

## Simon Potter: Implementing monetary policy with the balance sheet

Keynote remarks by Mr Simon M Potter, Executive Vice President of the Markets Group of the Federal Reserve Bank of New York, at the ECB Workshop on "Money markets, monetary policy implementation and central bank balance sheets", Frankfurt am Main, 6 November 2017.

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I'd like to thank the European Central Bank (ECB), both for inviting me to give this keynote address and for organizing this conference on money markets, monetary policy implementation, and central bank balance sheets. I'd also like to congratulate all of the presenters and discussants, whose engaging research and critiques help to foster a deeper understanding of some of the many policy implementation issues central bankers face as we digest past challenges and prepare for future ones.

This conference comes as several major central banks reached milestones using their balance sheets as active tools for providing monetary policy accommodation. The ECB just announced it will extend its bond purchasing program but scale back the pace of purchases starting next year. The Bank of England completed purchases under its Gilts and Corporate Bond Purchases schemes and confirmed an upcoming close to the drawdown period for its Term Funding Scheme. And the Federal Reserve has begun to reduce its sizable holdings of securities, built up through large-scale asset purchase programs (LSAPs) over the past decade.

My comments today will focus on the role that asset purchases may play in a central bank's toolkit for implementing monetary policy. I will briefly review how the Federal Reserve successfully adapted its operating framework to be able to achieve interest rate control with a large balance sheet and began its gradual and predictable balance sheet normalization program. Then, in thinking about the prospective use of asset purchases in providing additional monetary policy accommodation at the zero lower bound in the future, I will reflect on some lessons from the Fed's experience. Among other lessons, we have learned that asset purchases have clear benefits at the zero lower bound, perhaps with more limited costs than initially raised; that we had greater-than-expected capacity to conduct large purchases without harming market functioning; and that credible communications about use of the balance sheet and expectations for short-term interest rates support adjustments in market pricing and smooth monetary policy transmission. As always, the views presented here are my own and do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System.

### **The Federal Reserve's asset purchases and operating regime**

The severity of the global financial crisis that began in 2007 challenged central banks to use both conventional and unconventional measures to address the economic effects of the crisis and the sluggish recovery that followed. Using its conventional tool for easing the stance of monetary policy, the Federal Open Market Committee (FOMC or Committee) lowered its target for the federal funds rate in a series of steps from 5¼ percent in mid-2007 to a range of zero to ¼ percent in December 2008. With short-term interest rates effectively constrained at their lower bound, the FOMC provided further monetary policy easing with two unconventional tools: Forward guidance on the expected future path of overnight interest rates and asset purchase programs aimed at putting downward pressure on longer-term interest rates, supporting mortgage markets, and making broader financial conditions more accommodative.<sup>1</sup> Purchases of longer-term Treasury securities, agency debt, and agency mortgage-backed securities (MBS) expanded the size, duration, and interest rate and prepayment risk profile of the Fed's domestic

securities portfolio.<sup>2</sup>

In total, from 2008 through 2014, the FOMC undertook three rounds of LSAPs, resulting in an extraordinary expansion in the size of the Fed's balance sheet—from around \$900 billion (6 percent of U.S. nominal GDP) before the crisis, to \$4.5 trillion (23 percent of GDP) today.<sup>3</sup> For all but a brief period of that time and until last month, the FOMC maintained the face value of its securities holdings by reinvesting principal payments received on securities held in its portfolio. I will discuss reinvestments more specifically later.

These purchases were funded primarily by increasing the stock of reserve balances in the banking system, which compelled changes in the operating framework the Fed uses to achieve interest rate control.<sup>4</sup> With an abundant supply of reserve balances, variations in their supply—the mechanism through which the Fed implemented monetary policy before the crisis—would no longer cause meaningful changes in federal funds rates or other money market rates. Implementation of monetary policy therefore required a new operational approach.

The Fed's current policy implementation framework uses a system of rates that it directly administers to influence the level of short-term interest rates, without needing to actively adjust the supply of reserves. Specifically, the Fed uses the rate of interest paid on excess reserves (IOER) held by depository institutions as its primary tool for keeping the federal funds rate in its target range. It supplements this tool by offering overnight reverse repos (ON RRP) at a specified offering rate to a broad set of counterparties, including eligible money market funds, government-sponsored enterprises, primary dealers, and banks.<sup>5</sup> Together, IOER and ON RRP set a floor on rates, beneath which bank and nonbank financial institutions with access to these facilities should be unwilling to lend funds.<sup>6</sup>

This framework has been working very well. Since December 16, 2015, when the FOMC began the process of normalizing the stance of monetary policy, it has raised its federal funds target range four times to a current range of 1 to 1¼ percent. The effective federal funds rate (EFFR) has been within the FOMC's prevailing target range on all but one day, and changes in the federal funds rate continue to transmit in a predictable and effective way to other money market rates.<sup>7</sup>

### **Balance sheet normalization commences...**

With normalization of the level of the federal funds rate well underway and interest rate control effectively established, the FOMC has now begun the process of normalizing the Fed's balance sheet, using a program described this past June in an addendum to its Policy Normalization Principles and Plans.<sup>8</sup> Specifically, as of last month, the FOMC is gradually reducing the Fed's securities holdings by decreasing its reinvestment of principal payments received from those securities, with payments being reinvested only to the extent that they exceed gradually rising caps.<sup>9</sup>

This process for reducing the balance sheet will run in the background, while changes in the target range for the federal funds rate are the FOMC's primary means of adjusting the stance of monetary policy. However, the FOMC said it would be prepared to resume reinvestments if a "material deterioration in the economic outlook were to warrant a sizable reduction in the Committee's target for the federal funds rate," and it would be prepared to use its "full range of tools, including altering the size and composition of its balance sheet, if future economic conditions were to warrant a more accommodative monetary policy than can be achieved solely by reducing the federal fund rate." These conditions help identify the types of circumstances that might lead to some adjustments in the balance sheet normalization process, although Chair Yellen has noted there is a high bar for altering the balance sheet's current course.<sup>10</sup>

The FOMC's balance sheet reduction strategy lays out a gradual and predictable path for portfolio runoff, which should reduce the risk that balance sheet normalization will generate

undesirably large asset price reactions, volatility, or disruptions to financial markets or Treasury debt issuance.<sup>11</sup> That strategy—together with the FOMC’s steady communications throughout 2017 as the Committee developed it well in advance of implementing any change in policy—has helped to keep market expectations closely aligned with the FOMC’s intentions. The market response to the commencement of the Fed’s balance sheet reduction has been calm. The removal of policy accommodation associated with the Fed’s securities portfolio reductions should over time be expected to put some upward pressure on longer-term interest rates.<sup>12</sup> However, the relatively muted increase in term premiums seen so far may in part reflect the non-zero probability that market participants assign to the FOMC deploying the balance sheet again if future economic conditions were to warrant more monetary easing than could be achieved solely through reductions in the federal funds rate, consistent with the FOMC’s normalization plan guidance.<sup>13</sup>

### ... but where is it headed?

The FOMC has started the process of normalizing the Fed’s balance sheet and has provided some general guideposts. The Policy Normalization Principles and Plans state that the Committee intends for the Federal Reserve, in the longer run, to hold no more securities than necessary to implement monetary policy “efficiently and effectively,” and that it will hold primarily Treasury securities. In the June addendum, the FOMC noted that reducing the Fed’s securities holdings will result in a declining supply of reserve balances, and that it anticipates reducing the quantity of reserve balances to a level “appreciably below that seen in recent years but larger than before the financial crisis.”

New York Fed staff projections for possible paths of the Fed’s securities portfolio—constructed using a distribution of market participants’ surveyed expectations for the future size of the Fed’s balance sheet (conditional on not moving to the zero lower bound at any point between now and 2025), along with some staff modeling to fill in details—suggest it will take at least several years for the balance sheet to reach its “normal” size.<sup>14</sup> Uncertainty about the time of normalization arises from numerous sources, including future levels and variability of demand for different types of Fed liabilities, the pace at which the agency MBS portfolio will pay down, and of course the economic outlook.

Assuming that balance sheet normalization continues uninterrupted, it seems likely that the future balance sheet size will be driven largely by changes in longer-run demand for Fed liabilities—in contrast to the asset-driven balance sheet of the past decade. The FOMC explains in the June addendum that reserve balances will be driven by the banking system’s demand for reserves and the Committee’s decisions about how to implement monetary policy in the future. Banks’ experiences during the crisis, structural changes in the banking system, and post-crisis changes in financial regulations will likely increase the level and variability of the demand for reserves relative to before the crisis, but we don’t currently know the precise shape and position of banks’ demand curves. The FOMC has said that it expects to learn more about the underlying demand for reserves during the process of balance sheet normalization. In addition, the FOMC will need to decide what type of operating regime it wishes to run in the future—namely, whether it believes it will be efficient and effective continuing to use a reserve-abundant operating system (albeit with less abundance than seen at present) or returning to a reserve-scarce system, as the Fed used before the crisis. In sizing up the balance sheet, policymakers will also need to take into account several important non-reserve liabilities that are largely outside the immediate direct control of the Fed.<sup>15</sup>

On the asset side of the balance sheet, the normalized size of the securities portfolio is one whose level is consistent with the balance sheet’s longer-run trend. However, even once the Fed normalizes the *size* of its balance sheet and securities portfolio, the *composition* of its securities portfolio will not yet be “normal.” The projections I mentioned earlier—which assume ongoing implementation of the FOMC’s capped portfolio reduction strategy—estimate that the domestic

securities portfolio could contain more than \$1 trillion in agency MBS at the time the balance sheet reaches a normalized size, even though the FOMC has indicated a preference to hold primarily Treasury securities in the longer run. Meanwhile, the maturity profile of the Treasury portfolio at that time is projected to be more skewed towards longer-term holdings than it was before the crisis, when the Fed held one-third of its portfolio in Treasury bills, and about two-thirds of its holdings matured in less than three years.<sup>16</sup>

### **A role for asset purchases at the zero lower bound**

As they digest the experience of the past decade, policymakers, academics, and market participants are engaged in an active dialogue on appropriate monetary policy strategies and the role of unconventional policy tools in future zero lower bound episodes.<sup>17</sup> Amid widespread concerns of a secular decline in nominal interest rates, this is not just a theoretical discourse. The median of FOMC participants' projections for the longer-run value of the nominal federal funds rate is currently 2¾ percent, leaving little room to ease the stance of policy through changes in overnight rates. As a result, the likelihood of a return to the zero lower bound is, in Chair Yellen's words, "uncomfortably high, even in the absence of a major financial or economic crisis."<sup>18</sup>

Against this backdrop, Chair Yellen has expressed her views on the Fed's monetary policy implementation tools. She suggests that whenever possible, influencing short-term interest rates should be the Fed's primary policy lever, but that enhanced forward rate guidance and asset purchases should be considered again if that conventional tool reaches its limit, as would be the case if a future economic downturn drove short-term rates back to the zero lower bound. This view is consistent with her 2016 Jackson Hole remarks, where she presented analysis making the case that the Fed's use of forward guidance and asset purchases could improve macroeconomic outcomes on average in zero lower bound episodes, and indicated that she expected these tools to remain "important components" of the Fed's policy toolkit.<sup>19</sup>

The FOMC itself has not made any formal decisions about the Fed's long-run monetary policy implementation framework. However, minutes from a November 2016 discussion about potential choices of policy rates, operating regimes, and balance sheet policies indicate that a number of policymakers viewed expansion of the balance sheet as an "important tool" to provide macroeconomic stimulus in situations in which overnight interest rates were at their effective lower bound.<sup>20</sup> This approach is consistent with the balance sheet reaction function described in the June addendum to the FOMC's Policy Normalization Principles and Plans.

### **Lessons learned**

Of course, whether and under what circumstances the FOMC would again activate large-scale asset purchases are ultimately decisions for future policymakers. But, to the extent they remain a possible tool for providing additional monetary easing when overnight interest rates fall to the zero lower bound, it is worth considering some lessons about their use. Some personal observations follow.

#### ***Lesson 1: LSAPs had clear benefits at the zero lower bound***

Estimates of the magnitude and persistence of the effects of the Fed's purchase programs vary, as do assessments of the relative importance of the possible channels through which such programs are believed to work. However, research largely provides evidence that the Fed's asset purchases put downward pressure on longer-term interest rates and eased broader financial conditions, helping to improve macroeconomic outcomes.<sup>21</sup> Studies of asset purchase programs conducted by other advanced economy central banks also show positive results. In his survey of the range of research results, Joe Gagnon finds roughly similar median results for studies focusing on programs in the United States, United Kingdom, and euro area—citing a

median effect of about a 50-basis-point reduction in 10-year yields for a purchase equal to 10 percent of GDP.<sup>22</sup>

Regarding costs, in a recent exploration of strategies for defeating the zero lower bound, former Federal Reserve Chairman Bernanke dispels some of the common critiques of balance sheet programs (which he calls quantitative easing).<sup>23</sup> He points to unrealized worries about an upsurge in inflation, collapse of the dollar, currency war, and rise in household leverage, and he questions the effects in promoting asset bubbles and inequality. He notes that fiscal risks associated with quantitative easing must be balanced against benefits of tools that enhance policymakers' ability to meet their policy objectives in the face of a serious economic downturn or disinflation.

### ***Lesson 2: The Fed could control interest rates even with a large balance sheet***

An additional concern—that the Fed would not be able to control interest rates with a large balance sheet—proved to be surmountable. As I described earlier, the Fed successfully introduced new tools and counterparty relationships into a new operating regime that delivers interest rate control irrespective of the level of reserve balances in the banking system. In the event policymakers contemplate asset purchases again in the future, they should be able to undertake them with confidence that balance sheet expansion will not compromise the Fed's ability to effectively implement monetary policy when the time comes to lift rates from the zero lower bound.

### ***Lesson 3: The Fed could purchase large amounts of securities without damaging the market***

Absent a conflicting policy objective, a central bank should aim to promote good market functioning in its operations to help ensure effective transmission to the rest of the financial system. This objective is a vital one for the Fed because of the importance of the U.S. Treasury market as a global benchmark. As such, the staff of the New York Fed's Open Market Trading Desk considered how to execute asset purchase programs in ways that avoided harming market structures and activity.<sup>24</sup> If the Fed became too dominant a buyer or holder, it could have reduced the tradeable supply of targeted securities and discouraged trading among market participants, leading to diminished liquidity and price discovery. A significant deterioration in liquidity could lead investors to demand a premium for transacting in these markets, ultimately raising borrowing costs and undermining the program's policy goal.

I do not believe the Fed's purchase programs had any unintended adverse effects on market functioning. In fact, over time, we learned that we were able to purchase in larger sizes and faster paces than perhaps initially expected. Secondary market purchases of Treasury securities reached about \$100 billion per month during the second LSAP program (a time when proceeds from agency debt and MBS were being reinvested in Treasuries), and we doubled our per-issue concentration limit from 35 percent to 70 percent. Meanwhile, monthly purchases of agency MBS were successfully ramped up from a pace of \$25 billion per month for just reinvestments in the first half of 2012 to more than \$70 billion per month later that year when additional purchases under the third LSAP program were also conducted. This volume represented a substantial share of monthly gross issuance.<sup>25</sup> Staff actively monitored indicators of market functioning available in the broader market and through our own operations for signs of any material deterioration.<sup>26</sup> As necessary, we modified our operational schedules (while still meeting the policy directive we were given) to ensure smooth functioning, such as periods of ramping up or winding down purchase programs.

The Fed also put in place active policies to help prevent market dysfunction as a result of its operations. Preventive measures included concentration limits on holdings of individual Treasury securities and prohibitions against purchasing some specific, highly-demanded securities.

Agency MBS purchases were eventually targeted at newly issued, to-be-announced (TBA) securities, which tend to be the most liquid and readily available.<sup>27</sup> Further, we spread our agency MBS purchases out across multiple settlement months and used dollar rolls to facilitate the orderly settlement of unsettled purchases.<sup>28</sup> As a more general practice, the Fed actively promotes market functioning by running a securities lending program through which primary dealers can borrow Treasury and agency debt securities held in the Fed's portfolio.

#### ***Lesson 4: Reinvestments matter***

Relatively quickly, the Fed came to learn that the reinvestment of principal payments received from securities held in its portfolio represented a distinct balance sheet tool that could help to maintain the FOMC's desired level of monetary policy accommodation. The FOMC initially allowed agency debt and agency MBS acquired in the first LSAP program to run off as principal was repaid. However, as purchases ended, a decline in mortgage rates generated increased refinancing activity that accelerated repayments of principal on agency MBS held by the Fed. The resultant reduction in the Fed's agency MBS holdings pushed a large supply of securities into the hands of private investors, putting upward pressure on longer-term interest rates. In August 2010, after considering the implications for financial conditions and the economic outlook of not reinvesting these repayments, the FOMC announced it would reinvest principal payments from these securities in longer-term Treasury securities. Then, in September 2011, the FOMC announced that repayments from these securities would instead be reinvested in agency MBS to help support conditions in mortgage markets.<sup>29</sup> The FOMC then maintained reinvestments, including Treasury rollovers, until commencing balance sheet normalization last month.<sup>30</sup>

Keeping the Fed's holdings of longer-term securities at sizable levels helped to maintain accommodative financial conditions as economic conditions strengthened. This is because, in addition to the acquisition of securities through asset purchases, the period over which the central bank intends to hold its securities helps to shape market participants' expectations about the size and duration of assets available to the public. Extending the holding period through reinvestments prolongs this so-called stock effect. The 2010 episode when the Fed was not reinvesting agency-related principal payments demonstrated both term premium effects that might have been expected to be associated with a reduction in the Fed's securities holdings and the risks associated with an unexpected increase in the publicly-held stock of agency MBS. As we normalize the size of the balance sheet, maintaining redemption caps throughout the process (and continuing to reinvest any principal payments received in excess of those caps) provides an insurance mechanism that limits the amount of variation in the pace at which securities, particularly mortgages, will flow back into private hands.

#### ***Lesson 5: Credible communications influence the effectiveness of asset purchase programs***

As a general matter, monetary policy transmits more smoothly when market participants are able to understand and anticipate central bank actions. Managing market expectations about monetary policy implementation takes on even more importance in the challenging environment posed by the zero lower bound. Both in shifting into a regime that uses the balance sheet as an active tool for policy implementation and then shifting away from such use, there is an important interaction that the settings of overnight rates, forward guidance on those rates, and balance sheet configurations have on overall financial conditions. Having clear and credible communications that help market participants understand the central bank's intended use of these tools can thus affect overall program effectiveness. Indeed, a central bank's clarity around how it would pursue its goals at the zero lower bound can, in itself, produce a more stable environment with fewer and shorter trips to the zero lower bound.<sup>31</sup> And even at the zero lower bound, the speed and accuracy with which market participants understand the central bank's reaction function could contribute to better macroeconomic outcomes.<sup>32</sup>

My analysis takes its cue from the framework proposed by Chair Yellen, where unconventional policy tools are deployed to provide additional policy accommodation at the zero lower bound, and a supposition that balance sheet expansion would be introduced if the zero bound is viewed to be more restrictive than can be mitigated by forward guidance alone, just as they were during the financial crisis and subsequent recession.

Communications are central to the two primary channels through which balance sheet policies are believed to work. First, balance sheet policies can serve as a signaling device that strengthens forward guidance and reduces expectations for the path of short-term interest rates. Putting actions behind its words—either through new asset purchases or by maintaining reinvestments—helps the central bank to establish a credible commitment to maintaining monetary easing.<sup>33</sup> Second, balance sheet actions transmit through a portfolio balance channel, which—through the stock effect I described earlier—reduces term and risk premiums embedded in bond yields by reducing the supply of long-term bonds in the market. Many studies conclude that this channel is likely the dominant one.

With this in mind, the central bank should provide clear guidance at the start of its purchase program about its intended purchase and reinvestment plans—either in quantitative or qualitative, state-contingent terms—and then follow through on this commitment.<sup>34</sup> It seems sensible for the central bank to buy assets as quickly as possible, contingent on economic developments and no disruption to market functioning.<sup>35</sup> Once purchases have been completed, the central bank should then hold the assets for as long as it says it plans to—including maintaining its holdings through reinvestments, as appropriate—to align realized actions with market participants' expectations, again contingent on economic developments.<sup>36</sup>

By making purchases state-contingent—that is, tying their size or pace explicitly to the achievement of broader macroeconomic objectives or other conditions—like the Fed did in its third LSAP program and with reinvestments following liftoff, the central bank can help market participants understand its balance sheet reaction function and expected changes in the public stock of assets.<sup>37</sup> However, policymakers must also consider how market participants understand the central bank's approach to its balance sheet in conjunction with its guidance on the overnight policy rate. Failure to adequately distinguish between the two tools can lead to spillovers and undesirable outcomes. A cautionary example is the 2013 “taper tantrum,” when Chairman Bernanke's announcement of an eventual cessation in asset purchases was interpreted by market participants as signaling a sooner-than-expected increase in short-term interest rates, prompting sharp and unexpected declines in asset prices. Guidance that provides clarity around both short-term interest rates and the balance sheet might help to anchor interest rate expectations—for example by indicating while purchases continue that the central bank intends to maintain overnight interest rates at low levels even after the completion of asset purchases.<sup>38</sup>

### ***Lesson 6: Focus on one tool during normalization***

Uncertainty associated with managing multiple tools and the degree of substitutability between them poses possible challenges in removing policy accommodation after a zero lower bound episode, as the central bank switches from conducting policy with one lever to another. It therefore seems prudent to take a gradual approach to normalization, emphasizing one tool at a time.

The Fed's adopted normalization approach has thus far been an effective one. Starting to raise rates first, and waiting to start reducing the balance sheet until normalization in the level of overnight rates is well underway, has helped to ensure that the economic recovery is sufficiently advanced before making changes to the balance sheet.<sup>39</sup> This strategy has reduced the likelihood that an unexpected adverse shock to the economy not long after the start of policy tightening would have necessitated a return to the zero lower bound on the federal funds rate and

potentially a reversal in balance sheet normalization. Instead, the FOMC's approach promotes the use of the federal funds rate as the active monetary policy instrument—an instrument with which it has much greater experience, likely helping to minimize the risk of an error in the early and still-vulnerable stages of the economy's recovery.<sup>40</sup>

Running down the balance sheet passively, in a gradual and predictable manner, once normalization of short-term interest rates is well underway puts the balance sheet's normalization in the background. The stock view of central bank purchase programs holds that given an expected path of the portfolio, the pace of actual changes in the portfolio should have little direct effect on asset prices. Assuming markets anticipate a gradual unwind in the portfolio, asset prices would adjust gradually over time. Nevertheless, central banks may wish to mitigate any possible risk that flow effects associated with overly fast flows of securities into private hands interfere with monetary policy implementation or disrupt market functioning. A conservative feature in the Fed's approach is therefore a one-year transition period during which gradually rising redemption caps are phased in, thus allowing financial markets and the U.S. Treasury time to adjust to the Fed's declining market presence.

These design features likely enhance overall program effectiveness. However, this outcome is traded off against a more rapid achievement of balance sheet normalization—something some policymakers might hold as a desirable objective. For example, they might see a smaller balance sheet as one that offers greater capacity for using asset purchases more fully again in the future. Such capacity may be a concern given the risk that a more normal portfolio size and composition may not be reached before an adverse shock brings short-term rates back to their effective lower bound, perhaps warranting renewed balance sheet expansion.<sup>41</sup> This risk may be particularly pronounced in a low neutral rate environment. In principle, asset sales could accelerate normalization of the size and composition of the balance sheet, but the market effects of long-duration asset sales could be uncertain, and sales could affect the path of short-term rates.<sup>42</sup> Moreover, a central bank that does not hold the assets it has purchased as long as market participants anticipate could lose credibility, making future asset purchases less effective.

The central bank must therefore consider the effects of its balance sheet actions in the context of the overall monetary policy setting, including the interplay between changes in the balance sheet and changes in interest rates. Uncertainties related to this relationship help to explain the FOMC's choice to make changes in overnight rates its main tool for adjusting the stance of monetary policy in the normalization process while balance sheet normalization runs in the background. Still, having both instruments in the central bank's toolkit raises the importance of clear and cohesive communications about their respective use.

### ***Lesson 7: Operational flexibility is important***

As I noted earlier, the Fed successfully adapted its operating regime to be able to control interest rates even with a large balance sheet. The FOMC has not decided what kind of operating regime it wishes to run in the long run, but one lesson from the crisis is that not all operating frameworks may be robust to a wide range of circumstances, such as implementing policy at the zero lower bound. If one wished to retain the option that the balance sheet could be deployed as an active tool for policy implementation at this threshold and then gradually revert to a passive role when conditions normalize, then one needs to consider how to transition into and out of different operational modalities. This requires operational flexibility.

A byproduct of a central bank's portfolio-expanding asset purchase programs is an increased supply of reserve balances in the banking system.<sup>43</sup> Thus, once balance sheet tools are deployed, the central bank will find itself operating in a system with reserve abundance if it wasn't already, and will need to adopt instruments and arrangements that can deliver interest rate control accordingly. This imperative could imply switching operating regimes—from a corridor regime to a floor regime, or from a liability-driven floor to an asset-driven floor—and staying in the

new regime for an extended period. Some central banks, such as the ECB, have monetary policy implementation frameworks in which this transition happens relatively seamlessly, while others, such as the Fed before the crisis, required significant changes to tools and operations.

Timeliness of the transition is important, and overly complex transitions —especially if there is little time to prepare—could potentially restrain a central bank’s ability to respond aggressively to rapidly changing economic and financial conditions in a crisis. Perhaps more importantly, delayed transitions could interfere with market expectations about any change in the policy stance, even though appropriately-calibrated expectations, through their effect on market pricing, could be stabilizing and lower the risk of a crisis. Additionally, if a central bank chose to employ a framework that would need to be transitioned, it would need to make sure that the necessary tools were available to facilitate that transition. New tools and practices could potentially require new operational procedures, legal approvals, governance processes, counterparty administration, technological systems, and learning curves for both central bank staff and market participants. Such switching may also be costly for money market participants if resource needs, infrastructure, and expertise dedicated to certain activities change over time.

A separate challenge for the central bank to consider is how to maintain operational and analytical readiness, both to be able to implement monetary policy in different types of operating regimes and to be able to transact in potential markets targeted for asset purchases. For example, the Fed had no operational experience transacting in the agency MBS market prior to the crisis. It initially relied on outside investment advisors to support its first purchase program, before eventually bringing trading operations in house, and then later developing capabilities to conduct auctions on its proprietary auction platform.<sup>44</sup>

## Conclusion

The Federal Reserve and other central banks initially proceeded with asset purchases in a cautious way given that the tool was new. However, I believe we have learned that the benefits are notable and the costs likely less than feared. Moreover, U.S. fixed income markets were able to withstand more sizable purchase operations than we initially anticipated, and we now know that we can successfully maintain interest rate control with a large balance sheet as we raise rates. This experience could give policymakers greater confidence in using this tool to provide additional monetary policy accommodation in future zero lower bound episodes, and give market participants greater confidence in the effectiveness of the tool in mitigating the zero lower bound. With evidence suggesting the neutral fed funds rate has fallen notably, we should continue to absorb lessons from our and other central banks’ experiences. In particular, we will need to consider the importance of communications, how to organize an operating regime that transitions smoothly, and how to maintain operational readiness. As we normalize the Federal Reserve’s balance sheet, we continue to proceed cautiously given our lack of experience with this process. I think the gradual and predictable approach the FOMC has adopted has been successful so far, but we will learn more as we proceed and as other central banks reach those milestones as well.

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<sup>1</sup> My discussion here focuses on the Federal Reserve’s actions to adjust the stance and conduct of monetary policy in pursuit of its statutory mandate of full employment and price stability. However, the [Fed’s response to the crisis](#) also included numerous temporary programs and facilities aimed at supporting the liquidity of financial institutions and fostering improved conditions in key financial markets.

<sup>2</sup> The Fed’s outright purchases of securities did not raise any credit risk exposure.

<sup>3</sup> The FOMC also undertook a program to extend the maturity profile of its Treasury holdings. This Maturity Extension Program (MEP) did not affect the portfolio’s overall size, yet still increased the portfolio’s duration risk—an important characteristic of all asset purchase programs. A common metric for communicating about the dollar value of duration risk held in the portfolio is in terms of ten-year Treasury equivalents.

- <sup>4</sup> Even before asset purchases were launched, the reserve-adding effects of the Fed's crisis-related lending programs highlighted shortcomings of its pre-crisis monetary policy implementation framework. In the first year or so of the crisis, in order to maintain the relatively scarce level of reserves necessary to maintain interest rate control, the Desk offset balance sheet growth associated with the Fed's credit and liquidity facilities by reducing other assets on the Fed's balance sheet, notably holdings of short-term U.S. Treasury securities. By September 2008, amid a deepening crisis and widening policy response, the Fed lacked a sufficient volume of unencumbered Treasury securities to sell. Some additional reserve-draining capacity came from the Supplementary Financing Program (SFP), used from September 2008 through July 2011, through which the U.S. Treasury issued bills (separate from its regular borrowing program) and maintained the proceeds in an account at the New York Fed. Even with this program, the Fed's sterilization capacity was limited.
- <sup>5</sup> The FOMC's September 2014 [Policy Normalization Principles and Plans](#) indicate that the Fed plans to use an ON RRP facility only to the extent necessary and will phase it out when it is no longer needed to help control the federal funds rate. The FOMC's current directive for open market operations instructs the New York Fed's Open Market Trading Desk to undertake ON RRP in amounts limited only by [the value](#) of Treasury securities held outright in the System Open Market Account (SOMA) that are available for such operations and by a per-counterparty limit of \$30 billion per day.
- <sup>6</sup> In theory, a standing facility that pays IOER should set a floor on wholesale short-term interest rates given the safety and convenience of this investment, and the fact that competition should bid sub-IOER rates up to levels close to those paid on reserves. However, certain institutional aspects of U.S. money markets (including bank-only access to IOER, credit limits imposed by lenders and other impediments to market competition, and the costs of balance sheet expansion) appear to create frictions that have made IOER act more like a magnet that pulls up short-term rates. ON RRP fortify the floor on wholesale short-term rates by providing a similar investment option to a wide range of nonbank institutions that are not eligible to earn IOER. I discuss the rationale for the design of this framework and the efficacy of its performance in "[Money Markets after Liftoff: Assessment to Date and the Road Ahead](#)," remarks presented at the 70th Anniversary Celebration of the School of International and Public Affairs, Columbia University, New York City, February 22, 2016.
- <sup>7</sup> On December 31, 2015, the EFFR dipped to 0.20 percent, five basis points below the bottom of the FOMC's target range. In general, the EFFR shows temporary softness on month- and quarter-end dates as banks decrease the size and adjust the composition of their balance sheets around key reporting dates.
- <sup>8</sup> See [FOMC Communications related to Policy Normalization](#).
- <sup>9</sup> For maturing Treasury securities, the monthly cap is initially \$6 billion and will increase in steps of \$6 billion at three-month intervals over twelve months until it reaches \$30 billion per month. For agency MBS and agency debt, the initial monthly cap is \$4 billion and will increase in steps of \$4 billion at three-month intervals over twelve months until it reaches \$20 billion per month. The Committee anticipates that the caps will remain in place once they reach their respective maximums.
- <sup>10</sup> See [Transcript of Chair Yellen's Press Conference, September 20, 2017](#).
- <sup>11</sup> The gradually rising caps allow market participants to incrementally absorb additional supply and its attendant duration and prepayment risk. Leaving the caps in place over the course of the normalization process helps ensure a gradual pace of the portfolio's runoff, particularly in light of the lumpiness in the Treasury maturity profile and the risk of an increase in pay-downs on agency MBS. I explore these issues in more detail in "[Gradual and Predictable: Reducing the Size of the Federal Reserve's Balance Sheet](#)," remarks presented at SUERF, the European Money and Finance Forum, New York City, October 11, 2017.
- <sup>12</sup> Federal Reserve Board staff estimate paths for the term premium effect associated with different balance sheet scenarios in Brian Bonis, Jane Ihrig, and Min Wei, "[Projected Evolution of the SOMA Portfolio and the 10-year Treasury Term Premium Effect](#)," Board of Governors of the Federal Reserve System *FEDS Notes*, September 22, 2017. Median responses to the Desk's July 2017 [Survey of Primary Dealers](#) and [Survey of Market Participants](#) indicated the estimated cumulative effect on the 10-year Treasury yield to be around 25 basis points over two years following implementation, and the cumulative effect on the 30-year production coupon MBS option-adjusted spread to be 15 basis points over the same timeframe.
- <sup>13</sup> Results from the New York Fed's September 2017 [Survey of Primary Dealers](#) and [Survey of Market Participants](#) indicate expectations of about a one in four chance of a return to the zero lower bound at some point between now and the end of 2020. Conditional on that scenario occurring, survey respondents on average assigned probabilities of over 80 percent to the portfolio being larger than \$4 trillion at year-end 2020—an outcome suggesting a renewal of full reinvestments or large-scale asset purchases. Additional reasons for the

-muted response in asset prices are examined in a speech cited earlier, "[Gradual and Predictable: Reducing the Size of the Federal Reserve's Balance Sheet](#)."

- <sup>14</sup> Projection scenarios considered balance sheet sizes containing long-run levels of reserves of \$406 billion, \$613 billion, and \$1 trillion, as well as a range of sizes for other Fed liabilities and capital. However, the balance sheet's normal size is not a fixed value, since some factors, such as Federal Reserve notes (U.S. dollar paper currency) and capital, tend to grow over time. See the Federal Reserve Bank of New York's report and accompanying data file, "[Projections for the SOMA Portfolio and Net Income \(July 2017\)](#)."
- <sup>15</sup> These liabilities include Federal Reserve notes (U.S. dollar paper currency), the U.S. Treasury's General Account, deposits held by designated financial market utilities and government-sponsored enterprises, and reverse repos conducted with foreign and international account holders. On average, these line items summed to over \$500 billion in 2017, on top of more than \$1.5 trillion in Federal Reserve notes. Fed liabilities are discussed more thoroughly in Lorie Logan, "[Implementing Monetary Policy: Perspective from the Open Market Trading Desk](#)," remarks before the MoneyMarketEers of New York University, New York City, May 18, 2017.
- <sup>16</sup> It is worth noting that the size and structure of Fed's securities portfolio and the role the portfolio played have undergone substantial shifts at various times over the course of the Fed's history, reflecting changes in policy implementation imperatives. See Meryam Bukhari et al, "[The SOMA Portfolio through Time](#)," Federal Reserve Bank of New York *Liberty Street Economics* (blog), August 12, 2013.
- <sup>17</sup> Throughout this discussion, I focus on forward guidance and use of the central bank's balance sheet (through large-scale purchases of additional assets and reinvestment policies, but not funding for lending programs) as possible tools. U.S. policymakers have shown little appetite to pursue negative nominal interest rates, although that is another unconventional tool used by several central banks in recent years.
- <sup>18</sup> See Janet L. Yellen, "[A Challenging Decade and a Question for the Future](#)," Herbert Stein Memorial Lecture, National Economists Club, Washington, D.C., October 20, 2017. In a recent set of simulations using traditional monetary policy strategies based on simple policy rules, Federal Reserve Board economists estimate that the zero lower bound would bind with significantly higher frequencies than in previous analyses. See Michael T. Kiley and John M. Roberts, "[Monetary Policy in a Low Interest Rate World](#)," *Brookings Papers on Economic Activity* Conference Drafts, Washington, D.C., March 23–24, 2017.
- <sup>19</sup> She acknowledged, however, that the simulations on which her analysis was based could overstate the FOMC's current ability to respond to a recession, given little scope to cut the federal funds rate and the possibility that stimulus associated with forward guidance and asset purchases could be reduced with long-term rates already quite low. See Janet L. Yellen, "[The Federal Reserve's Monetary Policy Toolkit: Past, Present and Future](#)," opening remarks at the Federal Reserve Bank of Kansas City's Economic Policy Symposium, *Designing Resilient Monetary Policy Frameworks for the Future*, Jackson Hole, Wyoming, August 26, 2016.
- <sup>20</sup> Most participants did not indicate support for using the balance sheet as an active tool in other situations or for other purposes. See [Minutes of the Federal Open Market Committee, November 1-2, 2016](#).
- <sup>21</sup> Some surveys of the numerous studies of central bank bond purchase programs include: Joseph E. Gagnon, "[Quantitative Easing: An Underappreciated Success](#)," Peterson Institution for International Economics Policy Brief, no. PB16–4, April 2016; Saroj Bhattarai and Christopher Neely, "[A Survey of the Empirical Literature on U.S. Unconventional Monetary Policy](#)," Federal Reserve Bank of St. Louis Working Paper, no. 2016–021A, October 2016; and John C. Williams, "[Monetary Policy at the Zero Lower Bound: Putting Theory into Practice](#)," Brookings Institution Hutchins Center Working Papers, January 2014.
- <sup>22</sup> Studies show a lower median effect for Japan. Gagnon hypothesizes this may be associated with Japan's much larger government bond market relative to GDP than the other countries studied, perhaps suggesting that asset purchase effects operate in proportion to the size of the targeted bond market rather than the size of the economy.
- <sup>23</sup> See Ben S. Bernanke, "[Monetary Policy in a New Era](#)," presented at the Peterson Institute for International Economics conference, *Rethinking Macroeconomic Policy*, Washington, D.C., October 12, 2017. Bernanke argues, however, that deploying unconventional tools may not be sufficient in addressing a sharp downturn, and that changes in a central bank's monetary policy framework may improve a central bank's effectiveness in defeating the zero lower bound.
- <sup>24</sup> In addition, asset purchase programs may actively promote liquidity and improve market functioning during periods of financial market stress, as was the case with the Fed's first LSAP program, initiated at the height of

the crisis. In turbulent market conditions, the central bank's willingness to purchase particular classes of assets can boost confidence and lower liquidity premiums that investors would require to hold otherwise illiquid securities.

- <sup>25</sup> More detail about the Fed's purchases of agency MBS can be found in my "[Concluding Remarks at the Monetary Policy Implementation in the Long Run Conference](#)," Federal Reserve Bank of Minneapolis, Minnesota, October 19, 2016.
- <sup>26</sup> Broad market indicators include, among others, trading volumes, bid-ask spreads, trade quote sizes, financing costs, and settlement fails. Operations also yield valuable information, including executable prices compared to those prevailing in the market, counterparty concentration measures, and settlement fails.
- <sup>27</sup> The TBA market is a forward market that allows market participants to efficiently trade a wide range of agency MBS with similar characteristics without requiring them to analyze the underlying details of each individual mortgage security, since any security with the same agency issuer, original maturity term, and coupon can be delivered into a single TBA contract. This structure transforms a market of hundreds of thousands of individual mortgage securities into a limited number of homogenous TBA contracts. For more information on the TBA market, see James Vickery and Joshua Wright, "[TBA Trading and Liquidity in the Agency MBS Market](#)," Federal Reserve Bank of New York *Economic Policy Review* 19, no. 1, May 2013.
- <sup>28</sup> A dollar roll sale is a transaction that involves the sale of agency MBS for delivery in one month and the simultaneous agreement to purchase substantially similar securities in a later month, thus effectively postponing delivery when there is a dislocation in available supply. The Fed also used coupon swaps to settle some agency MBS purchases under its first purchase program. (A coupon swap is the simultaneous sale of one agency MBS and purchase of another agency MBS, which may have a different coupon, issuer, or both.)
- <sup>29</sup> See [Minutes of the Federal Open Market Committee, August 10, 2010](#) and [Minutes of the Federal Open Market Committee, September 20–21, 2011](#).
- <sup>30</sup> The FOMC suspended Treasury rollovers from July 2012 through December 2012, when it continued the MEP. At that time, redeeming Treasury securities expanded the Fed's scope to lengthen the maturity profile of its Treasury securities portfolio.
- <sup>31</sup> See the paper cited earlier by Ben S. Bernanke, "[Monetary Policy in a New Era](#)."
- <sup>32</sup> See Eric M. Engen, Thomas Laubach, and David Reifschneider, "[The Macroeconomic Effects of the Federal Reserve's Unconventional Monetary Policies](#)," Board of Governors of the Federal Reserve System *Finance and Economics Discussion Series*, no. 2015–005, January 2015. The authors found that the gradual nature of accompanying revisions to the FOMC's policy expectations may have limited the effectiveness of forward guidance and asset purchases. However, in a future crisis, market participants will have the benefit of the current episode in assessing the FOMC's likely response, leading to a faster adjustment of expectations.
- <sup>33</sup> The importance of a credible commitment for maintaining accommodative policy when the zero lower bound is reached is explored in Gauti Eggertsson and Michael Woodford, "[The Zero Bound on Interest Rates and Optimal Monetary Policy](#)," *Brookings Papers on Economic Activity*, no. 1, Spring 2003.
- <sup>34</sup> Such communications are a form of Odyssean forward guidance about the balance sheet. See Jeffrey R. Campbell et al, "[Macroeconomic Effects of Federal Reserve Forward Guidance](#)," *Brookings Papers on Economic Activity*, Spring 2012. The authors distinguish between central bank forward guidance that simply forecasts macroeconomic performance and likely monetary policy actions (Delphic guidance), and guidance that publicly commits the central bank to a set of future actions (Odyssean guidance).
- <sup>35</sup> Because market prices are forward-looking, an announcement that affects expectations about the stock of assets held by the Fed should have an immediate impact on market prices. However, the overall size of the market impact will depend on the expected path of portfolio holdings over time. In addition, completion of purchases may be perceived as strengthening the central bank's commitment by making it more difficult to deviate from announced plans.
- <sup>36</sup> However, since term premium effects decay as securities age, selling securities with relatively short remaining times to maturity may not be materially different than redeeming those securities.
- <sup>37</sup> The Fed's first two purchase programs were launched with pre-announced sizes and time frames (although the first program was later expanded). In contrast, the third program was open-ended and state-contingent.

Following each meeting, the FOMC announced a monthly pace at which it would buy Treasury securities and agency MBS, and provided guidance that it would continue its purchases until the “outlook for the labor market had improved substantially in a context of price stability.” The Committee also advised that it was prepared to increase or reduce the pace of its purchases to maintain appropriate policy accommodation as the outlook for the labor market or inflation changed.

- [38](#) The FOMC adopted such guidance throughout its third asset purchase program. Similarly, on October 12, 2017, ECB President Draghi pledged to maintain interest rates at their current, low level “well past” the end of the ECB’s bond-buying program.
- [39](#) Governor Brainard recently suggested that in a low neutral rate environment, delaying balance sheet normalization is a means to provide “makeup support” for the economy while enabling the policy rate to escape the lower bound earlier than otherwise. See Lael Brainard, [“Rethinking Monetary Policy in a New Normal,”](#) remarks for the panel on monetary policy at the Peterson Institute for International Economics conference, *Rethinking Macroeconomic Policy*, Washington, D.C., October 12, 2017.
- [40](#) This sequencing also allowed the FOMC to meaningfully assess the efficacy of its tools to control short-term interest rates with a large balance sheet, and thereby judge how patient it could afford to be in reducing the balance sheet to its longer-run level.
- [41](#) Whether there are diminishing marginal returns on additional purchases or actual limits on capacity for using this tool—implying a size of the balance sheet beyond which further asset purchases become difficult or less effective—is a question for further research. Nevertheless, policymakers may weigh the relative merits and risks associated with asset purchases differently based on the balance sheet’s starting size.
- [42](#) The FOMC’s Policy Normalization Principles and Plans note that the Committee does not anticipate selling agency MBS as part of the normalization process, but says that “limited sales might be warranted in the longer run to reduce or eliminate residual holdings.”
- [43](#) Changing the composition of assets within the portfolio, as was done during the MEP, can similarly influence financial conditions without changing the portfolio’s size or increasing the supply of reserve balances. In this case, capacity to reallocate the portfolio is constrained by existing holdings.
- [44](#) Previously, agency MBS operations were conducted on a commercial dealer-to-customer trading platform. The switch to FedTrade minimized operational risk, improved efficiency and competitiveness, and increased transparency around the Fed’s mortgage operations.