

September 30, 2016

## Considerations for the Design of Reserves Operating Regimes<sup>1</sup>

### 1. Introduction

As part of the long-run framework (LRF) project, this memo explores a range of issues related to different operating regimes that might be used to implement monetary policy, highlighting key reserve-related components of the regimes and their tradeoffs. Building on staff work presented to the Committee in both April 2008 and July 2016, we also discuss factors potentially affecting the supply of and demand for reserves that could be important to consider in regime design.<sup>2</sup> In particular, we focus on regimes that involve targeting either an unsecured interbank market rate or the interest on reserves (IOR) administered rate; we do not address regimes in which reserves are not an operating focus. We end by evaluating how the regimes considered perform against the LRF objectives.<sup>3</sup>

Our key takeaways are as follows:

- The distinguishing feature of a corridor (floor) reserve regime is that the central bank's supply of reserves intersects banks' aggregate demand for balances in the relatively steep (flat) portion of the demand curve (Figure 1).<sup>4,5</sup> In corridor (floor) frameworks, unsecured overnight rates trade above (at or below) the pecuniary return on holding reserve balances.

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<sup>2</sup> In particular, our work builds on the memo developed by the Interest on Reserves workgroup titled "[Interest on Reserves: A Preliminary Analysis of Basic Options](#)," April 2008, which was released to the public in May 2015, and on the foundational FOMC and supplemental memos prepared by the LRF workgroups on Foreign Experience, Lessons from the Crisis, and Money Markets and delivered to the FOMC in July 2016.

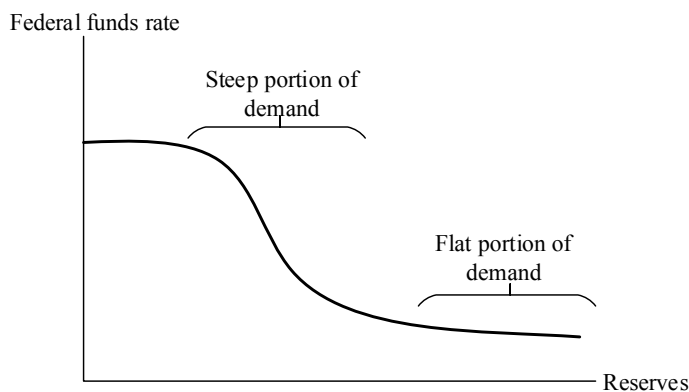
<sup>3</sup> The forthcoming "Interest Rate Targets and Operating Regimes" (IROR) main memo considers additional important factors related to IROR design, including governance issues, political economy considerations, and issues regarding central bank counterparties.

<sup>4</sup> As discussed in the LRF "Foreign Experience" foundational memo, operating regimes designed to establish an interest rate corridor are those in which the central bank maintains reserves at a level approximately equal to the demand for reserves at the desired target rate, with lending and deposit (or interest on reserves) rates provided to create a band around the target. Floors are operating regimes where excess reserves are supplied in sufficient abundance such that rates trade near a deposit or interest on reserves level.

<sup>5</sup> In this memo, we use the term "bank" to refer broadly to "depository institution" as defined in Regulation D, which includes a range of additional entities, such as thrifts and credit unions.

- The Federal Reserve has a variety of tools that should allow it to implement monetary policy effectively to achieve interest rate control at any point along the demand curve.
- The long-run demand for reserve balances is uncertain and dependent on a number of factors. However, as noted above, the Federal Reserve has the tools to operate on either the steep or flat portion of the demand curve at a wide range of levels of aggregate reserves.
- The regimes we considered perform differently against the LRF project objectives. In particular, there may be significant scope to reduce the costs associated with the administration of mandatory reserve requirements by eliminating these requirements in both corridor and floor frameworks. In particular, a regime with voluntary reserve targets may be an attractive alternative to mandatory requirements if policymakers would like to return to operating with a corridor framework, since voluntary targets would be a way to reduce the burdens associated with mandatory reserve requirements. Another finding is that floor regimes can accommodate shifts in reserve supply anywhere along the flat portion of the demand curve, making the regime particularly robust to the effective lower bound (ELB).

Figure 1. Demand for Reserve Balances



## 2. Determinants of demand for reserves

Banks demand reserves for a variety of reasons. Here we review some key factors and discuss their interest rate sensitivity. Understanding how these factors shape the demand curve is helpful for thinking about what it means for a central bank to operate on the steep or flat portion of the

aggregate demand curve, as will be discussed in the next section. The first reason banks may demand reserves is the need to meet mandatory reserve requirements. Second, banks may choose to hold reserves to meet clearing and internal liquidity needs in the event that mandatory reserve requirements are not sufficient to meet this need. Third, banks may hold excess reserves to boost their portfolio of high quality liquid assets (HQLA) that count towards the liquidity coverage ratio (LCR).<sup>6</sup>

As summarized in Table 1, factors affecting demand for reserves may vary in their interest rate sensitivity. In a regime that includes reserve requirements or voluntary targets, banks' demand to meet these requirements is relatively inelastic (row 1a and 1b, respectively).<sup>7</sup> Demand for clearing and internal liquidity needs can also be somewhat inelastic (row 2) depending on the extent to which banks see an immediate need to meet payments beyond what is available through borrowing relationships. In the pre-crisis regime, the Federal Reserve did not pay interest on reserves, and banks only demanded a small amount of excess reserves because of the positive opportunity cost.<sup>8</sup> Today, however, reserves are remunerated at rates which are close to market rates, and banks, especially the very largest institutions, are holding large liquidity buffers of which reserves are a significant component. This portion of demand for reserves (row 3) will be sensitive to the rates on alternative assets.

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<sup>6</sup> The LCR seeks to strengthen banks' liquidity positions by requiring them effectively to self-insure to a large extent against potential funding difficulties. In particular, the LCR requires banks to hold enough HQLA to cover a 30-day stress event. There are three categories of HQLA, based principally on asset class and liquidity characteristics. Level 1 assets include excess central bank reserves, U.S. Treasuries, Ginnie Mae debentures, and foreign sovereign debt securities with a 0 percent risk weighting. Level 2A assets include claims on U.S. government sponsored entities, agency MBS, and foreign sovereign debt securities with a 20 percent risk weighting. Level 2B assets include non-bank investment grade corporate debt securities and certain common equities. There are caps and haircuts for Level 2A and Level 2B assets.

<sup>7</sup> Reserve requirements are a key factor in determining the shape and position of the reserve demand curve. Banks face explicit penalties if they fail to hold sufficient reserve balances to meet their requirements. At the same time—when market rates are above the interest rate on reserves—banks face implicit opportunity costs in holding balances above requirements, contributing to the downward sloping characteristic of the demand curve.

<sup>8</sup> In addition, from the early 1980s to mid-2012, the Federal Reserve operated a contractual clearing balance program that provided banks with the ability to set voluntary targets in amounts above their mandatory reserve requirements and earn credits which could be used to offset the costs of Federal Reserve priced services. In addition to the supply of reserves needed for banks to meet their mandatory requirements and contractual clearing balance requirements, banks demanded a small amount of excess balances because in aggregate, some additional cushion was desired to avoid the penalties of being short on required balances regardless of the rate target. On a daily basis, the Federal Reserve estimated and supplied an aggregate quantity of balances that would be consistent with meeting the federal funds rate target. Using data between January 1998 and September 2007, during easing periods, excess reserves averaged \$1.3 billion and they averaged \$1.0 billion during tightening periods.

Table 1. Types of Demand for Reserve Balances and Relative Interest Elasticity

	Factor driving level of reserve demand	Location on demand curve	Available substitutes	Contribution to the LCR
(1)	Reserves held to meet requirements			
(1a)	To satisfy <i>mandatory</i> requirements	Steep portion		✗
(1b)	To satisfy <i>voluntary</i> targets	(Demand is relatively interest-inelastic)	None	✓
(2)	Additional reserves held for clearing needs and liquidity buffer			
(3)	Additional reserves held to satisfy HQLA requirements for the LCR	Flat portion (Demand is sensitive to opportunity cost of holding reserves)	Other HQLA	✓
(4)	Surplus			
			Other assets	✓

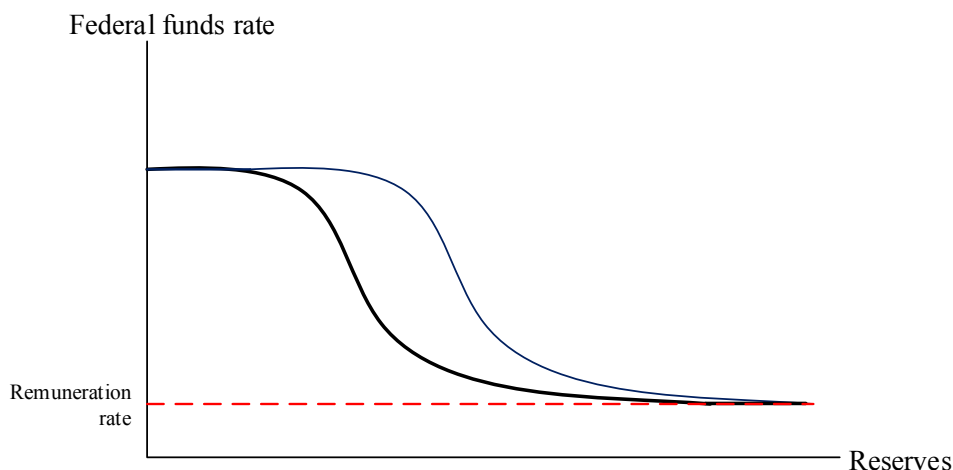
Of course, banks always have to hold, in aggregate, the amount of reserves that the Federal Reserve supplies, and banks currently hold \$2.3 trillion in reserve balances in the United States, of which nearly \$1 trillion is being reported by domestic banks subject to the LCR requirements.

To get a sense for how large banks view their long-run demand for reserve balances, staff asked nine of the largest domestic banks and eight foreign bank branches for estimates of their demand for reserves (specifically to meet clearing and payment, as well as other liquidity needs). In these consultations, the banks noted that a confluence of new regulatory, business model, and liquidity-risk management factors affect their demand for reserves. They also noted that these factors may not all be very interest rate sensitive, implying that there is uncertainty over where the steep portion of the reserve demand curve lies (Figure 2).<sup>9</sup> We note, however, that these banks reported a range of approaches to managing and meeting liquidity needs, and it appeared difficult for some of them to abstract from the current environment to discuss long-run demand.<sup>10</sup>

<sup>9</sup> In addition to direct bank feedback, market commentators have discussed the effects of banks’ enhanced risk management. Lou Crandall noted, “The LCR has leapfrogged required reserves as the effective liquidity constraint on large banks in the U.S. It completely changes their liquidity management.” Comments at workshop, *Implementing Monetary Policy Post Crisis: What have we learned? What do we need to know?* May 4, 2016. <https://www.newyorkfed.org/medialibrary/media/newsevents/events/markets/2016/frbny-columbiasipa-loucrandall-presentation.pdf>.

<sup>10</sup> Some banks indicated that their business model necessitates holding a sustained higher level of reserve balances, and others indicated that they can still hold a relatively small buffer of reserves and access intraday credit and funding markets to meet payment shocks.

Figure 2. Uncertainty over Where the Steep Portion of the Demand Curve Lies



If the opportunity cost to hold reserves increased on a sustained basis, we expect institutions would likely invest in means to economize on holding reserve balances. Business lines and market structures would adapt to the lower level of reserves in a manner consistent with the prudent liquidity risk management that is encouraged by regulation and supervision. These adjustments could be accompanied by shifts in relative prices of HQLA-eligible assets.<sup>11</sup> How quickly banks would re-optimize to the lower level of reserves is uncertain, though some signal could possibly be gleaned from money market rates.

### 3. Where to operate on the demand curve?

The 2008 “Basic Options” paper discussed several frameworks for operating monetary policy given the new authority to pay interest on reserves. While all of those frameworks can provide rate control, there are distinct characteristics across the regimes. For example, some features of the pre-crisis, corridor framework—such as promoting active interbank trading—could be achieved in a variety of ways going forward. In addition, corridor frameworks may reduce the political economy costs that may be associated with IOR to the extent that such systems may help to reduce the Federal Reserve’s interest expenses. Given some uncertainty about where the steep portion of the demand curve may lie, we highlight how different implementation tools can accommodate this uncertainty. There may be features of the previous regime that are no longer

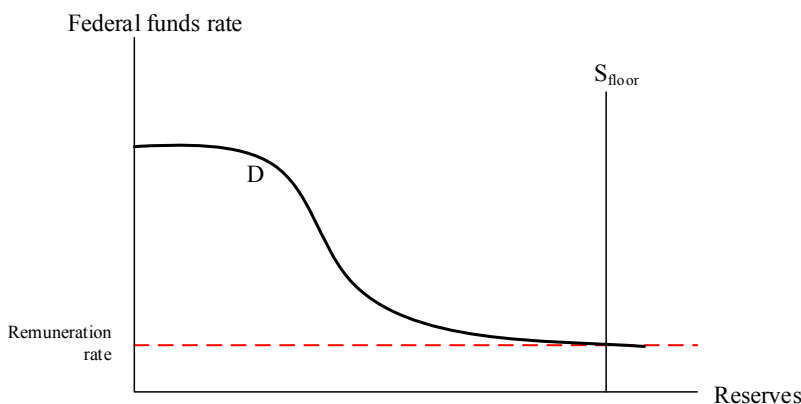
<sup>11</sup> Currently, we see limited response in the daily composition of HQLA portfolios to shifts in relative returns among the various assets that qualify as HQLA. Variations in Treasury bill supply also affect Treasury bill rates, and related spreads.

necessary, even when operating in a corridor. Notably, policymakers may wish to reduce reserve requirements to zero in the spirit of reducing administrative burdens on the banking system and rely instead on alternative means to shaping reserve demand. Alternatively, policymakers may prefer particular features of a floor framework—such as having a framework that easily accommodates policy actions at the ELB—and we discuss the key tools associated with this framework as well.

### 3.1 Floors: Operating with the supply of reserves intersecting the flat portion of the demand curve

In a floor system, there is generally little need for detailed information on the demand curve for reserves, and the regime is robust to shifts in demand and shifts in supply, given that a large volume of reserves is supplied (Figure 3). This regime type is currently employed by many central banks, including the European Central Bank, Bank of England, Bank of Japan, Reserve Bank of New Zealand, and Norges Bank.<sup>12</sup>

Figure 3. Floor Reserve Regime



To date in the United States, experience operating a floor system with very abundant reserves and administered rates suggests good rate control. In this regime, the IOER rate acts as floor on the rates at which banks will provide short-term funding to others and influences the rates at

<sup>12</sup> The LRF “Foreign Experience” foundational memo indicates that a number of central banks that operated floor regimes prior to the financial crisis, described their systems as “liability-driven” floors, which we interpret to mean that the level of reserves was chosen rather than being a by-product of asset purchase programs. We expect this distinction may not matter significantly in terms of regime functioning and performance.

which they are willing to borrow in overnight funding markets. Similarly, the overnight reverse repurchase (ON RRP) program supports policy implementation by providing an important “outside option” for major lenders in money markets.<sup>13</sup> Fine-tuning operations are not necessary because the quantity of reserves supplied far exceeds the level of reserves necessary for meeting banks’ reserve requirements, clearing, settlement, and other liquidity needs.

Going forward, if policymakers chose to operate in this reserve regime, it could be possible to significantly reduce the deadweight loss of mandatory requirements by setting reserve requirement ratios on all reservable liabilities to zero.<sup>14</sup> And administrative costs could be significantly cut by reducing the current mandatory weekly reporting of banks’ daily reservable liabilities to a much lower frequency.<sup>15</sup>

### **3.2 Corridors: Operating with the supply of reserves intersecting the steep portion of the demand curve**

Regimes that operate with the supply of reserves intersecting the steep portion of the demand curve generally use reserve requirements or reserve targets to shape demand (Figure 4). Such regimes rely on a relatively stable and predictable demand curve but differ in the manner by which this demand curve is shaped by the central bank. In addition, post-crisis, we also have new sources of supply volatility that the Federal Reserve would need to manage in a corridor framework; factors affecting supply are discussed in the appendix to this memo.

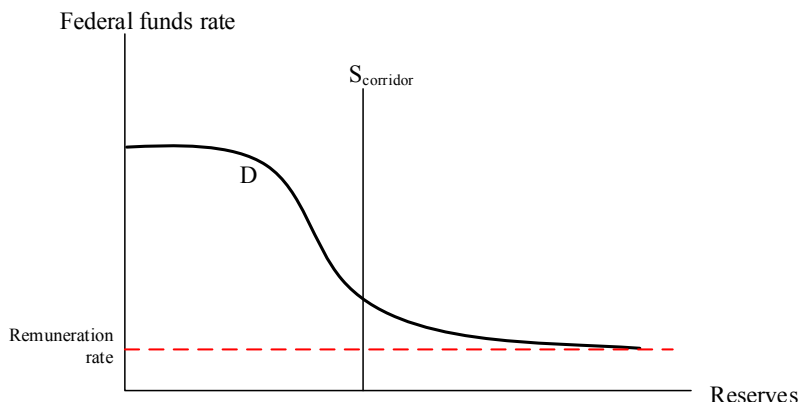
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<sup>13</sup> Please see the LRF “Money Markets” foundational memo for a complete discussion of arbitrage relationships and money market rates. The main IROR memo discusses counterparty considerations associated with operating the ON RRP facility.

<sup>14</sup> We define deadweight loss as costs associated with activity engaged in solely to avoid requirements. Section 19 of the FRA provides that each depository institution “shall maintain reserves against its transaction accounts as the Board may prescribe by regulation solely for the purpose of implementing monetary policy” in a ratio between zero percent and three percent for transaction accounts subject to the low reserve tranche, and in a ratio between zero percent and fourteen percent for transaction accounts over the low reserve tranche. 12 U.S.C. 461(b)(2).

<sup>15</sup> For example, every week the Federal Reserve collects daily deposit data from over 2,000 banks and thrifts based on deposit definitions that are only relevant to the administration of reserve requirements (for example, a distinction is made between transaction deposits versus savings deposits out of which only six convenient transfers may be made per month, with the distinctions determined by Regulation D). This collection could be significantly streamlined along with development of alternative means to collect data to compile the monetary aggregates for the public data release.

Figure 4. Corridor Reserve Regime



- Mandatory requirements** (pre-crisis regime): The pre-crisis reserves regime in the United States relied heavily on mandatory reserve requirements to create a relatively stable and predictable demand for reserves, against which the Federal Reserve would make modest adjustments to aggregate supply, operating on the steep portion of the demand curve.<sup>16</sup> As noted in the memo on “The Foreign Experience with Monetary Policy Implementation,” this type of corridor system was used pre-crisis by the majority of central banks of advanced foreign economies.<sup>17</sup> Reserve requirements were typically associated with an averaging feature which allowed banks to smooth funding needs across days of the maintenance period.<sup>18</sup> These features dampen interest rate volatility by providing some flexibility for banks in how they maintain reserves across days of a reserve maintenance period. Overall, the Federal Reserve experienced well-functioning and highly correlated money markets in the pre-crisis regime, with limited overnight rate volatility. There were several key features of the mandatory reserve requirement regime: Reserve requirements can only be imposed on the narrow statutorily-permissible types of

<sup>16</sup> The functioning of this regime is described in detail in the memo to the Committee, “Implementing Monetary Policy in the United States: the Policy Framework and Operating Procedures,” March 2008.

<sup>17</sup> Bindseil describes this framework as operating with a “liquidity deficit of the banking system vis-à-vis the central bank” (chapter 2.6 of Bindseil, U., *Monetary Policy Operations and the Financial System*, Oxford University Press, 2014). Operating with a liquidity deficit is typical of a regime operating with “reserves scarcity,” while operating with a surplus is generally referred to as operating with “reserves abundance.”

<sup>18</sup> The prior regime also included carryover or tolerance band provisions, which allowed banks to manage their final reserve positions with some flexibility relative to their requirements. A tolerance band is a range generally on both sides of a mandatory or voluntary target within which an institution needs to maintain its average balance over the maintenance period in order to satisfy its target. Note that there is likely a tradeoff between the flexibility provided around targets or requirements and the degree of interbank trading in such a regime.



deposits and involve a complex system of deposit reporting based on statutory definitions of reservable liabilities. Autonomous factors (which add and drain reserves to the banking system outside of direct actions by the Federal Reserve) were projected and managed as much as possible, and the Desk conducted fine-tuning open market operations (OMOs) with primary dealers (usually funds-adding repo transactions) in small amounts compared to volumes in these markets. In addition, the Desk conducted outright purchases of Treasury securities to accommodate trend growth in currency in circulation.

- **Voluntary targets:** In a system of voluntary reserve targets (VRTs), banks establish and communicate in advance individual reserve targets in line with their projected demand to the central bank. As described in the April 2008 “Basic Options” paper, under a VRT framework, banks can choose a target for their average balances over a maintenance period on which they can earn explicit interest.<sup>19,20</sup> Balances held to meet the voluntary requirement would earn interest at the target federal funds rate. Balances held that exceed the voluntary requirement would earn a lower rate on excess reserves. Banks that failed to meet their voluntary requirement would be assessed a penalty on the shortfall. Once VRTs are set, the central bank has a stable and observable demand for reserve balances, with the steep portion of this demand curve driven by the aggregate VRTs.<sup>21</sup> As with mandatory requirements, reserve averaging and tolerance bands around voluntary targets can be used in a voluntary framework to dampen rate volatility within a

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<sup>19</sup> The April 2008 Basic Options paper envisioned that large banks likely would chose a target balance close to estimates of their average need for balances to clear payments. Such behavior would be consistent with banks’ participation in the contractual clearing balance program. Demand for clearing balances was significant in the early 2000s, with banks setting voluntary targets in amounts roughly equal to or exceeding, in the aggregate, mandatory requirements, and staff analysis of the period finds that banks’ demand for these targets is consistent with the model specified by Poole (1968) in which banks seek to maximize profit but must address uncertainty with regards to payment flows. See Poole, William, “Commercial Bank Reserve Management in a Stochastic Model: Implications for Monetary Policy,” *The Journal of Finance* (1968).

<sup>20</sup> Please see the LRF “Foreign Experience” foundational memo for information on the Bank of England’s experience with voluntary targets between 2006 and 2009.

<sup>21</sup> The setting of VRTs might be related to the portion of reserves that banks subject to the LCR regulation would choose to hold in their HQLA portfolios. Using the reasoning that supported the treatment of TDF deposits with an early withdrawal feature as HQLA, VRTs would likely be eligible for inclusion in HQLA, given banks’ ability to use balances to meet immediate liquidity needs. Under U.S. rulemaking, TDF deposits with an early withdrawal feature qualify as central bank reserves and, thus, are included in Level 1 HQLA because they are explicitly and contractually repayable on notice. This rulemaking was coordinated between Monetary Affairs and Banking Supervision and Regulation Staff. See U.S. LCR rulemaking, September 2014: <https://www.federalreserve.gov/newsevents/press/bcreg/20140903a.htm>.

maintenance period and increase the ease of meeting the targets. In addition, fine tuning of reserve supply via open market operations would be necessary.

With both of these regimes (mandatory and voluntary), the Federal Reserve influences the federal funds rate through its control of the supply of reserves, encouraging interbank trading in unsecured markets. Reserve requirements and voluntary targets in corridor systems establish symmetrical incentives for banks in the management of their reserve holdings. Within these systems, banks typically transact—either lending or borrowing—when their reserve holdings are in excess or short of their individual required or target levels.

- **Regimes with no reserve requirements or targets (corridors):** In the April 2008 “Basic Options” paper a corridor was envisioned with reserve balances remunerated at a rate set below the target policy rate to serve as a lower bound, and the upper bound of the interest rate corridor set by the primary credit rate. Without reserve requirements or targets to generate a stable and predictable demand for reserves, the Desk would face the challenge of supplying exactly the quantity demanded each day, even though real-time demand would be quite uncertain. Day-to-day variability in the policy rate within this corridor would likely be high unless the Desk was able to observe each day’s realized demand for balances and adjust the supply of balances late in the day to meet this demand.<sup>22</sup> While this framework may seem attractive from the standpoint of low administrative costs for the Federal Reserve and the banking system, we expect that such a no-target corridor would be very difficult to operate successfully in terms of establishing and maintaining rate control given our relatively complex financial system.

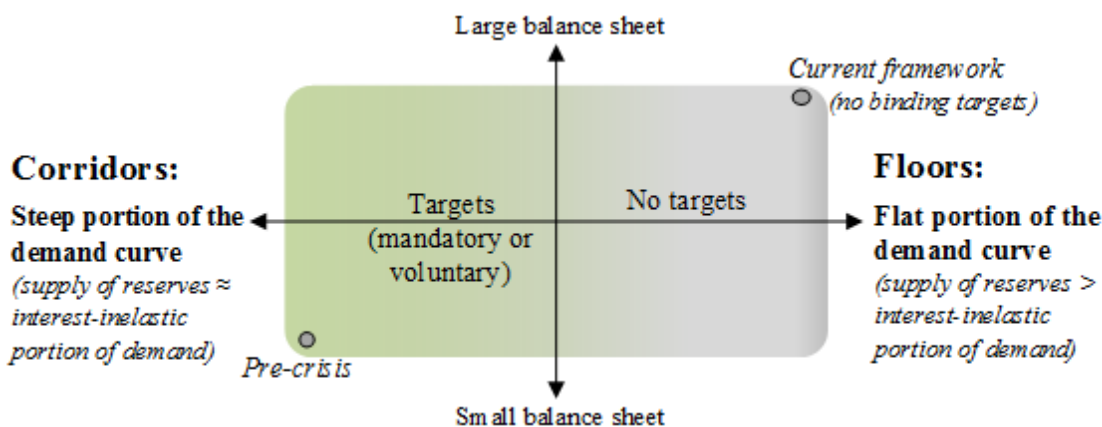
So far we have discussed how policymakers could operate anywhere on the demand curve and achieve rate control with the variety of tools available among a range of unsecured market rates. The spectrum of reserve regimes operating from the steep to the flat portion of

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<sup>22</sup> Versions of corridor regimes have been employed by the Reserve Bank of Australia and Bank of Canada, but these countries have much less complex market structures, with only a few major banks, and relatively small autonomous factors. As a reference point, there are only 83 banks in Canada, while the Federal Reserve currently collects daily deposit balances from over 2,000 banks on a weekly basis, with an additional 7,000 institutions reporting on a quarterly or annual basis. Large standing repo facilities on either side of the policy target could be employed to achieve rate control in a no-target corridor, but may have the effect of the central bank effectively intermediating money markets.

the demand curve is depicted in Figure 5. As highlighted by the two circles in the lower left and upper right corners of the schematic, the pre-crisis framework and the current framework are essentially opposites on this spectrum. In addition, the figure illustrates that a decision regarding balance sheet size can be made independently from a decision regarding whether to operate on the steep portion of the demand curve.<sup>23, 24</sup>

Figure 5. Spectrum of Reserve Regimes



If policymakers chose to operate policy on the flat portion of the demand curve as a long-run framework decision, further decisions for policymakers would include which tools would be used to support rates at the floor in the long run, and whether it was desirable to reduce reserve balances from their current level (see the forthcoming “Interest Rate Targets and Operating Regimes” (IROR) main memo for a full discussion). If policymakers find the features of operating on the steep portion of the demand curve desirable, a determination of both demand and supply would be necessary to target unsecured funding rates.

#### 4. Evaluation of regimes based on long-run framework objectives

Below we summarize the results of our evaluation of different reserve regimes against the LRF objectives (Table 2).

<sup>23</sup> We define a “small” balance sheet as one in which the size of the System Open Market Account is comparable to the size of currency in circulation, and reserve balances are minimal, as was the case pre-crisis.

<sup>24</sup> This outcome is possible because once the targets are set by banks in a voluntary target framework, the information on aggregate targets allows the central bank to know where the steep portion of the demand curve lies and to provide supply in a relatively scarce amount relative to this demand.

Table 2. Reserve Regimes and LRF Objectives

		Corridor		Floor
		Mandatory targets	Voluntary targets	Floor with reserve ratios set to zero
<b>LRF Objectives</b>	Short-term rate control	Generally		
	Promotes money markets	More fed funds (interbank) trading		Yes
	Goals attainable at ELB	Requires converting to a floor		Yes
	Reduces burdens and DWL of required reserves	No	Room for savings	Yes

- Floor regimes:** We note that the floor framework where reserve ratios are set to zero appears to perform well against the LRF objectives. For example, we have seen generally effective short-term rate control in our current system. Trading between banks in the federal funds market is depressed but banks remain active borrowers in money market trading with nonbank firms. The floor regime does not need to be adjusted when exceptional liquidity provision is required, such as in a crisis. And finally, the deadweight loss and administrative costs associated with mandatory reserve requirements can be essentially eliminated.
- Corridor regimes:** When operating in a corridor, mandatory reserve requirements and voluntary targets should perform similarly in terms of interest rate control if demand is reasonably predictable. However, as previous discussed, VRTs may provide more flexibility for banks to adjust to evolving clearing and liquidity needs, implying a more stable demand for reserves once VRTs are set. Corridor regimes incentivize interbank trading. They also economize on the payment of interest on reserves.<sup>25</sup> A framework that operates along the steep portion of the demand curve can likely accommodate rates near zero. However, if a significant volume of asset purchases are used, converting to a floor regime may be needed. Finally, the payment of interest on required reserve balances did not eliminate all deadweight loss, and the apparatus maintained by the Federal Reserve System to administer these requirements is costly and complex. Voluntary targets could reduce these costs.

<sup>25</sup> In any corridor that targets rates on the steep portion of the demand curve, the marginal reserve balance is remunerated below market rates.

## **Appendix: Supply of Reserves**

In this appendix, we highlight some major factors leading to changes in the volatility of reserve supply and provide some observations on how these factors could be managed. A number of policy changes have resulted in a much more volatile supply of reserve balances due to higher volatility of so-called “autonomous factors.” Autonomous factors are other Federal Reserve liabilities that are outside of our direct control, such as the Treasury general account (TGA), foreign central bank balances and investment in the foreign repurchase agreement pool, and currency in circulation.

In a reserves framework where the central bank manages reserves supply such that it intersects the steep portion of the demand curve, exogenous changes to the reserve supply must be offset. In a system that operates on the flat portion of the demand curve, where the supply of reserves exceeds the steep portion of the demand curve, changes in autonomous factors would be easier to accommodate because changes in reserve supply would have little effect on the level of money market interest rates.

Among the autonomous factors, the TGA, in particular, has exhibited the most significant volatility over the past year. During the crisis there was a change in the Federal Reserve-Treasury agreement that previously limited the size of the TGA at \$5 billion, which resulted in minimal volatility in this account. Perhaps more significantly, in May 2015 Treasury changed its cash balance policy so that it maintains a cash buffer at the Federal Reserve, to ensure it can cover one week of outflows despite disruptions to market access, with an account floor of \$150 billion. Because of the seasonality of Treasury’s payment needs, this policy has resulted in a much higher level of TGA (currently averaging around \$350 billion) and greater volatility. Policymakers’ decision on whether to operate on the steep (corridor) or flat (floor) portion of the reserve demand curve will likely affect the need to manage (with new policies) or offset (with OMOs) such supply volatility.

**Managing or offsetting supply volatility:** To operate a regime where the supply curve intersects the steep portion of the demand curve, the Federal Reserve needs to manage supply relative to demand to achieve the LRF objective of interest rate control. Movements in the

supply of reserves driven by autonomous factors would need to be offset by the Federal Reserve to avoid a change in unsecured market rates. While the Treasury's new cash management policy has increased both the TGA's level of balances and the volatility of these balances, policymakers may see a public policy benefit to supporting the Treasury's objective to hold a buffer to meet its obligations. As a result, if policymakers wished to return to operating a framework that necessitated tighter control around TGA volatility at a new higher level of balances, joint analysis, coordination of Federal Reserve and Treasury staff, as well as a phase-in of any plan that would be developed, would be needed.<sup>26</sup> In addition, consultation with other stakeholders would likely be needed to develop policies and procedures for managing the volatility of other autonomous factors, particularly if the volatility of these liabilities should grow. In contrast, a floor framework can accommodate large and volatile autonomous factors.

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<sup>26</sup> Treasury would need some time to design and develop a new cash management program since much of the infrastructure and legal arrangements of the former program has been dismantled. Treasury has indicated it would be interested in doing so if the amount it earned on balances in commercial banks was higher compared to IOER (the implicit interest the Treasury earns on TGA). In the previous program, Treasury earned a small fixed spread below the federal funds rate target from banks on its deposits with them. A new pricing scheme or structure of deposits or repo arrangements may need to be developed. Recently, another fiscal entity looking to invest large amounts of cash in collateralized commercial bank deposits at zero interest found banks unwilling to take these deposits. Even if TGA were to be managed to a higher level with minimal volatility under normal conditions, debt ceiling episodes would likely result in significant volatility.