Monetary Policy Implementation with Ample Reserves

YiLi Chien and Ashley Stewart

Abstract

The Federal Reserve currently implements its interest rate policy under a framework known as the floor system. In order for the floor system to operate smoothly, there must be sufficient liquidity in the federal funds market. The ongoing goal of quantitative tightening (QT) is to reach the minimal level of market liquidity required to implement monetary policy efficiently and effectively, also known as an ample reserves regime. We briefly discuss changes in the monetary policy framework from the previous corridor system to today's floor system as well as the circumstances that brought them about. Finally, this article complements the literature by proposing that liquidity changes in the composition of bank deposits since the COVID-19 pandemic, paired with modifications in savings account regulation, play an important role in increasing the demand for bank reserves, thus raising the threshold for what may be considered ample. A simple econometric analysis confirms our conjecture. Therefore, the composition of bank deposits should be considered when performing QT policy.

JEL codes: E42, E52, E58

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1. INTRODUCTION

In response to the Great Financial Crisis (GFC), the Federal Reserve used its balance sheet capacity to purchase government bonds and other longer-dated assets, a process known as quantitative easing (QE) that was meant to increase the money supply and revitalize the American economy. As a result of QE policy, the size of the Fed's balance sheet has expanded in accordance with the increased amount of bank reserves supplied to the banking sector. The rise in reserves has changed the framework in which monetary policy—or, more specifically, interest rate policy—is implemented. The previous framework, known as the corridor system, relied on a limited amount of reserves to effectively operate and as such is no longer suitable for monetary policy given the new state of the Fed's balance sheet. Consequently, the Fed has developed a new monetary policy framework, commonly referred to as the floor system, which relies on a new policy tool that involves paying interest on bank reserves. By paying this interest, the Fed can impose a rate floor on the federal funds market. In simple terms, interest rate policy is presently carried out through the determination of the interest rate on bank reserves (IORB).

For the floor system to continue to function smoothly and for the IORB rate to remain an effective policy tool, the Fed must maintain a sizable balance sheet. As such, the entire premise of the floor system relies on the

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reserve level being no less than that outlined by an ample reserves regime—a direct opposition to the corridor system. While there is no official definition of an ample reserves regime, ample reserves could be considered the minimal level of market liquidity required to implement monetary policy efficiently and effectively under this new system. Currently, however, the level of bank reserves on the market is considered abundant (i.e., higher than the minimum level). An ongoing goal of the Fed is to drain excess reserves such that the amount falls from "abundant" to "ample." To do so, it uses a process known as quantitative tightening (QT). For QT policy to reach ample reserves, estimating the appropriate size of the Fed's balance sheet is critical.

This article adds to the current literature by discussing an additional, so far overlooked, factor that may influence the level of reserves regarded as ample. This factor has arisen in the aftermath of the COVID-19 pandemic and suggests that the demand for bank reserves could deviate from its historical average. We argue that increased liquidity of private banks' liabilities due to changes in both portfolio composition and savings account regulation, which state that banks must no longer impose a six-per-month limit on transactions, will increase reserve demand. In other words, holding more bank reserves would be advantageous for private depository institutions as reserves provide liquidity on the asset side of their balance sheet, offsetting the increased liquidity of their liability. A simple econometric analysis suggests that this factor could play an important role in pushing ample reserves to higher levels and thus should be considered when performing QT policy.

The rest of this article is organized as follows. Section 2 briefly reviews the implementation framework of interest rate policy both before and after the GFC. In Section 3, we document the evolution of the Fed's balance sheet in response to several historical events as well as how those events have impacted the Fed's desire for ample reserves. In Section 4, we outline compositional changes in bank deposits and empirically test our theory of their impact on reserve demand. Finally, Section 5 contains concluding remarks.

2. THE IMPLEMENTATION FRAMEWORK OF INTEREST RATE POLICY

The Federal Reserve follows a dual mandate, which states its objective to support price stability and maximum sustainable employment within the economy, and the Federal Open Market Committee (FOMC) makes decisions regarding monetary policy (whether to ease or tighten it) with these goals in mind. The FOMC can signal its stance on monetary policy by shifting the target range for the federal funds rate (FFR), which is the equilibrium interest rate in the federal funds market. The federal funds market allows financial institutions, primarily banks, to borrow or lend funds—usually in the form of bank reserves—overnight; therefore, the FFR is the rate at which banks charge each other for overnight loans. Bank reserves are funds that are deposited by banks into reserve balance accounts held by the Federal Reserve. When a financial institution (the borrower) needs extra funds to meet its short-term liquidity needs or minimum reserve requirements, it will borrow from another institution (the lender) with excess reserves.

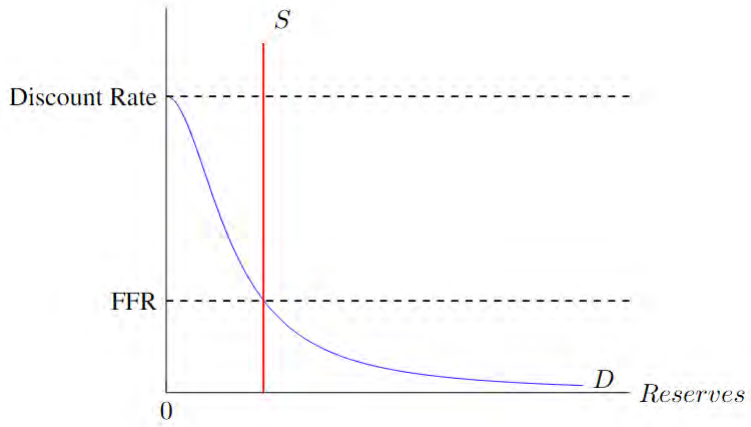
There are several tools through which monetary policy can be implemented, and it is the responsibility of the Federal Reserve Bank of New York's Open Market Trading Desk to determine which tools to use to carry out the monetary policy goals set by the FOMC. By using a number of policy tools, the Desk can influence the interest rate on the federal funds market to ensure it remains within in the specified target range. However, the framework through which the Desk implements monetary policy and influences the FFR has significantly changed since the GFC (see Ihrig and Wolla, 2020). In the following subsections, we will briefly discuss the different frameworks under each system in more detail, using the GFC as one of the catalysts for the change in monetary policy implementation.

2.1 The Corridor System

The aggregate quantity of reserves available on the market can be fine-tuned through open market operations, which refers to the purchasing or selling of securities, namely Treasury securities, by the Desk to adjust the level of bank reserves available on the federal funds market. The overall supply of reserves increases (decreases) if the Desk purchases (sells) Treasury securities. Figure 1 illustrates the Fed's implementation framework using a stylized model of supply and demand for reserves (see Poole, 1968). Since the supply of reserves on the federal funds market is tightly controlled by the Fed and is fixed within its balance sheet, the supply curve is perfectly inelastic, as depicted by the vertical red line.

Before the GFC, the banking system operated under a limited reserves regime, which meant the FFR was sensitive to small changes in bank reserves. The sensitivity of the FFR to changes in supply directly corresponds to the portion of the demand curve where supply intersects (see Figure 1). In the corridor system, the demand for reserves falls on the steep, downward-sloping portion of the demand curve. At this time, the Federal Reserve was imposing a reserve requirement on banks. Specifically, the reserve requirement is the minimum amount a bank must hold at any given time, determined by the level of bank deposits. Its purpose is to ensure

Figure 1
The Corridor System



that depository institutions hold enough liquidity to meet any unexpected and possibly large withdrawals.[1] Additionally, during this time, the IORB was zero, so banks had little incentive to hold any excess reserves. Therefore, the quantity of reserves held by banks closely resembled the reserve requirement before the GFC.

Furthermore, since bank reserves provide a liquidity service, banks are willing to borrow reserves at a high interest rate when the supply is relatively scarce, showing that demand for reserves is fairly sensitive to marginal changes in the supply. Under this framework, the Desk's main tool for implementing monetary policy and controlling the FFR is increasing or decreasing the quantity of reserves through open market operations (see Ihrig and Wolla, 2020). More specifically, if the FOMC's targeted rate range increased, the Desk would conduct open market operations to decrease the supply of reserves (i.e., shift the supply curve slightly to the left), typically by selling Treasury securities. Comparatively, the opposite would occur if the Fed lowered the targeted interest rate.

If the supply of reserves becomes so scarce as to reach the top of the demand curve, the FFR would eventually reach a ceiling, or upper bound, known as the discount rate. In Figure 1, note how the demand curve is converging to zero as the FFR approaches the discount rate, which is the interest rate charged by the Fed for lending to banks. In theory, banks would be unwilling to pay an interest rate higher than that they could get on a loan through the discount window, and demand for bank reserves would drop to zero. However, arguments questioning the discount rate's effectiveness as a ceiling exist and stem from the stigma of a "weakened financial condition" associated with borrowing from the Fed, which could lead banks to shy away from using the discount window (Ennis and Price, 2020; Ihrig and Wolla, 2020).

2.2 From the Corridor to the Floor System

At the onset of the financial crisis, the Fed began lowering its target for the FFR to 0 to 0.25 percent, also known as the zero lower bound. Lowering the target to the zero lower bound is rare, and the Fed has only done this twice, both times in response to great economic distress.[2] When the FFR is at the zero lower bound, the Fed must rely on unconventional monetary policy tools such as QE policy (Labonte, 2023). QE policy is the process of the Federal Reserve purchasing U.S. Treasury securities and mortgage-backed securities (MBS) to increase the amount of money circulating in the economy. During the GFC and in the years following, the FFR remained at the effective lower bound (from 2008 to late 2015), at which point the Fed implemented QE, significantly expanding the Fed's balance sheet and the amount of reserves on the market.

A high supply of bank reserves imposes a substantial challenge for implementing interest rate policy under the corridor system, as demand for reserves is no longer responsive to marginal changes in the supply. In other words, when the Fed enacts QE policy, the supply curve shifts significantly to the right, eventually intersecting with the flat portion of the demand curve. Figure 2 illustrates the shift in supply in response to QE, showing that the new equilibrium FFR (FFR′) is much less sensitive to open market operations. Therefore, the primary tools that the Fed previously used to implement monetary policy under the corridor system are no longer effective.

1. Today, the reserve requirement ratios for depository institutions have been 0 percent since March 26, 2020.
2. Most recently, the FOMC lowered the FFR target range to the zero lower bound in response to the COVID-19 pandemic.

Figure 2
The Corridor System in Response to QE

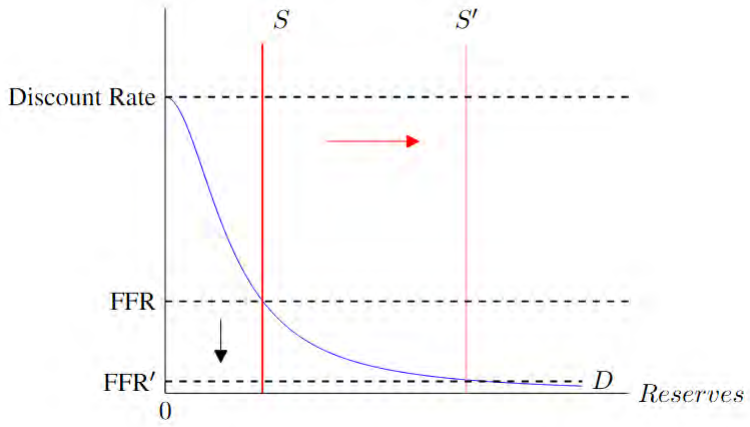
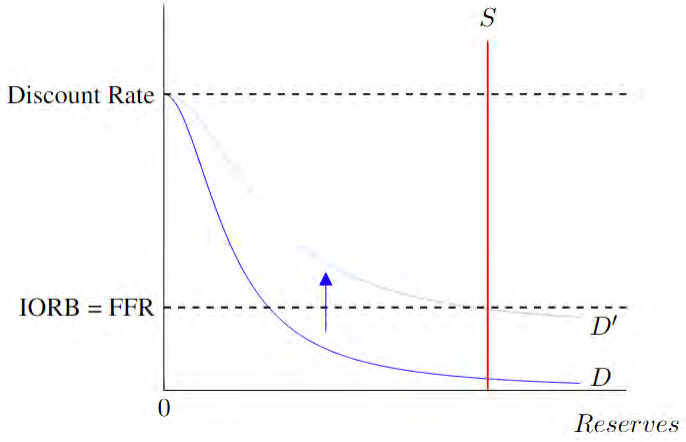


Figure 3
Changes in Demand Resulting from the IORB Rate



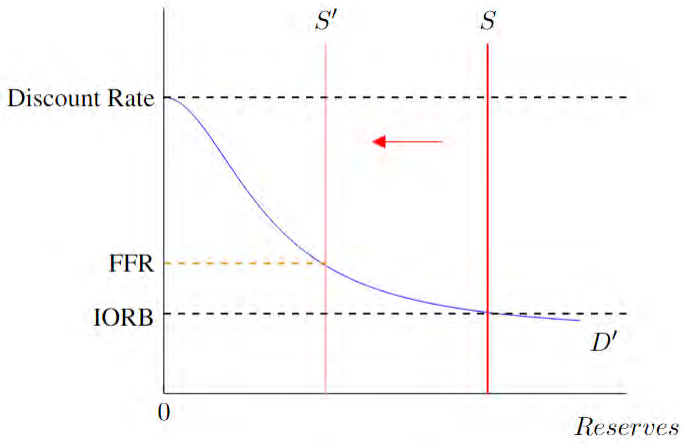
Consequently, the Fed needed to generate a new monetary policy framework.

This new framework relies on a new policy tool called the IORB rate. In 2006, the Financial Services Regulatory Relief Act of 2006 authorized the Federal Reserve Banks to pay interest on reserve balances.[3] As discussed in the previous section, banks had little incentive to hold excess reserves when the IORB rate was 0 percent. However, armed with a new policy tool, the Fed can now set an interest rate floor on the federal funds market. To conceptualize this new framework, assume that every possible lender in the federal funds market has a reserve account with the Fed and these reserve accounts pay the IORB rate. With these conditions in place, no lender is willing to accept a market interest rate below the IORB rate because they can instead select to deposit their excess reserves into the Fed, earning a higher yield. Therefore, the IORB rate effectively imposes a floor, or a minimum interest rate—a process by which the new implementation framework, the floor system, gets its name. In other words, by paying interest on bank reserves, the Fed is adding an additional advantage to holding reserves outside of the liquidity services it provides. In response to this extra benefit, the demand curve will also experience an upward shift equal to the magnitude of the IORB rate, as illustrated by Figure 3.

As briefly mentioned, the equilibrium interest rate in the federal funds market could be higher than the IORB rate because the IORB rate only imposes a lower bound on the market interest rate. When the supply of reserves is relatively scarce, meaning supply is limited relative to demand, the FFR will likely be above the IORB rate, as illustrated by Figure 4. For the Fed to control the FFR (i.e., to keep it sufficiently close to the floor), the

3. For more information, visit the Federal Reserve Board's Policy Tools webpage.

Figure 4
The Floor System in Response to Limited Reserves



federal funds market must be a borrowers' market such that there is little to no demand or desire for short-term borrowing. In other words, the liquidity premium is low, which requires a sufficient amount of bank reserves to be present within the federal funds market. To summarize, the Desk can implement interest rate policy by adjusting the IORB rate to ensure the FFR falls within the FOMC's established target range. However, for the floor system to function smoothly, meaning the IORB rate has the desired effect on the equilibrium interest rate, the Fed must be operating in an ample or abundant reserves regime. The floor system stands in stark contrast to the corridor system, which controls the FFR by keeping the supply of reserves limited.

2.3 The Reverse Repo

However, not all federal funds lenders have access to bank reserves. In fact, some lenders within the federal funds market, such as federal home loan banks, are prohibited from holding bank reserves. Thus, these lenders would be willing to accept a market interest rate below the IORB rate.[4] This phenomenon is known as leakage. Notably, leakage is more likely to happen when there is too much liquidity in the federal funds market (i.e., when supply far surpasses demand). When leakage is present, the FFR may fall below the floor established by the IORB rate. To patch this leakage and ensure the floor system operates smoothly, the Desk uses another tool known as reverse repo, or simply RRP.[5] The RRP is a financial repurchase agreement between the Desk and qualified institutions—such as money market funds, government-sponsored enterprises, primary dealers, and banks—in which the Desk sells securities to these institutions with the intention of buying them back for a specified price at a future date. Simply put, the RRP allows eligible institutions to deposit their excess funds into the Federal Reserve. It is essentially a collateralized version of "bank reserves." This new policy tool ensures that all possible federal funds lenders can deposit their excess liquidity into the Fed. However, the RRP rate offered by the Desk is most often lower than the IORB rate. Therefore, the RRP provides a so-called subfloor for the FFR.

With the addition of a new policy tool, our analytical framework—while still workable—requires a few adjustments, as shown in Figure 5. The supply curve now represents the sum of bank reserves and RRPs instead of bank reserves alone. There are now two floors in the federal funds market: the IORB rate for banks with access to the reserve accounts and the RRP rate for financial intuitions using the ON RRP facility. Overall demand lies somewhere between the IORB rate and the RRP rate.

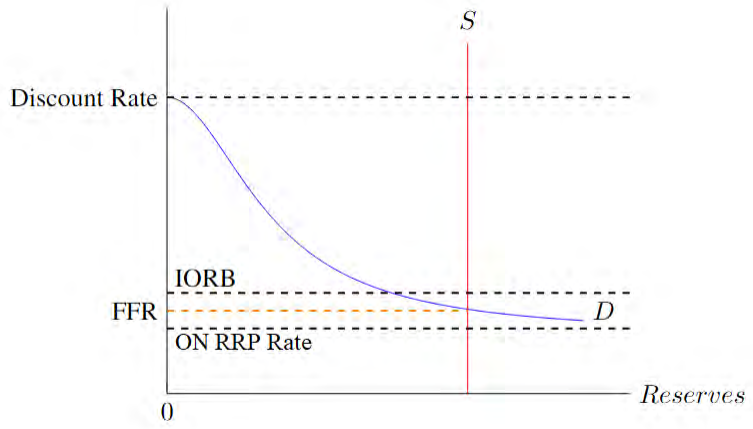
3. THE EVOLUTION OF THE FED'S BALANCE SHEET UNDER THE FLOOR SYSTEM

3.1 Composition of the Fed's Balance Sheet

In response to various historical events, the Federal Reserve has implemented several rounds of QE and QT—both of which have dramatically changed the size of the Fed's balance sheet since the GFC. This section documents the evolution of the Fed's balance sheet and its interaction with the new framework, focusing mostly on periods following the first implementation of QT policy. Table 1 presents a snapshot of the major items in the Fed's

4. See Afonso et al. (2023).
5. For more details, see "FAQs: Reverse Repurchase Agreement Operations."

Figure 5
The Floor System



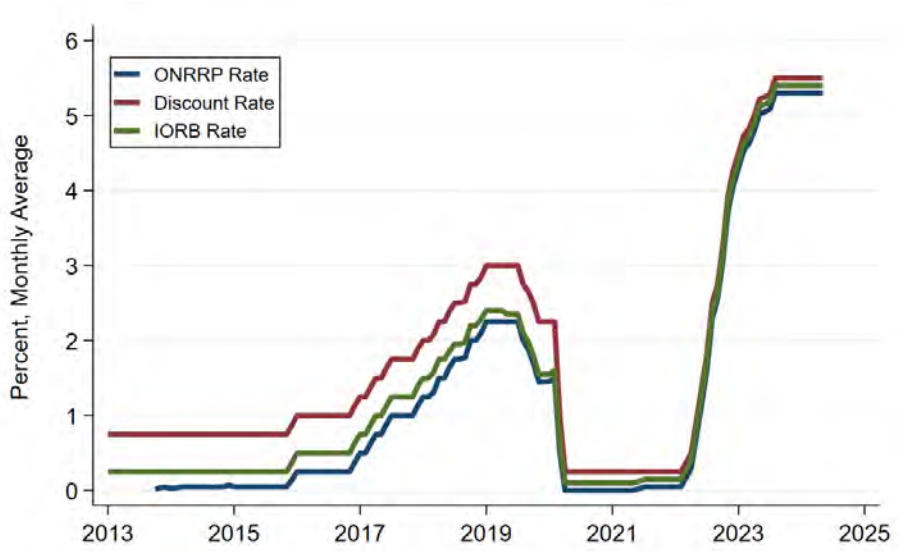
balance sheet as a percentage of GDP in October 2017 and September 2019. These two time periods mark the start and end of the first round of QT (QTI), respectively. The table also includes the periods June 2022 and May 2024, which represent the start of the second round of QT (QTII or current QT) and the newest data available.

The asset side of the balance sheet mainly consists of debt securities, which include Treasury securities and MBS. Meanwhile, the liability side is composed of currency, the Treasury General Account (TGA, a deposit made by the U.S. Treasury department), RRPs, and bank reserves. The data show that the amount of currency circulated in the economy as a percentage of GDP has remained roughly constant over time. Furthermore, the TGA is not directly related to the monetary policy. As such, we narrow our focus on the remaining liabilities, which account for the majority of the liquidity provided to the financial market by the Federal Reserve: bank reserves and RRPs.

Table 1
Major Financial Assets on the Federal Reserve's Balance Sheet

	Previous QT		Current QT	
Unit: % of GDP	Oct. 2017	Sept. 2019	June 2022	May 2024
Assets				
Treasury Securities	12.41%	9.73%	22.60%	15.68%
Mortgage-Backed Securities (MBS)	8.93%	6.83%	10.71%	8.26%
Others	0.94%	1.03%	1.60%	1.42%
Sum	**22.28%**	**17.59%**	**34.91%**	**25.36%**
Liabilities				
Reserves	**11.29%**	**6.74%**	**12.34%**	**11.91%**
Reverse Repo (RRP)	**1.69%**	**1.35%**	**9.70%**	**2.84%**
Treasury General Account (TGA)	0.99%	0.86%	2.97%	2.46%
Currency	7.97%	8.17%	8.93%	8.22%
Others	0.77%	0.52%	1.29%	0.24%
Sum	**22.72%**	**17.64%**	**35.24%**	**25.66%**

Figure 6
Key Policy Interest Rates



3.2 The Evolution of the Fed's Balance Sheet

In the wake of the GFC, the Fed implemented three subsequent rounds of QE in 2008, 2010, and 2012. Over time, the Fed's balance sheet expanded, from less than $1 trillion in 2008 to approximately $4.5 trillion in 2014. As previously explained, as the quantity of reserves in the market continues to rise, eventually becoming abundant, the monetary policy framework in which the Fed operates switches from the corridor system to the floor system. At the end of 2015, the Fed began a rate hike cycle, consecutively raising its target range for the FFR. At this point in time, the floor system was functioning effectively, with the FFR closely following the IORB rate. Figure 6 plots the evolution of key interest rates: the ON RRP rate, discount rate, and IORB rate.

In October 2017, the Fed launched its first round of QT policy to begin draining excess liquidity from the market. An addendum issued by the FOMC indicated that this round of QT intended to decrease the supply of bank reserves by reducing the size of its balance sheet. Additionally, the desired balance sheet level would reflect the demand for reserves, still allowing for monetary policy to be implemented efficiently and effectively.[6] As shown by Table 1, the quantity of bank reserves was successfully reduced during QTI. The data show that reserves, as a percentage of GDP, declined from 11.29 percent in October 2017 to less than 7 percent in September 2019.

Nevertheless, in September 2019, an unexpected rate spike event occurred in the repo market, which quickly affected the federal funds market, ultimately causing the FFR to deviate outside of the desired target range (for details, see Afonso et al., 2021). This event is indicative of the potential challenges of QT and highlights what can occur when reserves are drained too excessively from the market. When operating under a floor system, a too-low level of reserves can trigger a liquidity shortage and hamper the effectiveness of monetary policy. This phenomenon is depicted in Figure 4, which shows that the floor system requires both the IORB rate and a sufficient amount of reserves.[7]

Due to the rate spike event, QTI was quickly ceased and another round of QE was conducted to replenish market liquidity. The expansion the balance sheet continued through the COVID-19 pandemic in order to support the American economy and only stopped when the Fed decided to implement QTII in June 2022.

3.3 The Current QT and Ample Reserves

Compared with QTI, this current round of QT has been implemented at a much faster pace. At the end of February 2024, the combination of bank reserves and RRP was around 27 percent of GDP, which is down by more than 8 percent from the start of QTII. Another important difference between QTI and QTII is the

6. See the Federal Reserve Board's April 2020 press release.

7. Lagos and Navarro (2023) offer an explanation of this rate spike event despite a sufficient amount of excess reserves. This alternative explanation is based on banks' internal reserve management practices. That is, the banks would like to keep a sufficient liquidity buffer so that their reserve balances do not go below zero during the intraday trading period.

RRP position in the Fed's balance sheet. In June 2022, RRP was 9.7 percent of GDP, whereas during QTI, it floated between 1 and 2 percent of GDP. Given that QTII started with a much larger RRP position this time, the Fed's balance sheet could be reduced through bank reserves, RRP, or both. Table 1 shows that the majority of the reduction performed by this current round of QT comes from RRP. In fact, bank reserves have not yet been drained. So far, as a percentage of GDP, bank reserves have decreased only slightly from 12.34 percent at the start of QTII in June 2022 to 11.91 percent as of May 2024. In a statement made in May 2022, the Fed announced its move toward an ample reserves regime.[8] While there is no official definition of an ample reserves regime, ample reserves could be considered the minimal level of market liquidity required to implement monetary policy efficiently and effectively under the floor system. Ideally, under this regime, the equilibrium interest rate in the federal funds market would be such that the liquidity premium is exactly zero.[9]

Although theoretically reaching ample reserves sounds simple, practically the concept is much less straightforward. Reaching ample reserves would require accurate and up-to-date estimates of the demand curve within the federal funds market. However, estimating the demand curve is not a trivial matter given that reserve demand depends on several factors, not the mention that these factors tend to change over time and are subject to shocks. To add an additional layer of difficulty to the task of reaching ample reserves, without knowing exactly where the demand curve is, we may never know if we have reached the desired level of reserves.

In ex-post, there are two possibilities. First, suppose that the supply of liquidity is reduced to a point at which the FFR starts to drift above the IORB rate. In this case, we only know that the provision of liquidity is below the one consistent with ample reserves and the floor system is no longer operating smoothly. QT has been overdone, and the situation may be similar to the rate spike event that occurred in September 2019. An alternative possibility is that the FFR always remains close to the IORB rate. This simply indicates that the provision of market liquidity is sufficient but does not allow us to differentiate between abundant or ample reserves.

Several recent studies have attempted to shed light on this matter. By investigating the rate spike event that occurred in September 2019, Copeland, Duffie, and Yang (2021) conclude that the level of ample reserves should be significantly higher than 7 percent—the level at the time when the September 2019 rate spike event occurred. Wright (2022) argues that the ample reserves regime should consist of at least 10 percent of GDP in bank reserves and 5 percent of GDP in RRP. A more recent and comprehensive work by Lopez-Salido and Vissing-Jorgensen (2023) estimates the demand curve within the federal funds market to determine the appropriate size of the Fed's balance sheet consistent with ample reserves. The authors suggest that bank reserves and RRP could be reduced to 13.5 percent of GDP without rate spikes. Notably, the sum of current reserves and RRP (as in May 2024) is close to the above suggestions, around 14.7 percent of GDP.

4. BALANCE SHEET OF THE DEPOSITORY INSTITUTION

In their estimate of the demand curve, Lopez-Salido and Vissing-Jorgensen (2023) assume that the demand for liquidity depends on the level of total bank deposits. In the sections that follow, we show that total bank deposits have become more liquid since the COVID-19 pandemic. As a result, the liquid deposits, more so than total bank deposits, could alter the level of ample reserves.

4.1 Bank Deposits

Most bank deposits are short term, in the form of checking and savings deposits, and depositors can withdraw money from their bank accounts at almost any time with little to no restriction. In other words, these bank liabilities are highly liquid. However, most bank assets are long term, such as loans or debt securities, which typically receive smaller payments over a longer time period. For example, a bank may offer a household a mortgage that spans over a period of 30 years. As a result, there is a so-called maturity mismatch in banks' balance sheets between their long-maturity assets and short-maturity liabilities.

If most depositors were to withdrawal their money at the same time, the bank would be unable to handle such large, unexpected demand. To counteract any potentially sudden liquidity needs, banks need to hold some liquid asset in their balance sheet. Bank reserves play a critical role and are the most liquid asset in depository institutions' balance sheets, providing banks with the ability to satisfy any foreseeable liquidity needs. With this in mind, it is clear that demand for reserves will fluctuate with the level of bank deposits. This concept is commonly discussed and considered in the literature.

However, it is possible that the demand for bank reserves may also depend on the composition of these deposits. Deposits can consist of checking, savings, and time deposits, which each offer a different level of liquidity. In general, checking deposits are the most liquid, followed by savings deposits, and then time deposits.

8. See "FOMC Communications Related to Policy Normalization."
9. Ihrig, Senyuz, and Weinbach (2020) discuss the ample reserves regime in detail.

The composition of bank deposits changed significantly during the pandemic and post-pandemic periods. As reported by Table 2, throughout QTI, which occurred pre-pandemic, the total amount of deposits was roughly 71 percent of GDP, of which 11.8 percent consisted of checking deposits and 59.3 percent of time and savings deposits. At the onset of the pandemic, sometime in the second quarter of 2020, the total amount of deposits jumped to 82.3 percent of GDP. Deposits continued to climb, peaking at 86.9 percent of GDP in the first quarter of 2021. By the time QTII began in June 2022, total deposits had fallen only slightly and were still elevated to more than 82 percent of GDP. As QTII continues to progress, deposits have begun to gradually decline back to pre-pandemic levels, having reached 72.1 percent of GDP by the end of 2023. Nonetheless, the change in the composition may still have liquidity effects that could impact reserve demand.

Comparing the fourth quarter of 2023 to the last quarter of 2019, the checking-deposits-to-GDP ratio has doubled (from 11.6 to 23.6 percent). While total deposits remain of a similar size, the increase in checking deposits implies a significant reduction in time and/or savings deposits. Separable data from the Federal Deposit Insurance Corporation (FDIC), shown in the final row of Table 2, indicate that there is no significant change in time deposits (from 9.6 to 10.2 percent). Thus, the reduction can be primarily attributed to a decrease in savings deposits. Another feature accompanying the COVID-19 pandemic that may also have increased liquidity effects is the change in the regulation of savings deposit, in which the Fed no longer requires banks to impose a six-per-month transfer limit on savings accounts.[10] In short, the combination of increased checking deposits paired with newly relaxed restrictions regarding savings accounts means that banks' liabilities have become more liquid in the post-pandemic era, suggesting that banks may require more reserves. Moreover, the timing of these changes means they are more relevant to QTII than to the previous round of QT policy, altering reserve demand now more than before.

Table 2
The Evolution of Bank Deposits

	Previous QT		Current QT	
Unit: % of GDP	Q3 2017	Q3 2019	Q2 2022	Q4 2023
Checkable Deposits	11.79%	**11.62%**	27.11%	**23.57%**
Time & Savings Deposits	59.26%	**58.56%**	55.21%	**48.54%**
Total Deposits	71.05%	**70.18%**	82.33%	**72.11%**
Time Deposits (FDIC Data)	8.53%	**9.63%**	5.18%	**10.19%**

4.2 Estimation of the Reserve Demand since the Pandemic

We use a reduced-form model (following Lopez-Salido and Vissing-Jorgensen, 2023) to estimate the demand of bank reserves since the start of COVID-19 pandemic. Our estimate uses monthly data from 2020:06 to 2024:04. Let *BR*, *TD*, *DD*, and *LD* stand for bank reserves, total deposits, demand deposits, and liquid deposits (other than demand deposits), respectively. Our estimated equation is read as

$$r_{FFR} - r_{IORB} = a + b * ln(BR + RRP) + c * ln(TD) + d * ln(LD) + c * ln(DD) + u, \quad (1)$$

where u is the unobserved reserve demand shock. As highlighted by Lagos and Navarro (2023), a reduced-form estimate such as this one could perform poorly for out-of-sample reserve levels even if the model fits well within the sample. Specifically, the model could perform quite differently in the ample reserves regime than in a limited reserves regime. However, our sample period is limited to the ample reserves regime, potentially mitigating this concern. In a previous study, Lopez-Salido and Vissing-Jorgensen (2023) perform a two-stage least squares IV estimation where bank reserves are instrumented by bank reserves plus RRP. In performing a similar analysis, we find this approach to be ill-suited for our chosen sample period given that ln(BR+RRP) no longer appears to be a strong instrument for ln(BR).[11] We therefore run the reduced-form estimate shown in equation (1) instead. Nevertheless, our analysis extends on Lopez-Salido and Vissing-Jorgensen (2023)'s model by including two additional exogenous variables, demand deposits and liquid deposits (other than demand deposits), which reflect the composition of bank deposits. The data for total deposits, demand deposits, and

10. See the Federal Reserve Board's April 2020 press release.
11. We find that R^2 is only 0.23.

other liquid deposits can be obtained from the H.6 Table – Money Stock Measures provided by the Federal Reserve Board.

Table 3 presents the results of our reduced-form estimation. The first column reports the results of a simple regression of the FFR-IORB spread directly on the exogenous variables, ln(Reserves + RRP), and ln(Total Deposits). The results indicate that the FFR-IORB spread is estimated to be significantly related to the ln(Total Deposits) but concernedly with the wrong sign, suggesting that a higher level of deposits could lower the spread by making the reserves demand higher. These results are confusing and contradict the prediction within the theory.

The results displayed in the second column are more reasonable, with demand deposits and liquid deposits included in the reduced-form model. As previously discussed, the liquidity of deposits has changed significantly since the start of the COVID-19 pandemic. Not only have demand deposits grown, but savings deposits have also become more liquid. Our results indicate that this liquidity change could play an important role in estimating reserve demand. Specifically, a 10 percent increase in liquid deposits and demand deposits raises the FFR and the IORB rate by approximately 1.4 and 0.7 basis points, respectively. Furthermore, the impact of more liquid deposits is significant both statistically and economically. A 10 percent decline in reserves plus RRP decreases the FFR-IORB by 0.6 basis points, the lowest impact found. We take this as strong evidence that the liquidity of deposits has played a significant role in influencing demand for reserves since the COVID-19 pandemic.

Table 3
Reserve Demand Estimation, Reduced Form

	Dependent Variable: FFR-IORB	Dependent Variable: FFR-IORB
ln(Reserves+RRP)	-0.0439*	-0.0627***
	(t=-2.57)	(t=-9.05)
ln(Total Deposits)	-0.3036**	-0.5917***
	(-3.47)	(-6.65)
ln(Other Liquid Deposits)		0.1381***
		(9.94)
ln(Demand Deposits)		0.0703***
		(5.08)
Constant	3.275***	4.355***
	(4.55)	(6.14)
N (months)	47	47
R^2	0.843	0.922

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5. CONCLUDING REMARKS

This article briefly introduces and discusses the different frameworks through which the Federal Reserve has implemented monetary policy as well as the processes that brought about the shift. With the economic downturn triggered by the GFC, the Fed relied on its balance sheet capacity to stimulate the U.S. economy, implementing several rounds of QE. The Fed's balance sheet continued to expand as more and more bank reserves were dispensed into the federal funds market, causing previously used policy tools, such as open market operations, to become less effective. The current implementation framework, the floor system, takes advantage of the Fed's sizable balance sheet and the excess reserves. Now, by offering to pay interest on bank reserves, the Fed can impose an interest rate floor on the federal funds market. Hence, with sufficient liquidity in the market, the floor system should operate smoothly—i.e., keep the IORB rate sufficiently close to its floor and, consequently, within the targeted range.

Once again, the ongoing goal of QTII is to reach an ample reserves regime—i.e., the minimal level of market liquidity required to implement monetary policy efficiently and effectively under this new system. While several academic works have attempted to estimate market demand and provide suggestions regarding the ideal size of the balance sheet, differentiating between abundant and ample is challenging in practice. As Federal Reserve Chair Jerome Powell noted in his March 20, 2024, press conference, reaching a state of

ample reserves involves more than aiming for a specific dollar amount or percentage of GDP. The process of reaching ample reserves will depend on a variety of constantly evolving factors. One example is demand for bank reserves, which can be volatile. This article is well-timed in that it proposes an additional factor worth considering when implementing QT policy. We argue that changes in private depository intuitions' deposit composition, combined with new savings account regulations, suggest that banks' liabilities are much more liquid than before and could affect the relative level of demand for bank reserves. Additionally, our regression analysis indicates that the increase in liquid deposits relative to the overall level of deposits during the COVID-19 pandemic may raise the demand for bank reserves. With the possibility of bank reserves being in higher demand, this current round of QT should be executed with extra caution to prevent another rate spike event such as the one experienced in September 2019.

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