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Issues Regarding the Use of the Policy Rate Tool¹

This memo reviews two non-standard uses of the policy rate tool which provide additional stimulus when interest rates are close to or at the effective lower bound (ELB)—**forward guidance (FG)** and **negative interest rate policy (NIRP)**. In particular, the memo surveys the use of these tools since the start of the Great Recession, reviews evidence of their effectiveness, and discusses key considerations that confront monetary policymakers while using them.

FG has been used at the ELB by several central banks both to clarify their intentions in unusual times and to provide accommodation. Broadly, the evidence indicates that FG has been successful in reducing the expected path of the policy rate, uncertainty about that path, and longer-term interest rates. The consequences for economic performance are harder to judge, but a number of studies generally point toward stimulative effects. One reason macroeconomic responses to FG were not stronger could be that, at times, the private sector interpreted reductions in central banks' expected policy rates as reflecting policymakers' pessimism about the economic outlook. Avoiding unintentional communication of a negative outlook is an important challenge when designing FG policies.

FG has taken many different forms—FG tied to specific calendar dates (“date-based”), FG focused on achieving particular economic outcomes (“outcome-based”), and FG that has made purely qualitative statements about future policy rates (“qualitative”)—each with its own pros and cons. Empirically, there is a reasonably strong case that qualitative guidance is less potent than date- or outcome-based guidance. However, the experience so far leads to no firm conclusion about the relative effectiveness of the latter two approaches. Date-based FG seems particularly easy to communicate to the public, and there are more clear-cut instances of date-based guidance having substantial effects than there are for outcome-based guidance (at least with respect to financial markets). However, it is difficult to say whether this apparent difference reflects a weakness of outcome-based guidance generally, a timidity in the particular thresholds that central banks adopted, or external factors that may confound the comparison in the very small sample of cases available. In addition, date-based guidance may not give the Committee sufficient scope to respond to incoming data, and, if the provided dates are frequently

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revised, the strategy could lose credibility. Date-based guidance may also run a greater risk than outcome-based guidance of inadvertently signaling a pessimistic outlook.

All forms of FG require accurate communication of the Committee’s intentions and expectations to the public. The Committee has several communications tools that can help support and contextualize its FG. The Summary of Economic Projections (SEP), though not an official consensus forecast, can provide an indication of the Committee’s thinking about the course of policy and the associated macroeconomic outlook. Speeches and press conferences can be used to emphasize the factors underlying the FG and the contingencies around it. Coordinated balance sheet policies may help to reinforce FG (an issue that will be discussed in the companion memo “Issues in the Use of the Balance Sheet Tool”). Finally, FG can feature escape clauses that guard against unwanted circumstances, such as an unanchoring of inflation expectations or overheating in the financial system. While escape clauses can detract from the main messaging of FG—and we have no formal evidence on their optimal design—they allow the Committee additional flexibility and can help to clarify the conditions under which FG will remain in place.

NIRPs have been implemented by several central banks, but the evidence on their effectiveness has been mixed. It is hard to delineate the macro and financial effects of NIRPs since they were accompanied by other unconventional measures. Broadly, the empirical literature suggests that NIRPs have provided accommodation to the economies in which they have been used without significant adverse effects on financial intermediation to date. However, several caveats are in order: NIRPs have not involved a policy rate below negative 1 percent, and, as NIRPs have lasted longer than initially envisaged, many central banks have begun taking active steps to ease their burden on financial intermediaries (for example, via deposit tiering). Many differences also exist between the U.S. financial system and its counterparts in countries that have used NIRPs. These reasons call for caution when generalizing from the foreign experience with NIRPs.

I. Forward Guidance

FG is communication by the central bank about the intended course of policy. It can be used to help communicate the Committee’s objectives and reaction function, and it can also provide additional policy stimulus when understood by the public as a credible commitment to keep monetary conditions more accommodative than would have been expected absent the guidance. In this memo, we focus on the effects of FG about the path of the federal funds rate when it has already reached the effective lower bound (ELB). The Committee might also employ FG in support of other measures aimed at stimulating

the economy at the ELB, such as balance sheet policies.² Moreover, the Committee could use FG away from the ELB or within alternative monetary policy frameworks broadly referred to as “makeup strategies.”³

By lowering market expectations of future policy rates, FG also reduces longer-term rates and flattens the yield curve. These lower longer-term interest rates directly strengthen aggregate demand by stimulating consumption and investment through the interest-rate channel, by raising other asset prices, and by reducing the exchange value of the dollar. Lower expected policy rates also indirectly raise aggregate demand by raising expectations of future output, and they can indirectly lower real interest rates by raising expected inflation. Since FG may reduce uncertainty about future policy actions, it might also lower longer-term interest rates and stimulate economic activity by reducing term premiums.⁴

FG is most effective in aligning market expectations with policymakers’ intentions when it is communicated clearly and credibly to the public. In principle, clarity can be enhanced by spelling out more explicitly the conditionality of the guidance and by explaining what the central bank aims to achieve and how it will respond to economic developments. However, overly complex conditionality may confuse the public and lead to conflicting interpretations of policy intentions, with the risk of disruptive market reactions.

In general, FG can convey two types of information: the central bank’s assessment of the economic outlook and the degree of policy accommodation given the outlook. Campbell and others (2012) and Campbell and others (2017a) empirically showed the importance of the FOMC’s macroeconomic assessments in its FG. Campbell and others (2012) related changes in private-sector forecasts with changes to market forecasts of future policy rates on FOMC announcement days (their proxy for FG). The estimated effects were either small or had the wrong sign. For example, expectations of future FOMC tightening led to modest *increases* in expected inflation. Campbell and others (2017a) showed that accounting for differences between the Fed staff’s outlook (as embodied in confidential Tealbook forecasts) and the consensus private-sector forecasts remedied those results. When the staff forecasts for economic activity were stronger than those in the private sector, the FOMC’s communications raised market expectations of

² The companion October 2019 FOMC memo, “Issues in the Use of the Balance Sheet Tool,” discusses balance sheet policy, and its relationship to policy expectations, in further detail.

³ For the use of FG in conjunction with makeup strategies, see the staff memo by Duarte and others (2019) “Strengthening the Current Framework in View of the ELB and Some Considerations Related to Time-inconsistent Strategies.”

⁴ See Krugman (1998), Eggertsson and Woodford (2003), and Carlstrom and others (2015) for canonical discussions of the transmission channels. On the term premium effects, see King (2019).

future policy rates and raised private sector forecasts of inflation.⁵ Del Negro and others (2015) document substantially heterogeneous effects across FOMC FG episodes. In particular, they show that the August 2011 announcement (which introduced date-based FG) had little effect on inflation expectations and lowered near-term GDP growth forecasts about 60 basis points. Relatedly, Andrade and others (2019) used data from the Survey of Professional Forecasters (SPF) to demonstrate that even relatively sophisticated SPF respondents disagreed amongst themselves about whether the FOMC’s FG in late 2011 and 2012 communicated the Committee’s assessment of the economic outlook or the degree of policy accommodation given the outlook.⁶

Nakamura and Steinsson (2018) label the influence of FOMC FG on private-sector macroeconomic outlooks the “Fed information effect.” In light of this effect’s past relevance, communicating an intention to keep policy rates at the ELB for longer in order to increase the degree of policy accommodation may be misinterpreted as signaling a more pessimistic economic outlook by the central bank. In this case, FG would produce negative confidence effects instead of the intended stimulus.

Variants of Forward Guidance

As the ELB was reached in economies around the globe in the wake of the financial crisis, a number of central banks adjusted their communications strategies to provide greater clarity about the expected path of policy and to use communications to provide accommodation directly. The instances of policy-rate FG that central banks have used can be classified within three broad categories. *Qualitative* FG makes purely qualitative statements about the path of future policy rates (for example, saying they will remain low for an “extended period”). *Date-based* FG (also described as *time-based* or *calendar-based*) states how long an accommodative stance will be maintained (usually providing the earliest date that the central bank expects policy could begin to tighten). *Outcome-based* FG specifies economic conditions, such as thresholds for inflation or the unemployment rate, that trigger either the reevaluation of accommodation or its outright removal. All three types can come with *escape clauses* that detail specific macroeconomic or financial situations following which the central bank would abrogate its previous forward guidance.

The Federal Reserve provided qualitative policy-rate FG beginning in December 2008 when the federal funds rate was cut to a range of 0 to 0.25 percent, and at different

⁵ Campbell and others (2017b) provide an executive summary of these results.

⁶ Similar evidence on the potential for central bank accommodation to signal a negative outlook also exists for other economies: See Hubert (2017); Kane and others (2017); Andrade and Ferroni (2019); and Cieslak and Schrimpf (2019).

points during the ELB period it also turned to date- and outcome-based guidance.⁷ Table 1 reviews the main changes made to the FOMC’s policy rate guidance during this time.⁸ Over time the Committee complemented its FG with other communications, such as the SEP and statement on longer-run goals, and introduced escape clauses.⁹ The ECB, the Bank of England, and the Bank of Japan, as well as a number of central banks in smaller economies, have likewise implemented various forms of FG in recent years. The appendix to this memo provides some additional details about episodes of FG at the Federal Reserve and abroad since 2008. Taken together, these observations provide some scope to learn about how markets and the economy respond to FG of different types—evidence that we turn to next.

Evidence on the Effectiveness of Forward Guidance

Pass-through to Financial Conditions

Figure 1 shows how policy expectations evolved during the ELB period in the United States. Following the introduction of date-based guidance in 2011—and throughout the entire period for which quantitative FG was in effect—market-implied expectations of policy rates two years out remained very close to zero. Although responses to subsequent changes in FG were less dramatic, market measures of expected policy rates fell significantly after such announcements on average (see, for example, Moessner, 2013). Del Negro and others (2015) show that survey measures of expected short rates also fell after FG announcements. Furthermore, market-implied uncertainty about policy became very compressed during the period of date- and outcome-based guidance. These observations suggest that FG, on the whole, was successful in reducing the expected path of policy in the United States.¹⁰

⁷ The FOMC had previously employed qualitative guidance at the beginning of the tightening cycle in 2003 to 2005, when it noted that it anticipated keeping the federal funds rate low for a “considerable period” and then raising it at a “measured pace.”

⁸ For brevity, the table includes only language specifically regarding the trajectory of the federal funds rate. During this period, the FOMC also commented extensively on its macroeconomic outlook and perceived balance of risks, which may also have conveyed information about the likely course of policy and also, at times, provided FG about the balance sheet.

⁹ While the SEP provides information about participants’ views of appropriate policy under their individual economic forecasts, it does not represent the consensus view of the Committee. Thus, although the median or central tendency of the SEP can provide much more precise quantitative information about the annual future path of the funds rate, that information is only an approximation of the current Committee’s view. Nonetheless, the SEP may still provide useful context for the Committee’s FG statements. For example, it can help to signal to markets whether a change in FG is due to a change in the outlook for the economy.

¹⁰ One complicating factor in assessing the effects of FG is that it has often coincided or overlapped with other important central bank initiatives, most notably changes in asset purchase programs, which may

The empirical evidence generally indicates that these shifts in policy also passed through to longer-term interest rates and other asset prices. In particular, a number of papers show that bond yields, equities, and other financial markets moved significantly on FG announcements in the United States and that those changes were strongly related to changes in the market-based path of policy.¹¹ Based on responses in the Survey of Primary Dealers, Femia and others (2013) argue that these changes represented shifts in perceptions of the FOMC's reaction function, not just changes in expectations for economic performance. Filardo and Hoffman (2014), Hubert and Labondance (2018), and Ehrmann and others (2019) document similar financial-market responses for other central banks.

In addition to reducing the expected policy rate, it is also clear from figure 1 that FG lowered market uncertainty about rates. Hattori and others (2015) and Ehrmann and others (2019) document this effect more systematically. The literature also generally suggests that FG reduces disagreement across forecasters about the future policy rate, an effect that may be larger when the guidance is accompanied by an asset purchase program (Andrade and others, 2015; Coenen and others, 2017). Reduced uncertainty and disagreement strongly suggest that FG has been effective in clarifying and aligning the views of private agents around an accommodative policy path. Lower uncertainty about interest rates may also have served to compress term premia.

One reason that FG reduces uncertainty about the path of policy may be that it leads market participants to believe that policy is less likely to respond to incoming shocks over the period covered by the guidance. With this idea in mind, a few papers have tried to assess the effectiveness of FG by testing whether the sensitivity of longer-term interest rates to incoming news depends on the presence (and type) of FG. In particular, Swanson and Williams (2014) show that bond yields remained quite responsive to macroeconomic news during qualitative guidance in the United States but that responsiveness fell during date-based guidance, especially for short-to-medium term maturities. In a cross-country panel study of numerous FG episodes, Ehrmann and others (2019) also show that outcome-based FG reduces bond yields' responses to macroeconomic surprises.

Large-scale asset purchases and the accompanying balance sheet FG may serve to signal that short rates will remain low and in this sense could be viewed as enhancing FG. Indeed, some research suggests that this “signaling channel” was an important reason that

have signaling channel implications for the future policy rate path. (See, for example, Bauer and Rudebusch, 2014).

¹¹ See Campbell and others (2012), Femia and others (2013), Raskin (2013), Del Negro and others (2015), and Swanson (2016).

bond yields responded to asset purchases during the ELB period.¹² That said, there is little direct evidence that balance-sheet FG accounts for much of the impact of policy-rate FG on asset prices. Some of the instances of policy-rate FG that appear to have been most powerful, such as the announcement of calendar dates in the United States in 2011, were not accompanied by asset purchase programs, and some that occurred in conjunction with asset purchase announcements, such as the extension of the date-based guidance in September 2012, seem to have had only modest effects.¹³

Pass-through to Macroeconomic Conditions

Although the evidence shows that FG can be successful in reducing policy expectations and other market interest rates at horizons of at least a couple of years, the pass-through of these effects to macroeconomic performance is less clear. While standard theoretical models make firm predictions about the power of credible FG, in practice a number of factors may confound this mechanism.¹⁴ For example, as described above, communications intended to signal looser policy may inadvertently convey a pessimistic message about the economy. Alternatively, FG could simply be disregarded as incredible. Thus, the macroeconomic impact of FG is an empirical question.

Some indication of the perceived macroeconomic effect of FG comes from asset-price responses. The empirical studies cited above show that, on average, real yields fell and stock prices and inflation compensation rose around date-based FG announcements in the United States, suggesting that markets anticipated a stimulative effect. The international evidence on short-term market reactions to FG generally points in the same direction. However, overall, the responses of asset prices to policy-rate FG announcements have been small, on average, and somewhat inconsistent across episodes.

¹² See, for example, Bauer and Rudebusch (2014). The companion October 2019 FOMC memo, “Issues in the Use of the Balance Sheet Tool,” discusses balance sheet policy and its relationship to policy expectations, in further detail.

¹³ In a cross-country study, Coenen and others (2017) find that, for some episodes of date-based FG, interest rates were less responsive to macroeconomic news in the presence of an asset purchase program than they were when no such program was in place. In contrast, Moessner (2013) and Sutherland (2019) find no significant effect of asset purchase announcements on the effectiveness of policy-rate FG.

¹⁴ Indeed, standard New Keynesian models imply that accommodative FG should have very large effects on inflation and output when it moves expected rates far in the future by a small amount—an implausible result sometimes known as the “forward guidance puzzle” (see Carlstrom and others, 2015; Del Negro and others, 2015). While various extensions have been proposed that dampen the responses to FG shocks in these models, there is still broad agreement within this literature that the macroeconomic effects of credible FG are large enough to make the tool useful in practice. Campbell and others (2019) empirically demonstrate that the FOMC limited its FG to horizons short enough that the FG puzzle did not come significantly into play.

A number of papers suggest that information effects may have dampened the market reactions that one might otherwise have expected.

Another indication comes from quantitative structural models that allow FG to pass through to the economy by affecting agents' expectations. Engen and others (2015) and Campbell and others (2017) use New Keynesian models parameterized to U.S. data to evaluate the macroeconomic effects of the FOMC's policy-rate FG. They find that the Committee's shift to date-based guidance in 2011 substantially contributed to closing the output gap, though it had only small effects on inflation. In an incomplete-markets model also calibrated to U.S. data, Hagedorn and others (2018) find that date-based FG that commits to keeping rates at the ELB for a few quarters has generally small effects on both inflation and the real side.

Outside the context of specific structural models, Smith and Becker (2015) find substantial effects of FG on inflation and real activity in a VAR estimated over the ELB period with FG shocks identified from futures rates. Taking a somewhat longer view, D'Amico and King (2017) show that, historically, reductions in the expected path of policy that were accompanied by expectations for higher growth and inflation were successful in boosting economic activity, consistent with theoretical results. This type of shock might be expected to occur if FG is interpreted as an intention to keep policy looser than would be expected absent FG.

Finally, beyond the effect on the levels of prices and real activity, a separate question concerns the effects on macroeconomic volatility. While the evidence presented in Ehrmann and others (2019) points to reduced asset price responses to macroeconomic news during periods of FG, it is not clear that this necessarily translates into a smoother trajectory for the economy. Because some asset price movements moderate the effects of macro shocks (for example, lower bond yields following bad news may partially offset the effects of the news), reducing the responsiveness of asset prices may allow shocks to pass through more fully to the economy, analogous to the mechanism that can cause fiscal policy multipliers to increase at the ELB.¹⁵

Lessons Learned and Potential Considerations Going Forward

Central banks' communications regarding the likely course of the economy and, in particular, forecasts of the policy rate have been known for some time to help shape financial market expectations and improve macroeconomic performance (for example, Gurkaynak and others, 2005; Rudebusch and Williams, 2008). Traditionally, effective communication was seen as a way to tighten the link between the overnight nominal

¹⁵ See Christiano and others (2011).

interest rate (which the central bank controls) and the medium- and long-term interest rates that matter for saving and investment decisions (Blinder, 1998; Bernanke, 2004). But doing that became impossible once short rates hit their ELBs. As noted by Blinder (2018), at the ELB, “Communication thus morphed from a facilitator of conventional monetary policy into a new policy instrument in its own right.” As shown in various studies, the recent increased reliance on FG has been helpful in clarifying policy intentions in highly unusual economic circumstances. However, there is a danger of misinterpretation which can diminish the effectiveness of the guidance or even lead it to be counterproductive. Therefore, design issues are critical.

Broadly, the alternative variants of FG present a tradeoff between precision—which seems desirable from the perspectives of both clarity and commitment—and flexibility.

- Qualitative FG gives the Committee the most discretion in adjusting its stance and communication as necessary in light of the incoming data, but the absence of hard benchmarks against which the public can judge the Committee’s fulfillment of its promises potentially jeopardizes the credibility and effectiveness of such communications. Moreover, purely qualitative statements can lead to public confusion about the intended meaning of the language used.
- Date-based FG is particularly easy to communicate, and the public can assess compliance with the guidance. However, such a policy might constrain the ability of the FOMC to appropriately respond to incoming data. Moreover, especially if frequently revised, date-based FG may be particularly prone to credibility concerns. Thus, date-based guidance may be most appropriate if a central bank is confident that it will not frequently need to be modified.
- Outcome-based FG automatically conditions FOMC actions on incoming data, and it has the advantage of connecting the continuation of policy accommodation specifically to the achievement of certain outcomes related to the central bank’s objectives. The central bank does not need to communicate how long the accommodation will last, requiring less reliance on the particular forecasts of policymakers. However, outcome-based FG may pose greater communications challenges than date-based FG, particularly if the outcomes specified are not easily observable events, and it may also be less effective in reducing uncertainty about the course of policy. Private agents could also confuse thresholds that trigger a review of accommodation with ones that trigger the removal of accommodation. Indeed, when the FOMC implemented outcome-based guidance in 2012, participants frequently emphasized this distinction to combat such

confusion. (Nevertheless, some in the press remained confused—see, for example, the article “Fixing forward guidance” in *The Economist*, February 13, 2014.)¹⁶

As for the relative effectiveness of date- vs. outcome-based FG, it seems to be context specific.¹⁷ As noted above, the implementation of date-based guidance in the United States was associated with a large decline in policy expectations and bond yields. In this sense, date-based guidance might be said to have been more effective than the preceding qualitative guidance. In contrast, the implementation of thresholds in 2012 was not associated with a material shift in financial prices (see figure 1). However, the thresholds were specifically intended to be consistent with the earlier date-based guidance (and the accompanying FOMC statement made this explicit), so a muted market response was perhaps to be expected. Although it was not preceded by any formal FG, the BoE's introduction of thresholds in 2013 was generally in line with market expectations and similarly occasioned only modest changes in asset prices.

Under all types of FG, a key concern is that some unforeseen set of circumstances may lead the Committee to wish to deviate from its previously announced policy path. In this respect, a small, well-chosen set of escape clauses can both give the Committee necessary space for handling difficult contingencies and make its FG more credible by clarifying that the Committee does not intend to pursue its announced policy in circumstances where it would clearly result in significantly adverse outcomes. In both the United States and abroad, escape clauses have almost always accompanied outcome-based guidance and have typically related to alternative measures of labor-market conditions, inflation pressures and expectations, and financial developments. The design of such clauses should balance the objective of maintaining flexibility against potential communication challenges associated with multiple or vague contingencies. Although no

¹⁶ The Bank of England's (BoE) experience also suggests some of the communications dangers of outcome-based guidance. When the BoE introduced thresholds in 2013, it also announced that it did not expect the thresholds to be reached until at least 2016. However, despite the Committee's communications about conditionality, some market participants evidently interpreted the announced timing as at least a partial commitment. When the unemployment threshold was actually achieved in early 2014, the resulting forecast error thus led to some market confusion over the intended course of policy and arguably damaged the Bank's credibility.

¹⁷ Ehrmann and others' (2019) cross-country study is the only paper that directly compares the effects of different types of FG. As noted above, that paper finds that the responsiveness of bond yields to news is damped under most types of FG. However, this compression is particularly strong for date-based FG that has a long horizon (more than 1.5 years). Outcome-based guidance has a somewhat smaller effect, as one might expect, given its conditionality. Perhaps counterintuitively, date-based FG with a *short* horizon (less than 1.5 years) tends to *increase* the responsiveness of yields to news. This result relies heavily on the Swedish experience and so could be specific to that country. See Campbell (2019) for further discussion.

escape clause has ever been activated in practice, it is not difficult to envision a situation in which the possibility of their activation could create confusion and force the Committee to clarify its intentions under less than ideal circumstances. If, for example, financial markets were to approach undesirable levels of risk, uncertainty about the exact conditions that would trigger the escape clause could quickly become salient and lead to excessive volatility. In such a situation, the Committee might find it necessary to state its tolerance for financial imbalances with a level of precision that could be difficult to achieve. It might also risk surprising markets by activating the escape clause when it was not expected to, or vice versa.

Beyond the issues of clarity and transparency, the effectiveness of FG crucially depends on whether it is perceived as policymakers' credible commitment to a more accommodative policy path than would be otherwise expected.¹⁸ At the same time, as pointed out by Woodford (2013), the very reason that FG may be needed (and has particular force at the ELB) is to facilitate commitment on the part of the central bank. Perceptions of internal Committee dynamics—as reflected, for example, in dissents from FOMC decisions—may affect the degree to which any such commitment is viewed as credible, although the public may have difficulty assessing and interpreting the Committee's internal deliberations.¹⁹ The credibility of FG about the federal funds rate might also be reinforced if accompanied by balance sheet measures that signal the Committee's resolve in fostering accommodative financial conditions for an extended period. In particular, by targeting yields on assets maturing up to several years into the future, the Committee could back its FG with balance sheet measures that explicitly seek to anchor forward interest rates near desired levels.²⁰ At the very least, with two policy tools in play at the ELB, it is important to coordinate their use so as to convey a consistent policy stance.²¹

¹⁸ Markets' reactions to FG announcements have usually suggested that they have viewed the guidance as credible. However, instances in which central banks have been perceived as not delivering on expectations—such as the Bank of England's removal of outcome-based guidance after its unemployment threshold was achieved significantly earlier than it had forecast—may have hurt credibility, or at least contributed to public confusion.

¹⁹ In general, making monetary policy decisions by committee (as opposed to dictatorially) enhances status-quo bias and thereby makes the policy rate smoother and more predictable (Riboni and Ruge-Murcia, 2010 and Ruge-Murcia and Riboni, 2017). Riboni (2010) shows how dissenting members of a monetary policy committee can help induce the committee to follow through on commitments.

²⁰ Please see section D of the companion memo, "Issues in the Use of the Balance-Sheet Tool" for further discussion of yield curve control.

²¹ The Committee might also wish to coordinate the particular variants of FG and balance sheet policy that it pursues at any particular time. Fixed-size asset purchase programs are somewhat analogous to date-based FG in that they represent a discrete policy action that is not directly linked to subsequent events. Similarly, open-ended asset purchases resemble outcome-based guidance since the continuation of the

Blinder and others (2017) surveyed the heads of 55 central banks and found that policymakers believed that FG would continue to be used as a monetary policy tool after the end of the economic crisis. However, they doubted its effectiveness away from the ELB. Campbell and others (2019) evaluated FOMC forward guidance within the Chicago Fed’s DSGE model, both at and away from the ELB. They found in pre-2008 data that the FOMC’s FG only influenced private expectations over the next few quarters. Recent research by Maliar and Taylor (2019) finds that the usefulness of FG away from the ELB critically depends on the specific monetary policy rule.²² Very recently, a few policymakers and market commentators suggested using a form of outcome-based FG away from the ELB to firm the Committee’s commitment to returning inflation to its 2 percent goal. Such a policy would be unprecedented, so no empirical analysis of its effectiveness exists. If successful, the resulting increase in inflation expectations would raise the neutral nominal rate of interest. Therefore, implementing this policy without allowing inflation to exceed substantially the Committee’s 2-percent goal poses a novel challenge.

II. Negative Interest Rate Policy

Negative interest rate policy (NIRP) tries to create more space for policy accommodation by taking short-term rates negative, boosting private-sector borrowing and aggregate demand through familiar transmission channels. Many of the effects of NIRP in standard macro models are similar to those typically associated with lowering the policy rate, including the following: intertemporal substitution; portfolio reallocation into riskier assets; freeing up spending capacity through refinancing; increases in asset prices and wealth; and exchange rate depreciation.²³

However, there may be complexities and potential obstacles to the transmission mechanisms of NIRP that lie outside standard macro models. In general, NIRP raises the same set of financial stability and resource misallocation concerns that arise with low-for-long policy rates generally, such as concerns about reaching for yield or excessive debt

policy depends on how the economy evolves. Aligning the two policy tools along these lines could facilitate communication of the Committee’s expectations and objectives.

²² In particular, for plausible specifications of a variety of Taylor rules (based on anticipated or actual inflation measures in addition to the output gap), the effects of FG may be quite large but such effects decrease with the horizon of the policy announcement. In contrast, the effects of FG are indeterminate (ranging from extremely large to practically non-existent) if the monetary authority does not choose to follow any specific rule but rather chooses a sequence of interest rates directly.

²³ For example, in model simulations using FRB/US, Chung and Herbst (2016) find that lowering the ELB to negative 0.375 percent combined with outcome-based commitment FG marginally improves economic outcomes.

ratios.²⁴ Negative rates may also be associated with additional frictions that could impede financial intermediation and pose new risks to the financial system. For example, banks may find it difficult to pass on negative interest rates to retail depositors, which could damage bank profitability and reduce incentives for lending.²⁵ This phenomenon could lead to a restriction of intermediated credit and limit the extent to which negative rates are passed through to rates on loans.²⁶ Sims and Wu (2019) consider a structural model with a banking sector in which NIRP has this effect on banks. They conclude that NIRP would improve macroeconomic outcomes, but the degree to which rates would need to go negative to do so are implausibly large and, therefore, balance sheet policies and FG are useful alternative tools for providing stimulus.

Other financial institutions such as money market funds might cease operation if investors were unwilling to hold short-term investments with negative nominal yields and instead preferred to hold cash. To the extent that there exist institutional or psychological barriers to paying negative returns, intermediaries could face greater pressures to take on added risk in a reach for yield. Many of these possible complexities and impediments to the transmission of negative interest rates issues have been discussed in previous staff memos including Doyle and others (2017), Anbil and others (2016), DeBoer and others (2012), and Burke and others (2010) as well as by Bernanke (2016) and Eggertsson and others (2017).

Evidence on the Effectiveness of Negative Interest Rate Policy

NIRPs have been implemented by several foreign central banks, including the ECB and BOJ, which implemented negative rates in 2014 and 2016. Table 2 and figure 2 present an overview of these central banks' NIRPs. Discerning the effects of these NIRPs on financial and macroeconomic conditions is somewhat difficult because most negative rates have been close to zero, implemented with small rate cuts, and

²⁴ We also note that low policy rates may begin to have nonlinear effects before reaching zero. For example, deposit rates may become constrained by a zero lower bound while the fed funds rate is still positive.

²⁵ In addition, to the extent that retail deposits serve as a savings vehicle, not passing on negative rates to depositors could blunt the effect on the intended stimulus on consumption.

²⁶ Relatedly, Brunnermeier and Koby (2017) argue for the presence of a minimum “reversal rate” beyond which easing policy causes disintermediation because negative effects on banks' net interest margins become greater than the positive revaluations of their asset holdings. (The level of the reversal rate need not be zero.) The importance of this mechanism depends upon the degree to which NIRP passes through to longer-term asset prices. In a related paper, Ulate (2019) considers a structural model with a banking sector and finds that NIRP is less effective than conventional interest rate policy due to the contractionary effects of negative rates on bank lending.

accompanied by other nonstandard policy measures, such as FG and balance sheet policies.

Generally, it appears that negative rates have passed through to longer-term sovereign and corporate interest rates and to exchange rates to some degree (McCabe and others, 2016; IMF, 2017). Several studies have shown that bank profitability (as measured by bank stock price reactions) declines in response to NIRP, but the size of the effect varies (Ampudia and Van den Heuvel, 2019; Hong and Kandrac, 2018). Coeure (2016) and Hutchinson and Smets (2017) show that some banks have increased non-interest income through fees. The evidence on banks' lending behavior is mixed. In Sweden, Eggertsson and others (2019) find that negative rates are associated with higher bank loan rates and reduced bank lending, as banks raise loan rates instead of charging negative rates on deposits to preserve profitability. In the euro area, Heider and others (2018) find evidence that banks with a higher reliance on deposit funding reduced lending and increased risk taking in response to negative rates. In contrast, Bottero and others (2019) and Altavilla and others (2019) find that negative interest rates spur greater lending and lower loan rates as banks rebalance their portfolios away from liquid assets toward loans and pass on negative rates to a substantial share of their funding sources. Taken together, the existing studies suggest that NIRP may adversely affect some banks, especially those reliant on retail deposit funding and with an initially high loan-to-asset ratio, but that, in aggregate, NIRP has modestly boosted lending and lowered loan rates for many lenders (Lopez and others, 2018; Nucera and others, 2017; Jobst and Lin, 2016).

Empirical studies generally indicate that the effects of negative rates on financial stability and market functioning have been minor. Money funds in countries with NIRP have generally continued to operate well (McCabe and others, 2016; Bua and others, 2019). One caveat to these results, however, is that no central bank has yet cut its main policy rate below negative 1 percent, and in most cases negative rates were not expected to persist for a long time. As negative rates are continuing to persist in the euro area and Japan, central banks are taking steps to ease the burden on banks by taking such measures as tiered deposit pricing in which banks' deposits at central banks are charged negative rates only after a certain threshold.²⁷

There have not been many empirical studies on the overall macroeconomic effects of NIRP. Some studies based on smaller samples of micro-data have shown that some firms' investment spending increased in response to lower interest rates and more available funding following the implementation of NIRP in the euro area (for example, Bottero et al 2019; Altavilla and others, 2019), suggesting that the easier financial

²⁷ The ECB, BOJ, SNB, and DNB all exempt some percent of banks' reserves from negative rates.

conditions brought about by NIRP can support economic activity. That said, Christensen and Spiegel (2019) recently documented that medium-term inflation expectations in Japan fell in 2016 when the BOJ implemented NIRP which could indicate unintended contractionary consequences of NIRP and adds a note of caution regarding the effectiveness of NIRP when inflation expectations are already low.

Lessons Learned and Potential Considerations Going Forward

Although experiences with NIRPs are limited, negative interest rates appear to have had positive—albeit likely small—effects on monetary and economic conditions in the economies in which they have been implemented. However, empirical estimates are too imprecise to say whether these effects are materially different from those of policy rate changes in positive territory, and the longer-term consequences, should negative rates persist, are completely untested. Moreover, there is no evidence on how much lower negative rates could go, raising questions about NIRP as a primary tool to provide economic stimulus.²⁸ Nonetheless, Lilley and Rogoff (2019) recently argued that active steps should be taken in the United States to prepare for the ability to use NIRP as a credible monetary policy tool during future downturns.

Although the foreign experience with NIRP is instructive, the effects of NIRP in the United States could diverge substantially from that in other countries, given institutional differences across financial systems. For U.S. banks, the available evidence suggests that NIRP would have mixed effects. Anbil and others (2016) show that large banks that hold a significant share of excess reserves could be most affected by negative rates both because of their large reserves holdings and limited ability to lower rates on deposits and other sources of funding compared with smaller banks. As shown in Arseneau (2017), when negative rates were introduced as an explicit hypothetical scenario in the 2016 Comprehensive Capital Analysis and Review (CCAR) stress tests, roughly one-third of banks viewed themselves as exposed to lower profits through net interest margin (NIM) compression owing to negative policy rates controlling for macroeconomic conditions. However, an additional one-third believed that the incremental effect of negative rates would be to expand their NIMs as they expected to be able to charge more for liquidity provision to depositors. For the United States money market fund industry it is unclear whether the relatively benign effects of NIRP experienced by money funds abroad can be assumed for the United States. The money market fund industry in the United States is much larger and serves a larger set of

²⁸ Fatum and others (2019) find that in economies with NIRPs, the reaction of bond yields to macroeconomic news surprises is weaker than in economies with zero interest rates, suggesting that there may be a limit to how low negative rates can go, or an effective lower bound on NIRPs.

institutions and investors than in most other advanced economies. It is, therefore, possible that investor withdrawals from money market funds in response to negative rates could have adverse effects on short-term credit markets and Treasury security market functioning (Anbil and others, 2016).

Finally, implementing effective negative rate policy in the United States would require a host of operational changes both within the Federal Reserve and in the larger financial system and could entail legal risk to the Federal Reserve.²⁹ It is notable, however, that most of the changes were navigated fairly smoothly in countries that implemented a mildly negative rate policy. Because of market-functioning concerns, it would be prudent for the Committee to state, well in advance, its willingness to use the negative rates, if ever deemed necessary, so as to allow time for planning and operational testing by all parties to limit market disruptions.

²⁹ Several staff memos have explored many of these issues: Burke and others (2010, 2011a, and 2011b); DeBoer and others (2012); and Anbil and others (2016). See also Rogoff (2017).

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Appendix: Recent Instances of Forward Guidance

The Federal Reserve provided policy-rate FG in December 2008 when the federal funds rate was cut to a range of 0 to 0.25 percent, and it continuously provided some form of such guidance throughout the ELB period. Table 1 reviews the main changes made to its policy rate guidance during this time. The period can generally be divided into four regimes:

- From December 2008 through June 2011, the Committee relied on qualitative guidance, most notably describing its expectation that the federal funds rate would remain low for an “extended period.”
- From August 2011 through November 2012, the Committee relied on date-based guidance, announcing explicit dates (at least) through which it expected low rates to prevail.
- From December 2012 through January 2014, the Committee relied on outcome-based guidance, announcing economic thresholds that it expected would need to be met before it raised the policy rate.
- Finally, from March 2014 through December 2015, the Committee reverted to qualitative guidance. However, through much of this period, the FOMC stated that policy liftoff would likely not occur until after the end of the open-ended asset purchase program, which eventually wound down at a predictable pace. Thus, some of this guidance could be viewed as providing implicit dates.

Over time, the Committee gradually combined its FG with various types of ancillary communications and introduced escape clauses:

- In November 2009, the FOMC statement began pointing to the particular economic conditions that the Committee believed would continue to warrant low levels of the policy rate.
- In January 2012, the Summary of Economic Projections (SEP) began to include participants’ forecasts of the federal funds rate under appropriate monetary policy.
- Also in January 2012, the FOMC adopted the Statement on Longer-Run Goals and Monetary Policy Strategy, which, among other things, announced its 2 percent inflation goal and may have helped to cement the public’s perceptions about the ultimate objectives of FG.
- Beginning in September 2012, the Committee stated that it expected “that a highly accommodative stance of monetary policy [would] remain appropriate for a considerable time after the economic recovery strengthens.” Vice Chair Yellen (2012) characterized this guidance as signaling a longer stay at the ELB than a typical policy rule would prescribe, which could be seen as an attempt to use FG as a tool for providing accommodation, rather than simply clarifying the FOMC's expectations.

- During the period of December 2012 to January 2014 of outcome-based guidance, the statement noted a number of factors (measures of labor-market conditions, financial developments, and inflation expectations) that could affect the duration of exceptionally accommodative policy beyond the explicit unemployment and inflation thresholds.

The ECB, the Bank of England, and the Bank of Japan, as well as a number of central banks in smaller economies, have also implemented various forms of FG in recent years.³⁰

- The BoJ relied on outcome-based guidance for its policy rate, linked to progress on its inflation objective, from 2010 through 2013. At that point, the BoJ began its “quantitative and qualitative easing” (QQE) program, effectively abandoning the short rate as its main policy instrument. However, it maintained outcome-based guidance in the sense that it committed to continuing QQE until its 2 percent inflation target was achieved, and it also announced that it expected this goal to be achieved within about two years.³¹
- The BoE introduced outcome-based guidance in 2013, using inflation and unemployment criteria and escape clauses similar to the Federal Reserve’s. Like the BoJ, they also announced a date on which they expected the thresholds to be reached. Thus, the BoE effectively combined outcome- and date-based guidance. The unemployment threshold was actually achieved in early 2014 (amid some market confusion), and the Monetary Policy Committee (MPC) subsequently abandoned thresholds in favor of qualitative guidance.
- The ECB adopted qualitative (“extended period”) guidance in 2013. It subsequently moved to date-based guidance, with an outcome-based addendum stating that rates would remain low “for as long as necessary to ensure the continued sustained convergence of inflation to its aim over the medium term.”³²

³⁰ A few central banks, including the Reserve Bank of New Zealand, the Norges Bank, and the Sveriges Riksbank maintain FG as part of their standard operating procedures, communicating their intended policy path through the publication of a consensus forecast. While the market does appear to respond to the release of these forecasts, the evidence is somewhat mixed on whether they help to reduce disagreement among private-sector forecasters (Kool and Thornton, 2015; Detmers and others, 2018; Jain and Sutherland, 2018).

³¹ See the FOMC memo by Duarte and others (2019) for additional information. The BoJ had a relatively long history of forward guidance prior to 2010, dating back at least to 1999 when Governor Hayami stated that the policy rate would remain at zero “until deflationary concerns are dispelled.”

³² The ECB statements during this period also contained qualitative language highlighting the “need for a highly accommodative stance of policy for a prolonged period of time” and noted that the Governing Council was “determined to act” if the inflation outlook continued to disappoint (a vague form of outcome-based guidance).

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In September of this year, it adopted fully outcome-based (though not quantitative) guidance, saying that it would keep the key policy rates at their present or lower levels until its inflation outlook has “robustly converged” to its target and that this convergence is reflected in realized inflation outcomes.

Table 1.**Major Instances of Policy-Rate Forward Guidance in the United States, 2008 - 2015**

Dec-08	The Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.
Mar-09	The Committee ... anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period.
Nov-09	The Committee ... continues to anticipate that economic conditions, including low rates of resource utilization, subdued inflation trends, and stable inflation expectations, are likely to warrant exceptionally low levels of the federal funds rate for an extended period
Jun-11	The Committee continues to anticipate that economic conditions--including low rates of resource utilization and a subdued outlook for inflation over the medium run--are likely to warrant exceptionally low levels for the federal funds rate for an extended period.
Aug-11	The Committee currently anticipates that economic conditions--including low rates of resource utilization and a subdued outlook for inflation over the medium run--are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.
Jan-12	The Committee ... currently anticipates that economic conditions--including low rates of resource utilization and a subdued outlook for inflation over the medium run--are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014.
Sep-12	The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens. In particular, the Committee ... currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015.
Dec-12	The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens. In particular, the Committee ... currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored. The Committee views these thresholds as consistent with its earlier date-based guidance. In determining how long to maintain a highly accommodative stance of monetary policy, the Committee will also consider other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments.
Dec-13	The Committee today reaffirmed its view that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens. The Committee also

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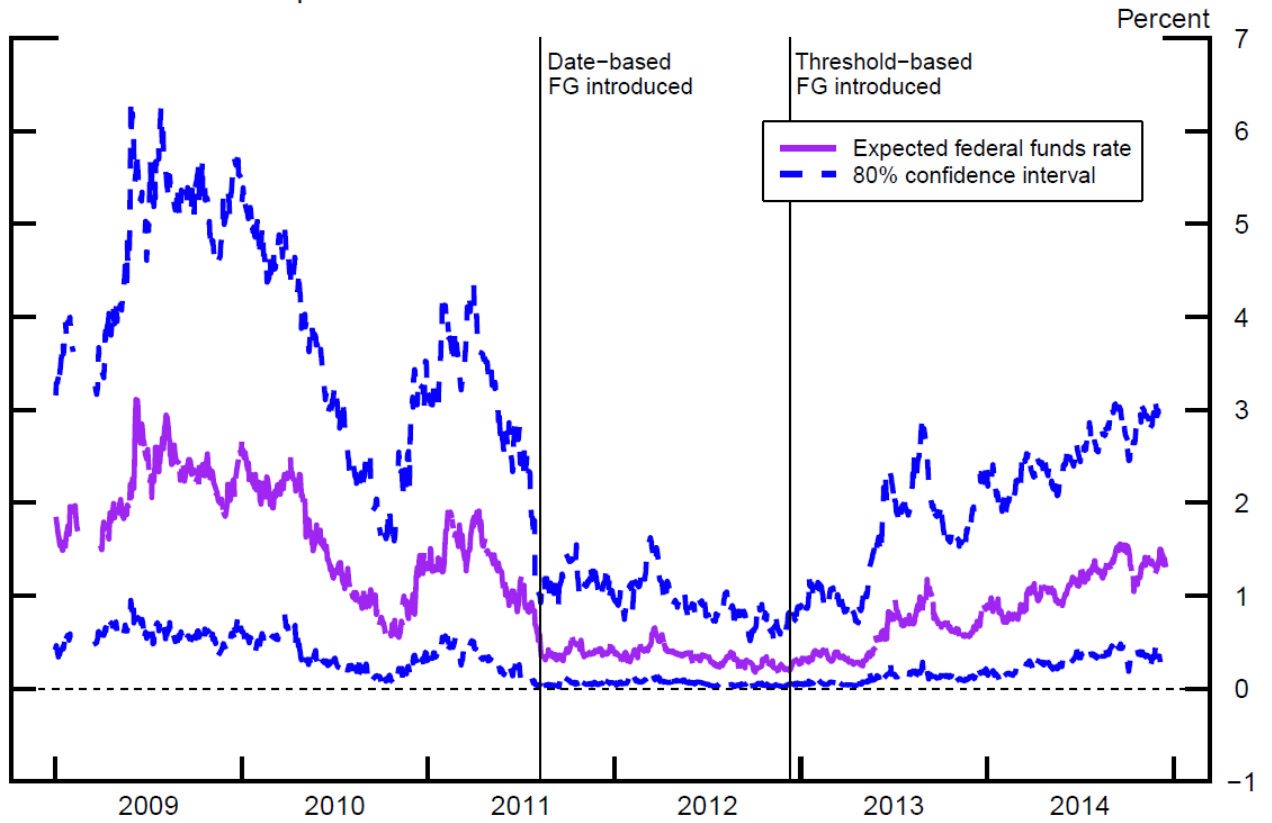
	<p>reaffirmed its expectation that the current exceptionally low target range for the federal funds rate of 0 to 1/4 percent will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored. In determining how long to maintain a highly accommodative stance of monetary policy, the Committee will also consider other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. The Committee now anticipates, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate well past the time that the unemployment rate declines below 6-1/2 percent, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal.</p>
<p>Mar-14</p>	<p>The Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate... The Committee continues to anticipate... that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored... The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.</p>
<p>Oct-14</p>	<p>The Committee anticipates ... that it likely will be appropriate to maintain the 0 to 1/4 percent target range for the federal funds rate for a considerable time following the end of its asset purchase program this month, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored. However, if incoming information indicates faster progress toward the Committee's employment and inflation objectives than the Committee now expects, then increases in the target range for the federal funds rate are likely to occur sooner than currently anticipated. Conversely, if progress proves slower than expected, then increases in the target range are likely to occur later than currently anticipated... The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.</p>
<p>Dec-14</p>	<p>Based on its current assessment, the Committee judges that it can be patient in beginning to normalize the stance of monetary policy. The Committee sees this guidance as consistent with its previous statement that it likely will be appropriate to maintain the 0 to 1/4 percent target range for the federal funds rate for a considerable time following the end of its asset purchase program in October, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored. However, if incoming information indicates faster progress toward the Committee's employment and inflation objectives than the Committee now expects, then increases in the target</p>

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	<p>range for the federal funds rate are likely to occur sooner than currently anticipated. Conversely, if progress proves slower than expected, then increases in the target range are likely to occur later than currently anticipated... The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.</p>
Mar-15	<p>Consistent with its previous statement, the Committee judges that an increase in the target range for the federal funds rate remains unlikely at the April FOMC meeting. The Committee anticipates that it will be appropriate to raise the target range for the federal funds rate when it has seen further improvement in the labor market and is reasonably confident that inflation will move back to its 2 percent objective over the medium term. This change in the forward guidance does not indicate that the Committee has decided on the timing of the initial increase in the target range... The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.</p>
Apr-15	<p>The Committee anticipates that it will be appropriate to raise the target range for the federal funds rate when it has seen further improvement in the labor market and is reasonably confident that inflation will move back to its 2 percent objective over the medium term... The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.</p>
Dec-15	<p>The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.</p>

Figure 1: Market Reaction to Forward Guidance Announcements

Market-Implied Distribution of Federal Funds Rate 2 Years Ahead



Source: Bloomberg; staff calculations.

Table 2. Overview of NIRPs at Foreign Central Banks

Country	Instrument	Rate (Date)
Denmark	Certificates of deposit (CD) rate	-.20 percent (July 2012) -.75 percent (Feb 2015)
Euro area	Deposit rate	-.10 percent (June 2014) -.50 percent (Sept 2019)
Japan	Deposit rate	-.10 percent (Feb 2016)
Switzerland	Rate on sight deposits at the SNB	-.75 percent (Jan 2015)
Sweden	Repo rate	-.10 percent (Feb 2015) -.50 percent (Feb 2016)

Note: The table shows the first and most negative rate thereafter.
Source: National central banks.

Figure 2: Policy Rates of Central Banks Implementing NIRP

