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The Federal Reserve's Floor System: Immediate Gain for Remote Pain?

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Abstract
The Federal Reserve's interest rate policy was insufficient, on its own, to achieve the Federal Reserve's goals during the recent financial crisis. Acquiring the legal authority to pay interest on reserves allowed the Federal Reserve to implement monetary policy using a floor system and thereby divorce interest rate policy from balance sheet policy. Although the floor system entails immediate benefits, such as eliminating the implicit tax on reserves and reducing the credit risk associated with daylight overdrafts, the remote effects include potentially large costs. More specifically, the Federal Reserve's balance sheet policies may reduce longer-run economic growth and risk the institution's independence. To maintain the floor system's present benefits, the Federal Reserve should therefore continue to implement interest rate policy through interest on reserves. To protect against the floor system's future costs, the Federal Reserve should, however, restrict its balance sheet policy to Bagehot's principles for last-resort lending.

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"No very deep knowledge of economics is usually needed for grasping the immediate effects of a measure; but the task of economics is to foretell the remoter effects, and so to allow us to avoid such acts as attempt to remedy a present ill by sowing the seeds of a much greater ill for the future."
—Ludwig von Mises ([1953] 2009, p. 14)

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I. Introduction

Before the recent financial crisis, US monetary policy was equivalent to "interest rate policy," meaning that the policy stance was defined exclusively in terms of a short-term interest rate. The Federal Open Market Committee (FOMC) set a target for the policy rate: the federal funds rate. The open market desk at the Federal Reserve Bank of New York then conducted open market operations to maintain the effective federal funds rate at or close to its target. The Federal Reserve, therefore, expanded or contracted its balance sheet in response to banks' shifting demand for reserves. Central bankers refer to this manner of implementing monetary policy as a "channel system."

During the financial crisis, the Federal Reserve lowered its policy rate repeatedly until it ultimately reached the zero lower bound. These actions failed to stabilize prices and to maximize employment. To remedy that ill, the Federal Reserve sought and obtained the legal authority to begin paying interest on reserves immediately.[1] Shortly after that, the Federal Reserve's implementation of monetary policy switched to a "floor system." The interest rate on reserves establishes a floor for the price of reserves. A floor system entails the Federal Reserve purposefully supplying the banking system with more than enough reserves to push the effective federal funds rate down to the interest rate on reserves. A floor system, therefore, allows the Federal Reserve to target a positive price and quantity of reserves simultaneously while holding reserve requirements constant (see, e.g., Goodfriend 2002).[2] In other words, the floor system "divorces" interest rate policy from changes in the size and composition of the Federal Reserve's balance sheet—that is, from "balance sheet policy."[3]

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[1] In practice, the Federal Reserve only pays interest on reserve balances. The other form of bank reserves, currency held in bank vaults, does not currently earn interest. To simplify our analysis, we use the term "reserves" to mean "reserve balances" throughout this article.

[2] Prior to implementing interest on reserve balances, the Federal Reserve could theoretically target both the quantity and price of nonborrowed reserves by adjusting reserve requirements and using open market operations. However, given fixed reserve requirements, the Federal Reserve could not use open market operations to target both policy instruments simultaneously unless the target federal funds rate was zero.

[3] Keister, Martin, and McAndrews (2008, p. 41) highlight how a floor system "can eliminate the tension between money and monetary policy by 'divorcing' the quantity of reserves from the interest rate target." However, this dichotomy ignores

Given the floor system's relatively immediate and seemingly positive effects, the Federal Reserve shows few signs of returning to a channel system. One effect was eliminating the implicit tax on reserves, which Milton Friedman (1959) initially recommended over fifty years ago. A second effect of the floor system was reducing the credit risk associated with daylight overdrafts, which are a function of the Federal Reserve's settlement system, Fedwire. The third and most significant effect is that the floor system provides the Federal Reserve with another policy tool: the size and composition of its balance sheet.

While the Federal Reserve's ability to implement balance sheet policy, independent of interest rate policy, yields potentially large short-run benefits, it also yields potentially large long-run costs. More specifically, the Federal Reserve's balance sheet policies may reduce longer-run economic growth by reallocating capital to less efficient financial and nonfinancial institutions. Separately, the Federal Reserve's balance sheet policies risk the institution's independence by increasingly blurring the line between monetary and fiscal policy. This article therefore seeks "to foretell the remoter effects" of implementing monetary policy with a floor system, so that central bankers can avoid "sowing the seeds of a much greater ill for the future" (Mises [1953] 2009, p. 14).

Section 2 briefly describes the history and mechanics of Federal Reserve operating systems, particularly the channel and floor systems. Section 3 highlights the immediate and beneficial effects of switching monetary policy implementation from a channel to a floor system. Section 4 attempts to foretell the remoter effects of implementing monetary policy with a floor system. Section 5 concludes with a suggestion of how to implement monetary policy using a floor system that maintains the present benefits while protecting against future costs.

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monetary policies that alter the composition of the Federal Reserve's assets. We therefore follow Borio and Disyatat (2010, p. 53), who are the first, to our knowledge, to classify unconventional monetary policies "as 'balance sheet policies', and distinguish them from 'interest rate policy'." In their words, the "distinguishing feature [of unconventional monetary policies] is that the central bank actively uses its balance sheet to affect directly market prices and conditions beyond a short-term, typically overnight, interest rate" (p. 53). Balance sheet policies therefore include quantitative easing, which focuses on the size of the Federal Reserve's balance sheet rather than its composition, and credit easing, which focuses on the composition of the Federal Reserve's assets rather than the size of its balance sheet.

II. History and Mechanics of Federal Reserve Operating Systems

The explicit objectives of US monetary policy, since an amendment to the Federal Reserve Act (section 2A) in 1977, are "to promote maximum employment, stable prices, and moderate long-term interest rates." The consensus on monetary policy, prior to the financial crisis, held that interest rate policy was sufficient to achieve these goals. In the words of monetary theorist Michael Woodford (2002, p. 88), "All that matters is that the [Federal Reserve] be able to control overnight interest rates; this gives it the leverage that it needs in order to pursue its stabilization objectives." Accordingly, the FOMC conducted monetary policy by setting a target for the federal funds rate.

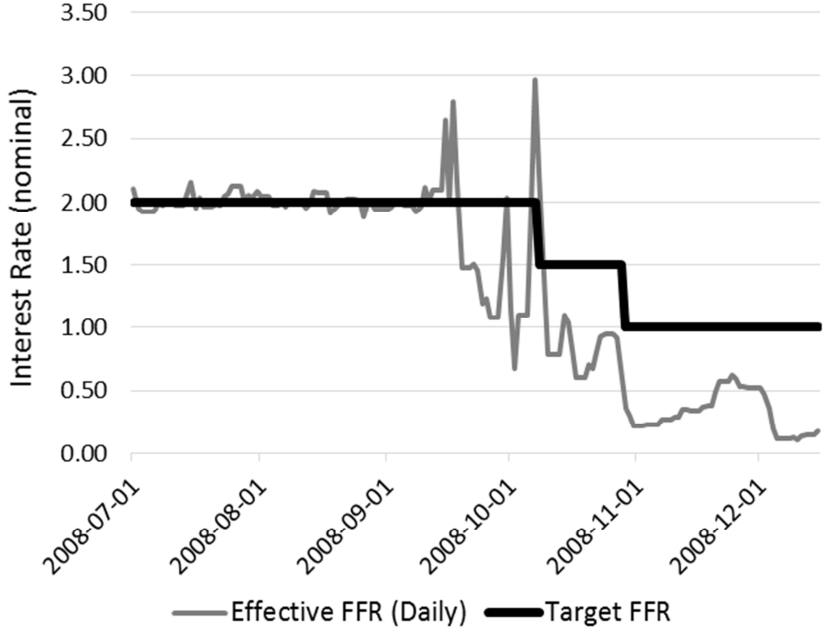
The FOMC's announcements of monetary policy were, however, generally insufficient to ensure that the effective federal funds rate remained at or close to its target. Responsibility for implementing monetary policy, therefore, lay with the open market desk at the Federal Reserve Bank of New York (hereafter "the desk"). Prior to the financial crisis, the desk implemented monetary policy using a channel system, which contains two standing facilities that form a "channel" around the target rate. The discount window—the lending facility—allows banks to borrow reserves freely, against acceptable collateral, at a fixed interest rate above the target rate. If the Federal Reserve provides too few reserves through open market operations, individual banks compete to borrow reserves until either the excess demand is satisfied or the effective federal funds rate reaches the lending facility rate. The discount window sets a ceiling on the price of reserves and establishes the top of the channel. The deposit facility, in contrast, pays banks a fixed interest rate on their reserves that is below the target rate. If the Federal Reserve provides too many reserves through open market operations, individual banks compete to lend reserves until the excess supply ceases to exist, or until the effective federal funds rate reaches the deposit facility rate. The interest rate on reserves sets a floor on the price of reserves and establishes the bottom of the channel. The desk, through open market operations, aims to set the supply of reserves equal to the demand for reserves, at the policy rate target.

Three important aspects of the channel system, as practiced in the United States, are worth highlighting. First, the Federal Reserve lacked legal authority to pay interest on reserves until October 2008. Therefore, the interest rate on reserves was zero, which meant zero

was also the "price floor." Second, the size of the Federal Reserve's balance sheet was a function of the policy rate target and banks' demand for reserves. Third, open market operations were limited to transactions involving short-term Treasury securities and reserves. The composition of the Federal Reserve's assets was therefore effectively Treasuries only. Given these features of a channel system, the Federal Reserve controlled overnight interest rates through adjustments to its balance sheet size and the composition of its liabilities. A channel system thereby inhibits the Federal Reserve's ability to conduct balance sheet policy, independently of interest rate policy, a tool it would come to seek during the financial crisis.

During the summer of 2007, global credit markets started to tighten as investors questioned the solvency of several large European banks (see, e.g., Lavoie 2010). Responding to rising global demand for dollar funding, the Federal Reserve began extending loans to foreign central banks and other financial institutions. With the supply of reserves rapidly increasing, the Federal Reserve found itself in a precarious position. To keep the effective federal funds rate from falling below its target, this expansion of reserves required sterilization. As Bech and Klee (2011, p. 418) note, "The intensifying financial turmoil over the course of 2008 required larger and larger injections of liquidity into the financial system and it became increasingly more difficult for the Federal Reserve to sterilize the resulting increases in [reserves] by redeeming or outright selling Treasury securities from the System Open Market Account (SOMA) portfolio." In other words, the appropriate interest rate policy for maximizing employment and stabilizing prices was inconsistent with the appropriate balance sheet policy for maintaining financial stability. Consequently, the effective federal funds rate fell and remained below the target rate (figure 1). This growing divergence between the desirable interest rate and balance sheet policies created a desire to separate these policy tools. However, doing so would require the legal authority to pay interest on reserves, an authority the Federal Reserve lacked historically.

Figure 1. Effective and target federal funds rate



Source: Federal Reserve Economic Database (FRED).

The idea of interest on reserves dates back at least to the National Bank Act of 1863 (Weiner 1985). Although the creators of the Federal Reserve System considered permitting the payment of interest on reserves, the final draft of the Federal Reserve Act ultimately failed to grant that authority to the Federal Reserve. Although the reason for that decision remains a bit of a mystery, it was clear to the founders that "the power to purchase and rediscount securities in exchange for its own non-interest-[bearing] liabilities gave the [Federal Reserve] a means of earning substantial income" (Goodfriend and Hargraves 1983, p. 11). These means were readily apparent during the Federal Reserve's first several years of existence, as its balance sheet and profits grew rapidly (Willis 1920).[4] The Federal Reserve retained these initial profits until its retained earnings equaled twice its subscribed capital. After that, the Federal Reserve

[4] Willis (1920, p. 26) states, "The total earning assets which at the close of 1916 were only about one billion dollars, had risen at the close of 1920 to [$6.5 billion]." Corresponding to this increase in earning assets, the Federal Reserve's current income grew from just over $5 million in 1916 to over $180 million in 1920 (Board of Governors 2014a). Of that $180 million, The Federal Reserve transferred just over $60 million to the US Treasury. For reference, total federal revenue in 1920 was approximately $6.6 billion (Bureau of the Census 1975).

turned its earnings over to the Treasury. The Federal Reserve therefore quickly became a meaningful source of revenue for the federal government.

The Federal Reserve's profits were not, however, the result of skillful investing. Instead, the profits resulted from an implicit tax on the private sector, assessed by requiring member banks of the Federal Reserve System to hold the Federal Reserve's non-interest-bearing liabilities as reserves (Friedman 1959). This implicit tax on required reserves expanded over time, especially when inflation and nominal interest rates were rapidly rising during the late 1960s and early 1970s. Responding to these higher costs of Federal Reserve membership, banks began to withdraw themselves from the system at an alarming rate. Concerned that the declining number of deposits and demand for reserves would limit its ability to control overnight interest rates, the Federal Reserve sought Congress's help in reversing the trend (Goodfriend and Hargraves 1983).

The Federal Reserve initially asked Congress to expand reserve requirements to all depository institutions, not merely those that were members of the Federal Reserve System. Congress and the American Bankers Association, which supported state chartered banks, met this proposal with substantial opposition (Goodfriend and Hargraves 1983). Arthur Burns, then chairman of the Federal Reserve, subsequently proposed the payment of interest on reserves to stem the decline of Federal Reserve membership (Goodfriend and Hargraves 1983). Congress met this proposal with equally strong opposition, concerned it would substantially reduce the Federal Reserve's transfers to the Treasury. Now fearing congressional inaction, the Federal Reserve contemplated circumventing congressional approval and paying interest on reserves under its own authority (Goodfriend and Hargraves 1983). Congress relented in response to these threats, ultimately passing the Monetary Control Act of 1980 and thereby instituting the Federal Reserve's initial proposal of universal reserve requirements.

Universal reserve requirements, however, merely shifted the corresponding competitive disadvantage. Instead of some depository institutions facing a disadvantage relative to others, all depository institutions now faced a disadvantage relative to nondepository institutions, for example, money market mutual funds. Commercial banks, once again, responded to this competitive disadvantage by reducing their quantity of deposits subject to reserve requirements

and their demand for reserves.[5] The Federal Reserve, facing renewed concern over its ability to control overnight interest rates, once again turned to Congress for help. This time, however, the Federal Reserve's request to pay interest on reserves drew support from the banking lobby and from the Treasury Department (VanHoose and Humphrey 2001).

Congressional concern over the federal budget was also waning during the late 1990s, as economic growth sped up and federal budget deficits turned into surpluses. Moreover, Congressional support was growing for broad financial deregulation.[6] In 1998, the House of Representatives backed the Federal Reserve's proposal by putting forth a bill explicitly granting the Federal Reserve authorization to pay interest on reserves.[7] The Senate held up this bill for several years, but Congress ultimately granted the Federal Reserve authority to pay interest on reserves through the Financial Services Regulatory Relief Act of 2006. That act added the following paragraph to Section 19(b) of the Federal Reserve Act:

> (12) EARNINGS ON BALANCES.— (A) IN GENERAL.—Balances maintained at a Federal Reserve bank by or on behalf of a depository institution may receive earnings to be paid by the Federal Reserve bank at least once each calendar quarter, at a rate or rates not to exceed the general level of short-term interest rates.

Although this amendment established the Federal Reserve's authority to pay interest on reserves, that authority would not become effective until five years later, in 2011.

By mid-2008, the Federal Reserve's balance sheet policies were increasingly interfering with its desired interest rate policy. To improve the Federal Reserve's ability to control overnight interest rates, Chairman Bernanke requested that the Federal Reserve's ability to pay interest on reserves become effective immediately (Bernanke 2008). Congress obliged by including a passage in the Emergency Economic Stabilization Act of 2008 that brought the effective date forward to October 1, 2008. The Federal Reserve began paying

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[5] We discuss the specific manner by which commercial banks reduced their quantity of deposits subject to reserve requirements in section 2.

[6] Examples of financial deregulation include the Gramm-Leach-Bliley Act, also known as the Financial Services Modernization Act of 1999, and the Commodity Futures Modernization Act of 2000.

[7] That bill was the Depository Institution Regulatory Streamlining Act of 1998 (H.R. 4364).

interest on reserves only a few days later.[8] However, it continued to implement monetary policy with a channel system for several more weeks.

In December 2008, the FOMC ceased setting a target policy rate and began setting a target range for the policy rate. The FOMC set the target range at 0 percent to 0.25 percent, effectively at the zero lower bound. The interest rate on reserves, which was set equal to the upper bound of the target range, established a floor on the price of reserves. Consequently, the Federal Reserve began implementing monetary policy using a floor system.

The significant difference between a floor and channel system is that with a floor system, the Federal Reserve intentionally supplies the banking system with more than enough reserves to push the effective federal funds rate down to the interest rate on reserves. Changes in the size and composition of the Federal Reserve's balance sheet are therefore no longer necessary to control overnight interest rates. Instead, the Federal Reserve controls overnight interest rates through its deposit facility rate, that is, the interest rate on reserves. The floor system divorces interest rate policy and balance sheet policy from one another.

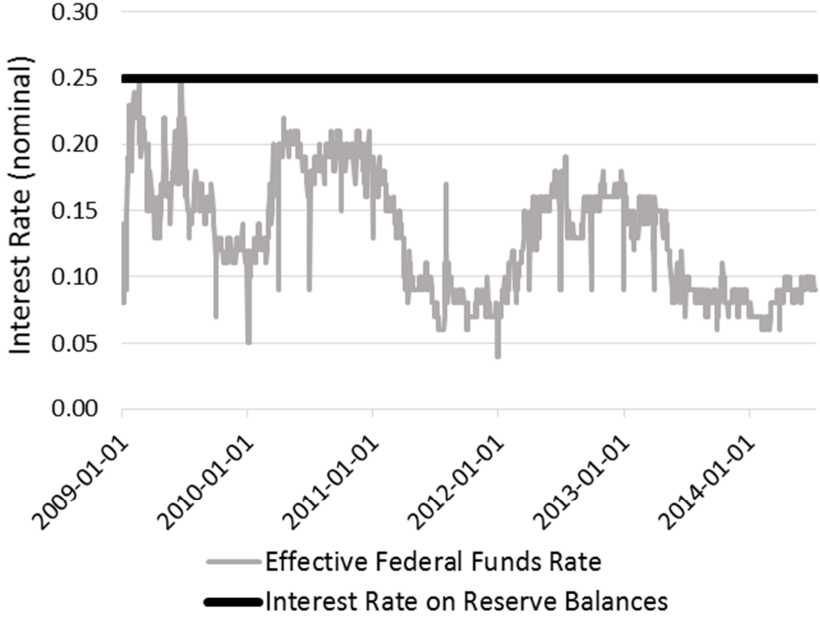
Before moving ahead to our discussion of a floor system's benefits and costs, we should note an apparent inconsistency between its theoretical and practical implementation. Since December 2008, the effective federal funds rate has remained consistently *below* the interest rate on reserves (figure 2). The consensus explanation for this "puzzle" involves government sponsored enterprises (GSEs) and foreign financial institutions, both of which lack the legal ability to receive interest on their reserves (see, e.g., Ennis and Wolman 2015).[9] Theoretically, US depository institutions would competitively bid up the price of reserves, eliminating this arbitrage opportunity. However, the Federal Deposit Insurance Corporation (FDIC) assesses a fee on

[8] There is some confusion regarding whether the initial purpose of paying interest on reserves was as a regulatory measure or, as we suggest, to regain control of overnight interest rates. It is therefore worthwhile to note that the Federal Reserve's own press release states, "The payment of interest on excess [reserves] will give the Federal Reserve greater scope to use its lending programs to address conditions in credit markets while also maintaining the federal funds rate close to the target established by the [FOMC]" (Board of Governors 2008).

[9] Although foreign institutions are unable to receive interest on reserve balances, "a separate, overnight reverse repo facility has long existed as an investment vehicle for foreign central banks and international accounts that hold dollars in their accounts at the New York Fed" (Potter 2013, p. 7).

commercial banks related to their balance sheet size, reducing the effective interest rate on reserves. This regulatory hurdle thereby prohibits commercial banks from fully exploiting what would otherwise be an arbitrage opportunity.[10] The Federal Reserve's ability to control overnight interest rates is, therefore, at least partially limited.

Figure 2. Effective federal funds rate "puzzle"



Source: Federal Reserve Economic Database (FRED).

To improve its ability to control overnight interest rates, while continuing to use a floor system, the Federal Reserve is currently testing out several new deposit facilities. For example, the Federal Reserve is currently assessing its ability to conduct, relatively seamlessly, so-called "full allotment" reverse repurchase agreements (RRPs).[11] This deposit facility would provide "all banks and many

[10] Foreign financial institutions, which are not assessed FDIC fees, can more fully exploit this arbitrage opportunity by borrowing reserve balances and investing them through the reverse repo facility, as noted above. This explains, at least partially, why foreign financial institutions significantly increased their reserve balances after 2008 (Ennis and Wolman 2015).

[11] Reverse repurchase agreements (RRPs) are a form of temporary open market operation by which the Federal Reserve sells securities to eligible counterparties with an agreement to repurchase those same securities in the near future. "Full

other financial institutions . . . an unlimited ability to invest at the [Federal Reserve] at the specified interest rate" (Gagnon and Sack 2014, p. 1). This option not only eliminates the arbitrage opportunity noted above but also expands access to the Federal Reserve's deposit facilities beyond depository institutions. The Federal Reserve's ability to control overnight interest rates, therefore, may extend beyond the federal funds market to other overnight markets, such as the repurchase agreement (repo) market. Given these plans to control overnight interest rates using deposit facilities, it is clear that the Federal Reserve intends to continue implementing monetary policy with a floor system well into the future.

III. Benefits of the Federal Reserve's Floor System

Mises ([1953] 2009, p. 14) is surely correct that "no very deep knowledge of economics is usually needed for grasping the immediate effects of a measure." However, a relatively deep knowledge of central banking is necessary to grasp the immediate effects of implementing monetary policy using a floor system. In this section, we describe the benefits from three immediate effects of the Federal Reserve's transition to a floor system: it eliminates the implicit tax on reserves, reduces credit risk associated with daylight overdrafts, and divorces interest rate policy from balance sheet policy.

1. Eliminates implicit tax on reserves

All depository institutions are required to hold a minimum percentage of reserves against certain types of liabilities, such as deposits in transactions (checking) accounts. Friedman (1959) and Mayer (1966) were among the first to argue that requiring member banks of the Federal Reserve System to maintain reserves in non-interest-bearing assets imposes an implicit tax on the private sector, equal to the opportunity cost of not holding interest-bearing assets. To remedy distortions from this implicit tax, Friedman (1959) suggested that the Federal Reserve pay interest, at a competitive market rate, on all *required* reserve balances. However, as noted previously, the Federal Reserve lacked the legal authority to do so for most of its history.

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allotment" means that the Federal Reserve sets the interest rate for RRPs then provides any quantity demanded, up to the amount of securities it holds.

Attempting to minimize this implicit tax, in January 1994 the Federal Reserve began allowing commercial banks to reduce their quantity of required reserves by "sweeping" (moving) deposits from transactions accounts to savings accounts (see, e.g., Anderson and Rasche 2001; VanHoose and Humphrey 2001). Since transactions accounts are subject to a 10 percent reserve requirement, while savings accounts are not, employing sweep accounts reduces banks' aggregate required reserves and the private sector's implicit tax. Nevertheless, creating and maintaining sweep programs requires investments in both technology and labor. Commercial banks were therefore able to reduce, but not eliminate, the implicit tax on reserves.

By paying interest on all reserves at a competitive market rate the Federal Reserve's floor system eliminates the implicit tax on reserves, including the cost of operating sweep programs. As Goodfriend (2011, p. 4) notes, "In effect, [the floor system] attains Milton Friedman's 'optimum quantity of money' with respect to bank reserves, although not with respect to currency unless interest rates are zero." Overnight interest rates are presently, however, effectively at zero. Friedman's "optimum quantity of money" therefore currently exists.

2. Reduces credit risk associated with daylight overdrafts

The creation of the Federal Reserve in 1913 was, in large part, a response to the Panic of 1907. Prior to the creation of a US central bank, private clearinghouses handled the settlement of debts between financial institutions and, in effect, the clearing of payments between private households and corporations. During the Panic of 1907, the most prominent private clearinghouse, the New York Clearing House Association, refused to extend liquidity to several financial institutions. The failure of these financial institutions to settle their debts precipitated a more widespread run on the banking sector and produced a relatively severe depression. The initial purpose of the Federal Reserve System was, therefore, to provide a public clearinghouse that could maintain a well-functioning payments system through its potentially unlimited extension of liquidity.

Clearinghouses, whether public or private, can conduct the settlement of payments between financial institutions through various different arrangements (for an overview, see Selgin 2004). However, for the purposes of this article, we focus solely on the current operations of Fedwire, the Federal Reserve's clearinghouse. Fedwire

is a real-time gross settlement (RTGS) system, which means it "executes payment orders as they arrive, at once transferring reserve credits representing the gross value of individual payments" (Selgin 2004, p. 334). A strict RTGS system would increase the precautionary and aggregate demand for reserves since banks must maintain sufficient reserves to cover both expected and unexpected payments. This increased demand for reserves would require, within the channel system, an increase in the supply of reserves at the target rate. Since a relatively large supply of reserves would create a relatively large implicit tax, the Federal Reserve chooses to operate a more flexible RTGS system. In practice, Fedwire therefore permits its "participants to rely on intraday credit or 'daylight overdrafts' to cover payments in excess of their available balances, on the understanding that the credits must be repaid at day's end" (Selgin 2004, p. 334).

While permitting daylight overdrafts reduces the demand for reserves, it also exposes the Federal Reserve and the public to credit risk. A consequence of implementing monetary policy with a channel system is that "the quantity of reserves needed for payment purposes typically far exceeds the quantity consistent with the [Federal Reserve's] desired interest rate" (Keister, Martin, and McAndrews 2008, p. 42). To ensure that Fedwire functions effectively, the Federal Reserve must provide substantial intraday credit on a daily basis. More importantly, the credit risk associated with such lending is borne entirely by the Federal Reserve, which has no recourse to credited accounts in the event of a settlement failure (Selgin 2004).

By implementing monetary policy with a floor system, in contrast to a channel system, the Federal Reserve allows the quantity of reserves consistent with its policy rate to equal or exceed the quantity needed for payment purposes. Since transitioning to a floor system in December 2008, average daylight overdrafts fell from over $70 billion to under $5 billion. Meanwhile, peak daylight overdrafts fell from over $180 billion to under $10 billion.[12] The floor system therefore entails an immediate and significant reduction in the Federal Reserve's and the public's credit risk associated with daylight overdrafts (Ennis and Weinberg 2007; Keister, Martin, and McAndrews 2008).

[12] Data from Board of Governors of the Federal Reserve System, Payment System Risk, Data.

3. Divorces interest rate policy from balance sheet policy

At a ninetieth birthday party for Milton Friedman, Ben Bernanke (2002) concluded his speech by saying, "To Milton and Anna: Regarding the Great Depression. You're right, we did it. We're very sorry. But thanks to you, we won't do it again." Only a few years later, Bernanke, as chairman of the Federal Reserve, would find himself and the country at the precipice of potentially another Great Depression. The Federal Reserve lowered its policy rate repeatedly, all the way to its zero lower bound. The transmission of lower, and ultimately negative, short-term real interest rates was, however, insufficient to restore financial stability, stabilize prices, and maximize employment. Nevertheless, Bernanke would ultimately make good on his words, using his academic research to guide the Federal Reserve's foray into balance sheet policy.

Bernanke's research on the transmission mechanisms of monetary policy is an important part of the "new credit view." Theories within the new credit view generally assume that imperfect substitutability exists between bank loans and open market credit, but nearly perfect substitutability exists between various forms of money (see, e.g., Bernanke 1983; Bernanke and Blinder 1992; Bernanke and Gertler 1995; Kiyotaki and Moore 1997). In other words, financial assets within the private sector are imperfect substitutes for one another. By changing the size and composition of its balance sheet, the Federal Reserve alters the relative scarcity and liquidity of private financial assets. Subsequently, these changes induce private portfolio rebalancing and movements in asset prices (see, e.g., Tobin 1969; Brunner and Meltzer 1972). Balance sheet policy can, therefore, affect the term and risk premia of interest rates, which in turn should affect aggregate demand and, ultimately, nominal output.

By implementing monetary policy with a floor system, the Federal Reserve enables itself to use interest rate policy and balance sheet policy simultaneously. Since the onset of the financial crisis, the Federal Reserve has actively engaged in balance sheet policy. As of June 2015, the size of the Federal Reserve's balance sheet, which was previously under $1 trillion, stood at nearly $4.5 trillion.[13] Separately, the composition of the Federal Reserve's assets, which previously included only short-term Treasuries, included large quantities of longer-term Treasuries and agency mortgage-backed securities, among other new asset classes. As predicted by theories within the

[13] Data from the Federal Reserve Economic Database (FRED).

new credit view, empirical studies generally show that these balance sheet policies were successful in reducing term and risk premia through portfolio rebalancing effects (see, e.g., D'Amico and King 2010; Gagnon et al. 2011; Gilchrist, López-Salido, and Zakrajšek 2015).

While these empirical results appear to support strongly a view that balance sheet policies improve the Federal Reserve's ability to counteract financial and economic shocks, there are reasons for hesitating to jump to such a conclusion.[14] First, theories within the new credit view assume, perhaps incorrectly, that households and firms "maintain a constant and material degree of interest rate sensitivity . . . through all phases of the business cycle" (Putnam 2013, p. 4). An important feature of financial crises is the relatively widespread attempt by private sector agents to deleverage. However, this widespread desire, or requirement, to deleverage may substantially reduce the private sector's interest rate sensitivity (Putnam 2013). Substantial decreases in term and risk premia (increases in financial asset prices) would therefore only induce limited growth in aggregate demand. The sharp divergence in recent years between the market value of all publically traded US securities and nominal gross domestic product (NGDP) provides some support for this thesis.

Second, even if the private sector's interest rate sensitivity is constant and material, present empirical studies may overstate the effects of balance sheet policies on financial asset prices due to their general exclusion of an external sector (Putnam 2013). Foreign central banks, from the outset of the financial crisis, were purchasing substantial quantities of US financial assets as part of their policies to either stabilize or weaken exchange rates against the US dollar (Putnam 2013). Separately, the ongoing crisis in Europe and other parts of the world, such as Russia, led foreign private sector agents to invest more heavily in US financial assets, at times, as a flight-to-safety (Putnam 2013). Independently of the Federal Reserve's balance sheet policies, the increase in foreign demand for US financial assets would decrease term and risk premia.

Overall, it seems reasonable to conclude that the Federal Reserve's independent use of balance sheet policies was initially effective, at least at the margin, in recreating financial stability and increasing aggregate demand. Combined with eliminating the implicit

[14] For a more detailed critique, see Putnam (2013).

tax on reserves and reducing costs associated with daylight overdrafts, the immediate effects of the Federal Reserve's floor system were, therefore, beneficial.

IV. Costs of the Federal Reserve's Floor System

There is widespread agreement regarding the net benefits of eliminating the implicit tax on reserves and reducing costs associated with daylight overdrafts. There is, however, far less agreement regarding the net effects of divorcing interest rate policy from balance sheet policy. The perception that independent balance sheet policy offers net benefits often stems from theoretical models that implicitly assume policymakers are omniscient. However, according to Buchanan and Wagner (2000, p. 123), assessing the actual practice of monetary policy requires that "this assumption of omniscience . . . be replaced by one of partial ignorance and uncertainty." The Federal Reserve's floor system, by increasing the discretion of monetary policy makers, therefore also increases the likelihood of policy errors. In this section, we describe the potential costs of the Federal Reserve's transition to a floor system, focusing on two more remote effects: reductions in longer-run economic growth and the loss of central bank independence.

1. Reduces longer-run economic growth

A tenet of monetary economics is the neutrality of money, which states that a change in the stock of money affects only nominal variables in the long run. Monetary policy, when constrained to merely changing the stock of money, is therefore also neutral in the long run. However, monetary policy now includes changes in the size and composition of the Federal Reserve's assets. Monetary policy is no longer constrained to merely changing the stock of money. The long-run neutrality of monetary policy, therefore, may cease to exist.

Balance sheet policies work, to a large degree, "by interposing the government between private borrowers and lenders and exploiting the government's creditworthiness—the power to borrow credibly against future taxes—to facilitate flows to distressed or favored borrowers" (Goodfriend 2011, p. 4). The Federal Reserve's actions therefore actively block market mechanisms like profits and losses from leading to an efficient allocation of capital. Balance sheet policies are then similar, in effect, to "debt-financed fiscal policy" (Goodfriend 2011, p. 4), which surely can affect longer-run economic growth. For our purposes, a few specific examples should suffice.

Central banks, to secure financial stability, provide a form of "insurance" to protect financial institutions against problems stemming from systematic illiquidity. As Bagehot ([1873] 2001, chap. 7, p. 21) explains, "Theory suggests, and experience proves, that in a panic the holders of the ultimate Bank reserve (whether one bank or many) should lend to all that bring good securities quickly, freely, and readily. By that policy they allay a panic; by every other policy they intensify it." Such a policy, however, produces moral hazard if the central bank provides loans at or below market prices. Bagehot's principles for last-resort lending are therefore to lend freely at above-market rates, against good collateral, to financial institutions that are merely illiquid, not insolvent. Contrary to Bagehot's principals, the Federal Reserve's balance sheet policies have often involved lending funds at below market rates and, in some cases, to seemingly insolvent institutions (Hogan, Le, and Salter 2015).

A specific example of the Federal Reserve's failure to uphold Bagehot's principals involves the Term Auction Facility (TAF), which provided term loans against various forms of collateral to supposedly solvent financial institutions. At the height of the financial crisis, from late 2008 into early 2009, increasing uncertainty regarding the solvency of borrowers and the liquidity of available collateral caused interbank market rates for borrowing to rise substantially. The TAF allowed financial institutions to substitute borrowing on the interbank market with relatively cheap loans from the Federal Reserve (Goodfriend 2011). Moreover, the TAF favored "those banks caught with a persistent funding shortfall" (Goodfriend 2011, p. 5), which are typically the largest financial institutions. The TAF, therefore, provided loans at below market rates, against questionable collateral, to potentially insolvent, large financial institutions. In effect, the Federal Reserve was subsidizing the costs of illiquidity and thereby encouraging the flow of capital toward less liquid financial assets. Furthermore, the Federal Reserve was subsidizing the funding costs of large financial institutions, thereby encouraging their expansion relative to smaller financial institutions. A result of such policies may be a more concentrated, less efficient financial sector, one that is increasingly susceptible to the problems of systemic illiquidity. From 2008 through June 2015, the share of US deposits held by the four largest financial institutions grew from

approximately 27 percent to nearly 38 percent.[15] In terms of financial sector concentration, the results are already clear.

The Federal Reserve's balance sheet policies not only redistribute capital among financial institutions but also among nonfinancial institutions. As noted previously, balance sheet policies stimulate economic growth by inducing private sector investors to rebalance their portfolios such that the term and risk premia on financial assets decline and their prices rise. While economic theory predicts that the decline in interest rates will ultimately increase the demand for loans, the initial and direct effect is to make borrowing in the capital markets cheap relative to borrowing from a financial institution. As a result, larger firms, which can typically access capital markets, experience a decline in their borrowing costs relative to smaller firms, which typically cannot (Bowdler and Radia 2012). Furthermore, firms that operate with relatively high leverage (with a high ratio of debt to equity) receive disproportionate benefits due to their ability to refinance outstanding debts at relatively lower interest rates. The Federal Reserve's balance sheet policies may therefore also result in a more concentrated, highly levered, and ultimately less efficient nonfinancial business sector. The Federal Reserve's actions can partially explain the relatively weak labor productivity growth during the recovery.[16]

The net distribution effects of the Federal Reserve's balance sheet policies on the household sector are harder to discern. On one hand, by increasing the value of the existing stock of financial assets, balance sheet policies disproportionately benefit households that own a relatively large share of those assets. In the United States, the top 10 percent of households, by wealth class, own nearly 85 percent of all US financial assets (Board of Governors 2014b). Meanwhile, the bottom 75 percent of households, by wealth class, own less than 4 percent of all US financial assets (Board of Governors 2014b). In terms of wealth, balance sheet policies disproportionately benefit relatively wealthy households.

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[15] Authors' calculations based on data from the FDIC.

[16] Nonfarm business (labor) productivity growth following the recession (2009 Q3 to 2015 Q1) averaged approximately 1.1 percent per year. In contrast, productivity growth during the previous expansion periods (1991 Q2 to 2000 Q4 and 2002 Q1 to 2007 Q3) averaged approximately 2.4 percent and 2.6 percent per year, respectively. Authors' calculations based on data from the US Bureau of Labor Statistics.

On the other hand, by reducing interest rates, balance sheet policies redistribute part of the flow of future interest income from savers to borrowers. Households that represent savers are, on average, older and relatively wealthy. Households that represent borrowers are, on average, younger and relatively less wealthy. The redistribution of future interest income, therefore, flows in the opposite direction of the distribution of wealth. The type and magnitude of balance sheet policies employed will determine any net distribution, or redistribution, of wealth and income between various groups of households. The net effect of such policies on economic, political, and social dynamics is, *a priori*, impossible to determine. Nevertheless, the potential costs of altering the distribution of wealth and income remain.

Overall, the Federal Reserve's balance sheet policies risk reducing longer-run economic growth, primarily through the reallocation of capital among financial and nonfinancial institutions. By divorcing interest rate policy from balance sheet policy, the Federal Reserve's floor system makes continued use of the latter policy even more likely. As Hummel (2014, p. 20) notes, "The real danger is that, given these tools, the [Federal Reserve] has no real need to normalize its balance sheet and therefore may not do so [even] after full economic recovery."

2. Risks central bank's independence

Goodfriend (2011, p. 2) argues, "Independence is essential to enable a central bank to react promptly to macroeconomic or financial shocks without the approval of the Treasury or the legislature." However, as the previous subsection displays, Federal Reserve balance sheet policies blur the line between monetary and fiscal policy. As Borio and Disyatat (2010, p. 54) aptly note, "Almost any balance sheet policy that the central bank carries out can, or could be, replicated by the government." To make this point clearer, consider the following example.

In January 2009, the Federal Reserve began purchasing fixed-rate mortgage-backed securities (MBS) guaranteed by Fannie Mae, Freddie Mac, and Ginnie Mae. From January 2009 through March 2010, the Federal Reserve purchased $1.25 trillion of these securities, commonly referred to as "agency MBS." The purpose of these purchases was to lower the term and risk premia of agency MBS, thereby also lowering the rates at which these institutions would provide mortgages to new borrowers and refinancers. In turn, the

lower mortgage rates would increase demand for housing. This increase in demand would ultimately drive house prices higher, generating increases in investment, due to new supply, and consumption, due to wealth effects. By accepting the credit risk associated with mortgage lending onto its balance sheet, the Federal Reserve effectively subsidized mortgage lending by these three financial institutions, which are all at least partially government owned.

To accomplish the same task (to subsidize mortgage lending by these three financial institutions), one option for the federal government was simply to nationalize Fannie Mae and Freddie Mac. While the federal government did place Fannie Mae and Freddie Mac into conservatorship, it did not explicitly extend the "full faith and credit" guarantee of the US government to these institutions. Doing so would further reduce these institutions' borrowing costs and allow for a reduction in mortgage rates. Another option for the federal government was to provide direct subsidies via tax credits to borrowers that either took out new mortgages or refinanced old ones. While the federal government did not provide any tax credits explicitly for mortgages, it did enact numerous policies aimed at increasing housing demand, such as a tax credit for first-time homebuyers. In effect, these policies similarly reduced the effective mortgage rate for borrowers. These actions make it clear that the federal government was equally capable of accepting credit risk associated with mortgage lending onto its balance sheet or committing taxpayer dollars to supporting the housing market. Moreover, the federal government is better suited to make such decisions since "a decision to *commit* substantial taxpayer resources . . . or one that *denies* taxpayer resources is inherently a highly charged, political, fiscal policy matter" (Goodfriend 2011, p. 7). The Federal Reserve's balance sheet policies therefore generally lack sufficient political legitimacy and weaken its case for remaining independent (Goodfriend 2011).

Apart from effectively acting as fiscal policy, the Federal Reserve's discretion in exercising balance sheet policies undermines the rule of law. White (2010, p. 452) states, "Under the rule of law, government agencies do nothing but faithfully enforce statutes already on the books. Under the rule of authorities, those in positions of executive authority have the discretion to make up substantive new decrees as they go along, and to forego enforcing the statutes on the books." The Federal Reserve's balance sheet policies during the

financial crisis, at times, clearly fell under the rule of authorities, that is, the "rule of central bankers."

Section 13(3) of the Federal Reserve Act permits the Board of Governors "in unusual and exigent circumstances . . . to discount for any individual, partnership, or corporation, notes, drafts, and bills of exchange when such notes, drafts, and bills of exchange are indorsed or otherwise secured to the satisfaction of the Federal Reserve bank."[17] However, as previously demonstrated, the Federal Reserve's balance sheet policies often entailed accepting questionable collateral, outside the stated range of "notes, drafts, and bills of exchange" (White 2010). These actions, by potentially violating procedures established in Section 13(3), encouraged Congress to amend that section of the Federal Reserve Act in hopes of limiting future Federal Reserve discretion (Mehra 2010). This revision includes provisions to improve collateral and, more significantly, requires prior approval of the Secretary of the Treasury for any policies that fall under Section 13(3)'s authorization. Even if Congress and the Treasury are unlikely to withhold approval in the event of new "unusual and exigent" circumstances, the message is clear. Through increasing oversight, Congress plans to hold the Federal Reserve more accountable for its actions.

Last, the Federal Reserve's decision to implement monetary policy with a floor system increases the risks of future fiscal dominance. As of September 2015, the Federal Reserve, through its balance sheet policies, owned nearly one-third of marketable US Treasury securities maturing in over five years.[18] Since the Federal Reserve essentially returns all interest accrued from these holdings to the Treasury, the Federal Reserve's actions effectively reduced the average maturity of the federal debt.[19] Simultaneously, the Federal Reserve substantially lowered short-term interest rates. These actions, taken together, significantly reduced the average interest rate on the public debt.[20] Consequently, net interest payments on federal debt in

[17] This version of the Federal Reserve Act was in place during 2008.

[18] Values based on authors' calculations, which exclude Treasury Inflation-Protected Securities (TIPS). Data provided by FRED and Treasury Direct.

[19] In practice, the Federal Reserve returns all interest after accounting for its annual expenses.

[20] The average interest rate on marketable public debt fell from 4 percent in June 2008 to 2 percent in June 2015. These rates, provided by Treasury Direct, also exclude TIPS and Treasury Floating Rate Notes. Moreover, these rates include marketable debt held by the Federal Reserve. Excluding the Federal Reserve's holdings would further reduce the average interest rate in June 2015.

2014 were lower than in 2008, even though the total amount of federal debt held by the public had more than doubled.[21]

Economists generally maintain that, for governments not running consistent budget surpluses, a level of federal debt is unsustainable when the average interest rate on federal debt exceeds the economy's growth rate. Under those conditions, and assuming the government finances interest payments with more debt, the ratio of debt-to-GDP will grow indefinitely (Sargent and Wallace 1981). The unpleasant monetarist arithmetic highlighted by Sargent and Wallace (1981, p. 7) is that in such cases, "the monetary authority can make money tighter now only by making it looser later." Their analysis implicitly assumes that money is noninterest bearing. However, the Federal Reserve's decision to pay interest on reserves means this assumption no longer holds. Moreover, by paying interest on reserves at a competitive market rate, the Federal Reserve's liabilities are now close substitutes for the Treasury's liabilities, Treasury bills in particular. In other words, money is now a close substitute for short-term federal debt. If the unsustainability case comes to fruition, the Federal Reserve's floor system essentially limits the federal government's options to financing interest payments through debt issued by the Treasury or debt issued by the Federal Reserve. The new "unpleasant arithmetic" is therefore that, in such an event, the Federal Reserve might be forced to maintain short-term interest rates at very low levels while reducing longer-term interest rates through balance sheet policies. Although the methods are different, the result of this scenario—fiscal domination of monetary policy—is the same.

Overall, it therefore seems equally reasonable to conclude that the remoter effects of the Federal Reserve's floor system—in particular, its balance sheet policies—entail potentially large costs. However, given the uncertainty surrounding possible reductions in longer-run economic growth and central bank independence, policy makers should discount these potential costs accordingly. Whether the present benefits of implementing monetary policy with a floor system outweigh its potential future costs remains unclear.

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[21] The net interest expense on federal debt outstanding fell from approximately $450 million in 2008 to approximately $430 million in 2014. These values include interest payments to the Federal Reserve, which were substantially larger in 2014. Meanwhile, the total federal debt held by the public rose from approximately $5.3 trillion in June 2008 to approximately $12.6 trillion in June 2014. All values provided by Treasury Direct.

V. Conclusion

This article has sought "to foretell the remoter effects" of implementing monetary policy with a floor system, so that central bankers can avoid "sowing the seeds of a much greater ill for the future" (Mises [1953] 2009, p. 14). If implementing monetary policy with a floor system yielded limited benefits relative to its potential costs, then returning to a channel system would be the obvious solution. However, the benefits of a floor system, in particular eliminating the implicit tax on reserves and reducing the credit risk associated with daylight overdrafts, are readily apparent and relatively significant. In contrast, the benefits of divorcing interest rate policy from balance sheet policy are difficult to assess, especially relative to the potential costs of reduced longer-run economic growth and the loss of central bank independence. The task for central bankers is then to find a means of implementing monetary policy with a floor system that maintains the present benefits while protecting against future costs.

Goodfriend (2011) offers a potential solution to this problem, which we support, in the terms of a new "accord" between the Treasury and Federal Reserve. This accord would rest on three basic principles (Goodfriend 2011, p. 10):

> Principle 1: As a long run matter, a significant, sustained departure from a "Treasuries only" asset acquisition policy is incompatible with [Federal Reserve] independence.
>
> Principle 2: The [Federal Reserve] should adhere to "Treasuries only" except for occasional, temporary, well-collateralized ordinary last resort lending to solvent, supervised depository institutions.
>
> Principle 3: [Federal Reserve balance sheet policies] beyond ordinary last-resort lending should be undertaken only with prior agreement of the fiscal authorities, and only as bridge loans accompanied by take-outs arranged and guaranteed in advance by the fiscal authorities.

Under normal circumstances, the Federal Reserve would continue to set interest rate policy using its deposit facilities and the supply of reserves would be set approximately equal to the quantity demanded for payment purposes. This accord retains the benefits of a floor system. Under unusual or exigent circumstances the Federal Reserve's balance sheet policies would be effectively restricted to

lending freely at above market rates, against good collateral, to financial institutions that are merely illiquid, not insolvent. This accord would, therefore, restrict the Federal Reserve's last-resort lending to Bagehot's principles and, in doing so, protect against the floor system's future costs. The real danger, then, is not that the Federal Reserve fails to return to a channel system, as Hummel (2014) suggests, but rather that it continues to engage in balance sheet policies that do not adhere to Bagehot's principles.

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