CHAPTER EIGHT

Normalizing the Federal Reserve's Balance Sheet and Policy Implementation

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This chapter's topic—what we are normalizing to—is a key issue facing central banks as they normalize monetary policy after the crisis. I hope to bring to this discussion an operational perspective from my position on the Federal Reserve Bank of New York's Open Market Trading Desk. I will highlight three points. First, the Federal Reserve's balance sheet, once normalized, is likely to be smaller than it is today but considerably larger than it was before the crisis, regardless of the type of operating regime the Federal Open Market Committee (FOMC) adopts in the long run. Second, while the FOMC could maintain interest rate control through a corridor system for its longer-run monetary policy implementation framework, it would require a lot of learning by doing and would be unlikely to look like our pre-crisis corridor system. And third, based on what we've learned from operating a floor system thus far, it appears that this type of system can provide effective control of rates with operational simplicity. Before I continue, I should note that the views presented here are my own, and do not

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necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System.

Last October, the Federal Reserve began the process of reducing the size of its balance sheet—a significant milestone in the ongoing monetary policy normalization process. Using a program of progressively increasing caps, we are gradually reducing the Fed's securities holdings, which will reduce the supply of reserve balances in the banking system.[1] This process will continue until reserves fall to a level that reflects the banking system's demand for reserve balances and the FOMC's decisions about how to implement monetary policy "most efficiently and effectively," as noted in the FOMC's Policy Normalization Principles and Plans.

However, there remains much uncertainty over what the "normal" size of the Fed's longer-run balance sheet will be and how long it will take to get there. This uncertainty arises from numerous sources. We don't know how fast our MBS (mortgage-backed securities) holdings will pay down, how quickly currency outstanding will grow, how many bank reserves will be required for the efficient and effective execution of monetary policy, or how other liability items on the Fed's balance sheet will evolve. The economic outlook also poses an ever-present source of uncertainty.

Although the committee has not yet specified what a normalized balance sheet will look like, market participants' expectations may provide some helpful context. The New York Fed's most recent annual report on open market operations (released in April 2018) presents a set of projections for possible paths of the Fed's securities

1. Principal payments from the Federal Reserve's securities holdings each month are reinvested only to the extent that they exceed gradually rising caps, laid out in a schedule in the June 2017 addendum to the FOMC's Policy Normalization Principles and Plans. See Federal Open Market Committee, "FOMC Communications related to Policy Normalization," accessed August 16, 2018, https://www.federalreserve.gov/monetarypolicy/policy-normalization.htm. Around the time the caps reach their maximum levels in October 2018, Treasury reinvestments will typically occur only in mid-quarter months, while agency MBS reinvestments are projected to end altogether (assuming no downward shock in longer-term interest rates).

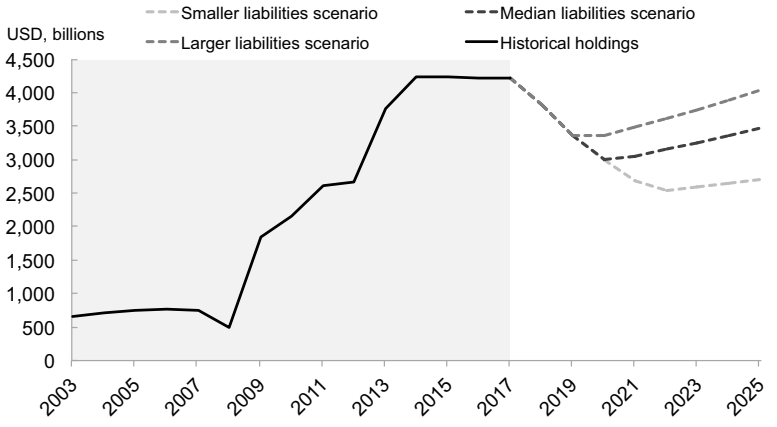

FIGURE 8.1.1 Historical and Projected SOMA Domestic Securities Holdings

Source: Federal Reserve Bank of New York Staff Projections (Report on Open Market Operations during 2017)

Note: Figures are as of year-end. Figures for 2018 onwards (dashed lines) are projected holdings and are rounded. Scenarios are based on the 25th, 50th, and 75th percentile responses to a question about expectations for the size and composition of the Federal Reserve's balance sheet, on average in 2025, conditional on not moving to the zero lower bound, in the Federal Reserve Bank of New York's December 2017 Survey of Primary Dealers and Survey of Market Participants.

portfolio.[2] As seen in figure 8.1.1, the report shows three scenarios constructed from distributions of market participants' surveyed expectations for the future size of the balance sheet.[3] Survey-based expectations for the path of interest rates and some staff modeling fill in additional details. While these scenarios by no

2. See the report and accompanying data file, *Open Market Operations during 2017*, Federal Reserve Bank of New York, accessed August 16, 2018, https://www.newyorkfed.org/markets/annual_reports.html.

3. The scenarios represent the twenty-fifth, fiftieth, and seventy-fifth percentiles of the combined responses to the New York Fed's December 2017 "Survey of Primary Dealers" and "Survey of Market Participants." See "Survey of Primary Dealers," Federal Reserve Bank of New York, accessed August 16, 2018, https://www.newyorkfed.org/markets/primarydealer_survey_questions.html; and "Survey of Market Participants," Federal Reserve Bank of New York, accessed August 16, 2018, https://www.newyorkfed.org/markets/survey_market_participants.html. The surveys asked respondents to provide their expectations for the composition of the Federal Reserve's balance sheet, on average in 2025, conditional on not moving to the zero lower bound at any point between now and the end of 2025.

means embody the full range of possible outcomes, they suggest the domestic securities portfolio's size could normalize at $2.5 trillion to $3.3 trillion, with the larger end of that range projected to be reached within two years. After its normalized size is reached, the portfolio is assumed to incrementally grow again as Treasury securities are purchased to keep pace with trend growth in liabilities, mainly currency.[4]

The projection exercise illustrates a key point: The Fed's future balance sheet will likely be considerably larger than its pre-crisis level. This outcome is likely regardless of the design of the operating regime that the committee ultimately uses to manage short-term interest rates. The normalized size will be determined by the liability side of the Fed's balance sheet, which will reflect two driving factors: growth in nonreserve liabilities and a potential shift in the structural demand for reserves.

First, there has been substantial growth in the Federal Reserve's nonreserve liabilities in recent years and some factors are expected to grow further, as seen in figure 8.1.2. US dollar currency in circulation tends to grow over time and has more than doubled since the start of the global financial crisis, to a current level of $1.6 trillion.[5] The median survey response implies an expectation for currency to grow to around $1.8 trillion at the time the size of the portfolio normalizes—in other words, the portfolio will need to be $1 trillion larger than before the crisis just to back currency in circulation. Meanwhile, various account holders—including the Treasury Department, foreign and international official institu-

4. Treasury securities would also be purchased to offset the ongoing runoff of the Fed's holdings of agency debt and mortgage-backed securities. Such rebalancing will support the continuing normalization of the composition of the Fed's securities portfolio, a process that is expected to take longer than normalization of the portfolio's size. The FOMC has stated that it intends to hold primarily Treasury securities in the longer run.

5. The December 2017 survey responses used in the three scenarios shown here imply average annual currency growth rates of 2.6 percent, 4.6 percent, and 5.8 percent through 2025—a deceleration from the actual average annual growth rate of roughly 7 percent over the past five years.

Billions of U.S. Dollars	*Pre-Crisis Average (H1 2007*)*	*Current Level (4/25/18)*	*Expected Average Value in 2025***		
			Smaller Liabilities Scenario	*Median Scenario*	*Larger Liabilities Scenario*
Reserve balances	16	2,011	412	600	750
Non-reserve liabilities:					
Federal Reserve notes	772	1,596	1,900	2,200	2,400
Treasury General Account	6	403	200	300	365
Other deposits	0	80	50	75	100
Reverse repos (foreign official accounts)	34	235	120	200	250
Reverse repos (private counterparties)	n/a	4	58	100	150
All other liabilities and capital	40	45	50	50	57
Total	**869**	**4,373**	**2,790**	**3,525**	**4,072**

FIGURE 8.1.2 Federal Reserve Liabilities and Capital

Source: Federal Reserve Board; Federal Reserve Bank of New York

* Average of Wednesday levels.

** Expected average values in 2025 are based on the 25th, 50th, and 75th percentile responses to a question about expectations for the size and composition of the Federal Reserve's balance sheet, conditional on not moving to the zero lower bound, in the Federal Reserve Bank of New York's December 2017 Survey of Primary Dealers and Survey of Market Participants.

tions, government-sponsored enterprises (GSEs), and designated financial market utilities (DFMUs)—have increased their balances held in Federal Reserve accounts or investment services, which currently represent over $700 billion in additional liabilities.

Second, it is likely there has been a shift in the structural demand for reserves, driven largely by banks' response to changes in regulations and risk appetite that favor safe assets, particularly reserves. If the demand curve for reserves has indeed shifted out, the amount of reserves the Federal Reserve will need to supply to achieve a given interest rate target will be comparably larger than it once was.

The FOMC acknowledged in last June's addendum to its Policy Normalization Principles and Plans that it anticipates a future level of reserve balances that is "appreciably below that seen in recent

years but larger than before the financial crisis."[6] In the three projection scenarios I've shown, reserve balances (as derived from market participants' expectations) are assumed to be around $400 billion, $600 billion, and $750 billion once a normalized balance sheet size is reached, well below the current level of $2 trillion and consistent with the committee's statement. However, we have insufficient information to identify what factors inform these views.

Taking reserves and nonreserve liabilities together, I see virtually no chance of going back to the pre-crisis balance sheet size of $800 billion. Thus, discussion of whether to have a large or small balance sheet in the long run partly misses the point. The conversation is really about the relative amount of reserves, which will be governed both by the banking system's demand for reserve balances—something we will learn more about during the process of balance sheet normalization—and by the committee's future decisions around how to implement monetary policy most efficiently and effectively.

Debates about monetary policy implementation regimes generally center on two frameworks, illustrated in stylized form in figure 8.1.3. The traditional framework—a version of which the Fed used before the crisis—is a corridor system, which is generally associated with a scarce supply of reserves. Policy is implemented through frequent adjustments to the supply of reserves, such that the supply intersects the steep portion of the reserve demand curve at the desired overnight interest rate. Fluctuations in reserves stemming from autonomous factors are borne by the private sector through the central bank's open market operations. In contrast, the framework used to implement policy today is a floor system, which is associated with an abundant supply of reserves and policy implementation that is achieved through periodic changes to

6. See the Federal Open Market Committee, "FOMC's Communications Related to Policy Normalization," accessed August 16, 2018, https://www.federalreserve.gov/monetarypolicy/policy-normalization.htm.

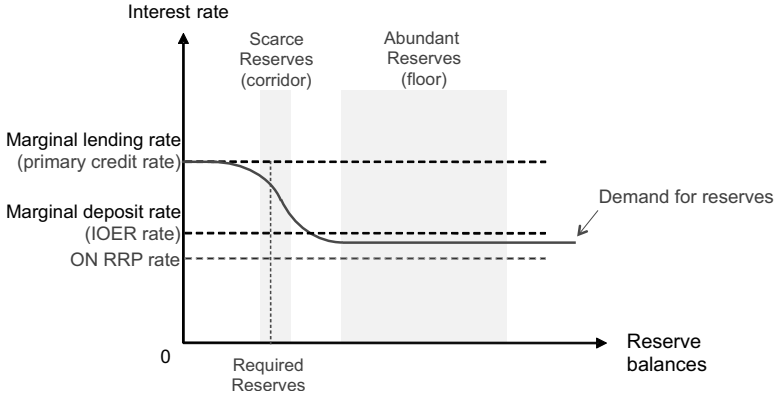

FIGURE 8.1.3. Stylized Monetary Policy Implementation Framework
Source: Federal Reserve Bank of New York

administered rates. A floor system is generally associated with a relatively larger balance sheet than a corridor system because the central bank needs to supply enough reserves to satisfy demand on the flat part of the reserve demand curve, perhaps with an additional buffer to accommodate reserve supply shocks. Such shocks typically stem from fluctuations in other liabilities.[7] However, we do not really know how large or small a difference in the amount of reserves would be needed to run an effective and efficient floor versus a corridor in the longer run. The answer will depend critically on the shape of the demand curve, which we will learn more about over time, as well as the specific design parameters of either framework.

I would emphasize that central banks have successfully implemented both types of frameworks, or variations of them, and that the Fed can achieve interest rate control with either one. Leaving aside some of the broader policy considerations, I'd like to make a few points about the technical operation of each framework in the longer run.

7. All else equal, changes in nonreserve liabilities have the opposite effect on the supply of reserves.

First, some observers see a return to the Fed's pre-crisis, reserve-scarce corridor system as the natural conclusion to the normalization process, highlighting that system's familiarity. But it is important to note that fundamental changes in the money market landscape over the past decade would likely make monetary policy implementation in a future corridor system look substantially different than before the crisis.

In the Fed's pre-crisis regime, hitting the target federal funds rate each day was a technically challenging exercise. Demand for reserves was driven largely by reserve requirements, in addition to intraday payment clearing needs. We started with a banking system that on most days was short of reserves. Then, using staff forecasts of various factors affecting the supply of and demand for reserves over multiple days ahead, we calibrated open market operations with the dealers in the repo market to bring the aggregate supply of reserves into balance at the target rate. With this aggregate balance achieved, individual banks distributed them. Banks facing a deficiency of reserves needed to find and trade with banks holding reserve surpluses, each balancing the costs associated with holding too many or too few reserves.[8] We were reliably proficient in hitting the FOMC's target rate in normal times, but interest rate control was more challenging at times when factors affecting reserves were harder to predict. This was particularly true in the early stages of

8. Reserve averaging over a two-week maintenance period provided a buffer around how precise the final distribution of reserves needed to be on any given day. Nonetheless, falling short of reserves could incur penalties or the need to borrow reserves at what might be relatively high rates. Since reserve balances were not remunerated, there was a steep opportunity cost to holding excess reserves. The degree to which such interbank trading, aimed at fulfilling a requirement imposed by the central bank, reflected fundamentals versus idiosyncratic factors is hard to assess. This ambiguity may obscure the value of its signal on market rates. Simon Potter explores this issue in "Discussion of 'Evaluating Monetary Policy Operational Frameworks' by Ulrich Bindseil," 2016 Economic Policy Symposium on Designing Resilient Monetary Policy Frameworks for the Future, Jackson Hole, WY, August 25–27, 2016, accessed August 16, 2018, https://www.newyorkfed.org/newsevents/speeches/2016/pot160826.

the crisis, when large changes in reserve demand caused significant intraday and interday swings in federal funds rates (figure 8.1.4).[9]

Today, with greater uncertainty and variability in factors affecting the day-to-day demand for and supply of reserves, it would be more difficult to anticipate fluctuations and achieve the necessary balance in reserve conditions even in normal times. In aggregate, reserve demand is likely to be guided by a more complex set of drivers, including post-crisis liquidity regulation, supervision, resolution planning, and intraday payments risk management. These needs have the potential to contribute to higher and more variable demand for reserves than banks had before the crisis.[10] Estimating reserve demand would need to take into account these factors, as well as banks' propensities to substitute between reserves and other relevant assets—something that may vary according to an individual institution's business strategy. Knowledge about the shape, position, and stability of banks' reserve demand curve will likely emerge only with experience.

9. Challenges operating in this environment are described by the SOMA manager in Federal Open Market Committee, FOMC meeting transcripts from September 18, 2007, and throughout the crisis, accessed August 16, 2018, https://www.federalreserve.gov/monetarypolicy/fomc_historical_year.htm. See also Spence Hilton, "Recent Developments in Federal Reserve System Liquidity and Reserve Operations," speech to the Reserve Bank of Australia Conference, July 14–15, 2008, accessed August 16, 2018, https://www.rba.gov.au/publications/confs/2008/hilton.html. A separate operational consequence of the corridor system, revealed during the crisis, is that it can constrain the Fed's ability to provide the types of lender-of-last-resort backstops that can help support financial stability. Accommodating broad-based, open-ended lending in a corridor system raises the need to drain any reserve additions to keep the federal funds rate close to the FOMC's target, thus posing a trade-off between the Fed's monetary policy and liquidity provision objectives. New York Fed President Bill Dudley recently highlighted this challenge in "Important Choices for the Federal Reserve in the Years Ahead," remarks at Lehman College, Bronx, New York, April 18, 2018, accessed August 16, 2018, https://www.newyorkfed.org/newsevents/speeches/2018/dud180418a.

10. Morten L. Bech and Todd Keister explore the links between open market operations and short-term interest rate changes when banks face the possibility of a liquidity coverage ratio shortfall in "Liquidity Regulation and the Implementation of Monetary Policy," BIS Working Paper no. 432, October 2013, accessed August 16, 2018, https://www.bis.org/publ/work432.pdf.

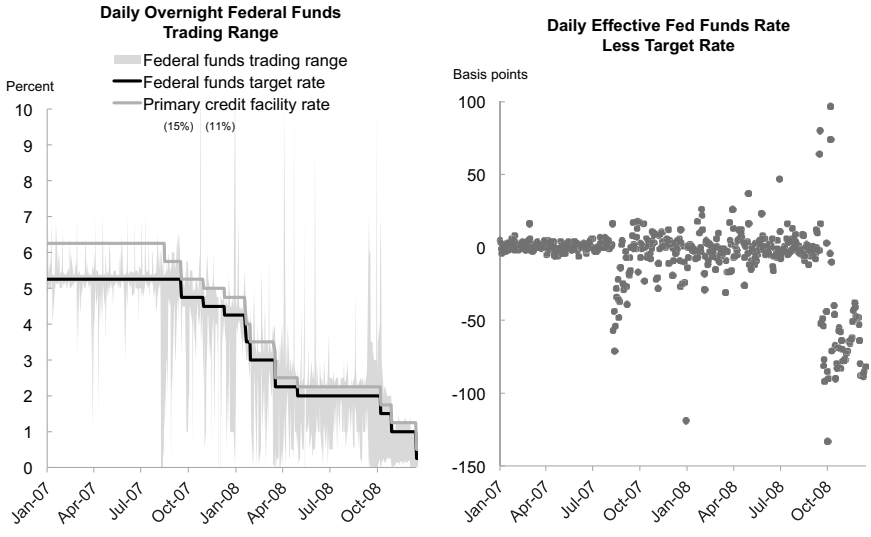

FIGURE 8.1.4. Intraday and Interday Volatility in Fed Funds Rates during the Crisis

Source: Federal Reserve Bank of New York

Note: Time series end on December 15, 2008, when the FOMC introduced a target range for the federal funds rate.

Additionally, we would need to consider shocks that affect the supply of reserves, such as those stemming from changes in the Fed's nonreserve liabilities. As seen in figure 8.1.5, net changes in nonreserve liabilities have become more variable in recent years.[11]

11. Increased variability arises from several changes over the past decade. Since 2008, the Treasury Department has managed its cash flows through the Treasury General Account (TGA) at the Fed. Balances in the TGA exhibit significant volatility, typically rising when auctions of Treasury securities settle and on tax receipt dates while shrinking when large payments are made. (Prior to 2008, the Treasury targeted a steady, low balance in the TGA. It also maintained private accounts, which absorbed the variability in cash flows.) DFMUs have gained access to Reserve Bank accounts since the crisis and GSEs now pre-position funds in their Fed accounts prior to making principal and interest payments. Overnight reverse repos have been introduced as a monetary policy implementation tool. Additionally, in response to foreign central banks' preferences to maintain robust dollar liquidity buffers and the reduced availability of alternative investments with private counterparties, the New York Fed has applied a less restrictive approach to the management of the foreign repo pool (a long-standing investment service through which foreign official and international account holders' balances are swept into overnight reverse repos).

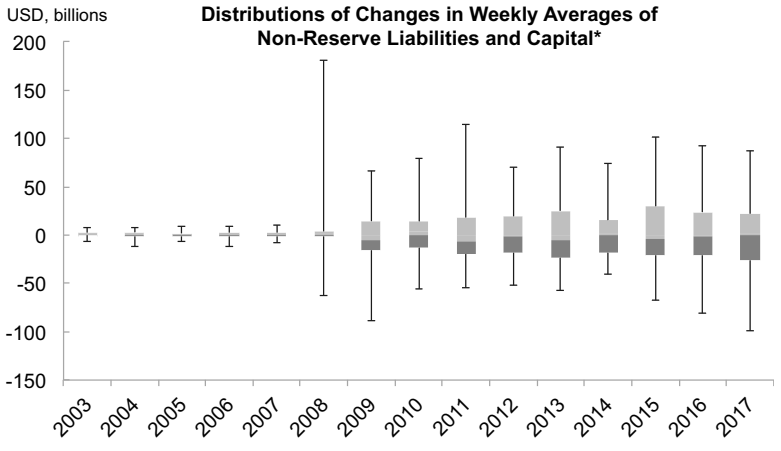

FIGURE 8.1.5. Variability of Non-Reserve Liabilities and Capital

Source: Federal Reserve Board; Federal Reserve Bank of New York Staff Calculations

* Boxes indicate interquartile ranges, and whiskers indicate minimum and maximum outcomes. Data show the distribution of changes in weekly averages of daily figures for liabilities outside the direct control of the Fed (currency, Treasury accounts, foreign repo pool, and other deposits) and capital. Liabilities associated with monetary policy instruments (overnight and term reverse repos conducted with private counterparties and term deposits held by depository institutions) are not included.

Even if fluctuations could be accurately forecast, in a corridor system, they would need to be offset through open market operations to maintain interest rate control. Larger fluctuations would likely require larger operations.[12] In the years before the crisis, the average size of daily overnight repo operations was around $5 billion—a relatively small amount given the size of the repo market and dealers' net securities financing needs. Roughly 95 percent of these operations were for less than $10 billion, and the maximum operation size in normal times was $20 billion. Looking just at recent variability in nonreserve liabilities and assuming overnight operations were used to offset their fluctuations, daily temporary

12. Changes in other features of the system could potentially help to smooth conditions. For example, certain alterations to the reserves averaging framework might allow the system to absorb more volatility.

operations in a corridor system might routinely need to be around $25 billion, but could go as high as $100 billion.[13] We would need to consider whether the Fed's repo and reverse repo operations could be dependably scaled to that degree and whether their effects would be transmitted to other rates.

One consideration in this regard is that there appear to be greater frictions across funding markets today. Dealer balance sheets have shrunk and become less elastic in the face of changes in regulation and risk management.[14] While dealer caution contributes to the overall safety and soundness of the banking sector, it could mean we would need more or different types of counterparties for traditional repo operations, or perhaps different types of operations altogether—particularly if federal funds trading became idiosyncratic or disconnected from other rates. In sum, a reinstated corridor might look less familiar than some expect.

For comparison, let me make a few observations about our experience with the floor system that the Fed is currently using. The FOMC has successfully raised its target range for the overnight federal funds rate six times since December 2015 and, as seen in figure 8.1.6, the effective federal funds rate has reliably printed in the prevailing target range over that time. The policy stance has transmitted to a broad constellation of money market rates. The system is simple and efficient to operate. The interest rate the Fed pays on excess reserves serves as the primary policy implementation tool, with support from a standing facility that offers overnight

13. These estimates are based on variability of liabilities that are outside the direct control of the Fed (such as currency, the Treasury General Account, the foreign repo pool, and other deposits) and capital. They exclude reserves and liabilities associated with monetary policy instruments (such as overnight and term reverse repos conducted with private counterparties and term deposits held by depository institutions).

14. Committee on the Global Financial System, "Structural Changes in Banking after the Crisis," CGFS Papers, no. 60, January 2018, accessed August 16, 2018, https://www.bis.org/publ/cgfs60.pdf.

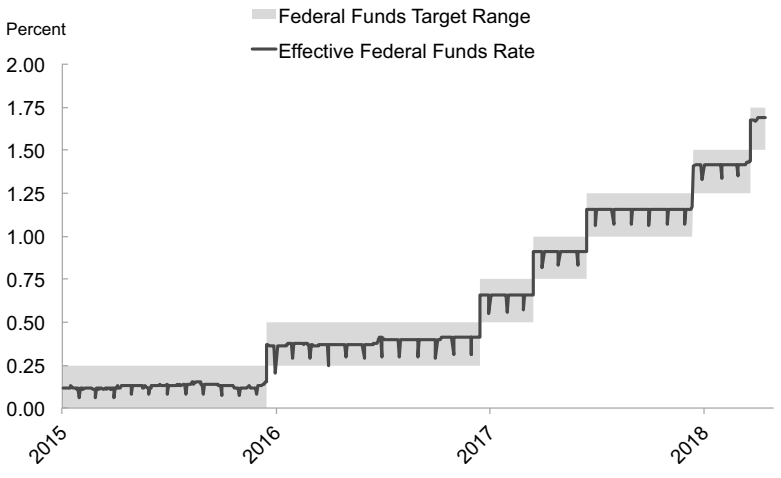

FIGURE 8.1.6. Effective Federal Funds Rate
Source: Federal Reserve Bank of New York

reverse repos (ON RRPs) at an administered rate.[15] There is no need to forecast specific factors affecting reserves or to conduct discretionary open market operations each day; overnight reverse repos are offered every day based on price, not quantity. Day-to-day fluctuations in factors affecting reserves are accommodated by the elastic reserve demand, given that reserve needs are widely met. Market forces keep the federal funds rate in the FOMC's target range by allowing a wide range of counterparties to price trades against the alternative option of investing with the Federal Reserve. And in the aggregate, use of the Fed's balance sheet is

15. The ON RRP facility helps to reinforce the floor under market interest rates by establishing an important investment option for a wide range of active lenders in short-term funding markets, including certain types of nonbank institutions that are not eligible to earn interest on reserves. Take-up in ON RRP operations is sensitive to the pricing of the Fed's reverse repos relative to the pricing and availability of comparable money market investments, including private repo, Treasury bills, and agency debt. Even with near-zero usage, as has been seen in recent months, the ON RRP facility supports market rates by ensuring that counterparties demand rates on other investments at least as attractive as the rate offered on the Federal Reserve's ON RRPs.

efficient by allowing private and official sector market participants to determine their preferred distribution across the range of Fed liabilities.[16]

This system could continue to work well with considerably lower levels of reserves, so long as the supply continued to intersect the flat part of the demand curve. If reserves fell too low, we could see high volumes of fed funds borrowing at interest rates well above the interest rate on excess reserves, which would indicate that we were no longer operating at the flat part of the demand curve.[17] As I noted earlier, maintaining a buffer of excess reserves to absorb reserve-draining shocks could prevent this outcome. An important trade-off arises between the size of that additional buffer and the frequency and size of open market operations.[18]

To sum up, the FOMC could choose to retain the floor system to implement policy in the longer run or it could choose to shift back to a corridor system. However, a reinstated corridor system may be less familiar than some expect. Such a framework would involve

16. In a preliminary discussion about the long-run monetary policy implementation framework, FOMC participants commented on the advantages of an approach to policy implementation similar to the one currently in use, in which the active management of reserves would not be required. Such an approach was seen as "likely to be relatively simple and efficient to administer, relatively straightforward to communicate, and effective in enabling interest rate control across a wide range of circumstances." However, policy makers made no decisions and acknowledged that they expected to learn from additional experience. See Federal Open Market Committee, "Minutes of the Federal Open Market Committee, November 1–2, 2016," accessed August 16, 2018, https://www.federalreserve.gov/monetarypolicy/fomcminutes20161102.htm.

17. We should also recognize that the fed funds rate might occasionally firm somewhat due to increases in interest rates in other money markets, which can affect the fed funds rate via arbitrage. Such developments are not necessarily a sign that reserves are becoming scarce. It is therefore important to understand dynamics not only in the fed funds market but also across a broader range of money market instruments and transmission across them. Simon Potter features some such analysis in "Money Markets at a Crossroads: Policy Implementation at a Time of Structural Change," remarks at the Master of Applied Economics' Distinguished Speaker Series, University of California, Los Angeles, April 5, 2017, accessed August 16, 2018, https://www.newyorkfed.org/newsevents/speeches/2017/pot170405.

18. I discuss these issues in more detail in "Implementing Monetary Policy: Perspective from the Open Market Trading Desk," remarks before the Money Marketeers of New York University, New York City, May 18, 2017, accessed August 16, 2018, https://www.newyorkfed.org/newsevents/speeches/2017/log170518.

uncertainties about reserve demand and greater variability in factors affecting reserve supply, and would likely require operations that are larger, more variable, or even very different from those used before the crisis. Meanwhile, those who favor a floor system may be encouraged by the performance of our current framework to date. We've learned that the floor system has proven to be highly effective at controlling the effective federal funds rate and other money market rates, is resilient to significant shifts in market structure, and is efficient to operate. Under either framework, the balance sheet will likely normalize at a level substantially larger than it was before the crisis to accommodate higher demand for reserves and nonreserve liabilities in the post-crisis landscape.