

March 8, 2019

Transitioning to an Ample Reserves Regime with Lower Reserves¹

Executive summary

In January, the Committee announced its decision to maintain a regime of ample reserves, in which administered rates provide the primary means of interest rate control and active management of reserve levels is not required. FOMC participants also discussed the possibility of ending asset redemptions in the second half of 2019 and, after that, allowing the average level of reserves to decline slowly for some time in line with growth in nonreserve liabilities.

A regime of ample reserves will require maintaining a minimum operating level of reserves that policymakers are confident is sufficient to meet banks' demand for reserves in an environment with market interest rates near the interest rate on excess reserves (IOER). In this regime, the average level of reserves would be higher than the operating minimum, as reserves would fluctuate above the operating minimum in response to day-to-day variation in nonreserve liabilities. As the end of redemptions nears, the Federal Reserve may wish to announce a level of reserves that will be initially established as the minimum operating level. Telegraphing this plan well in advance would help promote smooth adjustment to the chosen level of reserves.

Staff judge that, given current estimates of reserve demand and the uncertainty surrounding those estimates, a minimum operating level of reserves of \$1.05 trillion would provide reasonably high confidence in maintaining the ample reserves regime. This initial minimum operating level would likely result in an average level of reserves of around \$1.2 trillion. In order to prevent reserves from falling below the minimum operating level, asset purchases to offset trend growth in nonreserve liabilities would likely need to resume in the first quarter of 2020 if redemptions are tapered and in the fourth quarter of 2019 if redemptions are not tapered. (Please see the memo "Options for Ending Balance Sheet Runoff," dated March 7, 2019, for a description of tapering options under consideration.) This minimum operating level places a relatively high weight on avoiding the risk of unexpected interest rate volatility. If policymakers had a different tolerance for the risk of rate volatility or placed a high value on reaching lower levels of reserves, they might choose a different minimum operating level.

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Importantly, the minimum operating level of reserves will need to be regularly evaluated and can be adjusted periodically, based on changes in banks' demand for reserves, growing knowledge about that demand, and changes in risk tolerance. As uncertainty around estimates of reserve demand diminishes and as banks adapt to lower reserve levels, it is possible that the minimum operating level of reserves can be reduced.

The first section of this memo describes how a regime of ample reserves would be maintained and communicated. The second section considers strategies for transitioning into the steady-state regime and for potentially seeking to move toward a lower minimum operating level over time. The appendices provide detail on the estimates of reserve demand that inform the setting of the minimum operating level and on the process for forecasting nonreserve liabilities and planning for open market operations, which affect how reserves would fluctuate above the minimum operating level.

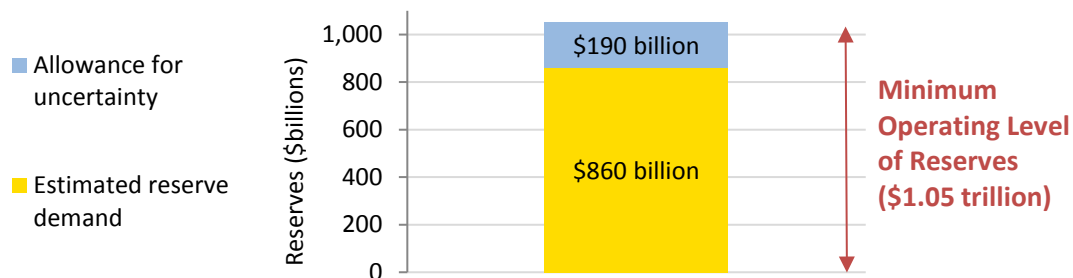
1. Maintaining the ample reserves regime

A regime of ample reserves operates on the flat part of the reserve demand curve, such that day-to-day variations in reserve supply and demand do not lead to volatility in the federal funds rate or other market interest rates. To maintain such a regime, the Federal Reserve will need to establish a minimum operating level of reserves below which the actual supply of reserves will not be allowed to fall on any day, and then operate so as to keep reserves above that level.

Determining a minimum operating level of reserves

The minimum operating level would comprise two building blocks, illustrated in Figure 1.

Figure 1: Building blocks of the minimum operating level of reserves.



- **Estimated Reserve Demand:** The first building block is an estimate of the lowest quantity of reserves that banks would demand in an environment with market interest rates near IOER. The supply of reserves must be maintained above banks' minimum demand to avoid upward pressure on rates. The staff's

current point estimate of banks' minimum demand is \$860 billion. Appendix 1 discusses the wide range of information that can contribute to estimates of reserve demand.

- **Allowance for Uncertainty:** It is prudent to maintain reserves above the point estimate of demand, because there is uncertainty around the estimate and thus the actual level of demand may be above the estimated level. In addition, the aggregate quantity of reserves needed to meet banks' demand might exceed the sum of individual banks' minimum demands if frictions in interbank markets prevent reserves from being efficiently distributed across banks; however, the potential size of these frictions is highly uncertain. The second building block is an allowance for these uncertainties. The size of the allowance may depend on policymakers' risk tolerance and on the estimated slope of the demand curve. Higher levels of risk aversion would lead to a larger allowance for uncertainty. Likewise, because the effect on interest rates of supplying too few reserves depends on the slope of the demand curve, a larger allowance for uncertainty is needed if the demand curve is thought to be steep. As detailed in Appendix 1, the staff's proposed initial minimum operating level incorporates an allowance for uncertainty of \$190 billion, based on a 95 percent confidence interval around the point estimate for demand, as well as other considerations such as frictions in interbank markets.

Because the building blocks are likely to change, the selection of a minimum operating level is not a one-time decision but, rather, a periodic choice that the Federal Reserve will need to make. Banks' demand for reserves could change in response to changes in market dynamics or structure or the size of the economy. Staff will continue to learn about demand, meaning that the estimate of demand will evolve over time. The accumulation of additional information may also improve the precision of demand estimates, potentially permitting a smaller allowance for uncertainty. For example, if reserve markets remain stable and efficient during a period of time when the initial operating minimum is in effect, it could be possible to modestly reduce the operating minimum with little risk. Section 2 describes in more detail how adjustments of the operating minimum could be part of the transition to lower reserve levels, should market and reserve demand information support lowering the minimum operating level of reserves.

Operations to maintain reserves above the minimum operating level

Once a minimum operating reserve level is established, the Desk would create an operational program to ensure that reserves do not fall below that level on any given day.

Consistent with the Committee's stated preference for avoiding active management of reserves, the Desk expects to supply reserves primarily with periodic,

scheduled permanent open market operations. These operations would keep the average level of reserves high enough to absorb daily swings in nonreserve liabilities without allowing reserve supply to fall below the minimum operating level and without requiring temporary market operations on a regular basis to actively adjust reserve levels.² Reserves would then fluctuate in a range above the minimum operating level, as illustrated in Figure 2. Reserves would be well above the minimum operating level on average, but would fall close to the minimum operating level on days with large increases in nonreserve liabilities. Open market operations would add reserves to maintain overall reserve levels, but, in contrast to the pre-crisis framework, daily interventions would not be used to actively manage to a particular reserve target.

To implement this approach, the Desk would create medium-term forecasts of reserve levels and develop a plan for asset purchases sufficient to maintain reserve levels above the minimum operating level. In the absence of open market operations, reserves decline at a slow average pace in line with trend growth in nonreserve liabilities, primarily Federal Reserve notes in circulation. However, there are intermittent sharp declines in reserve levels, typically on dates with high tax inflows to the Treasury General Account (TGA). In addition, strong seasonality in Federal Reserve notes in circulation results in a faster decline in reserve levels in the latter half of the year. Forecasting over medium-term horizons would allow the Desk to plan well in advance and adjust planned asset purchases to prepare for seasonal movements or high daily variation in reserve supply.³

Given the inherent uncertainty in forecasts over medium-term horizons, the Desk also expects to design operations so that reserve levels will be maintained above the minimum operating level even if there are forecast errors. The Desk would revise forecasts of reserve levels at a high frequency and adjust the open market operation schedule based on the updated outlook. Treasury purchase amounts could be announced to the public on a monthly or semimonthly schedule, allowing for frequent updates based on changes in the outlook for reserve levels. Nonetheless, there would be some potential for forecast misses over shorter time horizons. Designing operations to allow for these

² This level of reserves acts like a “buffer” for anticipated declines in reserves associated with projected autonomous factor changes. Higher expected variability in autonomous factors would result in a higher average level of reserves to absorb these changes. Appendix 2 provides additional details on how the dynamics of nonreserve liabilities will influence the average level of reserves.

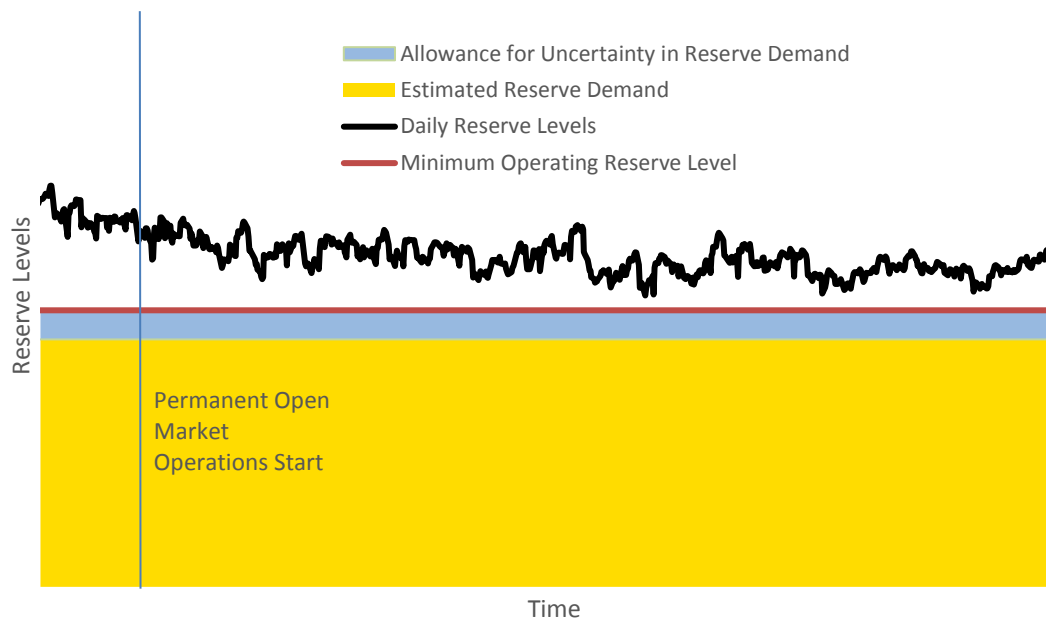
³ The Desk could also forecast reserves and operate over shorter horizons, or operate with lower levels of reserves. If so, operations would be more variable, and sometimes sizeable, as the Desk responded to seasonal and daily variation in reserve levels. Such an approach would represent more active management of reserves. There are also practical limits to the size of operations that could be executed on any given day without undue influence on market pricing.

misses would help reduce the possibility that reserves would breach the publicly communicated minimum.⁴

Although the Desk would plan to use mainly permanent asset purchases to maintain the supply of reserves, temporary repurchase operations could still be used if unexpected changes in nonreserve liabilities brought reserve levels near the minimum operating level or if other developments posed a risk that the federal funds rate would rise above the target range.⁵

The current forecast suggests that, once asset growth resumes, the portfolio would increase by an average of \$11 billion per month, and reserve levels would average \$150 billion to \$175 billion above the minimum operating level. Appendix 2 provides more detail on forecasting and operational planning.

Figure 2: Management of the ample reserves regime



2. Transition strategies

Depending on the plan the Committee chooses for ending balance sheet runoff, as well as policymakers' preferred allowance for uncertainty above estimated reserve

⁴ The Desk would not attempt to actively limit increases in reserves due to transitory decreases in nonreserve liabilities, as these movements would be expected to reverse over time and would not affect interest rate control in a regime operating on the flat part of the reserves demand curve.

⁵ Desk outreach to current primary dealers suggests only modest appetite for triparty repurchase operations that intermittently add reserves, due to dealers' limited balance sheet capacity. The Desk could likely execute in larger size with greater price concessions or explore changes in infrastructure that might increase dealers' willingness to participate

demand, the level of reserves when redemptions end could be above the average level of reserves that the Committee views as appropriate. If so, the average level of reserves could be allowed to decline for some time in line with trend growth in nonreserve liabilities. But even during such a period, establishing and communicating a minimum operating level of reserves would help to maintain the ample reserves regime by ensuring that neither the trend nor daily variability brings reserves below the quantity judged to be necessary for the regime. This section describes why establishing a minimum operating level is useful even during the transition to lower reserve levels, discusses how periodic adjustments of the minimum operating level could be implemented and might support a continued shift to lower reserve levels, and concludes by discussing how the initial minimum operating level might be communicated and what it implies for the timing of open market operations.

The benefits of establishing a minimum operating level while average reserves are falling

Choosing a minimum operating level of reserves in advance of the transition to the new regime reduces the risk of rate volatility that could arise with large swings in reserve levels. As noted above, the daily level of reserves drops significantly below the average on days when there are large increases in other liabilities. Such days are infrequent, but the drop in reserves can be significant – on the order of \$50 billion below the lowest level of reserves previously experienced. Moreover, such an abrupt drop in reserves might lead to an abrupt increase in market interest rates. Selecting an operating minimum well before reserve levels get close to the range of demand estimates allows the Desk to better control this risk.

As discussed above, the choice of an initial minimum operating level will reflect current views on the uncertainties surrounding reserve demand estimates and the tradeoffs between the risk of rate volatility and the potential benefits of a lower level of reserves. Based on the significant uncertainty in current estimates of reserve demand, the proposed initial operating minimum incorporates a large allowance for uncertainty in reserve demand. This choice may limit the potential for rate volatility by providing a margin for the possibility that demand has been underestimated. It would also allow staff and markets to gain experience with the procedures needed for the regime, such as the forecasts of nonreserve liabilities and the resulting permanent open market operations, at a level of reserves where there is relatively little risk of experiencing rate pressures.

Although the proposed initial operating minimum provides reasonably high confidence that the level of reserves will be sufficient to maintain the ample reserves regime, there remains some residual risk that signs of scarcity could appear at higher

levels of reserves.⁶ Staff are monitoring conditions closely for such signs. If unexpected pressures appear in reserve markets, open market operations would be required to rebuild the supply of reserves, and the initial operating minimum would need to be reexamined.

The initial selection of a minimum operating level does not imply that the process of learning about reserve demand has ended or that reserve supply could never go lower. Staff expect to continue to learn about reserve demand through a variety of methods over time. An important component of this learning will be actual experience with market dynamics at the initially chosen operating minimum. By observing how banks manage their liquidity and redistribute reserves at lower aggregate reserve levels than those in place today, staff will be able to more precisely judge the quantity of reserves needed to meet demand.

Continued learning in this manner could change both the estimate of reserve demand and the allowance for uncertainty that contribute to the minimum operating level. Over time, if the Federal Reserve gains certainty about reserve demand, the Desk and policymakers may feel comfortable moving the minimum operating level closer to the point estimate of the lowest quantity of reserves demanded by banks when market rates are near IOER. Even if uncertainty itself does not diminish, the allowance for uncertainty could be reduced if the tolerance for some risk of potential rate volatility grows once there is more experience with the regime. All else equal, reducing the allowance for uncertainty would bring the operating minimum lower over time, thus continuing the process of moving toward lower reserve levels. Staff believe it would be appropriate to review the operating minimum every six to 12 months to evaluate whether available information supports bringing the level lower. The minimum operating level may also eventually rise, for example if banks' reserve demand grows with the size of the economy.

Communications

The Federal Reserve can communicate to the public about the transition into the new operating regime by announcing a minimum operating level of reserves that it will maintain at least for some period of time. This clear and concise communication would provide key information about the operating regime to market participants and the general public, without requiring them to understand how daily changes in Federal Reserve liabilities impact the management of reserves. More detailed information and analysis about how autonomous factors affect reserve forecasts and realized reserve levels can be provided periodically and in the SOMA annual report to maintain

⁶ In particular, reserve levels are likely to dip to temporary lows on a few key dates over the next year, and the approach to these temporary lows could be quite rapid, especially following the resolution of the debt ceiling – likely in late September or October – when the Treasury would likely rebuild the balance in the TGA fairly rapidly.

transparency. The weekly H.4.1 release also provides more frequent and timely updates on reserve balance outcomes.

In consultation with the Committee, the Desk could publish the minimum operating level of reserves in a Desk statement. Over time, the Desk could revise the level published in the statement if, after consulting with the Committee, the minimum operating reserve level were changed.

The initial statement could also include general information on the operational framework for maintaining reserves above this level. As noted above, the Desk would expect to communicate a monthly or semimonthly purchase schedule as a means to provide greater certainty to market participants about the expected size, type, and timing of open market operations.

Operational implications

Announcing the minimum operating reserve level framework well before asset redemptions end would provide advance notice to participants both in the market for reserves and in the market for Treasury securities where the Desk will conduct operations. It would also allow for a smoother operational transition, as high variability in reserve levels makes it important to begin forecasting and planning for security purchases well in advance of the average reserve level falling to the minimum operating level of reserves. The Desk could announce a minimum operating reserve level with less advance notice, but a more rapid increase in securities purchases might be required.

Table 1 shows projections for the approximate timeframe in which purchases would need to occur to maintain a minimum operating reserve level of \$1.05 trillion. If asset redemptions are not tapered before ending in September 2019, asset purchases would likely resume two months after redemptions end. A longer pause between ending redemptions and resuming asset purchases would be possible if redemptions are tapered or a lower minimum operating level is selected, although the latter would entail a greater risk of experiencing interest rate pressures.

Table 1: Potential timing of resumption of asset purchases

Minimum operating level of reserves	Timing for Start of Purchases	<u>No taper</u>	Timing for Start of Purchases	<u>Taper</u>
		Projected Avg. Reserve Levels Around the Start of Purchases		Projected Avg. Reserve Levels Around the Start of Purchases
\$1.05 trillion	Fourth quarter 2019	\$1.2 trillion	First quarter 2020	\$1.2 trillion

Appendix 1: Estimates of reserve demand and implications for the minimum operating level

Staff use a variety of methods to assess reserve demand. This appendix reports the staff's current estimate of the lowest level of reserves consistent with meeting banks' demand at market interest rates near IOER, then discusses uncertainty around that estimate and how the estimate and the uncertainty can be used to inform the decision on the minimum operating level of reserves.

An ample reserves regime can be operated with a wide range of reserve levels, although, at a minimum, reserves should be supplied in adequate quantities to remain on the flat portion of the demand curve so that IOER is the primary influence on the policy rate. We have not observed meaningful signs of reserve scarcity to date,⁷ but that observation indicates mainly that reserves remain ample at current levels and does not make clear how much further reserves could fall without creating rate pressures. To learn more about how banks might behave at lower levels of reserves, staff conduct the Senior Financial Officer Survey (SFOS), which asks respondent banks to report the lowest level of reserves they would be comfortable holding in the current rate environment before taking active steps to maintain or increase their reserve balances. In addition to using the survey responses to estimate reserve demand, staff test the validity of the results to the extent possible by comparing them with available data on banks' actual behavior and insights from market outreach.

The second round of the SFOS was conducted in February, updating the results from the initial September 2018 survey. The most recent survey panel contained 80 banks, of which 75 responded. The respondent banks together hold 77% of reserves in the banking system and 66% of assets.⁸ In the aggregate, the lowest comfortable level of reserves of the respondents was \$701 billion.

Staff extrapolate the survey results to the population of banks by assuming that non-surveyed banks have the same ratio of lowest comfortable level to assets as the total of surveyed banks in a similar category. This extrapolation implies a point estimate of the aggregate lowest comfortable level of reserves of \$860 billion.

There is substantial uncertainty around this point estimate, as it is subject to both sampling error and non-sampling error. We briefly summarize estimates of the size of these sources of error here; details will be provided on request.⁹

⁷ See, for example, "Report on Reserve Conditions, January 2019," January 25, 2019.

⁸ The banking system is defined for this analysis as the domestic offices of U.S. banks, branches and agencies of foreign banking organizations, and Edge and agreement corporations that have reserve accounts with the Federal Reserve.

⁹ Other analyses have produced a wide range of estimates of the level of reserves consistent with maintaining market interest rates near IOER. Using a vector autoregression, Smith (2019) estimates that reserve balances around \$1.5 trillion, with a 90% confidence interval of \$1.36 trillion to \$1.69 trillion, would be needed to maintain a near-zero spread between the fed funds rate and IOER (*Macro Bulletin*,

Sampling error results from the possibility that the surveyed banks differ from those not in the survey and that we would have obtained different results if we had surveyed a different or larger set of banks. However, the potential size of the error is limited by the fact that the survey sample contains a very large fraction of major reserve holders, including all eight domestic global systemically important banks (G-SIBs) and many other large domestic banks. Accounting for the structure of the sample, staff calculate that the standard error of the aggregate estimate of demand is around \$50 billion. This implies a 95 percent symmetric confidence interval of \$760 billion to \$960 billion, and a 99 percent symmetric confidence interval of \$730 billion to \$990 billion.¹⁰

Non-sampling error results from the possibility that a bank's survey response does not represent the actual level at which that bank would begin to take action to increase its reserves. Such an error could occur because the person answering the survey might misinterpret the question or might not have complete information about the bank's liquidity management decisions. In addition, the bank could change its plans over time in response to business, market, or regulatory developments. Staff found that the upper bound of the 95% confidence interval for the aggregate estimate would be about \$60 billion higher if we allow for the possibility that non-G-SIB domestic banks do not fully understand their reserve demand or the survey and that, as a result, their reserve demand might be better characterized by other banks' survey responses. This interval does not allow for any non-sampling error among G-SIBs and foreign banks, because the heterogeneity in business models among those types of banks makes it much less plausible that a bank's behavior would be more accurately described by another bank's survey response than by its own response. As such, this method may underestimate the total size of non-sampling error.

Staff also assessed the reliability of the survey results by comparing banks' answers in the September 2018 SFOS with their actual reserve holdings since that time. More than 90 percent of the total lowest comfortable level of reserves in the first SFOS was reported by banks that never or only rarely allowed their reserves to fall below their reported lowest comfortable level. However, because the aggregate level of reserves remains high, many banks are not yet experiencing shocks that would test their lowest comfortable levels of reserves. The majority of banks that were included in both SFOS rounds did not change their responses between rounds. Of the banks that did change their

Federal Reserve Bank of Kansas City, March 6). In a calibrated model, Afonso, Armenter, and Lester (2018) present a baseline scenario in which the reserves demand curve begins to slope upward at a reserve level of \$850 billion, but also find that the upward slope could begin at reserve levels as low as \$500 billion or as high as \$1.1 trillion in other scenarios, depending on the concentration of reserves across banks and other variables such as the configuration of market repo rates and administered rates (Staff Report No. 840, Federal Reserve Bank of New York).

¹⁰ The confidence interval is calculated with a *t* distribution in light of the relatively small sample size within each class of banks. Staff have also calculated an asymmetric confidence interval using a multiple imputation approach that accounts for randomness in the extrapolation of survey responses to non-surveyed banks; that interval is narrower.

responses, many attributed the change to elevated market rates or changes in their business models. Structured interviews with banks indicate that most large institutions responding to the survey have carefully considered the survey question and are reporting a level at which they would act to maintain or restore reserve balances.¹¹ Taken together, these analyses and interviews may provide some basis for confidence in the results, although it remains the case that the survey asks a hypothetical question and may not perfectly measure actual reserve demand. Additional information on these analyses is available on request.

Another consideration in establishing the minimum operating level of reserves is that, due to frictions in the interbank market, the total quantity needed to meet demand may be more than the sum of the amounts needed to meet individual banks' demand. On any given day, some banks could have more reserves than their minimum demands, yet be unwilling to lend those reserves to other banks at rates near IOER because of balance sheet costs, institutional frictions such as counterparty credit limits, or other issues. Qualitatively, frictions in overnight markets can be large, especially on a temporary basis. Quantitatively, however, staff find it difficult at this stage to judge the quantity of reserves that might be needed to guard against distributional frictions. Learning about this issue will continue; in the meantime, it could be accounted for through the sizing of the allowance for uncertainty in the estimate of demand.

Table 2 shows how the estimate of reserve demand and the estimates of uncertainty could be combined to build up a minimum operating level of reserves. The calculation in the table is based on the staff's estimated 95 percent confidence interval for reserve demand and accounts for only some sources of uncertainty. The point estimate of demand and allowances for sampling error and non-sampling error together total \$1,020 billion. Communicating a minimum operating reserves level in units of only \$10 billion could imply a greater degree of precision in estimates of reserve demand than is actually the case, so staff recommend rounding the minimum operating level to the next highest \$50 billion. Rounding up rather than rounding to the nearest \$50 billion is appropriate because the calculation does not incorporate all sources of uncertainty – for example, there is no explicit allowance for distributional frictions in reserve markets – and because supplying too few reserves poses a greater risk to rate control than supplying too many reserves. Importantly, policymakers who had a different degree of tolerance for the risk of rate volatility, who were concerned with other potential sources of uncertainty, or who

¹¹ A small number of banks appear to defend reserve levels higher than the lowest comfortable levels they report in the SFOS. Outreach to some of these institutions suggests that their trading desks manage to internal minimum reserve targets that are set at levels above those reported on the survey; the survey answers appear to reflect levels established by other governance processes. For example, over the 2018 year-end, when Treasury repurchase rates were elevated, some banks active in repo markets either did not lend in repo or lent only the amount of reserves available above their trading desk's internal minimum.

placed a high value on reaching lower levels of reserves might choose a different minimum operating level.¹²

Table 2: Quantitative construction of a minimum operating reserve level.

Estimate of reserve demand (aggregate lowest comfortable level)	\$860 billion
+ allowance for uncertainty I (upper half of 95% confidence interval for sampling error)	\$100 billion
+ allowance for uncertainty II (multiple imputation estimate of non-sampling error)	\$60 billion
+ allowance for uncertainty III (rounding)	\$30 billion
Total	\$1,050 billion

In the future, staff will continue to use surveys, bank micro data, and outreach to assess the level of reserve demand. Data on market prices, reserve balances, and the intraday timing of payments may also provide insight on reserve conditions, as shown in the “Report on Reserve Conditions” circulated to research directors before each FOMC meeting. Both the estimate of reserve demand and the allowance for uncertainty can continue to be revised, and the minimum operating level adjusted, in response to this ongoing learning.

Appendix 2: Open market operations and the buffer above the minimum operating level

This appendix describes the Desk’s process for forecasting reserves and planning operations, and provides current estimates of the range in which reserves might vary above the minimum operating level of reserves and the size of open market operations that might be conducted. In practice, staff will re-evaluate these estimates frequently and adjust plans as forecasts change. For example, the growth rates and variability of nonreserve liabilities will change over time, which will influence the size of open market operations and the average level of reserves. And, importantly, the Desk will learn over

¹² The slope of the steeper portion of the demand curve is also an important consideration in selecting a minimum operating level: the greater the slope, the greater the potential upward pressure on interest rates if the aggregate reserve level falls below banks’ minimum demand. Although banks have been asked about reserve demand with market rates above IOER both in the SFOS and in interviews, these questions are hypothetical and uncertainty about the slope remains. The proposed minimum operating level is designed to provide reasonably high confidence that reserve supply would be sufficient to remain entirely on the flat part of the demand curve, so that the potential steepness of the sloped part of the curve does not create a risk of rate volatility.

time about operating an ample reserves regime with lower reserve levels and will improve methods of forecasting and operational planning.

Forecasting reserves levels

The Desk uses time-series models to create daily forecasts of nonreserve liabilities and other balance sheet components.¹³ Models of this type have been in use since before the financial crisis, when they were employed to forecast the path of reserves and plan daily operations in the scarce reserves operating regime. The models take into account seasonal patterns and calendar effects, and can project reserves over shorter or longer time horizons.

Once balance sheet redemptions end, reserves are projected to decline at a slow average pace in line with trend growth in nonreserve liabilities, primarily driven by growth in Federal Reserve notes in circulation. However, there is also a high degree of daily variability in reserve levels, and large drops in reserve levels occasionally occur. These drops are most frequently associated with large inflows into the TGA on tax payment dates.¹⁴ In addition, strong growth in Federal Reserve notes in circulation in the second half of the year tends to result in a period of steeper declines in reserves in the last quarter of the year.

At medium-term forecast horizons, the Desk can account for these strong seasonal patterns and daily variation in reserve levels well in advance, in effect, by offsetting medium-term trend growth in nonreserve liabilities, and leaving sufficient reserves to absorb daily shocks to reserve balances. In practice, the Desk would plan to re-forecast frequently, so that adjustments in monthly or semimonthly purchase amounts could be made to offset changes in the outlook.

Estimates based on current forecasts of daily reserve levels, and assuming a 12-month forecast horizon projected monthly, suggest that the average level of reserves could be around \$150 billion to \$175 billion above the minimum operating level of reserves from 2020 to 2022, with occasional peaks up to around \$300 billion above the minimum operating level. In practice, the average and the range of reserve levels would depend on updated forecasts and operational planning and could vary significantly from these levels.

¹³Staff forecast each of the following components: Federal Reserve notes in circulation, the TGA, the overnight reverse repo facility, the foreign repo pool, other deposits, asset premiums and discounts, Federal Reserve assets, and capital.

¹⁴ At the resolution of debt ceiling events, the TGA also typically increases sharply, but this increase typically follows a period of reduction so that it does not necessarily result, on net, in a reduction in the reserve level.

Allowance for uncertainty in reserve forecasts

There is inherent uncertainty around forecasts of reserve levels, even at short time horizons. Because the minimum operating level of reserves will be communicated to the public, forecasting and operational planning will need to be designed to provide a high degree of confidence that this level will not be breached on any day. Updating the reserve forecasts and associated planned purchase amounts frequently will reduce the effects of errors in medium-term forecasts. However, some allowance should be made for uncertainty around the forecast based on unexpected changes over shorter time horizons. The Desk will therefore manage reserves to an internal minimum that is above the publicly announced minimum operating level of reserves, so that short-term forecast errors will not result in breaching the publicly communicated level. Staff will gain more experience with assessing the appropriate allowance of reserves to cushion against forecast errors in nonreserve liabilities as operational practices are more fully developed.

Due to the strong seasonal patterns in reserve levels and the potential for the reserve level to occasionally drop rapidly, it will be important to begin reserve forecasting and planning for security purchases well in advance of average reserve levels falling to the internal reserve minimum, as discussed in Section 2.

Open market operations

Over time, the Desk will gain more insight on the optimal mix of open market operations for efficient and effective implementation. In principle, these could consist of permanent Treasury purchases only, or permanent purchases could be supplemented with periodic repurchase agreements. In order to avoid active management of reserves, the Desk would expect to adjust reserves primarily with permanent open market operations.

Permanent purchases of Treasury securities would be conducted in the secondary market through a schedule of outright auctions. Before the financial crisis, such “coupon pass” or “bill pass” purchases were intermittent and not announced in advance. In recent years, it has become standard practice for the Desk to issue monthly or semimonthly calendars for securities purchases to enhance transparency about operations. Given the much larger size of currency in circulation, which is the primary driver of growth in nonreserve liabilities, the average level of monthly purchases is expected to be significantly higher than pre-crisis, and these amounts will be added to purchases already being conducted to reinvest MBS proceeds into Treasury securities. In light of these factors, the Desk will expect to plan for purchases at a monthly or longer interval, but communicate these levels over a shorter horizon in order to provide flexibility to update the amounts as the forecasts change. (The memo “Options for Ending Balance Sheet Runoff,” dated March 7, 2019, describes how asset purchases would be allocated across securities.)

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Assuming a 12-month forecast horizon projected monthly, purchases of Treasury securities to offset balance sheet growth and expected variability in nonreserve liabilities are currently predicted to range between around \$5 billion and \$15 billion a month, with an average level around \$11 billion.¹⁵ In practice, planned purchase amounts will vary by more than this amount as the current forecasts do not account for changes in the outlook that will occur.

Although the Desk would generally expect to keep monthly purchases in a fairly stable range, there may be instances, such as an unanticipated level shift in the TGA balance or acceleration in the growth of Federal Reserve notes in circulation, where less graduated changes in monthly purchases, or even temporary open market operations, may be necessary. The Desk will continue to develop new operational planning and execution practices over time to maintain reserves above the minimum operating level of reserves.

¹⁵ In addition, the Desk would be conducting purchases of securities to reinvest MBS proceeds. Please see the memo “Options for Ending Balance Sheet Runoff” dated March 7, 2019.