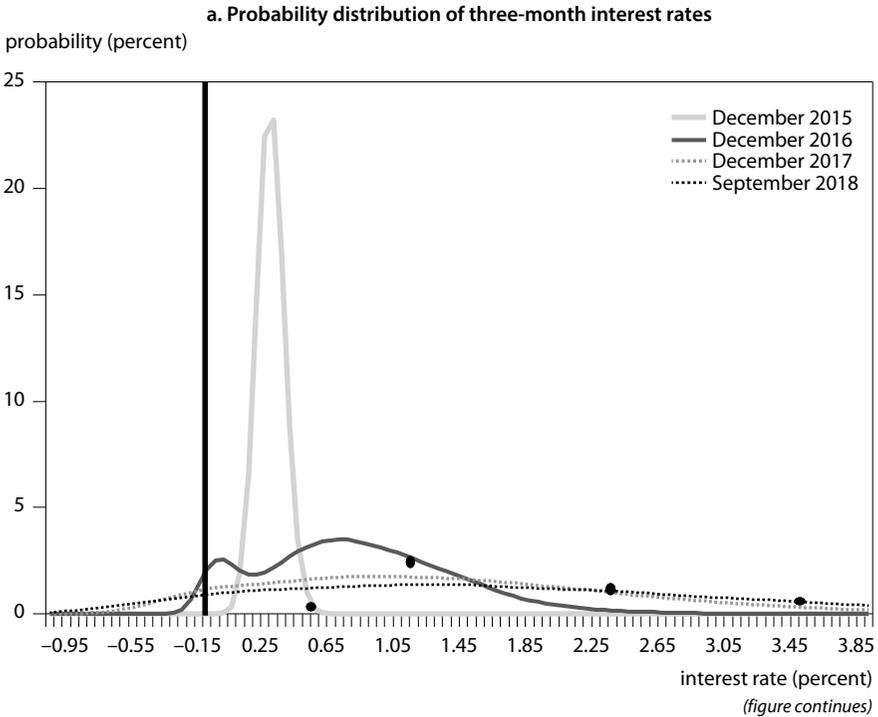
A few central banks have used explicit forward guidance. The Czech National Bank, the Bank of Israel, the Reserve Bank of New Zealand (RBNZ), the Norges Bank, and the Sveriges Riksbank all publish a path of interest rates. In 2012 the Federal Reserve started to publish a path for its policy rate, in the form of the dot plot, collecting individual FOMC participants' judgments of the appropriate level of the policy rate over three calendar years and the longer run. The BoE uses forward guidance implicitly, by publishing the path of market interest rates that underlies the inflation forecast. The ECB and the BoJ, still buying assets and at the zero lower bound, give calendar guidance on rates.

Explicit forward guidance outside the zero lower bound has had a mixed record. In general, markets have been reluctant to price the central bank path, especially beyond horizons of six months. Lars Svensson (2014) reviews the experience of the Sveriges Riksbank since 2007. He finds periods of success (2007–09) and periods of failure—for example, September 2011, when the Riksbank announced a policy rate path showing an increase of about 75 basis points over the next six quarters while market expectations before and after the announcement indicated a fall of about 75 basis points over the same period. Ex post the market expectations were right, and the Riksbank lowered the policy rate by 100 basis points over the next six quarters (Svensson 2015). The experience of Norges and RBNZ is similarly mixed, although there have not been long periods of explicit disagreement on the near-time direction of rates.

The experience of the FOMC with the dot plot is also mixed. During 2012 and 2013, market expectations were broadly aligned with the FOMC policy rate path. Sharp divergence appeared in 2014, with market expectations of policy rates falling increasingly below the FOMC dots. This divergence has remained ever since. Several reasons may explain this divergence. Chief among them is the fact that the market rate is a probability-weighted interest rate whereas the FOMC dots are an optimal policy path. The market shows the average across different scenarios, whereas the dots show what the Fed assesses to be the most likely path under its economic scenario.

The main difference between the Fed's experience and the experience of the other central banks is that market pricing has always been either in line with or below the FOMC dots, never above. The discrepancy has been

Figure 5.3 Probability distribution of US three-month interest rates in November 2015

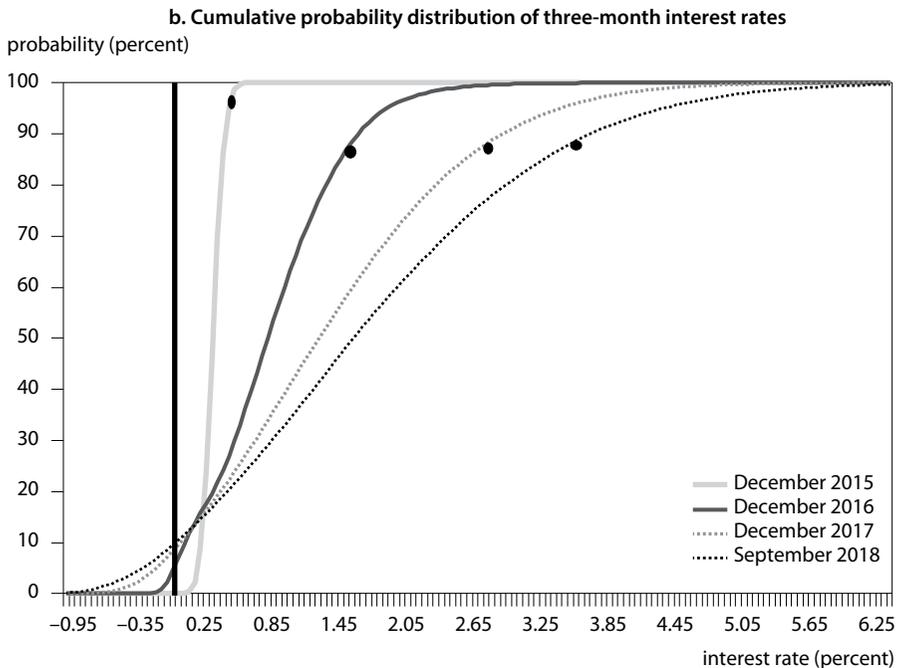


one-sided—and at times extreme. In fact, not only do markets think (rationally) that the probability of a bad scenario is not zero, they also think that the single most likely outcome for interest rates is lower than the FOMC’s.

Figure 5.3 illustrates this point by showing the probability distribution of three-month interest rates in the United States in early November 2015, just a few weeks after publication of the September 2015 dot plot. It shows that the market-assigned probability to the dot plot was very low. For example, the market suggested that there was close to a 90 percent probability that interest rates by December 2016 would be below the December 2016 dot. The range of probabilities for 2016–18 was very wide, but the mode (the peak probability) of the market distribution was always lower than the dots.

One possible explanation for this wide discrepancy is that the Fed was starting the tightening cycle after a long period of expansion and markets assumed a nonzero probability of a recession in the near term. Market pricing therefore reflected a probability-weighted path that included a nonzero probability of the Fed having to cut rates before having reached neutral levels. The market was pricing some probability of a policy mistake.

Figure 5.3 Probability distribution of US three-month interest rates in November 2015 (continued)



Note: The dots in the figures illustrate the location of the dots, for each dataset, from the September 2015 FOMC dot plot.

Source: Data from Bloomberg.

The BoE methodology—publish the inflation forecast under constant rates and under market rates and let markets make inferences—has its own problems. If the inflation forecast under market rates is at target, markets infer that the BoE is endorsing the market path. But, as BoE deputy governor Ben Broadbent stresses, this inference may not be correct.¹⁶ To start, if risk premia vary over time, it may not be easy to extract the path of expected interest rate moves from market pricing. In addition, several interest rate paths may lead to a similar inflation forecast, especially in situations in which inflation and the output gap are of the same sign. There are trade-offs in terms of timing and speed of interest rate moves that cannot be explained by an inflation forecast. The decision of when to start selling assets, for example, could introduce a kink in the interest rate path that cannot be inferred from the inflation forecast. A similar consid-

16. Ben Broadbent, “The MPC’s Forecasts and the Yield Curve: Predictions versus Promises,” speech at Reuters, Canary Wharf Midlands, London, November 18, 2015.

eration could apply to the exchange rate and how tolerant the central bank may be about rapid moves in it resulting from interest rate changes.

The experiences of the Fed and the BoE show that there is no perfect method for delivering forward guidance on interest rates. Central banks have made very large growth and inflation forecasting mistakes in recent years, which have cast doubt on their credibility. Precision is dangerous when the variables to be forecast are uncertain and subject to shocks.

Therefore, a better strategy is to focus forward guidance on describing the central bank's reaction function and its deep parameters (e.g., the desirable tradeoff between inflation and slack)—in other words, to communicate how the central bank would react to different scenarios. Doing so would allow central banks to deemphasize their published macro forecast as “illustrative”—an example of an outlook that the central bank sees as plausible and “likes” because it achieves the mandate objectives in a balanced manner—rather than as the best possible forecast of the economy at that time.

The Fed is close in spirit to this concept, as the forecasts it publishes in the dot plot for growth, inflation, and unemployment are conducted under optimal policies (and thus it is a forecast that the Fed “likes”) and Fed officials have discussed extensively the use of policy rules as informal ways of understanding their thinking. However, the dot plot is also prone to creating confusion, for two main reasons. First, because the dots are anonymous, it is impossible to link changes in them to changes in the growth and inflation forecast—and thereby infer the true reaction function of FOMC members. An improvement would be to identify each dot with its growth and inflation forecast on a historical basis (e.g., once a year for the previous year), so that analysts can better identify the reaction function.

Second, the dot plot forces the Fed to communicate in a time dimension—“three rate hikes this year”—leading markets to believe that this optimal path is the most likely outcome. However, markets do not believe this optimal path is likely to happen—and they have been right. In December 2015, for example, the Fed's path was suggesting four rate hikes in 2016; it ended up delivering only one. No wonder a survey of Fed communications gave the Fed a median grade of B–, highlighting the flip-flopping nature of this dimension of its discourse.¹⁷ Partly because of these problems, in mid-2016 St. Louis Federal Reserve Bank president James Bullard stopped submitting his rate forecast, arguing that the economy shifts among different regimes and that the accuracy of any rate forecast will therefore be very low and add more confusion than clarity.

17. Peter Olson and David Wessel, “Improving the Fed's Dots,” *Up Front* (blog), December 13, 2016, www.brookings.edu/blog/up-front/2016/12/13/improving-the-feds-dots (accessed on March 30, 2017).

This suggested emphasis on communicating the reaction function would also imply stressing possible alternative paths for growth and inflation and the policy responses that these alternative paths would require. The Norges Bank and Sveriges Riksbank have adopted this strategy, always showing alternative interest rate paths together with the baseline case. The BoE has started a similar, more narrative, approach in its *Inflation Report*, explaining the main assumptions underlying the forecast. Providing alternative rate paths is a way to educate markets on the likely reaction of the central bank to changes in the macroeconomic outlook and better approximate the concept that forward guidance is a conditional forecast rather than a promise.

Using Cyclically Adjusted Forward Guidance to Manage Leverage

The degree of explicitness and the focus on baseline or alternative scenarios are not static. Forward guidance should be cyclically adjusted, and vary depending on the cyclical position and the degree of risk aversion of the economy. Thought about this way, forward guidance would be the way monetary policy addresses financial stability and an integral part of the macroprudential toolkit.

A useful way to think about the relationship between forward guidance and financial stability is in terms of stabilizing the macroeconomic value at risk (VaR). VaR is a risk management tool widely used by financial institutions. It measures the expected loss of a portfolio as a function of portfolio size and the volatility of its assets relative to the capital available. The larger the portfolio size and the greater the volatility of its assets, the higher the expected loss. VaR is therefore a function of leverage (defined as portfolio size relative to capital) and uncertainty (for which volatility is a proxy). Financial institutions typically aim for a stable VaR, which makes leverage procyclical. During good times uncertainty is lower; for a given level of capital, portfolio size can be increased. During bad times higher uncertainty or portfolio losses that reduce capital require a reduction in portfolio size.¹⁸

This framework can be applied to the macroeconomic outlook. Assuming the economy wants to preserve a constant macroeconomic VaR, less uncertainty would make room for more leverage and vice versa.

A major source of macroeconomic uncertainty is the path of interest rates. If a central bank communicates a high degree of certainty about the expected path of interest rates, the economy will likely respond by

18. See the discussion about the interlink between leverage and uncertainty in crises in Ubide (2008) and Adrian, Colla, and Shin (2012).

increasing leverage—as happened when the Fed adopted the “measured pace” language in 2004–07. The economy became confident that there would be no interest rate surprises, and leverage rose. When interest rates are within normal ranges, the level of leverage is thus not a function of the level of interest rates but of the degree of certainty about the path of rates.

Leverage is a slow-moving variable, but uncertainty is not. Leverage should therefore be the purview of macroprudential supervisory and regulatory policies, and uncertainty should be the focus of monetary policy. For a given level of leverage, when uncertainty is within “normal” levels, monetary policy should focus on stabilizing inflation and maximizing GDP growth. When uncertainty becomes abnormal, either too high or too low, monetary policy should focus on restoring it to more normal values.

Uncertainty can be too low. The best indicator of financial stability is not past stability but moderate volatility in the recent past. In his 2015 book *Foolproof: Why Safety Can Be Dangerous and How Danger Makes Us Safe*, Greg Ip provides vivid examples from economics and finance as well as aviation and sports, making a strong case that too much safety can be dangerous and that some danger makes us safe. Forward guidance should aim at stabilizing uncertainty and risk premia within normal levels—not too low, not too high. This concern about stabilizing uncertainty around normal levels also applies to international capital flows. H el ene Rey (2014) documents the negative comovement between capital flows and credit growth on the one hand, and measures of uncertainty, such as the VIX, on the other. Abnormally low uncertainty leads to large capital inflows and rapid credit growth and vice versa.

How should the cyclical adjustment of forward guidance operate? Let’s start from a recession. Especially if it is driven by financial crisis, recession leads to elevated levels of risk aversion and uncertainty, which can become very elevated if monetary policy is constrained by the EZLB and there are doubts about the ability of policies to restore growth.¹⁹ In fact, a major drawback of the dynamic stochastic general equilibrium (DSGE) models used for policy analysis is that they assume that agents “know” that the economy will recover to the steady state after the shock. This assumption may be fair for a small shock, but it is not reasonable for a large, systemic shock with policies constrained by the EZLB.

Therefore, during crises and deep recessions, monetary policy should focus on reducing uncertainty, lowering risk aversion (the insurance channel of monetary policy), communicating a change in the reaction function that overcomes the restriction of the EZLB, and increasing confidence in a

19. According to the finance literature, time-varying risk premia are the main drivers of asset price changes (see, e.g., Cochrane 2012).

rebound to the steady state. In the context of the macro VaR, by reducing uncertainty, monetary policy can preclude an excessive reduction in leverage and contain its recessionary impact.²⁰ Narayana Kocherlakota and Jeremy Stein argue along similar lines, using a mean-variance approach.²¹ They suggest that policymakers should care not only about the level of inflation and unemployment but also about their variability. Doing so requires the central bank to be as precise and detailed as possible about the expected path of rates. Explicit calendar guidance becomes a useful complement to state-contingent guidance at the peak of the crisis, especially when the central bank has high confidence in the need to keep the strong easing stance for at least two years, the standard forecasting horizon of central banks.

This insurance channel of monetary policy suggests the design of balance sheet policies in an open-ended, state-contingent fashion, combined if needed with threshold-based forward guidance that “insures” the delivery of economic outcomes. Threshold-based forward guidance has an advantage over pure calendar guidance in that it is asymmetric: It promises to keep the easy policy stance during bad times, but if data provide sufficient surprise to the upside, it will breach the thresholds and the policy will end (see Boneva, Harrison, and Waldron 2015).

In fact, all of the most successful strategies during the crisis were open-ended and contingent on achieving economic objectives. Beyond the insurance motive, there is an additional logic to it. When a central bank starts an easing cycle from a sufficiently positive interest rate, markets immediately price the whole easing cycle, based on experience and a notion of the neutral rate. In principle, central banks could cut rates as much as needed, so cutting rates was akin to an open ended program.

With balance sheet policies, there is no such guidance. Markets do not have enough history to calibrate the amount of easing they should be pricing. If, however, QE is open-ended and based on credible forward guidance about economic outcomes, markets can use that guidance to price those outcomes. An additional advantage of an open-ended strategy is that if the central bank provides calendar guidance and then has to extend it, there is a risk of losing

20. Caballero and Simsek (2017) model a similar dynamic, in economies where the output and risk gaps are joint phenomena that feed into each other, and where policy needs to address both gaps. In their models, an increase in volatility depresses Sharpe ratios, lowering asset prices and growth. Policies that reduce volatility help increase Sharpe ratios and stabilize asset prices and growth.

21. Narayana Kocherlakota, “Discussion of 2014 USMPF Report,” presentation at the US Monetary Policy Forum, University of Chicago Booth School of Business, New York, February 28, 2014; Jeremy Stein, “Incorporating Financial Stability Considerations into a Monetary Policy Framework,” speech at International Research Forum on Monetary Policy, Washington, March 21, 2014.

credibility along the way, as the public may wonder if the policy is just ineffective rather than insufficient. Therefore, if political imperatives force the central bank to use calendar, rather than open-ended state-contingent, guidance, it should err on the side of too much, not too little.

As the crisis and recession subside and the economy recovers, forward guidance should become less explicit. Risk aversion and leverage probably stabilize around normal levels, and the central bank reaction function likely returns to its steady-state formulation. Guidance should therefore be based on the macroeconomic forecast, the expected pace of hikes, and the neutral rate. There is no longer a need to be as detailed as before, which provides the central bank with more flexibility to respond to unexpected shocks and avoid being boxed in by an explicit rate path that becomes, de facto, calendar guidance (as has happened to the Fed with the dot plot).

The mixed experience of the Norges Bank, RBNZ, and Riksbank would advise against providing the explicit interest rate path after liftoff. Because the noise-to-signal ratio in central banks' interest rate forecasts is high, more transparency is not necessarily welfare improving. If a central bank clearly communicates its economic outlook and reaction function, there is no need to also communicate the interest rate path that delivers that outlook; doing so is redundant, as one is a function of the other. Furthermore, central banks do not communicate only with financial markets—they also communicate with firms and households. What firms want to know in order to hire and invest—and what households need to know in order to make their consumption and saving decisions—is not the precise path of interest rates but that the central bank is ready to do what it takes to deliver strong growth and stable inflation and that average interest rates over the next few years will not be too high. The travails of the Fed with the dot plot show that communicating an explicit interest rate path can create a tremendous amount of noise, with very little benefit.

As the cycle matures and inflation is at or above target, the central bank will be facing the unpredictability of the next recession. It should communicate its growth and inflation forecast, its assessment of the amount of slack, and the balance of risks, but there is little information in the explicit path of interest rates, beyond signaling the best estimate of the neutral rate. Recessions are impossible to predict, and central banks do not have superior information in this regard. They should therefore probably reduce the amount of forward guidance.

In addition, at the top of the cycle, forward guidance should be reduced on financial stability grounds. When the economic cycle is advanced, there is a possibility that uncertainty could be reduced to abnormally low levels. Reduced uncertainty reduces margin calls and haircuts for levered investors and fosters an increase in maturity mismatches, either by shortening

the terms of debt financing or extending the horizons of investment projects (see the discussion in Brunnermeier and Pedersen 2009).

For example, the VIX was at record lows in 2006 and 2007, indicating very low expected volatility of asset prices. At that time the “measured pace” guidance of the FOMC was contributing to a high level of certainty about the expected path of rates. Certainty about the expected path of rates is a major determinant of carry trades, much more important than the level of interest rates. In the macro VaR framework presented above, the lower the uncertainty, the higher the leverage possible for a given level of VaR risk. Lower uncertainty leads to higher leverage.²² Therefore, when the cycle is more advanced, and asset valuations are typically richer, the excessive provision of monetary policy insurance can increase financial stability risks. Monetary policy should be wary of offering one-way bets. Systemic crises happen when paradigms are broken; monetary policy should avoid reinforcing paradigms.²³

Forward guidance is essentially akin to selling an option to the markets, an economic put; it is critical that this option be properly priced. As the cycle matures, the price of the option should increase, and the amount of forward guidance should diminish.

In summary, forward guidance should focus on describing the reaction function of monetary policy and be cyclically adjusted, varying the degree of explicitness as a function of the cyclical position of the economy and of risk aversion.

Communication: Stop Calling It Unconventional

Central banks entered the crisis hoping to return soon to standard interest rate policies, but they are going to spend the best part of a decade at the EZLB, and the odds are very high that the next downturn will arrive while interest rates are still low. At the same time, trust in central banks has declined. The share of respondents in polls who evaluated the job of the Fed as good or excellent fell from 53 percent in 2003 to 38 percent in 2014.²⁴ Forecasting mistakes have been large at times, low interest rates and

22. This relationship between volatility and leverage is a simple way to describe the “volatility paradox” of Brunnermeier and Sannikov (2014).

23. The crisis saw the smashing of three paradigms essential for asset pricing: house prices cannot decline, securitized assets are informationally insensitive, and repo has no counterparty risk (Ubide 2009). A fourth paradigm—there is no risk of the euro area breaking up—was broken later.

24. Jon Hilsenrath, “Years of Fed Missteps Fueled Disillusion With the Economy and Washington,” *Wall Street Journal*, August 26, 2016, www.wsj.com/articles/years-of-fed-missteps-fueled-disillusion-with-the-economy-and-washington-1472136026 (accessed on March 30, 2017).

asset purchases have been politically controversial, and central banks have increased their reach and power. As a result, their activities have become more salient, and the potential for a political backlash has increased.

Central banks need to step up their outreach to regain the confidence of the people. They can take several steps to enhance their communication.

First, central banks should change the language they use to communicate their policies. They must stop using the word *unconventional* to describe asset purchases, negative interest rates, or forward guidance—all of which are part of the arsenal of tools that the central bank must have at its disposal. Similarly, they should stop talking about *exit*. They should talk about adding or reducing accommodation, which describes a continuous process, not exit, which describes a discrete process. Central banks should stop using negative narratives to describe their policies. Doing so creates confusion and negative sentiment and fuels political opposition to these policies.

Second, central banks, especially the ECB, must explicitly stress that their inflation targets are symmetric. The ECB’s “close but below” formulation is a handicap in the face of the need to increase inflation and inflation expectations, because it creates confusion among politicians, policy-makers, and market participants. This lack of precision in its mandate is a key reason why the ECB has been persistently behind the curve. What is “close but below”? 1.5 percent? 1.9 percent? The answer makes an important difference at the time of recommending policies that could be politically costly in some countries.

Third, it is important to better prepare the public so that central banks can handle large shocks. The Fed’s statement of monetary policy provides a good benchmark with its “balanced” approach to achieving its mandate. This balanced approach is the narrative expression of the lambda (the ratio of the expected reduction of the inflation gap versus the output gap) in the inflation forecast targeting literature (see the discussion in Qvigstad 2006 and Svensson 2010). The lambda need not be constant, but it should change depending on the relative size of the inflation versus output gap. The central bank may at times prioritize the reduction of one of the gaps and communicate it clearly. This time-varying nature of lambda reinforces the recommendation made earlier about the adoption of dual mandates. Decisions about the tradeoff between growth and inflation should be made explicit in order to enhance the transparency and credibility of monetary policy.

Fourth, central banks should increase their efforts at educating the public about the way they reach monetary policy decisions—for example, by making available the model they use for simulations and policy preparations. Making the FRB/US model available has enhanced the public’s understanding of the tradeoffs involved in different interest rate paths. Other central banks should follow the Fed’s example.

Central bank speeches that explicitly discuss this tradeoff could complement this step. Members of monetary policy committees should articulate their views around this tradeoff, explaining their outlook and what it implies for the near-term path of interest rates. It is important for markets to learn about the diversity of views inside the central bank, but the diversity needs to be well articulated. There is an inherent conflict between transparency and efficiency in deliberations: Too much transparency when addressing complex policies can lead to public confusion and a deterioration of trust (Faust 2016). However, in the current context of increasing mistrust of central banks, the approach should be better, not less, communication. A well-informed community watching the central bank is the best way to ensure an efficient transmission of monetary policy actions to the real economy and to counteract the political criticism that central banks have become too discretionary, powerful, and unaccountable.

Fifth, central banks should explain to the public that they need the widest possible arsenal of tools. Financial crises typically require central banks to adopt policies that are not politically popular, such as bailouts that involve public funds, or asset purchases that lower interest rates for savers. Unfortunately, legislation adopted after the crisis, such as the Dodd-Frank Act in the United States, has restricted the ability of the central bank to manage crises, leaving the economy more vulnerable as a result.²⁵ Central banks should explain that the policies they adopt may look unfair but are designed to maximize economic welfare. They should actively counteract the criticism that QE increases inequality, hurts pensioners, or saves banks at the expense of workers. While chair of the Fed, Ben Bernanke went on 60 Minutes, a popular TV program, to explain Fed policies. Mark Carney, the governor of the BoE, has done similarly in the United Kingdom. Central bankers need to earn the trust of citizens. They should not shy away from communicating with the public at large in simple language.

Institutional Design: Financial Stability as Part of Central Banking, Not Monetary Policy

Perhaps the most important transformation of central banking since the crisis has been the focus on macroprudential policies. The debate on whether monetary policy should “lean against the wind” and preemptively tighten monetary policy to avoid financial excesses or “clean up” after the bust of a financial bubble has not been resolved. Who should take care of financial stability?

25. The Dodd-Frank Act included reforms designed to limit the discretion available to the Fed, the FDIC, and the Treasury to act without congressional approval, reducing their ability to act as a lender of last resort, guarantee liabilities, and safely unwind failing firms.

Conceptually, monetary policy should address the residual macro risks that regulation, micro, and macro prudential policies do not or cannot address (assuming that the cost-benefit ratio of addressing that residual policy risk is positive; otherwise, the central bank should try to convince other policymakers to address it). But defining these residual risks is challenging. Assessing asset mispricing is complex; there is no reason why central banks should be better able to price than markets. In addition, because innovation and financial development are an integral part of economic growth, Type II errors are easy to make in bubble spotting. Macro measures of leverage, such as the credit-to-GDP ratio, have given plenty of false signals, and monetary policy is difficult to calibrate for such a slow-moving variable.²⁶ Regulation and macroprudential policies, including horizontal assessments and stress tests, not monetary policy, should be used to control leverage.

Price stability may not be sufficient to guarantee financial stability. The financial cycle and the business cycle can become out of sync, especially during periods of persistent structural change, and risks can emerge in the periods of disconnect between the two cycles. In the run-up to the global financial crisis, for example, imbalances were building up in the housing and financial sectors while inflation was low and stable.

The mandate of monetary policy should be to deliver maximum growth subject to price stability. It should not include addressing potential instability in financial markets (beyond changing the nature of forward guidance as a function of the cycle, as discussing above). Financial stability should be the remit of macroprudential policy. Such policy is not a panacea that will forever prevent financial crises—and it can introduce unforeseen distortions—but it is superior to burdening monetary policy with an additional objective for which it does not have an effective instrument.

Monetary policy cannot, and should not, be used to deal with financial instability in asset markets, for several reasons. First, price-stability and financial-stability objectives can at times lead to contradictory policy needs, and monetary policy should not abandon its publicly stated priorities. It would be highly controversial, for example, to engineer a mini-recession to cool down asset markets while inflation was in line with price stability or to refrain from boosting economic activity as needed to achieve the inflation target in order to guard against perceived financial excesses. As the recent Swedish experience shows (see the discussion below), the latter strategy could seriously endanger the price-stability mandate of the central bank and dent its credibility.

26. Stein, “Incorporating Financial Stability Considerations into a Monetary Policy Framework.”

Second, it is unclear whether monetary policy, through its interest rate policy instrument, can effectively influence and target asset market prices. Capital asset price models (CAPMs) assess prices as a function of the discounted stream of future earnings, using the interest rate as the discount factor. But the empirical relationship between interest rates and asset prices is weak and unstable and, as Greenspan's famous "irrational exuberance" speech showed, verbal interventions have very limited, if any, effectiveness.

Third, monetary policy simultaneously affects all sectors of the economy. It is therefore a very rough and ineffective tool for coping with specific imbalances in the financial sector.

Fourth, it is essentially impossible to define an operational interest rate rule to deal with financial instability, given the very vague, imprecise, and often contradictory evidence on the effects of interest on asset prices and of asset prices on economic activity.

Finally, by independently addressing financial stability concerns, macroprudential policy provides monetary policy with additional input for its decision and room for maneuver to better focus on ensuring price stability, thus enhancing the welfare of the economy.

Add Macroprudential Policy to Central Banking

Macroprudential policy uses regulatory measures to deal with systemic financial risk, which may originate from three sources: (1) macroeconomic shocks, which can make the financial sector vulnerable; (2) contagion, which may stem from the default of a few financial institutions as a result of growing interconnectedness in the system; and (3) the development of endogenous financial imbalances associated with credit booms, excessive leverage, and risk taking by financial institutions. A systemic approach is critical, because sound capital and liquidity at the level of individual institutions, as monitored by microsupervision, does not guarantee the stability of the system as a whole, as the crisis showed. Systemic risk arises from the intrinsic excess procyclicality of the financial system and the complex interconnections across institutions.

In this context macroprudential policy has two main objectives: to enhance the resilience of the whole system and to smooth the financial cycle. The first challenge for macroprudential policy is to identify the variables policy should aim to lean against, in order to reduce excess procyclicality and interconnectedness. Standard variables include equity, the interest rate, and housing and credit markets as integral components of the financial cycle. The most important driver of the financial cycle is credit flows into real estate. The correlation between mortgage credit flows and house prices is strongly self-reinforcing (Favara and Imbs 2015).

Having the tools to address the link between credit and real estate is therefore critical to the success of macroprudential policy. The instruments should span the domain of lenders and borrowers and include most of the microsupervision instruments related to capital and liquidity when applied to the system as a whole, beyond the specific characteristics of individual exposures. They also extend to other categories, such as limits to loan-to-value ratios in housing credit, countercyclical capital buffers, global leverage ratios, and haircuts and margin requirements in securities transactions and clearing activities.

Acting on the lending side involves imposing conditions on banks and other lending institutions that enhance the resilience of the financial institutions either in case of losses (capital-based instruments) or in funding crises (liquidity-based instruments). These conditions include capital buffers, sectoral risk weights, loan-to-deposit ratios, and loan-to-core funding ratios. The Basel Committee on Banking Supervision (BCBS 2010) suggests that a 1 percentage point increase in capital requirements reduces the likelihood of a systemic crisis by 20–50 percent. Acting on the borrower side involves imposing restrictions on borrowers that limit their risk taking and reduce their probability of default and loss given default. These restrictions include, among others, loan-to-value ratios, loan-to-income ratios, and debt service-to-income ratios.

Both sets of instruments are necessary. There are several potential problems with using only lending-side instruments to smooth the financial cycle. First, capital-based measures tend to focus on building resilience and are hence applied in a static way (with the exception, of course, of the countercyclical buffer). Second, even if applied in a more dynamic fashion, such measures have only indirect and limited effects on the costs of loans and thus on mortgage lending growth, limiting their effectiveness in environments of optimistic expectations of house price appreciation. Thierry Tresselt and Yuanyan Zhang (2016) find that, for the euro area, capital-based measures are effective in slowing credit growth and house price appreciation, with the main channel of transmission the cost of loans and banks' interest rate margins.

Third, it is not clear that lending-side instruments have any effect during asset price downturns. They are essentially ways to force banks to adopt more conservative valuations of their balance sheets during boom times, something that markets could agree on. It is very difficult to make a convincing case in favor of a more aggressive valuation during downturns and to convince markets of it. There is therefore a certain degree of asymmetry in lending-side instruments that could be very difficult to overcome.

Borrower-side instruments are generally more effective in curtailing excessive credit growth via lower bank leverage and weaker asset growth

during booms (see Cerutti, Claessens, and Laeven 2015). Whenever possible, these indicators should be constructed as ratios to income, not prices, in order to prevent undesirable procyclicality. As the recent experience in the United States and Spain shows, during housing booms loan-to-value ratios likely underestimate the true amount of leverage. These indicators should be time varying, in order to be effective and avoid procyclicality. An alternative to varying the ratios over time would be to conduct borrower stress tests that incorporate interest rates, housing price, employment uncertainty, and the speed of repayment.

Borrower-side instruments should be applied based on activity (lending) rather than institutional characteristics (bank versus nonbank), in order to minimize leakage. Institution-based application can lead to leakage via cross-border activities of branches and cross-sector activity of nonbank lending activities. These leakages are likely to be dynamic: Financial markets will evolve as new regulations and policies are put in place. Monitoring of coverage therefore has to be continuous.

A strong case can thus be made in favor of a solid macroprudential policy framework. But who should be in charge of macroprudential policy? Monetary policy and macroprudential policy are very closely related. Monetary policy action and its transmission to the real economy via the financial sector determine the impact of monetary policy. Markus Brunnermeier and Yuliy Sannikov (2014) argue that in a world with financial frictions, central banking should follow a “bottleneck approach,” constantly trying to identify the sectors that impair the transmission mechanism. This approach leads to an integrated view of monetary and macroprudential policies, as causality runs both ways. Forward guidance can affect risk taking and leverage. At the same time, tighter macroprudential policies create downward pressure on inflation. Coordination between monetary and macroprudential policies should therefore be close.²⁷

The institutional setting is critical in this regard. The lack of response by the Swedish Financial Stability Authority to the repeated calls by the Riksbank to tighten macroprudential settings in the Swedish housing market led to the Riksbank’s decision to use the flexibility embedded in its inflation-targeting mandate to tighten policy with the near-term objective of preventing overheating of the housing market and reduce longer-term recession and disinflationary risks. The result was too low inflation, which led the Riksbank to change strategy and ease policy aggressively, despite a still overheated housing market.

27. See the discussion on the interaction between monetary and macroprudential policies in Borio and Drehmann (2009); Agur and Demertzis (2010); and Angelini, Neri, and Panetta (2011).

The lack of a proper institutional setting for macroprudential policies in the United States is a major risk factor for the US economy. The euro area setting is more solid but still suboptimal, as many macroprudential policies are decided at the national level while monetary policy is set at the euro area level. National macroprudential policies can have spillovers for the entire euro area. For example, a refusal by, say, Germany to tighten macroprudential policies in its housing market could lead the ECB to have to adopt a suboptimal policy for the euro area.

The Financial Policy Committee (FPC) is close to an optimal institutional setting. It is part of the BoE, independent of the Monetary Policy Committee (MPC) but with some shared membership. The close cooperation in the BoE between the MPC and FPC was displayed during the period after the Brexit referendum. The easing package delivered by the BoE had elements of both monetary and macroprudential policy (e.g., the decision to reduce the countercyclical capital buffer for banks). The risk of housing macroprudential policies in the central bank is that financial crises could hurt its credibility and contaminate the credibility of monetary policy. But the benefits of better coordination and flow of information surpass these potential costs.

In summary, financial stability should not be the mandate of monetary policy, but it should be part of central banking. Because of the endogeneity between the two policies, macroprudential policy should be independent of monetary policy, but the central bank should closely coordinate both.

A Game Plan for the Future

Expansions do not die of old age. But the odds of a recession increase as the business cycle progresses. As the output gap closes, the odds of overheating—be it in the real economy, via goods and services inflation, or in the financial sector, via emergence of asset mispricings and, eventually, bubbles—increase.

A standard recession requires at least a 300 basis point cut in real interest rates. Given the secular downward trend in equilibrium real interest rates, current market pricing of future nominal interest rates, and inflationary trends, the probability that major central banks will have that room to cut real interest rates when the next recession hits is low. The package of structural changes for central banks and their monetary policy framework outlined in this chapter is based on the experience since 2007 and the lessons learned from it. It includes a process of opportunistic reflection toward a higher inflation target and the adoption of dual mandates; a willingness to use the full arsenal of tools at all times, combined with higher capital to protect against losses and free central banks from polit-

ical interference; cyclically adjusted forward guidance to better manage risk taking; more effective communication to eliminate the stigma of asset purchases and forward guidance; and better integration of macroprudential policies in the institutional setting of central banks.

Some of these changes may prove to be politically impossible or may not be ready in time for the next recession. But there should be no doubt that they are badly needed. Some central banks are already putting some of these suggestions in practice, as the next chapter shows.