Perspectives on U.S. Monetary Policy Tools and Instruments*

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ABSTRACT

The Federal Reserve characterizes its current policy decisions in terms of targets for the fed funds rate and the size of its balance sheet. The fed funds rate today is essentially an administered rate that is heavily influenced by regulatory arbitrage and divorced from its traditional role as a signal of liquidity in the banking system. The size of the Fed's balance sheet is at best a very blunt instrument for influencing interest rates. In this paper I compare the current operating system with the historical U.S. system and the procedures of other central banks. I then examine strategies for transitioning from the current system to one that would give the Federal Reserve more accurate tools with which to achieve its strategic objective of influencing inflation and output.

*I thank Peter Ireland, Andrew Levin, and John Taylor for helpful suggestions.

1. Introduction.

This paper discusses the policy instruments that the central bank uses in pursuit of its broader strategic objectives of influencing variables like inflation and output. For many decades, the primary instrument of U.S. monetary policy was the federal funds rate, which is an interest rate on overnight loans of Federal Reserve deposits between depository institutions. When this rate fell essentially to zero in 2009, the Fed implemented massive purchases of Treasury securities and mortgage-backed securities as an alternative policy instrument with which it hoped to influence longer-term interest rates. Although the fed funds rate is no longer at the effective lower bound, today the Fed continues to treat both the fed funds rate and its holdings of securities as policy instruments.

I review the current operating procedures and conclude that neither instrument is well suited for achieving the Fed's broader strategic objectives. The fed funds rate has become a largely administered rate that is heavily influenced by regulatory arbitrage and divorced from its traditional role as a signal of liquidity in the banking system. To the extent that the size of the Fed's balance sheet matters today, it is primarily from the liabilities rather than the asset side of the balance sheet, with the size of the balance sheet at best a very blunt tool for influencing interest rates. I discuss alternative possible operating procedures such as a corridor system based on repurchase agreements.

Section 2 reviews the effects of the Fed's asset holdings on long-term interest rates over 2009 to 2019. I conclude that this instrument has less influence on interest rates than is sometimes believed. Section 3 describes a traditional corridor system such as used by the European Central Bank. Sections 4 and 5 discuss the discount rate and interest on excess reserves, respectively, tools that could in principle operate like the ceiling and floor of a corridor system but in U.S. practice have not. Section 6 discusses the reverse repo rate and argues that this policy rate is the true floor on short-term interest rates in the current system. Section 7 notes how the operation of the system changed in 2018. Section 8 concludes with some thoughts on how the U.S. could transition to a system that would give the Federal Reserve more accurate tools with which to influence inflation and output.

2. The effects of large-scale asset purchases.

Figure 1 displays the Fed's holdings of Treasury and mortgage-backed securities. These rose from $500 billion at the start of 2009 to $4.5 trillion by 2017. These purchases are sometimes described as "quantitative easing," and were implemented in three phases popularly referred to as QE1, QE2, and QE3. In November of 2017, the Fed stopped some of its purchases of new securities, allowing its holdings of securities to gradually decline to a level of $3.8 trillion as of May 2019.

In many standard macroeconomic and finance models, if the nominal interest rate is zero, purchases of securities by the central bank would have no effects on any real or nominal variable of interest; see for example Eggertsson and Woodford (2003). As discussed by Hamilton (2018), adding various financial frictions to the models can change that prediction; see among others Cúrdia and Woodford (2011), Gertler and Karadi, (2011), Chen, Cúrdia and Ferrero (2012), Hamilton and Wu (2012), Woodford (2012), Greenwood and Vayanos (2014), Eggertsson and Proulx (2016), and Caballero and Farhi (2017). However, it is not clear from theory how large the potential stimulus arising from these channels could be.

A number of empirical studies concluded that QE1-3 were successful in their goal of bringing down long-term interest rates; for surveys of this literature see Williams (2014), Borio and Zabai (2018), and Swanson (2018). It is useful to put these claims in perspective. Figure 2, updated from Woodford (2012), plots the interest rate on 10-year Treasury bonds over this period. On net this rate rose during QE1 when the Fed was trying to bring it down, fell when QE1 ended, rose in QE2 when the Fed again resumed its efforts to lower long-term rates, dropped after QE2 was halted, only to rise again in QE3. One can of course claim that, if the Fed had not been purchasing bonds, the rate would have risen even more than it did during the QE1-3 episodes. But at a minimum we are forced to conclude that Fed purchases were only one of many factors influencing bond yields during these episodes, and certainly not the most important factor.

One way we might try to isolate the effects of Fed actions is to focus only on the particular days when the FOMC issued a statement or released its minutes or when the Fed Chair gave a speech on the economy or monetary policy. Figure 3, adapted from Greenlaw et al. (2018), shows the cumulative change in the 10-year yield that occurred on those days alone. Figure 3 turns out to show the same broad pattern as Figure 2—yields on average rose, not fell, during QE1-3, even if we focus on just days in which the Fed made an announcement.

Many researchers have conducted event studies using a subset of days on which there were particularly important announcements of the Fed's intentions to implement additional large-scale asset purchases. But the analysis of some of these days by Thornton (2017), Hamilton (2018) and Levin and Loungani (2019) suggest that previous studies may have overestimated the role of the purchases in moving interest rates. One key question is the extent to which interest rates were responding to the Fed's assessment of the economic situation rather than to the purchases themselves. See Melosi (2016), Nakamura and Steinsson (2018), and Miranda-Agrippino and Ricco (2018) for more discussion of this issue.

Regardless of one's position on whether large-scale asset purchases are an important tool when the traditional instrument of controlling the fed funds rate is unavailable, the case for its importance in 2019 when short rates are significantly above zero is far from compelling. I conclude below that the primary relevance of the size of the Fed's balance sheet today for the conduct of monetary policy comes from the liabilities side rather than any tangible consequences of its asset holdings for long-term interest rates. But before returning to that issue, I first discuss alternative monetary procedures for controlling the short-term interest rate.

3. The corridor system for controlling short-term interest rates.

The European Central Bank is one of many central banks that use a corridor system for controlling interest rates. The ECB stands ready to lend banks as much as they want at a particular rate i_L that is set by policy. This sets a ceiling on short-term loans between banks. Why should I pay more than i_L to borrow from another bank when I can get all I want from the ECB at i_L? The ECB sets another rate i_D on funds that are left on deposit with the ECB. One can think of these as short-term loans from private banks to the ECB. The rate i_D sets a floor on the interest rate on interbank loans. Why should I lend to another bank for less than i_D when I can earn i_D risk-free just by leaving my funds with the ECB? The policy instruments are the ECB's choices for i_L and i_D which define a corridor within which the interbank loan rate trades, as seen in Figure 4. Since June 2014 the ECB has charged a fee rather than pay interest on deposits (essentially a negative value for i_D) which it has used to cause interest rates to become negative.

It's worth remembering that the core power that gives the central bank the ability to specify i_L and i_D as instruments of policy is its ability to create new deposits of private banks with the ECB. This is what enables the central bank to satisfy all demand for borrowing at the chosen i_L. By choosing particular values for i_L and i_D the ECB is implicitly committing to a level and growth rate of the monetary base which may or may not be consistent with its broader strategic inflation objective. Indeed, one could think of monetary policy equivalently either as a decision for i_L and i_D or as a decision about monetary aggregates. Modern economic theory (e.g., Woodford, 2003) and central bank practice usually adopt the former perspective, essentially for reasons described by Poole (1970): the demand for monetary aggregates can be very volatile, making targeting interest rates a more reliable tool than targeting monetary aggregates for purposes of stabilizing inflation and real activity

4. The Federal Reserve's discount window.

Like the ECB, the U.S. Federal Reserve historically offered to lend to banks at a policy-determined rate i_L through its discount window. Figure 5 compares the fed funds rate with the discount rate. Over most of the last half century, the fed funds rate was above the discount rate. In the U.S., i_L served as a floor, not a ceiling for the fed funds rate!

Why would I pay another bank an interest rate higher than i_L to borrow funds? The answer is that U.S. banks traditionally imputed some nonpecuniary costs to borrowing at the discount window. Although the identities of banks that borrowed at the discount window was not publicly released, other banks could usually find out who had borrowed, and borrowing from the discount window was associated with a certain stigma. Banks only wanted to borrow at the discount window if they had trouble borrowing fed funds from other banks, which could be a sign of weakness.

Banks differed in their perceived nonpecuniary costs and would turn to the discount window when the marginal nonpecuniary cost was less than the spread between the fed funds rate and the discount rate. Figure 6, adapted from Goodfriend and Whelpley (1986), illustrates how the fed funds rate was determined in this system. The Fed's open-market operations resulted in a certain level of nonborrowed reserves, which are deposits with the Fed that banks would have even if they do no borrowing at the discount window. As the fed funds rate rises above the discount rate, more banks would be willing to borrow at the discount window, thereby increasing the total supply of nonborrowed plus borrowed reserves until supply equals demand.

Figure 7 compares the gap between the fed funds rate and the discount rate (top panel) with the total volume of discount window borrowing (bottom panel), showing how the system worked in practice. A higher value for the fed funds rate relative to the discount rate was associated with a higher volume of borrowing. Indeed, some observers at the time thought of the operating system as one of borrowed reserves targeting rather than fed funds rate targeting.

5. Interest on excess reserves.

Beginning in October 2008, the Federal Reserve began paying an interest rate on excess reserves (IOER), akin to the interest rate i_D in a corridor system. Figure 8 shows the recent relation between the fed funds rate and IOER. Whereas i_D acts as a floor in the traditional corridor system, until very recently IOER seemed to be a ceiling on the fed funds rate! Indeed, at times IOER looked like a deterministic ceiling. On most days, the average effective fed funds rate would be exactly 9 basis points below the interest on excess reserves, though it would drop significantly below on the last day of the month.

Why would anyone offer to lend at a fed funds rate below IOER if they could earn IOER just by parking the funds with the Fed? The answer is that not all depository institutions can earn IOER. Federal Home Loan Banks (FHLB) have deposits with the Fed but are not paid IOER, so they have an incentive to lend to banks that can earn IOER. But why wouldn't banks that can earn IOER bid up the fed funds rate so as to earn the risk-free arbitrage from borrowing at the fed funds rate and earning IOER? Part of the answer is on the supply side; individual Federal Home Loan Banks set limits on to whom and how much they lend. Afonso, Armenter, and Lester (2019) modeled these frictions using a search and matching model for the fed funds market. Another factor is nonpecuniary costs on the demand side, as discussed by Klee, Senyuz, and Yoldas (2016), Banegas and Tase (2017) and Anbil and Senyuz (2018). If a bank tries to arbitrage by borrowing fed funds and holding fed deposits to earn IOER, it expands its balance sheet. A larger level of assets exposes U.S. banks to higher fees from the Federal Deposit Insurance Corporation. For this reason, foreign banks are a more natural counterparty than domestic banks to borrow the fed funds from the FHLB. In addition, both domestic and foreign banks are subject to complicated capital requirements, another source of nonpecuniary costs associated with borrowing fed funds. A larger balance sheet may require the bank to make other adjustments to meet capital requirements, which imposes another nonpecuniary cost on arbitraging the IOER-fed funds spread. For European banks, the capital requirements are primarily based on end-of-month assets. This explains why before 2018 there was usually a sharp spike in the gap between IOER and the fed funds rate on the last day of a month; this was the one day those banks didn't want to borrow fed funds.

One can think about the determination of the fed funds rate in this setting as in Figure 9. Banks differ in their marginal nonpecuniary costs of borrowing fed funds and would be willing to borrow more the bigger the gap between IOER and fed funds. The apparent deterministic nature of the IOER-fed funds gap in early 2017 arose from the fact that, on days other than the last day of the month, and over the range of volume traded at that time, there was a sufficient volume of borrowers with fixed nonpecuniary costs of 9 basis points. In other words, the demand curve was flat over that range resulting in essentially a constant gap between IOER and the fed funds rate.

6. Reverse repo rate.

The true floor in the current operating system comes not from IOER but instead from a different facility. The Fed offers to conduct reverse repurchase agreements with a broader group of financial institutions that includes money market funds. These are essentially short-term loans from the institution to the Fed at a policy-determined rate RR. Figure 10 compares RR with the tri-party Treasury repo rate. In a typical tri-party repo transaction, a money market fund would lend overnight to a primary security dealer (one of the large financial institutions authorized to be a counterparty to transactions with the trading desk of the Federal Reserve Bank of New York). The agreement is settled through one of the large clearing banks (Bank of New York Mellon or JP Morgan Chase), with the security dealer temporarily delivering Treasury securities to the clearing bank, essentially as collateral for the loan. Unlike the fed funds rate, the tri-party repo rate is a true market rate that varies daily with market conditions. But RR puts a floor under the tri-party repo rate, for the same reason that i_D functions as a floor in a traditional corridor system. Why should a money-market fund loan to a private counterparty at the private repo rate when it can earn RR risk free from the Fed?

7. Changes in 2018.

But while RR puts a floor under the tri-party repo rate, as seen in Figure 11, IOER does not set a ceiling. Up until the end of 2017, the tri-party repo always traded in between RR and IOER. This fact could give the impression that the system was functioning something like a corridor system. But there's nothing that prevented the private repo rate from going above IOER, and indeed throughout 2018 it often did.

Figure 11 also plots another market-determined short-term interest rate, the Treasury general collateralized finance rate (GCF). These are also repurchase agreements collateralized with Treasury securities that are cleared through a third party, in this case the Fixed Income Clearing Corporation[1]. A typical transaction here would be a loan from a primary security dealer to a nonprimary security dealer, again collateralized by Treasuries, with the primary dealer often rehypothecating the Treasury securities for purposes of its own borrowing through tri-party repos. The GCF rate is generally above the tri-party repo rate. It's interesting to compare the 2018 portion of Figure 11 with Figure 8. GCF started to trade consistently above IOER at the same time that IOER stopped being the de facto ceiling on the fed funds rate.

What changed in 2018? The elimination of the gap between IOER and fed funds could have come from either a rightward shift of the demand curve in Figure 9—the nonpecuniary costs of borrowing fed funds decreased, leading borrowing banks bid up the cost of fed funds—or from a leftward shift of the supply curve—FHLB are less willing to lend fed funds. If the first explanation was correct, we would expect to see an increase in the volume of fed funds lending, whereas if the second, we would expect to see a decrease. Figure 12 plots the effective fed funds rate together with the volume of borrowing. It shows that the disappearing gap between IOER and fed funds coincided with a decreased volume of fed lending, favoring the second explanation based on the supply side. Figure 13 plots selected assets held by the FHLB. It paints a picture of the FHLB turning from lending fed funds to alternative ways of investing short-term funds that presumably provide a higher yield.

8. Perspectives on the current and potential future operating systems.

I've described the current operating system as one with a floor but no ceiling. What then is holding rates down? I think the answer is twofold. First, there has been weak demand for

[1] For more details on GCF see Agueci et al. (2014).

investment both in the U.S. and around the world for some time. Second, there remains a huge volume of reserves in the system. Figure 14 summarizes the implications of the Fed's balance sheet from the perspective of its liabilities. The large security purchases of Figure 1 were primarily financed by an expansion of bank deposits with the Fed. Banks so far have been willing to hold these reserves as a result of IOER. As the Fed's balance sheet contracted (and as demand for cash gradually climbed), excess reserves have slowly been coming down.

Another important development in 2018 was increasing demand for borrowed funds, in part arising from an elevated level of borrowing by the U.S. Treasury to finance the federal government budget deficit. This could be one of the factors that has driven GCF up in 2018 and that pulled lending away from the fed funds market. As we look ahead, we should expect demand for loans to continue to change. The Fed will want some more accurate policy tools to respond to these changes.

One option would be to allow reserves to shrink until we are back in something like the historical system in Figure 6. That system worked when fluctuations in the Treasury's balance with the Fed (which are a choice of the Treasury, not the Fed) were on the order of a few billion dollars. But one sees in Figure 14 that fluctuations today are in the hundreds of billions. It's also far from clear how we would make a smooth transition from the current operating system to something like Figure 6.

A more natural transition from the current system would begin by acknowledging that something like the tri-party repo rate is currently a more relevant market measure than the fed funds rate. The Fed could introduce an open repo facility from which the same institutions that currently use the reverse repo facility could also use direct repos to borrow all the funds they usually wanted at a chosen policy rate. This would establish a corridor system for controlling the private repo rate. I specify "usually" here because it would not be necessary, or even desirable, to fully smooth out the "window dressing" that one sees in the end-of-quarter spike in private repo rates. The end-of-quarter spikes arise because some institutions do not want to acknowledge the extent of their exposure to private counterparty repos in their publicly available statements, which are only based on assets as of the last day of a quarter. There's no compelling policy reason why the Fed should accommodate that seasonal demand. Indeed, historically a specified fed funds target was viewed as perfectly consistent with end-of-month spikes in the effective fed funds rate above the target arising from such forces.

The drawback of such a system would be that it puts the Fed in the position of effectively insuring a broader set of institutions than those over which it has regulatory authority. The longer run goal should therefore be to return both the ceiling and the floor for the policy rate to offers to lend or borrow from only regulated institutions. The Fed could initially implement a repo corridor system with a broad range of counterparties at the same time that it continues to reduce the volume of excess reserves. As we reach a level when banks are more actively managing their reserve balances, the Fed could restrict access to both repo facilities to regulated institutions. This could be a practical path toward the goal of replacing the discount window with a stigma-free facility.

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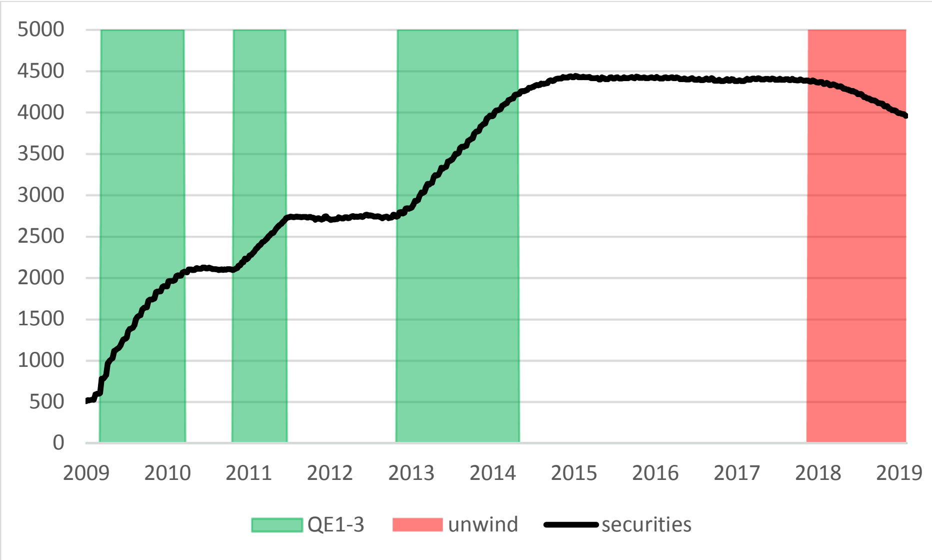
Figure 1. Federal Reserve holdings of securities, billions of dollars.



Notes to Figure 1. Weekly Fed holdings of Treasury securities, mortgage-backed securities and agency debt, plus unamortized premiums minus unamorized discounts, Wednesday values, Jan 7, 2009 to Feb 6, 2019. Data source: Federal Reserve H.4.1 release. Shading dates for QE1: Mar 18, 2009 to Mar 24, 2010; QE2: Nov 3, 2010 to Jun 22, 2011; QE3: Nov 7, 2012 to Apr 30, 2014 (halfway through taper); unwind: Nov 22, 2017 to present.

Figure 2. Interest rate on 10-year Treasury bond.

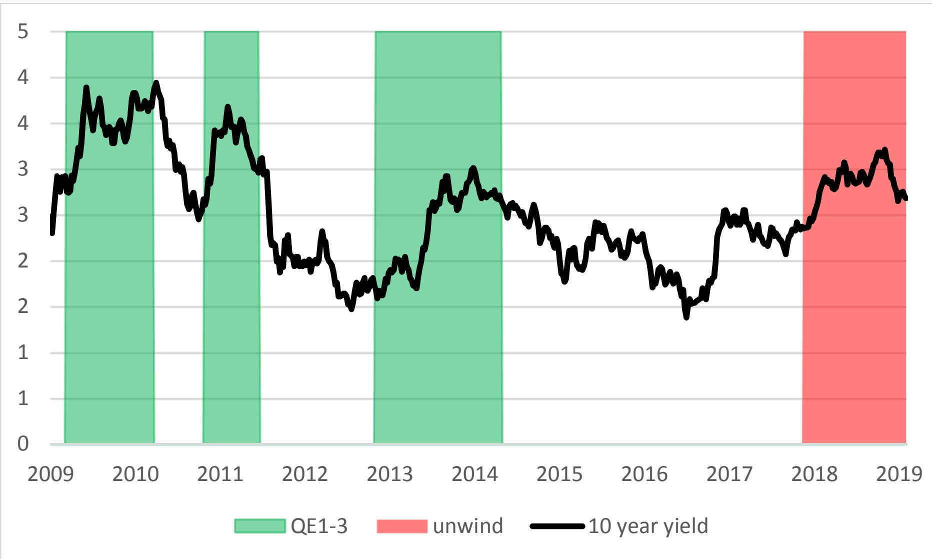
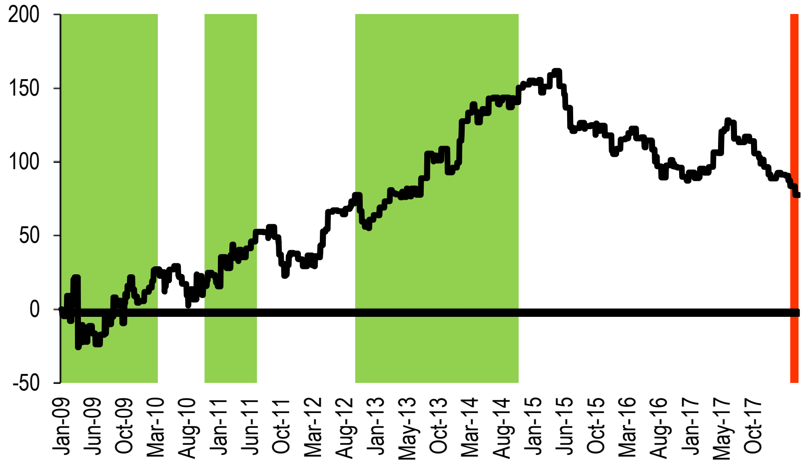
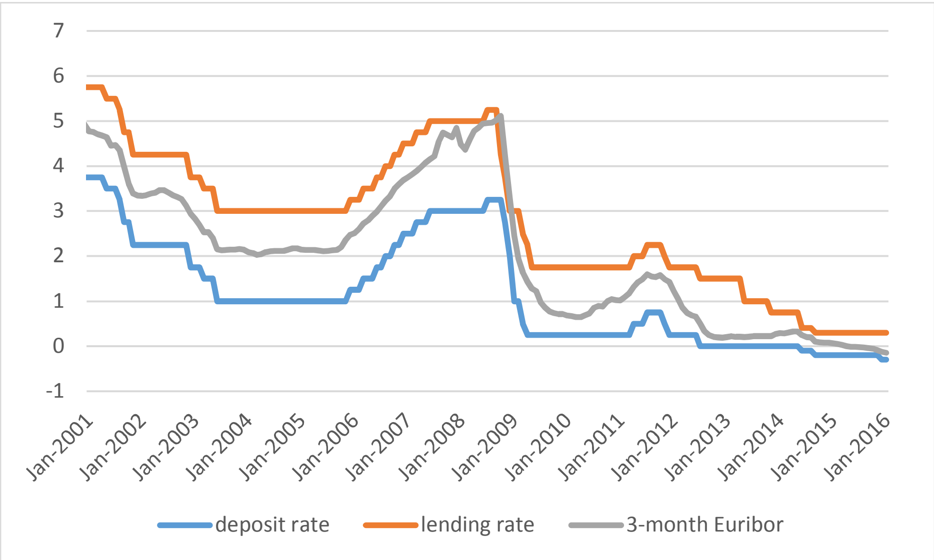


Figure 3. Cumulative change in 10-year yield on Fed Days.



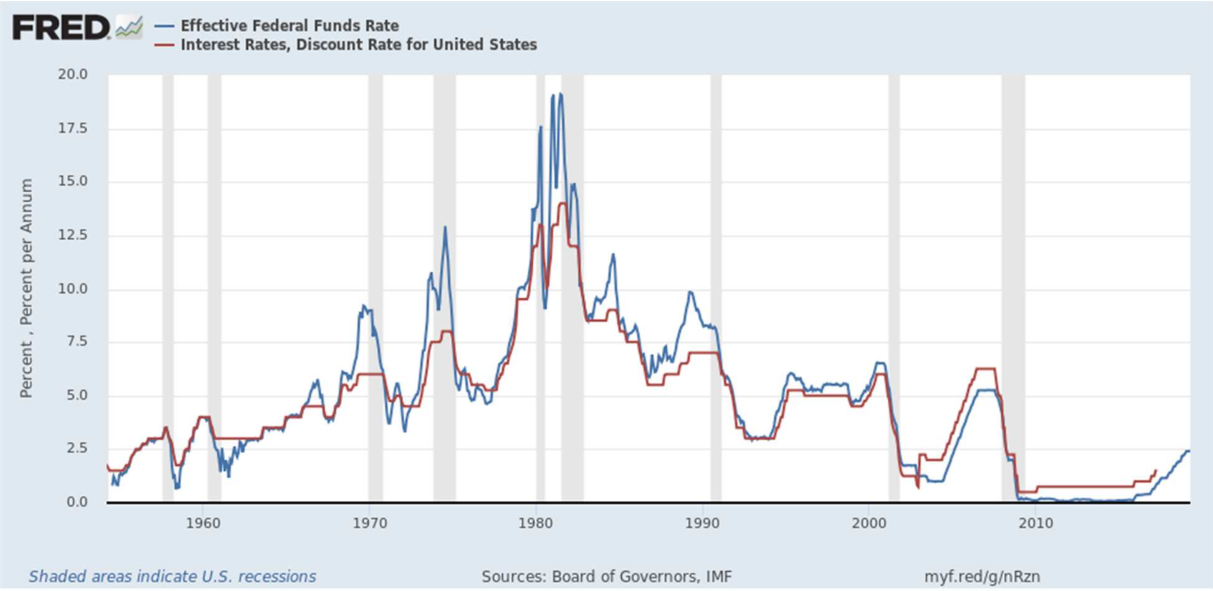
Notes to Figure 3. Cumulative change in interest rate on 10-year Treasury bond on FOMC meeting days, days when FOMC minutes were released, or days with speech by Fed chair on economy or monetary policy, Jan 1, 2009 to Dec 29, 2017. Data source: Greenlaw et al. (2018).

Figure 4. Corridor system for controlling interest rates used by the European Central Bank.



Notes to Figure 4. End-of-month values for ECB marginal lending rate (orange) and deposit facility (blue) along with monthly average 3-month Euribor rate (gray), Jan 2001 to Jan 2016.

Figure 5. Fed funds rate and discount rate.



Notes to Figure 5. Monthly average effective fed funds rate, Apr 1954 to Apr 2019 (blue) and discount rate, Apr 1954 to Apr 2017 (red). Figure source: FRED Economic Data, Federal Reserve Bank of St. Louis.

Figure 6. Determination of fed funds rate in historical U.S. system.

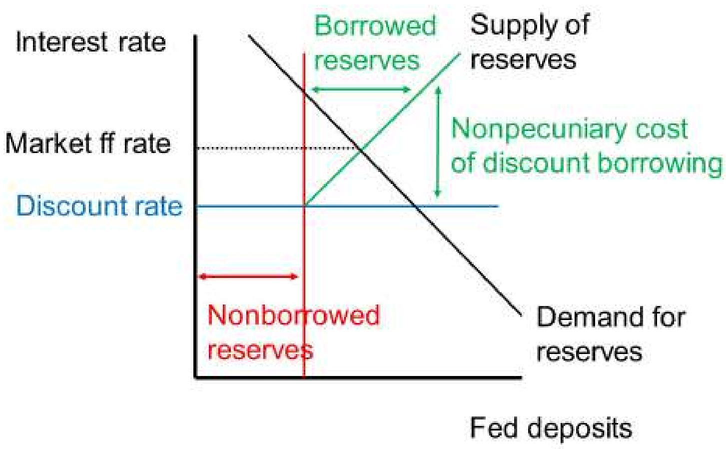
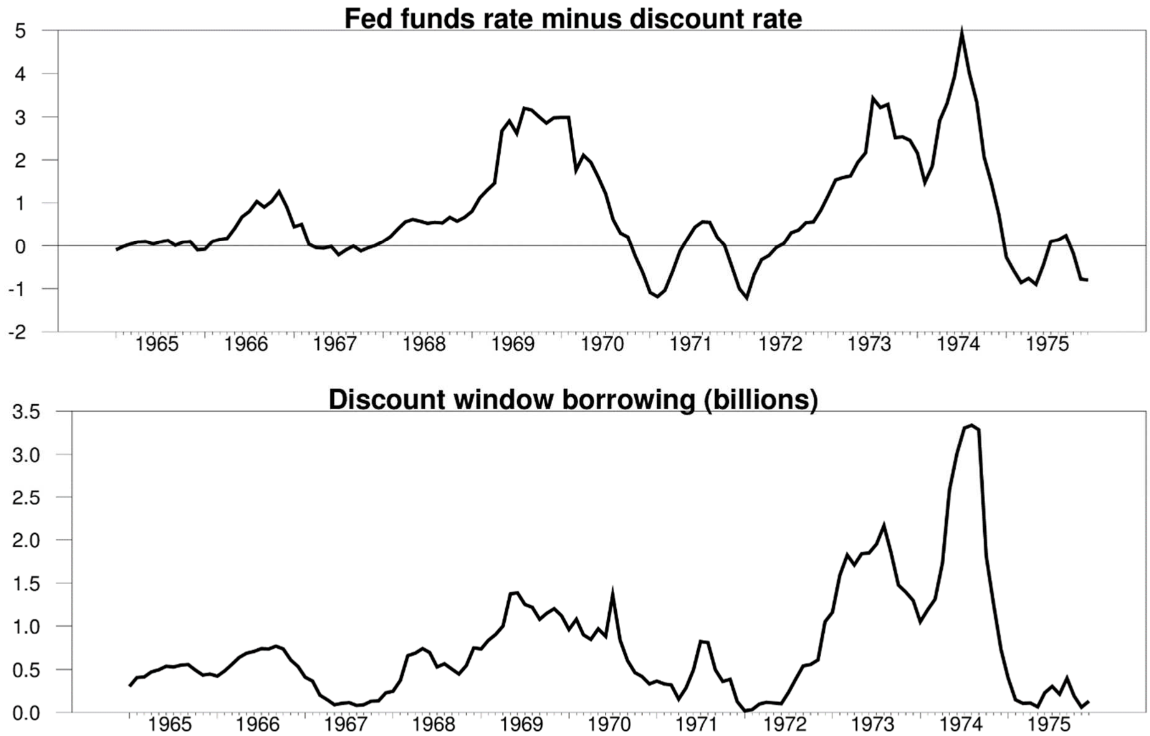
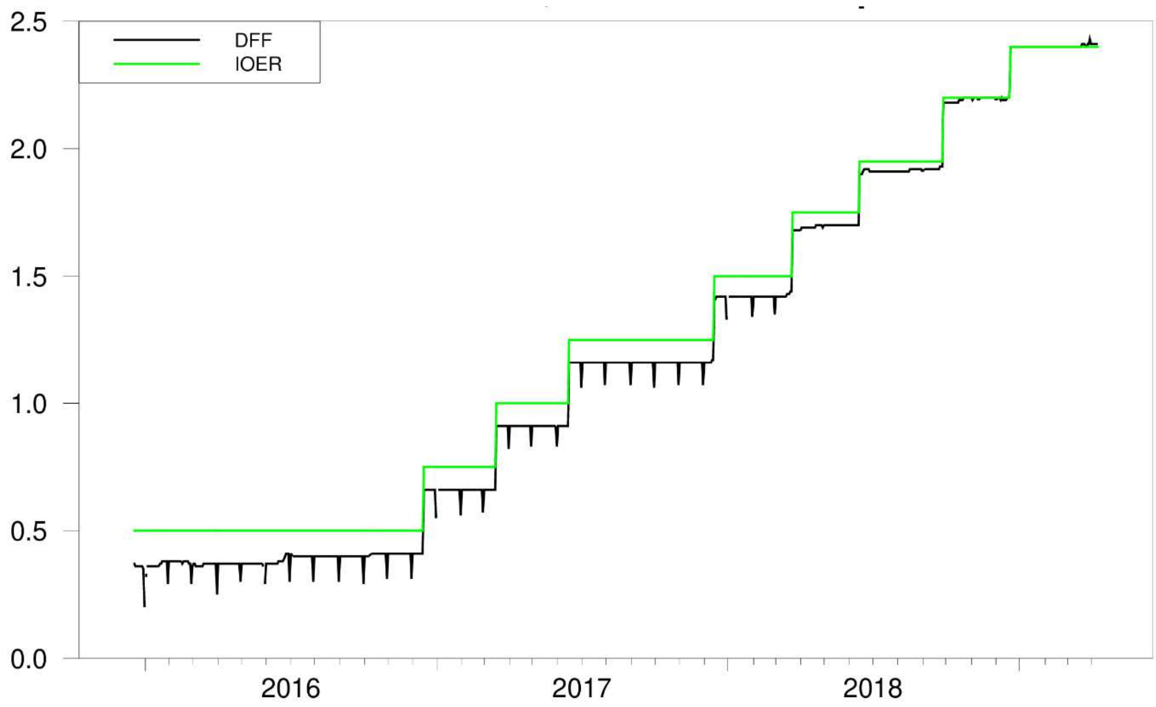


Figure 7. Volume of borrowed reserves and gap between fed funds rate and discount rate.



Notes to Figure 7. Top panel: monthly average effective fed funds rate minus discount rate, Jan 1965 to Dec 1975. Bottom panel: discount window borrowings of depository institutions from the Federal Reserve, billions of dollars. Data source: FRED.

Figure 8. Fed funds rate and interest on excess reserves.



Notes to Figure 8. Daily effective fed funds rate (black) and interest on excess reserves (green), Dec 17 2015 to Apr 10, 2019. Data source: FRED.

Figure 9. Determination of the fed funds rate in 2017.

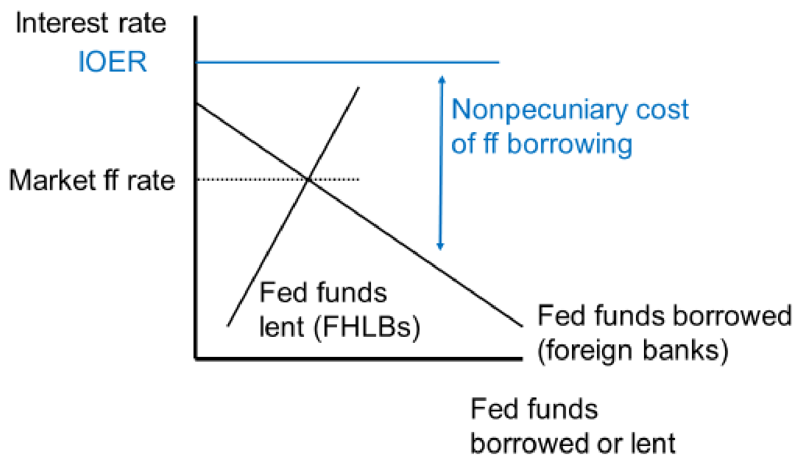
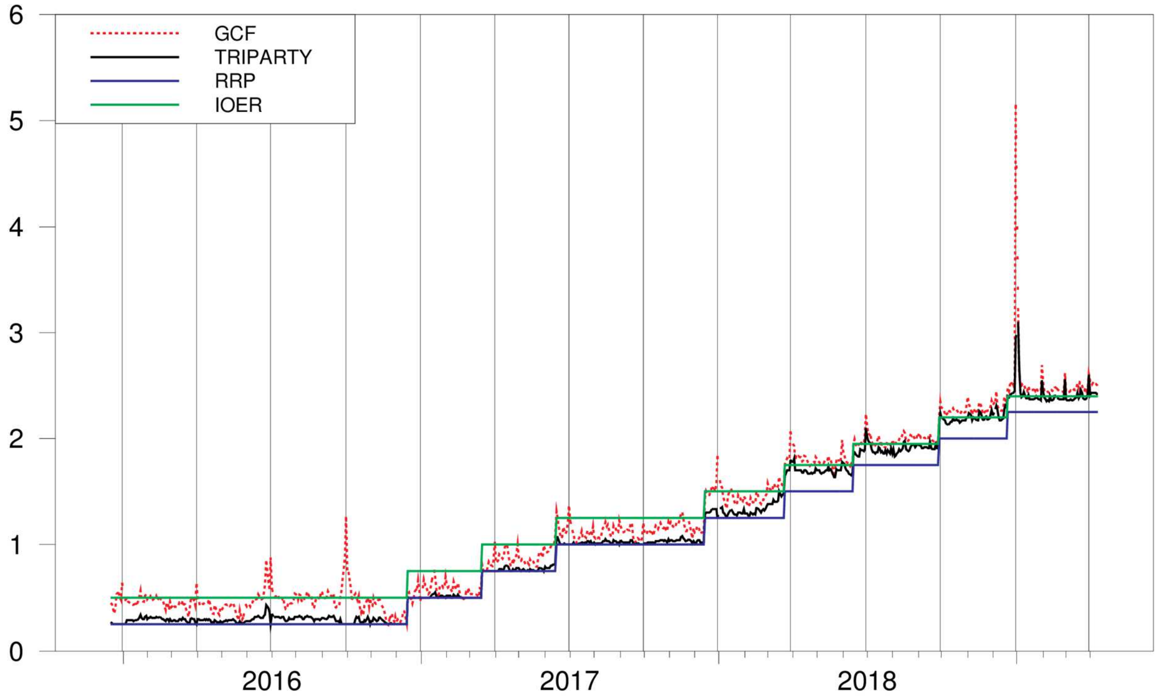


Figure 10. Tri-party repo rate and interest on excess reserves.

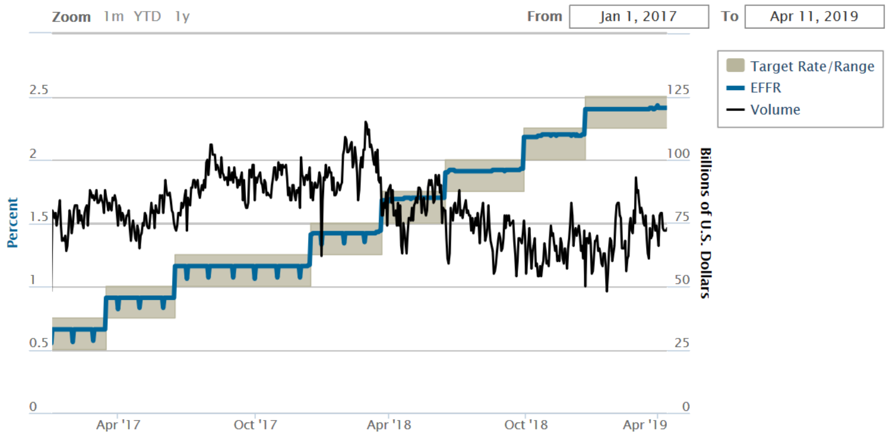
Notes to Figure 10. Daily interest rate on tri-party repurchase agreements based on Treasury securities (black) and Fed reverse repo rate (blue), Dec 17 2015 to Apr 10, 2019. Vertical lines denote last day of a quarter. Tri-party repo rates from Bank of New York Mellon (https://repoindex.bnymellon.com/repoindex/).

Figure 11. GCF rate, tri-party repo rate, reverse repo rate, and interest on excess reserves.



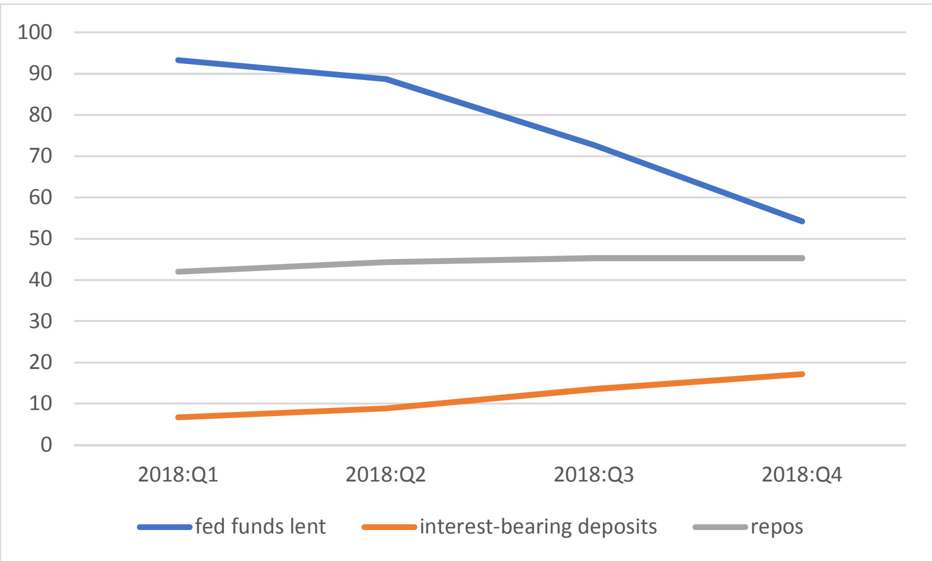
Notes to Figure 11. Daily general collateralized finance rate for repurchase agreements based on Treasury securities (dashed red), rate on tri-party repurchase agreements based on Treasury securities (black), interest on excess reserves (green), and Fed reverse repo rate (blue), Dec 17 2015 to Apr 10, 2019. GCF data from DTCC (http://www.dtcc.com/charts/dtcc-gcf-repo-index#download).

Figure 12. Daily effective fed funds rate and volume of fed funds lending.



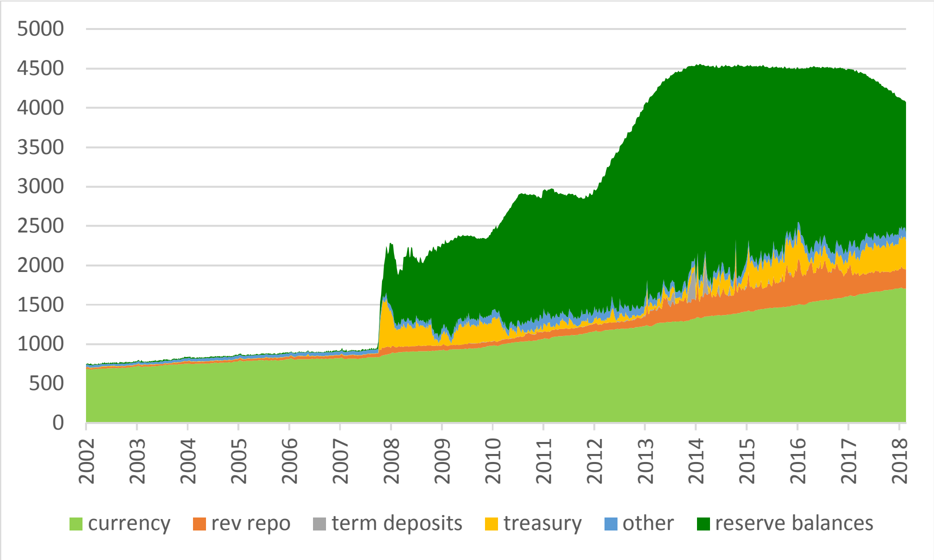
Notes to Figure 12. Figure source: Federal Reserve Bank of New York (https://apps.newyorkfed.org/markets/autorates/fed%20funds).

Figure 13. Selected end-of-quarter assets of Federal Home Loan Banks (billions of dollars).



Notes to Figure 13. Data source: FHLB end-of-quarter financial reports (http://www.fhlb-of.com/ofweb_userWeb/pageBuilder/fhlbank-financial-data-36).

Figure 14. Weekly Federal Reserve liabilities (billions of dollars).



Notes to Figure 14. Wednesday values. Dec 18, 2002 to Feb 6, 2019. Currency: currency in circulation; rev repo: reverse repurchase agreements; treasury: U.S. Treasury general account plus supplementary financing account; reserve balances: reserve balances with Federal Reserve Banks. Data source: Federal Reserve H.4.1 release.