

Monetary policy after the crisis: mandates, targets, and international linkages

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The global financial and economic crisis of 2008 has raised several questions on the future of central banking in general, and of monetary policy in particular. This paper focuses on three of these questions: central bank mandates, price stability/inflation targets and international monetary policy linkages. While the crisis has effectively moved financial stability to the center stage of central banks' policymaking, no consensus has emerged on the extent to which financial stability needs to be reflected formally in central bank mandates. There has, however, been a change in how financial stability concerns are reflected in monetary policy analysis. We do not see that the crisis has produced any new arguments in favor of dual central bank mandates that include growth or employment in addition to price stability. Despite ongoing debate, the crisis has not prompted constraints on central bank independence as central banks' consistent drive for more transparency has enhanced their accountability commensurately with their broader scope of action. Regarding inflation targets, we discuss the pros and cons of several proposals, in order to cope with a possible secular decline in the natural rate of interest and a flatter Phillips curve. The most promising strategies in our view are those with a flexible interpretation of the inflation target, e.g. with flexible time horizons for reaching the target or with tolerance bands. Finally, unconventional monetary policies have highlighted international monetary policy spillovers and raised concerns about global competitive devaluations and monetary easing cycles. Attempts toward closer international coordination have, however, been muted. It seems that future generations of policymakers will also have to deal with spillovers from large countries as best as they can.

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The 2008 Great Financial Crisis and its global consequences sharply changed monetary policy from what had been considered best practice during the “Great Moderation.” Central banks had to deal with the deepest financial and economic crisis since the 1930s. As a result, financial stability concerns dominated monetary policy considerations for some time around the world. A sovereign debt crisis in several euro area countries jeopardized the very existence of the currency union, prompting the Eurosystem to take far-reaching steps to preserve the integrity of the monetary union. These crises caused inflation to temporarily drop below zero, with inflation and inflation expectations deviating persistently from central banks' targets. With official monetary policy rates approaching the effective lower bound, new territory was tested both for interest rates and “unconventional” monetary policies.

Now, more than ten years after the onset of the crisis, the world economy and the euro area are enjoying a long period of robust economic recovery with unemployment rates receding markedly. However, financial and real asset prices have risen in many countries, reflecting improved economic prospects and expansionary monetary policies, but raising concerns about new price bubbles and possible financial imbalances. Central banks have become key arbiters in a fast-changing financial sector, acting alongside newly created regulatory and supervisory bodies.

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Income pressure from low interest rates and cost pressures from financial innovation, combined with more stringent financial sector regulation, have induced a surge in less regulated shadow banks and prompted financial firms to adjust their business models and change their lending behavior.

Hence, monetary policy faces a different environment than the one before the crisis. Wage and price developments seem to have changed their response to growth and unemployment, keeping consumer price inflation low. In addition, the level of the “natural rate of interest” may be lower than before the crisis. Expansionary “unconventional” monetary policies (including large-scale purchases of various asset classes and zero or negative policy rates) have replaced pre-crisis standard monetary policy measures. Through large-scale asset purchases, central banks have become prominent holders of government and corporate debt, influencing asset prices, yields, risk premiums and market liquidity. The monetary policy stimulus injected – or eventually removed – in major countries also accentuates potential spill-overs to other countries.

Against this background, this paper discusses three topics. Section 1 provides an overview of the ongoing discussion whether the pre-crisis consensus on the central bank mandate(s) warrants adjustments. In this context, box 1 addresses the question of whether the increased responsibilities of post-crisis central banks are compatible with current arrangements for independence and accountability. Based on this, section 2 discusses recent developments and arguments relating to the definition of price stability. In this context, box 2 outlines the implications of the zero (or effective) lower bound of interest rates. Section 3 addresses international monetary policy spillovers and reflects on lessons to be drawn from the crisis. Finally, section 4 offers a summary and draws conclusions.

1 Central banks’ mandates between monetary and financial stability

1.1 Flexible inflation targeting as central banks’ pre-crisis best practice during the “Great Moderation” ...

Central bank mandates reflect both the evolution of economic thinking as well as society’s preferences, which in turn reflect economic developments. The prevailing consensus in central bank mandates – the pursuit of price stability – is the product of lessons from previous crises. In the past, flawed monetary policy regimes were often the cause of both economic and financial crises (Bordo and Siklos, 2017).

The policy responses, as well as the growth and inflation experiences (“stagflation,” “Great Inflation”) after the 1974 and 1981 oil price shocks, prompted economists and policymakers to fundamentally reconsider their understanding of macroeconomics and the role of monetary policy in stabilizing the economy. The consensus that arose, and still prevails, is that economic growth is driven by real economic factors (such as the capital stock, labor force and technological progress). Monetary policy can mitigate fluctuations in growth and employment around potential or trend growth only in the short run, but is neutral in the long run. Moreover, since central banks can only control nominal variables, they should provide a nominal anchor and therefore be primarily accountable for consumer price stability. This is the best contribution the central bank can make to stabilize the economy (Mankiw and Reis, 2017).

In Europe many countries pegged their currencies to the Deutsch mark after the breakdown of the Bretton Woods System. Thus, the Bundesbank provided the nominal anchor in a fixed-exchange rate system – a system that would eventually be replaced by the Economic and Monetary Union (EMU). During the 1990s, inflation

targeting became the standard global approach to monetary policy (Bordo and Siklos, 2017; Cobham, 2018). Inflation targeting – understood as “the commitment to a quantitative objective for medium-term inflation” (Reichlin and Baldwin, 2013) – has evolved since its introduction in New Zealand in 1991. Its implementation and exact definition varies across central banks (Mishkin and Posen, 1998). “Flexible inflation targeting” refers to an approach where a central bank’s response to economic shocks depends on the type of shock. This gives the central bank some leeway in the speed at which it should return to its inflation target.

While the European Central Bank (ECB) does not pursue an inflation targeting strategy, it does aim for consumer price stability, which it defined as reaching an inflation rate of below, but close to, 2% over the medium term. The EU Treaty relegates the pursuit of growth and full employment to a secondary level. In practice, the state of the business cycle and the labor market feeds into the ECB’s assessment of the outlook for price stability.

By contrast, the U.S. Federal Reserve (Fed) has a dual mandate that considers both full employment and price stability, for which the Fed adopted an explicit (numerical) inflation target of 2% in 2012. Advocates of a dual mandate argue that there are situations where a tradeoff between output stability and price stability exists (in the short run). For example, a cost-push shock (e.g. an oil-price shock) increases consumer prices, while it slows down economic activity. In such a scenario, the central bank should, according to advocates of a dual central bank mandate, take into account both economic and price stability. Assuming long-run neutrality of money, this means in practice that the speed at which price stability is restored is slower than if economic stability is ignored. Another example is a situation in which growth is vigorous but inflation is below target, due to structural and global factors. In such a situation, a dual mandate might give the central bank more leeway in the speed at which it normalizes its monetary policy stance, by temporarily tolerating below-target inflation.

1.2 ... but then came the Great Financial Crisis

The two decades up to 2007 are often called the “Great Moderation,” reflecting the smooth path of growth at consistently low rates of consumer price inflation. Part of the reason for this success was attributed to independent central banks pursuing the primary objective of consumer price stability (mostly by using inflation-targeting strategies). However, in 2008 the Great Financial Crisis prompted an abrupt reconsideration of this assessment.

In the aftermath of previous crises, monetary policy was often perceived either as having sowed the seed of the crisis (due to an overly expansionary pre-crisis monetary policy stance) or as a reason why the crisis was not adequately managed (e.g. too little accommodation too late, undue accommodation weakening the necessary adjustment incentives of other actors, etc.). This time has been no different, and the notion that price stability is a necessary and sufficient condition for economic and financial stability has been questioned (Reichlin and Baldwin, 2013).

The long-term neutrality of monetary policy and the existence of a natural rate of interest² serving as a guidepost for monetary policy are seen as the foundations

² *The natural rate of interest is broadly defined as the rate at which the economy is at full capacity and the rate of inflation is constant. The monetary stance is considered restrictive if the policy rate is above this natural rate, because in this case inflation will fall, and vice versa.*

of inflation targeting (Blanchard, 2018). Monetary policy is said to be neutral because in the long run it only affects nominal variables (interest rates, prices, money stocks) but not real variables (GDP, consumption, employment, etc.). However, the Bank for International Settlements (BIS) argues in several studies that the expansionary monetary policies followed by most major central banks since the introduction of inflation targeting have led to a secular decline in real interest rates, which in turn contributed to a build-up of financial imbalances (Borio et al., 2017). The main argument is that structural changes³ have altered the inflation process,⁴ so that monetary policy has less control over inflation. Since real interest rates are nominal rates minus inflation expectations, each time the nominal interest rate is cut (while inflation expectations do not change) real interest rates are pushed downward. As, however, inflation does not recover sufficiently due to the aforementioned global factors, the central bank subsequently does not bring nominal and real interest rates back up to the initial level. As a result, monetary policy may in the long run turn out to influence the level of real interest rates and thus no longer be neutral. In this view, a protracted period of expansionary monetary policies geared narrowly toward consumer price inflation targeting can create financial imbalances and a misallocation of credit, which as a further consequence can weaken potential output and therefore also may lower the natural rate of interest.

Many argue that the natural rate of interest has fallen considerably since at least the onset of the crisis (but probably for longer), due to weaker productivity growth, a slower-expanding and aging population, cheaper capital entailing lower investment needs, higher income inequality, a global savings glut emanating from emerging economies, and higher risk premiums. There is no agreement, however, on the scale of this effect or its duration. Furthermore, looking at very long-term developments, Borio et al. (2017) question the very existence of this phenomenon and its frequently cited possible explanations. Due to the uncertainties surrounding estimates of the natural rate of interest, critics argue that it should not be used as a guidepost for monetary policy. The fact that inflation has recently not responded to monetary policy as fast as in the past, is considered by some as evidence that central banks are using a flawed economic model (Reichlin and Baldwin, 2013). As a result, there is an ongoing debate whether consumer price inflation targeting is still best practice, or whether central bank mandates should be extended to include financial stability.

1.3 What should be the relationship between monetary policy and financial stability?

The Great Financial Crisis highlighted one of central banks' core functions, namely to act as a lender of last resort, and prompted them to devote more attention and effort to maintaining and restoring financial stability. Central banks in many countries had to "mop up the mess" of the financial crisis. Many of the tools implemented in response to the crisis as well as the institutional arrangements developed in response to the crisis to bolster financial stability conferred major powers on central banks (see Aziz, 2013, for a detailed review of changes after the crisis).

³ *Globalization, digitalization of the economy, etc.*

⁴ *Inflation responds less strongly/quickly to the level of slack in the economy.*

More importantly, the financial crisis made clear that central banks cannot simply ignore financial stability. On one hand, the Great Financial Crisis disrupted the monetary transmission mechanism and the effectiveness of monetary policy, thus seriously hampering the achievement of price stability for a prolonged period. On the other hand, the financial crisis as well as the deployment of unconventional monetary policy measures, has also made clear that monetary policy has a large influence on financial stability (Papadia and Välimäki, 2018). Therefore, the crisis highlighted the need to analyze financial sector developments very closely and to integrate financial markets in central banks' models and analytical tools (Reichlin and Baldwin, 2013).

1.4 ... should central banks have a financial stability mandate as part of their monetary policy function?

There seems to be a broad consensus on the importance of micro- and macro-prudential policies as separate tools to contain financial imbalances. At the same time, the hotly debated question as to whether monetary policy should additionally “lean against the wind” to avoid financial asset bubbles has still not been resolved.

A related question is whether to include financial stability in the central bank mandate (Bordo and Siklos, 2017). This would mean that monetary policy not only considers price stability, but also its effects on financial stability. Thus, central banks would not just forecast economic activity and inflation: they would also have to perform stress tests to gauge the effects of the monetary stance on credit conditions, asset prices and ultimately financial stability. Such an approach would go beyond the hotly debated issue of whether central banks should “target asset prices” and would imply that central banks analyze and assess whether financial imbalances are building up. The task would then be to design monetary as well as micro- and macroprudential policies in an integrated manner so as to optimize economic performance while minimizing risks (Eichengreen et al., 2011).

Others argue that financial stability policies (rather than monetary policy) are better equipped to take measures to control the buildup of financial imbalances, in particular when they affect specific sectors. Macro- and microprudential measures are more effective than monetary policy in preventing such imbalances. In this view, monetary and financial stability policies should remain distinct, with separate mandates, instruments and institutions (see e.g. Bordo, 2017). The most compelling argument is that price stability and financial stability may imply tradeoffs. For example, in a balance sheet recession the central bank would reduce interest rates to stimulate the economy, while the financial stability authority might wish to tightening regulation to avoid exaggerated risk-taking (Hellwig, 2014).

For a currency union like the euro area, this last argument is even more compelling. In a monetary union, there will inevitably be countries and/or sectors at different phases of the business and financial cycle. Overheating could theoretically occur in one isolated market. Interest rate policies aimed at curbing this market may have unnecessary adverse effects for the rest of the economy. In this case, national micro- and macroprudential measures are better suited to address the buildup of local imbalances.

Central bank independence and accountability

The lessons drawn from the Great Inflation of the 1970s combined with new developments in economic theory (rational expectations, time inconsistency theory) have led to the consensus that central banks are more credible and thus effective when they are independent from their governments. Being exempt from the political decision-making process, with its short-term electoral pressures, central banks are seen to be in a position to react more consistently and effectively to safeguard price stability.

The concept of time inconsistency – the rational temptation of policymakers to renege on their initial promises in order to stimulate demand by allowing a higher rate of inflation – was a major theoretical breakthrough, prompting legislators worldwide to grant central banks independence from governments (Kydland and Prescott, 1977). By delegating monetary policy to an independent central bank, the promise of stable prices becomes more credible with economic agents. The resulting stabilization of inflation expectations allows the achievement of low inflation without foregoing growth or employment, thus maximizing economic welfare.

The corollary to central bank independence are mechanisms to ensure accountability, which give the central bank democratic legitimation (Eijffinger and Hoeberichts, 2000). In fact, the concept of inflation targeting goes hand in hand with a numerical target and reporting by the central bank to the government, parliament and the public on the success in meeting this target. This has made conventional pre-crisis monetary policy accountability fairly straightforward.

The extension of central bank tasks to include macroprudential policies and financial supervision as well as the use of unconventional measures have revived debates about central bank independence and accountability. For example, the notion that unconventional measures affect the distribution of wealth more than conventional policies earned central banks criticism about their democratic legitimation (Goodhart and Lastra, 2017). The large-scale purchase of government debt by central banks is seen by some as blurring the frontiers between monetary and fiscal policies, again raising questions of democratic legitimacy.

There are also different views regarding the need for independence of financial supervisors. On the one hand, some argue that financial stability authorities are subject to time inconsistencies in similar ways to monetary policymakers. Independence may also be useful to withstand regulatory capture. Only an institution with far-reaching delegated powers can react to financial crisis situations sufficiently quickly and effectively. On the other hand, there is no agreed definition of what financial stability is, except the “absence of crisis.” Therefore, mechanisms for accountability seem much more difficult than for monetary policy. The decision to let banks fail (or rescue them) may have vast and highly uncertain consequences for welfare. Bail-outs may have very damaging effects on fiscal balances, while bail-ins could have negative effects on financial stability through contagion and uncertainty (Hellwig, 2014) and may be politically controversial. Thus, the consequences are too far-reaching and too complex to allow adequate mechanisms for accountability and should thus be left to elected policymakers.

Finally, the concentration of responsibilities for monetary policy and financial stability is sometimes perceived as conferring too much power on a single, unelected governmental body (Aziz, 2013; Cukierman, 2013; Hellwig, 2014).

2 Which inflation target/definition of price stability?

Monetary policymakers face three major challenges which have prompted discussions about the optimal price stability aim or inflation target, and how to approach it in a flexible way.

First, as outlined above, the natural level of real interest rates may, for an extended period, remain considerably lower than in the past decades, due to domestic and global structural factors. As argued in box 2, the zero or effective

lower bound on nominal interest rates could effectively limit the scope for an expansionary monetary policy.

Second, the relationship between domestic economic slack and inflation – the Phillips curve – has proven rather weak for several decades. Again, this may be due to structural factors. Thus, inflation responds more weakly to domestic output gap developments than in the past. Even if the natural level of real interest rates were known, using it as a guidepost would not reliably bring inflation back to target with the usual lag of one-and-a-half to two years, as had been the case in the past. Therefore, some economists spoke of a “twin puzzle” after the Great Financial Crisis: first, “missing disinflation” between 2009 and 2011 in response to the deep recession (Coibion and Gorodnichenko, 2015), and second, “missing inflation” following the recovery after 2012, particularly in Europe (Constâncio, 2015).

Third, the sum of structural shifts affecting the level of interest rates and the inflation process raises the issue of how monetary policy should best deal with these supply shocks in the pursuit of price stability and macroeconomic stability at large. In particular, we ask how the tradeoff between inflation and output volatility should be handled.

This section discusses various options, put forward in the literature, regarding post-crisis modifications to inflation targeting that would create a coherent framework to explicitly address the above three challenges systematically.

Box 2

Zero or effective lower bound

When inflation and nominal interest rates approach zero, the central bank finds itself in a situation where monetary policy must be forceful and credible to avoid a deflationary spiral, while the normal policy instrument, the interest rate, cannot be cut any further. Until the Great Financial Crisis, the existence of the zero lower bound (ZLB) for nominal interest rates was mostly found in theoretical papers. Most concluded that with an inflation target of around 2%, the probability of being restricted by the ZLB was negligible (Fischer, 2016). As most major central banks were dangerously close to the ZLB by 2009, the discussion shifted to, first, which monetary policy instruments can be used to avoid a deflation spiral and, second, whether nominal interest rates could actually fall below zero.

Such a situation requires other monetary policy instruments that can increase inflation expectations and stimulate demand. The theoretical papers written in the previous decade foresaw the use of forward guidance as well as large-scale asset purchases to lower real interest rates and manage inflation expectations (Goodfriend, 2000; Eggertson and Woodford, 2003). The argument was that setting negative interest rates would be ineffective because people would hoard cash and banks' profits would fall due to legal or practical impediments to cut deposit rates below zero. Thus, negative rates would have little or no effect on aggregate demand and could even be counterproductive in managing inflation expectations.

Despite these theoretical concerns, several major central banks, such as the ECB, have used slightly negative interest rates either to boost inflation and inflation expectations or to discourage capital inflows (e.g. the SNB). The jury is still out on the effects of negative interest rates. Experience to date, however, shows that cash hoarding seems to be a negligible problem. The prevalent view now is that zero is not the lower bound because cash hoarding carries a cost (e.g. cash handling, transport, storage and insurance). At the same time, there are limits on how low negative nominal interest rates can be: estimates point to an effective lower bound (ELB) of -0.5% to -0.75% . In the same vein, interest rates clearly cannot be maintained at negative levels for too long without threatening financial stability.

Looking ahead, the secular decline of nominal and real interest rates implies that compared to previous decades, the distance to the ELB will be small more frequently. Thus, the policy space will be more constrained. This is the consequence of low inflation combined with a lower natural rate of interest, which together have shifted the probability distribution of nominal interest rates closer to zero, increasing the likelihood of falling below zero or of reaching the ELB (Kiley and Roberts, 2017).

2.1 When a lower level of the natural interest rate moves the effective lower bound closer ...

2.1.1 ... one could increase the inflation target

In response to lower natural interest rates, central banks could raise inflation targets from the currently common 2% to, say, 3% or 4%. If the new target is credible, inflation expectations would adjust, and – based on the Fisher equation – nominal interest rates would rise accordingly. This would then give the central bank more space to cut rates in a downturn (see e.g. Ball, 2013). Dorich et al. (2017) find that such an increase in the level of the inflation target can indeed be helpful in enhancing macroeconomic stability in two cases: first, when unconventional monetary policy is not available; second, when the neutral real interest rate is persistently and deeply negative, forcing monetary policy to operate close to the effective lower bound. However, if the central bank has powerful unconventional policy tools and the real natural interest rate is positive, as generally assumed, these authors claim that increasing the inflation target only produces modest improvements in macroeconomic outcomes.

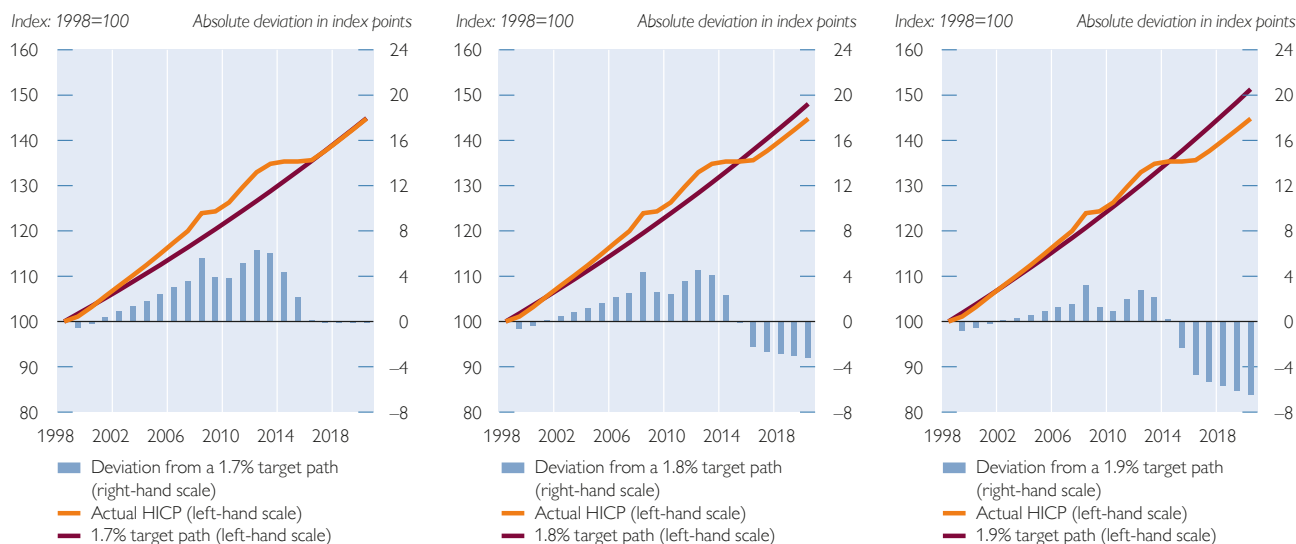
The potential gains must therefore be weighed against the costs of higher inflation, such as greater variability in relative prices, higher volatility of inflation itself (and thus increased probability of misallocations of resources) and greater distortions in the tax system. Finally, inflation expectations might become unanchored. For decades, central banks have worked hard to establish credible inflation targets anchoring inflation expectations. Increasing them once might be perceived as the beginning of an upward spiral. If a central bank changes its target once, why not a second time – or more often?

Eggertsson and Woodford (2003) as well as Krugman (1998) argue that raising the inflation target is an inefficient approach in dealing with the zero lower bound (ZLB). Under the theoretically optimal approach, inflation should rise only temporarily when monetary policy is constrained by the ZLB. As Woodford (2012a) points out, raising inflation permanently would be suboptimal, as it forces society to bear the costs of higher inflation at all times, instead of only when needed. This raises the question of how the central bank might bring inflation expectations back down after such a temporary intended hike in inflation. The experience of the 1980s suggests that this might incur considerable output costs (“Volcker recession”).

2.1.2 ... one could switch to a price level target

An alternative – and according to Eggertsson and Woodford (2003) and Krugman (1998) more effective – monetary policy framework for managing temporary inflation expectations is price-level targeting. The idea is to keep the level of prices

Theoretical price-level target for the euro area HICP



Source: ECB (forecast for 2018–2020).

on a steady growth path of, say, 2% per year. Shortfalls in inflation are matched by inflation lying above target at other times. Following this strategy, monetary policy keeps the expected real burden of nominal debts at what they were expected based on the central bank’s inflation target, and so the long-term risks for savers and investors are smaller than in an inflation-targeting environment.

Chart 1 shows hypothetical inflation gaps for the euro area, which would have accumulated because the actual path of the harmonised index of consumer prices (HICP) deviated from a hypothetical price stability path, assuming (purely for the sake of illustration) 1.7%, 1.8% and 1.9% as numerical values for the ECB’s price stability definition. Thus, monetary policy decisions become history dependent and must make up for past misses. Price-level targeting builds in a commitment to higher inflation rates in the future, when inflation missed the target in the past (see the middle and right panels of chart 1). The resulting “low for longer” interest rate path is, according to Eggertsson and Woodford (2003), the theoretically optimal strategy in a zero lower bound environment.

To make this strategy work, economic agents must be forward looking. If they are in a low-inflation situation, they will expect higher inflation rates in the years to come, which feed into lower real interest rates that stimulate demand and encourage firms to raise their prices. However, Gaspar et al. (2007) show that if price expectations do not change at all, a price-level target may even be less effective than an inflation target. Similarly, Andersson and Claussen (2017) argue that if inflation expectations are adaptive, a price-level target implies greater fluctuations in the real economy than an inflation target.

Another drawback of this strategy is that the central bank cannot “look through” supply shocks, such as an oil-price hike that temporarily drives up inflation.⁵

⁵ Under a flexible inflation-targeting framework, the central bank can disregard the initial inflationary effect of a cost-push shock and can concentrate on mitigating second-round effects, if they materialize.

Instead, it has to commit to tightening in order to reverse the oil price effects on the price level. This will lead to bigger fluctuations in real output growth and inflation rates, which casts doubt on the usefulness of this strategy in stabilizing inflation expectations. Furthermore, given that in the case of cost-push shocks, price-level targeting is costly in terms of output fluctuations, it might not be fully credible. Mester (2018) points out that apart from the Swedish Riksbank, which pursued such a strategy from 1931 to 1937, there is little international experience with this framework. Moreover, policymakers would have to contend with measurement issues, such as the choice of the starting point and revisions to price-level data (which are, however, usually negligible).

Because of these serious drawbacks, Bernanke (2017b) suggests a compromise approach that he calls “temporary price-level target.” This applies a price-level target only to periods when the zero lower bound becomes binding. In normal circumstances the central bank follows an inflation target. This approach should combine the advantages of a price-level target at the zero lower bound and at the same time avoids the drawbacks during normal times, when cost-push shocks might hit the economy. However, it may be doubtful whether economic agents would understand such changes or would find the announcement of a return to inflation targeting after the end of the crisis credible.

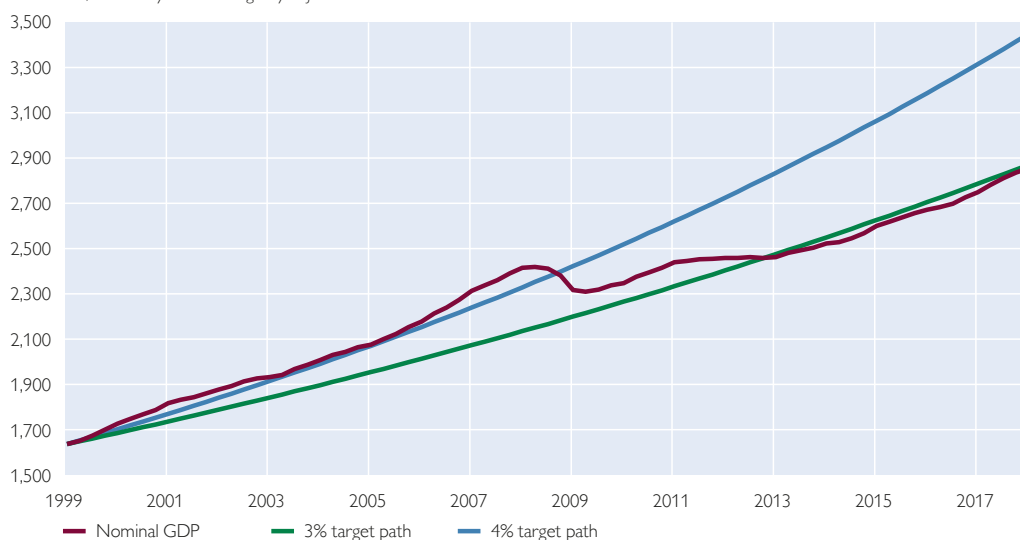
2.1.3 ... one could switch to nominal GDP targeting

Proponents of stabilizing the level of nominal GDP around a targeted path, such as Romer (2011) and Woodford (2012b), argue in much the same way as the advocates of price-level targeting. Like price-level targeting, nominal-income targeting is also history dependent. Deviations from trend are to be corrected by subsequent deviations in the other direction. A central bank following this strategy could, for instance, aim to stabilize nominal GDP along a path that grows by 4% annually,

Chart 2

Nominal GDP target

EUR billion, seasonally and working-day adjusted data



Source: Eurostat, authors' calculations.

assuming that long-term potential growth averages 2% and annual inflation is 2%. Thus, the nominal growth target can be regarded as a combined inflation target and a target for real GDP growth. Central banks pursuing this strategy are indifferent whether they achieve the target because of inflation or real GDP growth. Both variables feature prominently in their reaction functions.

Woodford (2012b) argues that a nominal GDP target path would not achieve quite the full welfare gains associated with a credible commitment to the price-level target as suggested in Eggertsson and Woodford (2003). However, such a proposal would retain several of its desirable characteristics. Additionally, it entails the central bank explicitly taking into account the real economy. Thus, the expectations channel not only works via inflation expectations, but also – as Romer (2011) argues – via economic confidence.

At the same time, nominal GDP level targeting poses several problems. The most challenging one is already evident in chart 2, and relates to uncertainty and changes to the long-term growth potential of GDP. If potential output growth changes, for example due to a crisis, what will be the correct target path afterwards? Should it be adjusted, and if so, by how much? If the long-term sustainable real growth rate changes and the central bank's targets are not adjusted accordingly, there will be undetected changes in the implicit inflation target. Anchoring inflation expectations will prove to be a difficult task in this regime.

This task might also be problematic because there is no explicit inflation target guiding expectations. Moreover, the built-in inflation objective is defined in terms of the GDP deflator. If the link between the GDP deflator and inflation as measured by a consumer price index is weak, or if the public does not understand the link, the anchoring of inflation expectations may be weak. Bean (2013) highlights two more problems. First, overshooting the (implicit) inflation target deliberately might be perceived by the public as an attempt to inflate away debt burdens. Inflation expectations might become unanchored. Second, maintaining low interest rates for too long carries financial stability risks.

A practical problem with nominal GDP targeting is that GDP data are published with a time lag and tend to be revised frequently and substantially. It is difficult to determine monetary policy without data on the current level of the target variable. If GDP data are revised, it might prove difficult for central bankers to explain their policy decisions after the event.

2.2 When structural changes in price-setting depress inflation ...

2.2.1 ... one could adjust the inflation target downward

Several reasons have been put forward why the Phillips curve has become flatter. One explanation is the greater anti-inflation credibility that central banks have gained over the past decades, making actual wage and inflation developments less responsive to domestic cyclical activity (Bernanke, 2007a). Moreover, the indexation of wages to domestic inflation developments has become less prevalent, reducing inflation persistence. Wage dynamics have also changed because of globalization and increased global labor competition (Freeman, 2007). At the level of goods markets, Auer et al. (2017) argue that the expansion of global value chains has intensified global interconnectedness, making the global output gap more important in driving domestic inflation (“globalization of inflation hypothesis”). Hence, Constâncio (2015) points out that “a flatter slope of the Phillips curve would make

controlling inflation either more costly or more difficult.” Thus, it might prove hard for monetary policy to achieve an inflation target of 2% (BIS, 2017).

One conclusion might be to adjust the inflation target downward to a level which is more easily achievable, such as 1% or 1.5%. This would lower the risk of overheating and the same time scale down financial stability risks. The major risk associated with such a move is that inflation expectations might adjust downward or become unanchored altogether, further reducing the future scope of monetary policy to counter economic downturns and deflationary episodes.

2.2.2 ... one could use target intervals for inflation instead of point targets

Another option would be to replace inflation point targets by target intervals. Thus, instead of a point target of 2%, a central bank could aim for a range between 1% and 3%. This seems especially appealing if global forces pushing down inflation were to be only temporary. As long as they are at work, the central bank can (internally) aim for the lower region of the target interval. Once they fade out, it can slowly return to the middle of the corridor, without changing its target.

Only a few central banks (e.g. the Reserve Bank of Australia, South African Reserve Bank) follow a target interval in the sense that within the target interval there is no preferred target point.

A central bank that utilizes a target range to change the point target from time to time may, however, experience instability in inflation expectations. Economic agents are bound to notice that the central bank is aiming for a different part of the target interval, so inflation expectations will adjust accordingly. Furthermore, absent explicit central bank guidance on inflation expectations, different economic agents might expect different levels. Hence, inflation expectations may become more heterogeneous and unstable, leading to more volatile wage and price changes. Svensson (2001) argues that it is more difficult to anchor inflation expectations with a target range than with a point target. Also, real economic stabilization becomes trickier and there will be larger fluctuations in economic activity.

In essence, there is little difference between aiming for different regions within a target interval and changing the point target every now and then. Apel and Claussen (2017) conclude that “if the motivation for a target range is to be able to adjust for changes in the optimal rate of inflation, it seems more reasonable to discuss and evaluate the appropriate level of a point target.” This argument becomes even more relevant should the global forces currently dampening inflation persist for longer.

2.3 When supply shocks create a tradeoff between inflation volatility and output volatility in the short to medium term ...

2.3.1 ... one could target core inflation

The conventional wisdom (see e.g. Mishkin, 2007) is that policymakers should “look through” cost-push shocks, as long as inflation expectations remain anchored. This insight is rooted in the experiences gained in the 1970s. When an oil-price shock pushes energy prices up, headline inflation will rise in line with energy prices. However, once energy prices have reached their (permanently) higher level, headline inflation will revert to its underlying trend rate. As the long transmission lags mean monetary policy can do little about such first-round effects of unexpected cost-push shocks, and as headline inflation will ultimately revert to trend anyway, central banks should refrain from monetary policy intervention. If, however, the

temporarily higher headline inflation rates lead to higher inflation expectations feeding into wage negotiations and bring about second-round effects in inflation dynamics, then there needs to be monetary policy action (see e.g. Clarida et al., 1999).

The challenge of cost-push shocks is that they drive up inflation and depress GDP growth (or vice versa). So monetary policy must decide whether to bring inflation back to its target level or to close the output gap. However, it cannot do both at the same time. Put differently, it faces a tradeoff in the short term between output and inflation volatility.

One way to shield monetary policy decisions from being distracted by commodity-price shocks is to use core inflation instead of headline inflation as target. Wynne (2008) argues that the basic idea of core inflation is that there is an aggregate inflation component in the inflation process (besides a relative price change component) strongly influenced by monetary policy. Consequently, abstracting from shocks to relative prices, core inflation captures the underlying rate of inflation going forward and hence is a better guide to where headline inflation itself is moving.

However, there is no single measure capturing the underlying rate of inflation. The most commonly used measure excludes food and energy and dates back to the 1970s. Depending on the type of shocks commonly hitting the economy, specific product categories can be excluded from core inflation measures. Having compared different subindices of the HICP, the ECB (2013) concludes that none of them satisfies the criteria for an unbiased underlying-inflation measure for the euro area. Any core measure will itself likely be subject to transitory shocks. New approaches to core inflation measurement, such as one isolating the common component in monthly price statistics, might improve upon simple subindices of headline inflation (see e.g. Vega and Wynne, 2003). However, Mishkin (2007) concludes that no measure of core inflation will work in all situations, because the nature of shocks changes over time.

Furthermore, a strand of literature challenges the conventional wisdom that monetary policy should look through commodity price shocks. Filardo et al. (2018) argue that oil price rises due to worldwide exuberant demand would call for a different monetary policy response than if caused by a supply shortage; particularly if the currency area for which the central bank is in charge makes up a significant fraction of global demand. In this case, targeting core inflation measures that exclude energy prices can lead to poor policy outcomes.

Consequently, as Wadsworth (2017) points out, most central banks – like the Bank of Japan, the Bank of Canada, the Bank of England, the Swedish Riksbank, the Reserve Bank of Australia and the European Central Bank – target headline inflation. Headline inflation is based on the theory of the cost-of-living index,⁶ which is by far the most well-developed and coherent framework for inflation measurement. Because households care about the prices of all the items they buy, controlling headline inflation, instead of some subset of it, is the ultimate target for most central banks.

⁶ *The European Central Bank targets the harmonized index of consumer prices (HICP) which captures “final household monetary consumption”. For example, the HICP omits the cost of owner-occupied housing, which is – by Eurostat’s definition – no monetary consumption of households. Hence, the HICP’s conceptual framework does not follow the theory of the “cost-of-living index” like most other consumer price indices.*

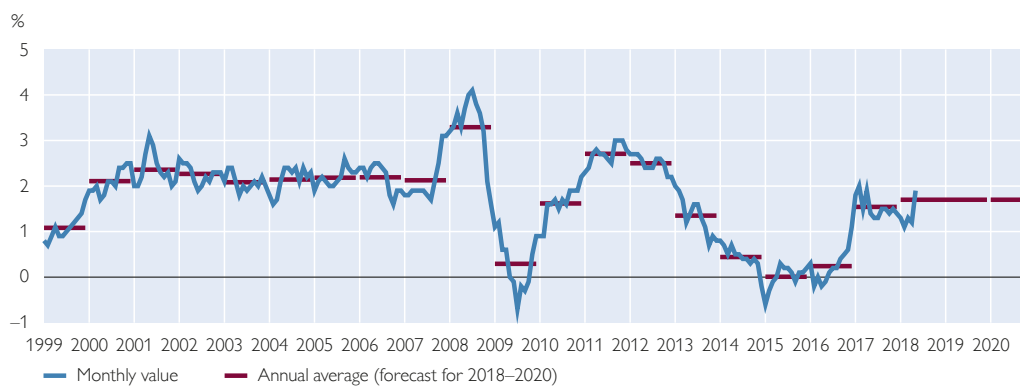
2.3.2 ... a medium-term orientation of monetary policy creates some leeway

Most (formal or informal) inflation-targeting frameworks have built-in room for maneuver, as central banks are not required to bring back inflation to its target immediately after a shock. Wadsworth (2017) shows that most central banks of advanced economies are given several years for inflation to return to its target level. Their policy frameworks state that inflation should return to target within “two years” (Swedish Riksbank), “in the medium term” (e.g. European Central Bank, Swiss National Bank, U.S. Federal Reserve), “over time” (e.g. Bank of Canada, Reserve Bank of Australia, Norges Bank), or over a time horizon that depends on the shock (Bank of England). This more or less concrete “time to target” (Wadsworth, 2017) gives central banks some leeway to find the right balance between inflation and output variability.

When Borio (2017) calls for lengthening the horizon over which monetary policy brings inflation back toward target at the current juncture, he refers to the inflation-output tradeoff. If inflation is indeed pushed down by various global forces, bringing inflation quickly back up to target might imply an overly expansionary monetary policy and a significant overshoot of the output gap. By contrast, a more gradual upward convergence of inflation to target would reduce output volatility.

Chart 3

HICP inflation in the euro area



Source: ECB.

Take the ECB’s price stability target, which aims for an HICP inflation rate for the euro area of below, but close to, 2% over the medium term. Starting in 2013, inflation dropped and deviated from its target for five consecutive years after a – severe double-dip recession (see chart 3). At the same time, for almost the same period, the euro area has experienced a robust economic recovery. The ECB’s flexible medium-term orientation provides the necessary leeway to allow for a smooth return of inflation to the price stability definition, without undue risks to output volatility.

2.3.3 ... one could use “tolerance bands” around the inflation target instead of point targets

Tolerance bands around an inflation target (not to be confused with target intervals)⁷ are based on a similar line of argument as the medium-term orientation. They give the central bank some leeway in meeting the inflation target. Some central banks (e.g. in Canada, New Zealand, Poland and Brazil) define their inflation targets as being the mid-point of a variation (i.e. tolerance) band. Only recently, the Swedish Riksbank also switched its policy target to a tolerance band of 1%–3%. This band makes clear that inflation varies around the target and will rarely be exactly 2%. Generally, tolerance bands work like point targets, with the distinction that they recognize that monetary policy operates with considerable and unpredictable time lags. Because of the explicit reference to the short-term limitations of monetary policy, this inflation-targeting strategy might be especially successful in highlighting that moderate deviations from the point target are unavoidable. Hence, Apel and Claussen (2017) argue that using a tolerance band may strengthen confidence in the point target.

2.3.4 ... one could switch to nominal GDP growth targeting

Targeting nominal GDP growth could be another option to deal with the short-term tradeoff between inflation volatility and output volatility. When a central bank targets nominal GDP growth, higher inflation and lower output growth in response to an adverse supply shock might ideally cancel out and monetary policy “looks through” the shock automatically. McCallum (2011) argues that this strategy might help simplify central bank communication, as there is only one target even if central banks try to stabilize both growth and inflation. Bean (2013) counters that a nominal income growth target means less to the average person than an inflation target.⁸

As with price-level targeting and nominal GDP-level targeting, nominal GDP growth targeting also seems attractive in certain circumstances, but is not necessarily optimal more generally. Over and above the arguments already stressed against nominal GDP-level targeting in section 2.1.3, Ball (1999) adds that practical problems may arise if monetary policy affects output and inflation with different time lags (which is the case according to empirical findings and many models). Assuming backward-looking inflation expectations, nominal income targeting can lead to increasingly volatile inflation and growth.

3 Monetary policy in an integrated world economy

It has long been known that the impact of a large country’s monetary policy can spill over to other countries. Three recent episodes have highlighted the potentially powerful nature of such spillovers. First, the repercussions from a prolonged period of expansionary U.S. monetary policy prior to the outbreak of the financial crisis. Second, the “taper tantrum,” following statements by the Federal Reserve in 2013

⁷ A tolerance band allows for ex post flexibility in contrast to a target range that allows for ex ante flexibility in defining the target. Monetary policy operating a tolerance band is intended to return inflation to the middle of the corridor.

⁸ Summers (2017) finds another benefit in nominal GDP growth targeting in a low interest rate environment, similar to arguments in favor of price level and output level targeting discussed above, since targeting a constant nominal GDP growth rate will automatically result in a higher implicit inflation target.

that it would scale back its quantitative easing (QE), triggering capital outflows and financial instability in several emerging economies. Third, the discussion about competitive exchange rate devaluations resulting, among other things, from “competitive monetary policy easing” or “competitive QE.” While in the past, research focused primarily on spillovers from U.S. monetary policy to emerging economies and also the euro area (e.g. Bowman et al., 2015; Chen et al., 2015; Fisher, 2017; Georgiadis, 2015; Hofmann et al., 2015; Lombardi et al., 2017; and Miyajima, 2014; Tillmann, 2016), recently the effects from euro area unconventional monetary policies on other countries have attracted greater attention from researchers (see e.g. Falagiarda et al., 2015; Feldkircher et al., 2017; Fratzscher et al., 2013; Moder, 2017). As a result, the debate has revived about possible ways to deal with far-reaching externalities from monetary policies. The next section first recalls the main spillover channels, then illustrates the possible consequences of uncoordinated policy behavior, and concludes by surveying views on the desirability, feasibility and limitations of a global coordination of monetary and exchange rate policies.

3.1 Monetary policies may spill over to other countries through various channels

The literature distinguishes the following channels: a global demand channel; an exchange rate channel operating through exports and through global financial flows; a signaling or interest rate expectations channel; a portfolio rebalancing or risk-taking channel; and interactions among monetary policy authorities.

In the face of global shocks, which affect countries in the same direction and in a largely synchronized way, a big country’s expansionary monetary policy benefits other countries by stimulating import demand for global goods (global demand channel). But what if economic conditions and shocks are of a more idiosyncratic nature?

Exchange rates affect countries’ relative international price and cost competitiveness, and thus aggregate demand. The more open a country is to trade, the bigger the impact of exchange rate fluctuations on net exports. Thus, exchange rate developments are often included in measures of overall financial conditions, with currency appreciation being equivalent to rising domestic interest rates and therefore implying a tightening of financial conditions (exchange rate channel). In the case of fixed exchange rate regimes, the interest-rate level of the pegging economy is determined by the level of interest rates in the anchor economy. The “impossible trinity” implies that with liberalized capital flows, countries with fixed exchange rate regimes may be faced with inadequately loose or tight financial conditions. An example for the constraints arising from participation in the Exchange Rate Mechanism (ERM II) is Denmark. Other forms of exchange rate pegs to the euro are followed by several Central, Eastern and Southeastern Europe (CESEE) countries. In the case of floating exchange rate regimes, the exchange rate is determined by current and expected interest-rate differentials – the uncovered interest rate parity. Indeed, empirical results based on event studies suggest that exchange rates react to information on the future relative path of short-term interest rates contained in QE announcements (see Coeuré 2017a, b). In practice, however, exchange rates reflect complex portfolio decisions by international investors, who react to incoming information (data releases, statements by policymakers, publication of minutes/accounts etc.), but these reactions are seldom in line with the theoretical forecasts from the uncovered interest rate parity.

The “financial channel of exchange rates” rests on the observation that capital inflows into smaller economies following ultra-loose monetary policy in a big anchor country may reduce bond yields and credit spreads, leading to an easing of financial conditions (see Bruno and Shin, 2012; Shin, 2017; Hofmann et al., 2016). These monetary policy spillovers may create booms and busts and financial instability, which may in turn spill back to the originating country. Another recent example is Switzerland. Due to the expansionary policy of the ECB (as well as safe-haven capital inflows in the context of the European sovereign debt crisis), Switzerland faced such strong upward pressure on its exchange rate against the euro that the Swiss National Bank had to abandon its exchange rate goal, cut key interest rates below zero and intervened in foreign currency markets to contain the appreciation of the Swiss franc.

Beyond their effect on short-term interest rates, unconventional monetary policies (large asset purchases and forward guidance) affect longer-term interest rates through the expectations channel. This effect can be observed also across countries. Furthermore, monetary shocks in one country (or area) prompt global investors to rebalance their portfolios across countries, which will also affect yields as well as term and risk premiums (global portfolio rebalancing channel). A large body of research has documented spillovers from U.S. yields to other currency areas including emerging economies and the euro area (see e.g. Nyholm, 2016). Monetary policy in the euro area has also been shown to trigger spillovers to other jurisdictions (for an overview, see Coeuré, 2017b).

Similar portfolio rebalancing effects can occur in equity markets, when the monetary policy of a large country not only influences equity valuations in the home country but also abroad. In the extreme, boom and bust cycles can be propagated this way. These considerations can be extended to real-estate prices (see e.g. Luo et al., 2017) and to financial cycles more generally (see e.g. WGEM, 2018). In a world of free capital movements, financial cycles have been shown to contain an important global component (see e.g. Borio 2014; Gourinchas et al., 2016; Rey, 2015). In other words, the links between monetary policy and financial stability policy highlighted in section 1 not only apply domestically, but also globally.

What has made the topic of international monetary policy spillovers even more complex and controversial since the financial crisis is that theoretical and empirical evidence indicates these spillovers are time-variable and state dependent. One argument is that they are stronger in times of crises (see e.g. Ostry, 2014). There is also the notion that unconventional monetary policies (QE, longer-term open market operations and forward guidance), which affect medium and long-term interest rates, exert stronger spillover effects than conventional monetary policies, which focus on short-term interest rates. Furthermore, when the zero or effective lower bound of interest rates is reached, cross-border monetary policy spillovers from foreign countries may force central banks to react with nonstandard measures as well. By contrast, Ammer et al. (2016) argue that it is not the type of instrument that makes the difference, but the large scale of the monetary expansion in response to the crisis which causes spillovers to be more noticeable.

3.2 Interaction between monetary policymakers

Spillovers may also be propagated through interactions among different countries' policymakers. Exchange rate developments are a case in point: central bankers usually hesitate to comment on exchange rate misalignments or exchange rate movements as policy targets. Even so, exchange rates do play a role in central banks' monetary policy considerations because they affect net exports, aggregate demand, import prices, domestic financing conditions, and ultimately consumer price inflation and potentially financial stability. Therefore, the current level and the expected path of exchange rates are by necessity an element included in monetary policy considerations (see e.g. Draghi, 2017).

“Competitive devaluations” or “currency wars” describe a situation in which countries seek to devalue their currency to stimulate aggregate demand (see e.g. Coeuré, 2013; Fels, 2018). During the financial and economic crisis, a variation of this idea – “competitive (monetary policy) easing”⁹ – was discussed. In this scenario, monetary policy easing in one country leads to a tightening of financial conditions in other countries through the exchange rate channel. “Other central banks are then forced to react to defend their domestic mandates” (Draghi, 2016) by also easing their monetary policies. The result of such interaction may be a monetary policy easing cycle, which overall at global level, leads to excessively loose monetary conditions and in turn becomes the source of global imbalances and financial instability.

Naturally, these considerations are particularly relevant for central banks of large countries or monetary areas. Given the strong impact of their policy on the world economy, reactions to big countries' monetary policy actions by other policymakers are likely to be the norm. These reactions therefore become a normal part of the monetary policy transmission and financial stability considerations.

3.3 Approaches to coordination: options and practice

The global monetary system in force since the end of the Bretton Woods System rests on national monetary authorities pursuing their own independent monetary policies to achieve price stability. During the “Great Moderation” from the 1980s until the early 2000s, the widespread use of inflation targeting ensured that, even without formal coordination, the international monetary system operated close to a cooperative equilibrium. Thus, the outcome of these domestically oriented monetary policies was almost as good as formal coordination (see e.g. Taylor, 2013).

The expansionary monetary responses to the Great Financial Crisis have increased monetary policy spillovers and thus highlighted the risks from uncooperative policy interactions, prompting calls for more formal coordination. The main argument is that without coordination, policies with positive spillovers are undersupplied, while those with negative spillovers are oversupplied from a global wealth perspective. Closer cooperation would improve Pareto welfare (Ostry, 2016).

Ostry (2014) suggests that the lack of cooperation is because policymakers fail to recognize the tradeoffs and are uncertain (or disagree) about the nature and size of the spillovers. He therefore suggests introducing a “neutral assessor” (such as the IMF) with detailed knowledge of the economies involved to reduce uncertainty, to

⁹ For a situation where the easing happens mainly through central bank asset purchase programs, the terms “competitive QE” (Rajan, 2014) or “beggar thy neighbor QE” (Grosse et al., 2018) were coined.

provide “rules of the road” and limit the damage when coordination turns out to be infeasible.

Taylor (2013) proposes instead to reinstate an expanded rule-based global monetary system similar to the one of the 1980s and 1990s, in which equilibrium was reached without coordination. Similarly, Eichengreen (2016) advocates widespread adoption of flexible inflation targeting that also addresses financial stability and improved communication, which he expects would deliver more stable exchange rates across countries with inflation targeting regimes.

Mishra and Rajan (2016) suggest that countries should agree on guidelines for responsible monetary policy behavior, which would improve collective outcomes. Another proposal is to achieve at least some coordination by means of transparency and communication on reaction functions and policy frameworks. This approach aims for an “alignment” of policies in the sense of a “shared diagnosis” and a “shared commitment to sound ... domestic policies on that diagnosis” (Draghi, 2016). In this vein, in October 2017 the members of Washington’s International Monetary and Financial Committee (IMFC) reaffirmed their “commitment to communicate policy stances clearly” (IMFC, 2017).

Skeptics on international monetary policy coordination base their view on empirical or theoretical findings showing that the gains from such coordination are quantitatively quite small (see e.g. Coenen et al., 2008; Obstfeld and Rogoff, 2002). Alternatively, they argue that such coordination is legally and institutionally difficult to realize as well as politically impractical (see e.g. Coeuré, 2014, who emphasizes political economy constraints; Blanchard, 2017, who categorizes recurring attempts as “empty calls for cooperation at G20 meetings”; or Eichengreen, 2016, who, given political resistance to radical reform, advocates incremental reforms, “tinkering around the edges” of the current global monetary order).

So, what did recent attempts toward closer international monetary and exchange rate policy coordination actually achieve? In 2013, in response to growing concerns about global financial stability repercussions from major central banks’ monetary policy measures, the G7 issued a statement which established market-oriented rules on how to deal with exchange rate effects from global monetary policies (G7, 2013). Very similar formulations were reiterated in the Communiqué of the Thirty-Sixth IMFC Meeting on 14 October 2017, in which members committed to “*refrain from competitive devaluations*” and that they “*will not target ... exchange rates for competitive purposes*” (IMFC, 2017).

So, while spillovers from monetary policies and the risk of competitive devaluations have repeatedly been acknowledged by global policymakers, the solution has been limited to joint commitments on a code of conduct, which shuns formal rules or coordination.

Against this background, the question is how can countries deal with spillovers in the future? A first option, which has gained prominence since the financial crisis, is to deploy macroprudential policies. Second, capital controls have become more common and accepted since the financial crisis. In fact, both sets of tools were explicitly mentioned in the G20 Communiqué of March 2018 (see G20, 2018). Third, central banks can develop customized instruments to contain undesired spillovers from foreign monetary policies. Mexico and Turkey are two recent examples of such attempts. In February 2017, the Foreign Exchange Commission in Mexico announced interventions of up to USD 20 billion in foreign-exchange-hedging

non-deliverable forwards. The measure seems to have contributed to stabilizing the peso's exchange rate. Similarly, in November 2017, the Central Bank of the Republic of Turkey announced an auction of foreign-exchange-hedging instruments to mitigate risks from the corporate sector's open foreign exchange positions (see Ortiz et al., 2017). Ghosh et al. (2017) suggest that emerging economies experiencing a combination of currency appreciation and compression of bond yields and credit spreads, due to ultra-loose monetary policies in the major economies, should resist this development by issuing government bonds to increase their foreign exchange reserves ("reverse QE"). Along more conventional lines, Eichengreen (2016) advocates shifting investors' incentives toward longer-term and equity investments through adjustments in national tax and capital adequacy regimes, and developing domestic corporate debt markets to reduce the incentive for firms to take out foreign currency denominated debt.

4 Summary and conclusions

While the post-crisis discussion on central bank mandates, their targets and international monetary policy spillovers is still in full swing, our reading of the current related literature at this point suggests the following broad tendencies.

The crisis has clearly highlighted that central banks will always have to play a role when it comes to safeguarding financial stability. While most of them have effectively built expertise in this field as the crisis unfolded, so far this has barely been reflected in changes to formal mandates. In many countries mixed institutional solutions have been chosen, requiring complex interactions between several institutions, but at the same time ensuring checks and balances. In the euro area, the single monetary policy needs to rely on national fiscal and macroprudential policies to take care of divergent business and financial cycles.

The greater legal or *de facto* scope of central banks' actions has so far not prompted limitations to their independence. One reason may be that central banks' consistent drive for more transparency well before and throughout the crisis has enhanced their accountability, commensurately with their wider scope of action. However, it may also have helped that memories of the crisis, and central banks' important actions and success in overcoming it, are still too fresh to seriously question central banks' legitimacy.

Bringing inflation back up to target has proven to be a challenge in many developed economies, most likely reflecting a weaker response of inflation to domestic capacity utilization due to global structural factors. At the same time, there are reasons to assume that the level of the natural rate of interest may remain subdued. All else being equal, this would make the constraint of the effective lower bound for nominal interest rates more likely binding in the future. Central banks may respond to this by making unconventional monetary policy instruments permanent elements of their toolboxes in the future. We have not elaborated further on operational issues such as future monetary policy instruments and the size of central bank balance sheets in a post-crisis new normal. Instead, we have provided an overview of the current literature on possible responses regarding the price stability or inflation target.

To respond to a lower natural rate of interest, we discussed three options: a (temporary or permanent) hike in the inflation target, price-level targeting, and nominal income targeting. To respond to structurally lower inflation, we identified two options in the literature: a cut in the inflation target, and the use of inflation

target intervals. To deal with a possible tradeoff between volatility in inflation and output, caused by the supply shocks that currently dampen inflation, we discussed four options: to target some measure of core inflation, to emphasize that the price stability definition needs to be achieved over the medium term, to use inflation targeting tolerance bands, and to adopt GDP growth targeting.

It is clear from our discussion that all options have their merits and limitations. In addition, some of them contradict each other, e.g. the proposal to increase inflation targets in response to a lower natural rate of interest, on the one hand, and the proposal to lower them to adjust for structural factors dampening inflation, on the other. Furthermore, it also became clear that changes to monetary policy strategies potentially come at a high price in terms of loss of credibility and should only be done occasionally and with very thorough consideration of second and third-order effects over many years. Against this background, we think the ECB's definition of price stability of below, but close, to 2%, in combination with the emphasis on reaching this objective over the medium term, is still the best solution in the foreseeable future for dealing with the two possible challenges of a structurally low inflation and a persistently low natural rate of interest. Another promising approach, adopted by some central banks, appears to be the introduction of tolerance bands around inflation point targets.

The crisis has also drawn more attention to the international dimension of monetary policy. Our survey shows that monetary policy spillovers happen through a number of real and financial channels. The size and scope of unconventional monetary policies have exacerbated spillovers. In particular, a cycle of “competitive monetary easing” and “competitive exchange rate devaluations” was at times seen by some authors as a tangible risk or as actually happening, potentially leading to excessively loose monetary conditions and surplus liquidity at the aggregate global level. The views regarding closer international coordination of monetary policies range from strong advocacy in favor of explicit coordination to hopes for implicit coordination through similar rule-based policies, agreement on the effects of policy, and increased transparency. Recent G7, G20 and IMFC statements signal that global spillovers are recognized as a relevant topic, but there is no commitment to coordination beyond vague declarations. Thus, countries need to continue to cope with spillovers from other large countries' monetary policies as best as they can in the foreseeable future, potentially resorting to innovative instruments.

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