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Detecting and Approaching the Long-Run Level of Reserves¹

1. Introduction

As reserves decline, the Committee will need to assess whether the banking system is approaching a level of reserves consistent with its objectives. In addition to making this assessment, the Committee will need to choose the best way to approach the long-run level of reserves, including what to communicate about the transition strategy and whether to slow or smooth the pace of reserve reduction to ease the transition process.

There is some uncertainty about how money markets will evolve during the transition to lower reserve levels. To date, the effective federal funds rate has risen gradually relative to the interest on excess reserves (IOER) rate, from 9 basis points below IOER on average in October 2017 to a level equal to IOER more recently. As SOMA portfolio redemptions proceed, the transition could continue smoothly, with money market rates slowly increasing above IOER, until permanent market pressures are observed, signaling that the system has moved below the lowest level of reserves possible in an abundant reserves regime in the long-run.

However, as reserves decline and more banks operate closer to their minimum desired reserve holdings, money market rates could be temporarily elevated and exhibit some volatility. Such episodes could be observed if depository institutions and Federal Home Loan Banks (FHLBs) were unable to redistribute reserves effectively, or if banks faced temporary shocks that are not easily absorbed. Alternatively, it is possible that persistent signs of scarcity could be observed even as the supply of reserves remains relatively high, without clear indications that these signs were likely to subside.

Given these dynamics, key questions for policymakers are: 1) how to assess whether pressures are transitory or permanent; and 2) how to promote a smooth transition to lower reserve levels.

2. Money markets during the transition to long-run reserve balances

For the last decade, reserves have been abundant, and there has been little need to redistribute reserves among banks. In this environment, a portion of overnight unsecured activity has represented deposit-taking activity by banks to earn the spread to IOER. More recently, amid sharp increases in Treasury security issuance and ongoing declines in reserve levels, money market rates have risen gradually relative to IOER, and most money market rates

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are now near or above IOER. As a result, simple arbitrage activity into IOER has waned and money market dynamics started to shift. Increasingly, banks that borrow overnight do so to improve liquidity metrics, fund higher-yielding assets, or respond to outflows.

As the aggregate supply of reserves continues to decline, an increasing number of banks will reach levels of reserves closer to their desired minimums. Outflows, such as those arising from payment shocks or deposit flows, will leave these banks looking for short-term funding more often than they currently do. The reduction in the supply of reserves resulting from SOMA portfolio redemptions could be an added source of outflows for some banks, as their customers purchase Treasury securities that replace maturing securities that had been held in the SOMA portfolio.

Banks and other money market participants will face the challenge of adapting to a lower level of reserves. Banks have not had to manage their reserve levels closely for nearly a decade, and many now face new internal drivers of reserve demand, such as risk management and internal controls. Some banks may adjust their internal guidelines and business models to reduce their demand for reserves. Banks may need to establish new counterparty relationships with nonbank lenders in money markets, or with other banks, to be able to borrow additional funds if they are short of their desired level of reserves. Banks may also compete for deposits, obtain advances from FHLBs, or sell holdings of Treasuries or other securities. As these changes occur, money market participants will need to adapt to an environment where redistributing reserves between depository institutions is more important than it is today.

Going forward, money market rates will reflect, to a greater extent, the impact of this need to redistribute reserves. This adjustment may take place smoothly, with rates rising gradually and remaining connected across markets. However, there is some risk of volatile trading. At some point, elevated rates will reflect a steepening of the demand curve, rather than transitional volatility. In what follows, we describe three possible scenarios.

A Smooth Transition: Several factors support an expectation that banks will be able to adapt their practices in line with the pace of reserve reductions and that markets will redistribute reserves in a relatively smooth fashion. Market participants understand the pace of reserve reductions and that reserves are likely to settle at a significantly lower level. Although there may be frictions to increased interbank trading, FHLBs have broad reach across the banking system and can provide a flexible source of immediate funding through advances and federal funds, thus smoothing the volatility from reserve reductions and deposit flows. In this scenario, overnight unsecured rates may gradually rise relative to IOER as reserves decline. Treasury repurchase rates may display more volatility, reflecting higher Treasury issuance, although banks will likely be willing to reduce reserves by lending in markets for repurchase agreements, maintaining the general relationship between these markets.

Transitory Volatility in Rates: There is some risk of increased volatility as more banks experience payment shocks and deposit outflows. FHLBs' capacity to accommodate these shocks may be insufficient, particularly if they occur late in the day when availability of FHLB

advances is limited. Late-day needs may grow more common if banks delay payments as reserve balances decline. Traditional bank lenders may also require higher spreads to lend in interbank markets than they did pre-crisis because of stronger regulatory disincentives to hold overnight unsecured exposures. In addition, frictions in short-term money markets may hinder and delay the redistribution of reserves. As a result, on days when shocks are particularly large, rates could be volatile. As cash lenders shift to meet banks' needs, rate pressures may spill over into other money markets, such as repo, and may increase interest rates relative to IOER, on average. Over time, we would expect market participants to find ways to redistribute reserves more efficiently among banks, potentially reducing volatility and interest rate pressures for any given level of reserves.

Encountering a Steeper Demand Curve: Whether the transition is smooth or volatile, higher rates at some point will reflect a steepening in the demand curve for reserves. Staff will monitor a number of indicators of potential reserve scarcity. An overview of some of these indicators is provided in the next section. Outreach to banks and other money market participants will be an important source of information to evaluate whether interest rate pressures are transitory or permanent and this market outreach will provide context to interpret data. Signs of scarcity across a broad set of indicators, and persistence in these signs, are likely to be indicative of permanent scarcity.

3. Monitoring reserve levels and money markets

The staff monitors a broad set of data on reserves, payments, and money markets. In addition, staff's approach to monitoring reserve levels and money market conditions includes systematic outreach to bank management to understand desired reserve levels and reserve management strategies, as well as routine engagement with market participants to understand high-frequency and thematic developments in money markets.

Short-term funding market pressures

Unsecured Rates and Volumes: In an environment where reserves are becoming scarce relative to the banking system's demand, decreases in reserve balances will lead more banks to seek reserves, putting upward pressure on the effective federal funds rate (EFFR) and other money market rates. As a result, a positive relationship between daily changes in the stock of reserves and daily changes in the spread between IOER and overnight interest rates may emerge (Figure 1). Monitoring this relationship may be particularly useful for providing early indications of permanent scarcity on days when changes in non-reserve liabilities result in significant shifts in reserve supply. Moreover, persistence in this indicator in particular could help distinguish between temporary and more permanent aggregate scarcity.

As reserves continue to decline, there will likely be upward pressure on short-term rates, as well as a shift in the composition of borrowing and lending activity. An increase in the share of trades in overnight unsecured markets at rates above IOER provides another indicator of reserve demand pressures (Figure 2). Additionally, as reserves decline, new participants may

borrow in the federal funds market as they need to fulfill their funding needs and establish borrowing relationships. A significant broadening in the number of participants in the federal funds market could also signal higher demand for reserves (Figure 3). It may be difficult to distinguish whether reserves pressures are temporary or permanent using these indicators, as the borrowing may reflect a slow adjustment by banks or new interbank market dynamics.

Secured Rates and Volumes: As competition for reserves increases, short-term unsecured funding market dynamics may spill over to secured funding markets. In particular, as reserves decline, banks may be less willing to lend cash into secured funding markets, despite relatively attractive repo rates. Therefore, bank repo lending volumes could decline even as repo spreads to IOER increase (Figure 4). Elevated Treasury and repo rates are other indicators that may be particularly helpful at detecting whether large banks are nearing their lowest comfortable levels for reserves: both reserves and Treasuries satisfy regulatory requirements for liquidity, so a wider spread between IOER and the rate on repo lending – which entails an exchange of reserves for Treasuries – may indicate growing scarcity of reserves, rather than regulatory pressures. Similarly, a consistent positive spread between Treasury bill rates and overnight indexed swap rates could be consistent with banks being unwilling to use reserves to buy bills and earn the relatively higher rate of return, again signaling reserve scarcity.

Reserves buffers and payments pressures

Senior Financial Officer Survey: Surveys and market outreach can help staff better understand banks' demand for reserves and banks' internal views about the extent to which their current reserve levels represent an excess buffer. In August, the Senior Financial Officer Survey (SFOS) asked respondents to identify the approximate lowest level of reserve balances that their institutions would feel comfortable holding before taking actions to maintain or increase reserves, given the current configuration of interest rates. The difference between banks' reserve levels and their stated lowest comfortable levels from the SFOS can provide an indicator of reserve scarcity (Figure 7). As reserves decline, this difference will narrow and will reveal which institutions are closest to their minimum levels. Banks' desired minimum reserve levels may also change over time. Collecting updated data on banks' lowest comfortable reserve levels, through surveys or bank outreach, and monitoring the difference between a bank's actual and lowest comfortable level of reserves, as well as changes in its reported lowest comfortable level of reserves – especially among the banks where most reserve holdings are concentrated – could serve as a leading indicator of reserve scarcity. Staff expects to repeat the SFOS every six months going forward, with the next survey to be conducted in the first quarter of 2019.

Reserve Requirements: Bank outreach and the SFOS will be helpful at revealing reserve conditions among large banks, for whom internal liquidity guidelines are now a meaningful driver of reserve demand. However, reserve requirements still represent an important determinant of minimum reserve levels for the majority of U.S. banks, only a small number of which were surveyed. As aggregate reserves decline, we expect the number of banks with relatively small buffers over their reserve requirements to increase. Monitoring these buffers

could signal which banks, or types of banks, are facing an increasing need to borrow reserves (Figure 5).

Payment Timing and Daylight Overdrafts: Small reserve buffers may make banks seek to match incoming flows to outgoing payments, although the Payment System Risk policy does provide for access to free collateralized daylight overdrafts. Banks may shift the timing of their outgoing payments toward the end of the day, when the timing of incoming payments becomes more certain. Increases in the volume of payments processed later in the day thus could signal reserve scarcity (Figure 6). To the extent that incoming and outgoing payment flows do not match, smaller reserve buffers may also increase banks' use of daylight overdrafts from the Federal Reserve, both in terms of the number of banks using daylight overdrafts and the extent of overdraft activity.²

Discount Window or Repo Operation Usage: Small reserve buffers among some banks could also prompt a shift in the use of Federal Reserve lending facilities. Lower excess reserve buffers may increase banks' use of primary credit, in terms of either dollars borrowed or the number of banks borrowing. Additionally, should the Federal Reserve choose to establish additional ceiling tools – as described in the accompanying memo “Interest Rate Control During the Transition to a Long-Run Operating Regime” – the size, breadth and persistence of usage could provide important information about the banking system's demand for reserves. Persistently high borrowing might be an indication that the aggregate level of reserves is reaching a point of scarcity.

Detecting scarcity

While there is no single, *leading* indicator that would alert the Committee that aggregate reserves are becoming scarce, persistent pressures across a range of indicators will likely portend conditions characterized by aggregate reserve scarcity, at least on a temporary basis. As our understanding of money market dynamics continues to evolve, we expect to learn more about the efficacy of these indicators, as well as other potential indicators. Furthermore, market outreach will continue to help determine whether developments reflect temporary or idiosyncratic dynamics, or more persistent pressures resulting from aggregate reserve scarcity. For example, recent outreach about trading activity in the federal funds market at rates above IOER revealed that these trades were generally driven by banks willing to pay a premium to meet regulatory requirements with LCR-favorable sources of short-term funding, which was not evident from the data. Thus, the combination of indicators and market outreach will be important to identifying whether conditions consistent with aggregate reserve scarcity have emerged.

4. Promoting a smooth transition

The Committee has options at its disposal to promote a smooth transition, which it can use either in advance of detecting reserve scarcity or once reserve scarcity is detected. Before

² In 2008, the PSR policy was revised, allowing banks to incur free collateralized overdrafts and raising the fee for uncollateralized overdrafts to 50 basis points.

scarcity is detected, the Committee could provide more information about its plans and its expectations for market dynamics during the transition, which would give market participants a better idea of the scope of adjustments they will need to make to adapt to the long-run level of reserves. The Committee could also indicate what tools it might want to use to help control rates, which may influence negotiating dynamics in markets. Once some signs of reserve scarcity are detected, options could include slowing the pace of asset redemptions, as well as using open market operations or ceiling tools to enhance rate control – as detailed in the accompanying memo “Interest Rate Control During the Transition to a Long-Run Operating Regime.”

Communications

Information about the Committee’s expectations for the transition and the long-run operating regime would help banks and other money market participants evaluate how much and how quickly they might need to adapt to the change in reserves supply. Providing information could promote early adjustments by money market participants and increase the likelihood of a smooth transition. Relevant information would include guidance on the approximate level of the supply of reserves in the long run, on how the Committee expects money markets to behave during the transition period, and on how the Committee might react to signs of reserves scarcity and the extent to which the Committee is willing to tolerate interest rate volatility or upward pressures on money market interest rates during the transition.

Communication of these expectations could occur in a variety of ways. There are many venues to provide detail, such as FOMC meeting minutes, formal statements, and speeches and testimony of system policymakers.

Slowing or smoothing the pace of decline in reserve supply

To reduce the likelihood that money market rates become volatile, the Committee could choose to slow the pace of reserve declines or use open market operations (OMOs) to smooth the volatility of reserve levels.

Slowing the Pace of Reserve Decline: As described above, money market participants are likely to need some time to adjust to a lower level of reserves. During this time, market rates could be volatile if the supply of reserves falls faster than market participants can adjust. If the Committee wishes to reduce the likelihood of this outcome, it could slow the pace of reductions in reserve supply.

The simplest method for changing the pace of reductions in reserve supply would be to change the pace of asset redemptions from the SOMA portfolio. Maintaining the current pace of redemptions has some benefits. Under this policy, the balance sheet would reach its minimum size more quickly, allowing the FOMC to say that it has normalized the size of the balance sheet. Second, a period of elevated market interest rates relative to IOER could be an incentive for money market participants to make changes to their internal guidelines and to their business models.

However, slowing the pace of redemptions may be helpful at reducing market volatility and making it easier to distinguish between temporarily elevated and volatile rates and more permanent rate pressures, which would occur once the steep part of the demand curve for reserves has been reached.

Should the Committee desire to slow the pace of reserve decline, it could choose to adjust the pace of redemptions of SOMA Treasury securities, MBS securities, or both. One option would be to reduce the pace of redemptions for Treasury securities, for example by reducing the cap on Treasury redemptions, possibly all the way to zero, while leaving the MBS cap in place and thus continuing to reduce MBS holdings. This approach would allow the Committee to combine a slowdown in the pace of redemptions with continued progress in moving toward a primarily Treasury composition of the SOMA portfolio.

Another option would be to allow redemptions to cease altogether at some level higher than the expected minimum level of reserves in an abundant excess reserves regime. Even without redemptions, reserve levels would continue to decline along with growth in non-reserve liabilities. This approach would allow banks ample time to adjust to new reserve levels, which could ease the adjustment in money markets and help detect the point of steepening in the demand curve with more certainty.

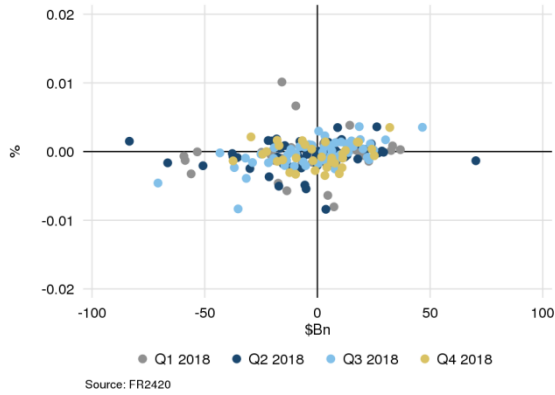
Smoothing the Path of Redemptions: Whether or not the pace of redemptions is maintained, the Committee may wish to smooth the decline in reserve levels by using OMOs to offset large daily changes in reserves during periods in which portfolio redemptions or changes in autonomous factors are particularly sizeable. OMOs could increase the supply of reserve balances in the banking system, thereby lowering the rate banks are willing to pay for reserves. The frequency and size of these operations would depend on the banking system's demand for reserves, and these operations could be particularly helpful at muting market volatility as reserves approach the lowest level consistent with an abundant excess reserves regime.

Appendix Table: Explanations of selected indicators of reserve scarcity

Indicator Description	Indicator Explanation
<i>Short-term funding market pressures</i>	
Figure 1. Correlation between daily changes in aggregate reserve balances and daily changes in IOER minus the fed funds rate	In an environment where reserves are scarce relative to the banking system’s demand, increased competition for reserves would put upward pressure on fed funds rate, leading to a positive relationship between changes in reserve balances and changes in the spread between IOER and the fed funds rate.
Figure 2. OBFR activity at rates at or above IOER	As banks increasingly borrow for reasons other than IOER arbitrage, or new banks enter the market, they will be willing to pay higher rates, placing upward pressure on unsecured overnight rates.
Figure 3. Number of borrowers in the federal funds market	As competition for reserves increases, new borrowers may enter the fed funds market and existing participants may change the frequency at which they borrow.
Figure 4. Bank lending in overnight Treasury bilateral repo and repo spreads	As reserves decline, banks may be less willing to lend reserves in secured funding markets, despite relatively attractive repo spreads; therefore, repo lending by banks could decline and a negative relationship between bank repo lending volumes and repo spreads could emerge.
<i>Reserves buffers and payments pressures</i>	
Figure 5. Share of banks with relatively small reserve buffers	As aggregate reserves decline, fewer banks will hold large buffers of excess reserves. Tracking which bank types hold small reserve buffers could identify for which types reserves are becoming scarce.
Figure 6. Share of payments settled late in the day	As reserve buffers decline, banks may delay their payments towards the end of the day to economize on the use of daylight overdrafts.
Figure 7. Difference between individual banks’ reserve levels and their self-reported minimum reserve levels	As reserves decline, the difference between individual banks’ reserve levels and their self-reported minimum reserve levels will likely narrow. Monitoring individual banks would allow us to identify the institutions or types of institutions that will reach their minimum levels first.

Sample of Reserve Scarcity Indicators

Figure 1: Correlation between changes in aggregate reserve balances and changes in the IOER-EFFR spread



Note: Correlations between changes in aggregate reserve balances and changes in the IOER-EFFR spread: 0.12 (2018 Q2), 0.63 (2018 Q3), and 0.10 (2018 Q4)

Figure 2: OBFR activity at rates at or above IOER

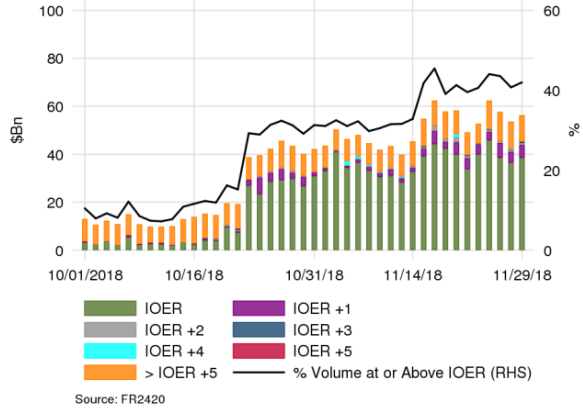


Figure 3: Number of borrowers in federal funds

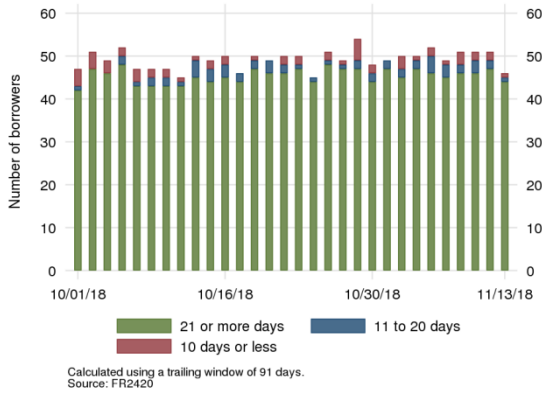


Figure 4: Bank lending in overnight Treasury bilateral repo and repo spreads

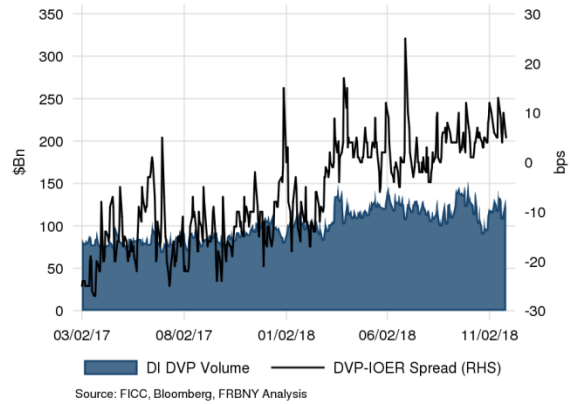


Figure 5: Share of banks with low reserve buffers

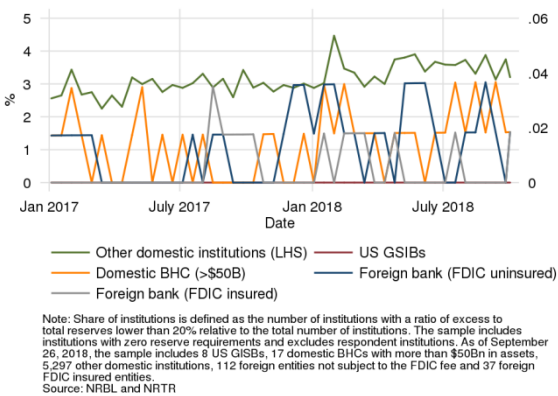


Figure 6: Payments settled late in the day

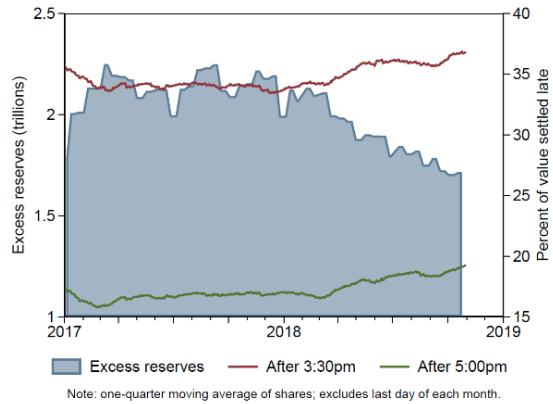


Figure 7: Difference between banks' reserve levels and their self-reported minimum reserve levels

