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# **IMF Working Paper**

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## **Managing the Fed's Liftoff and Transmission of Monetary Policy**

Manmohan Singh

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**I N T E R N A T I O N A L M O N E T A R Y F U N D**

**IMF Working Paper**

Monetary and Capital Markets Department

**Managing the Fed's Liftoff and Transmission of Monetary Policy**

**Prepared by Manmohan Singh**

Authorized for distribution by Karl Habermeier <sup>1</sup>

September 2015

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**Abstract**

In recent years, many money and repo rates in the United States have been between zero and 25 basis points. As Fed's liftoff approaches, the question of the level of these rates (and the markets that determine them) becomes increasingly important. The paper discusses (i) whether the Fed can control short-term rates as it starts to tighten; and (ii) what are the advantages and disadvantages of using asset sales versus a large reverse repo program (RRP). A large RRP by the Fed will deprive the financial system of the money pool (i.e., GSEs and money market funds) as the Fed will directly absorb the money on to its balance sheet. This will rust the financial plumbing that connects the money pool to collateral suppliers. Some asset sales may be preferred to a large RRP as this will result in a market-determined repo rate and will allow the Fed to reach its monetary policy liftoff objectives with minimal footprint on market plumbing. We also discuss cost of issuing short tenor T-bills relative to a large RRP in a rising rate environment.

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## I. INTRODUCTION

Many recent studies focus on the tools available to the Federal Reserve (Fed) for liftoff, i.e., the gradual increase in its policy rate after several years of keeping it at zero (e.g., Frost et al, 2015). Some studies and policy makers link the liftoff issues with financial stability elements where they allude to the academic literature on the need for safe assets (Stein 2014; Caballero and Fahri, 2013). Recent FOMC minutes, academic studies (Barnes, 2014) and speeches by the Fed discuss these issues in detail. However, aside from analysis by market participants that generally favor a large supply of safe assets, there is limited discussion about the financial plumbing connecting bank and nonbank balance sheets, or the changes to those balance sheets stemming in part from proposed regulations such as the leverage ratio and the liquidity coverage ratio (LCR). This paper looks at the reshuffling of the bank/nonbank nexus that is likely to occur as a result of Fed's increasing role in dealing directly with nonbanks.

As background, in the aftermath of the 2008–09 crisis, the Fed purchased United States (U.S.) Treasuries and mortgage backed securities (MBS)—both high quality collateral—through large scale asset purchases primarily from nonbanks (Carpenter et al, 2013). Those nonbank assets were converted into ‘deposit liabilities at banks’, with a corresponding asset entry of ‘reserves at the Fed’. In other words, the asset purchases converted good collateral in the market into banks’ holding of sizable excess reserve balances at the Federal Reserve.

The interest rates in most of these markets are in the range of zero and 25 basis points (bps). The Federal Funds (FF) rate or policy rate has been around 10–15 bps since the crisis, and is largely a negotiated rate stemming from the excess cash balances of nonbanks such as GSEs (i.e., Fannie Mae, Freddie Mac etc.), and banks. Only banks have access to the 25 bps interest on excess reserves (IOER) and thus arbitrage by depositing nonbanks cash at the Fed. With interest rate bound at zero since 2008, the Fed introduced the overnight reverse repo program (ON RRP) in Sept 2013—with the goal of preventing the price of collateral (i.e., repo rate) from going below zero thus, minimizing the wedge with policy rate. The amount of ON RRP, a temporary tool, is capped at \$300 billion, and has so far provided an effective floor to the repo rate at 3–5 bps. Simon Potter, who heads the markets group at New York Fed, in a recent speech (April 15, 2015) highlights that other short-term rates will also be important to gauge, along with the FF, during liftoff:

*“The (March, 2015 FOMC) minutes highlight that policymakers will be particularly careful at the start because demonstrating appropriate control over the federal funds rate and **other short-term rates** is a priority. This may **entail elevated aggregate capacity in an ON RRP** facility at liftoff because we don't know how much support we are currently getting from the zero lower bound, which creates some uncertainty about the demand for ON RRPs. However, the ON RRP will be used only to the extent necessary for monetary policy control because it has some potential financial stability **and footprint costs** associated with it.”<sup>2</sup>*

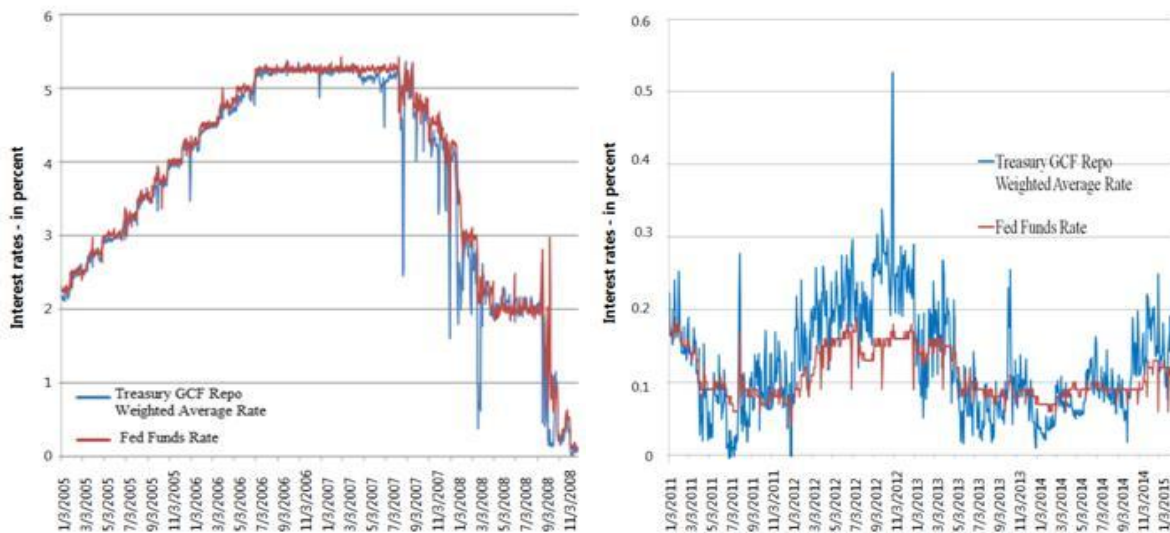
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<sup>2</sup> <http://www.ny.frb.org/newsevents/speeches/2015/pot150415.html> (See conclusion paragraph).

Bilateral pledged collateral market rates (via the bank/nonbank plumbing)—although unobservable—do pass-through to other interest rates and thus, to the real economy. When the market plumbing works, the general collateral (GC) rate is a reliable proxy for bilateral repo rates. Without the plumbing the GC rate would have little information content. At lift off, it will be important that the FF rate be broadly in line with the GC rate, as was the case pre-Lehman— see Figure 1.<sup>3</sup> The FF rate was within +/-3 basis points of the GC rate, except for quarterly-ending dates that straddle inventory, regulatory, and reporting aspects.

Figure 1. Fed Funds Policy Rate and General Collateral Rate, Pre-Lehman vs. Present

(First panel 2005–08; second panel 2011–15)



Sources: Depository Trust and Clearing Corporation (DTCC); Federal Reserve; and Bloomberg.

This paper focuses on the critical pieces of the plumbing in the wake of the liftoff—the repo markets and the bank deposits market. It argues that monetary policy during liftoff will have to address the new financial plumbing created by the sizable asset purchases to accommodate the (i) “excess” depository market with the money funds; (ii) the demand for collateral stemming from proposed regulations; (iii) and the balance sheet cost (or balance sheet space) as excess reserves are included in the supplementary leverage ratio in the U.S.<sup>4</sup> The next section (II) discusses the basic components of the Fed balance sheet since Lehman and the

<sup>3</sup> The U.S. bilateral repo market is a *market for collateral*: securities for possession and use (against cash). The Triparty repo market in the U.S. is a *market for funding*: money for broker dealers/ banks (collateralized by securities). The liftoff should be about rates that pass-through to the real economy and bilateral pledged collateral market provides this information. GC rate is often used to proxy for bilateral rates when the financial plumbing works (Singh, 2014, Box 2). Since FOMC and Fed speeches focus on IOER (i.e., interest on excess reserves), ON RRP, GC, and FF, we restrict the discussion to these four rates (see Annex 1).

<sup>4</sup> To the extent that banks face leverage ratio (or, SLR in the U.S.), constraints as a result of asset purchases by the Fed, they want balance sheet “space” for higher return financial intermediation/non-depository activities.

role of the Reverse Repo Program (RRP) vis-à-vis excess reserves. Section III highlights the two broad choices that the Fed will face to increase the repo rate. Section IV discusses the supply of safe assets and in this context, compares debt issuance costs since 1982 relative to the RRP cost. Section V concludes and discusses how monetary policy choices will be affected by the new plumbing environment.

## II. THE FED'S BALANCE SHEET, RRP, AND EXCESS RESERVES

The Fed's balance sheet increased from roughly \$1 trillion (end-2007) to over \$4 trillion by end-2014, owing mainly to some \$3.4 trillion of asset purchases that sit on its asset side. The approximate corresponding entry are excess reserves of \$2.9 trillion on the liabilities side—these are deposits of nonbanks (who sold assets to the Fed) at banks, who then place them as deposits at the Fed. Since October 2008, the Fed offers banks 25 basis points per annum for their deposits (including excess deposits over the required reserves), but pays zero interest on deposits from nonbanks, especially GSEs.<sup>5</sup> It is important to note that a decline in excess reserves does not necessarily result in a reduction of the Fed's balance sheet.<sup>6</sup>

Figure 2. Main Changes in the Fed's Balance Sheet (2007 vs. 2014)

Assets	Liabilities
↑ Asset Purchases, change since 2007 <i>\$ 3.4 trillion approx</i>	↑ Excess Reserves (i.e. deposits of banks at Fed) <i>\$ 2.9 trillion approx</i>

In this context, it is useful to understand the Triparty system. The operational structure of the RRP facility puts practical restrictions on the reuse of collateral outside the Triparty system. Collateral can only be used in a Triparty repo liability. (So a firm that is a “dealer” in the Triparty system such as JPMorganChase or Bank of New York Mellon could have as an asset a Fed RRP and as a liability a Triparty repo with a customer).

Members of the Government Securities Division (GSD) of the Depository Trust and Clearing Corporation (DTCC) can reuse the collateral within the General Collateral Finance (GCF)

<sup>5</sup> To be precise, the total U.S. Treasuries and MBS held by the Fed as of April 22, 2014 was \$4.2 trillion, of which \$750 billion were held as of end-2007. Excess Reserves as per April 22, 2014 were \$2.9 trillion, basically all of which was added after end-2007. Also, FDIC website data suggests that the top 50 bank holding companies (including foreign) held \$7 trillion of deposits as of June 30, 2014, relative to \$4 trillion as of June 30, 2008. In fact the top four bank holding companies (Bank of America, Wells Fargo, Citibank and JPMorgan) hold about \$3.8 trillion in deposits as per FDIC's June 30, 2014 data, relative to \$1.9 trillion as of June 30, 2008.

<sup>6</sup> Prior to the Lehman's crisis, there was generally a *shortage of reserves* that was met by Fed's interventions from repo operations (via the relatively small SOMA account at the New York Fed) so that the Fed Funds rate was kept aligned with the collateral rate (i.e., GC rate to be specific). Fast forward seven years, and now there are an *excess of reserves* with the banking system so changes in Fed Funds rate are not possible.

Triparty system. Here, we use the term “banks” very loosely: for example, Citibank could take collateral from the Fed and give to a Fidelity mutual fund as a Triparty investment, or could take collateral from the Fed and give in GCF to Credit Suisse to give to that Fidelity fund. To be clear, members of the GSD may be classified differently: Goldman Sachs is actually Goldman Sachs & Co., Deutsche Bank is Deutsche Bank Securities Inc., Barclays is Barclays Capital Inc. But members also include Pierpont Securities LLC, Jefferies LLC, Cantor Fitzgerald & Co., etc. The important point is that reuse of collateral can only end in a Triparty repo; it can have no other use. Of the counterparties the Fed has taken on via the RRP, only the “banks” take on Triparty repo liabilities. The “released” collateral from the RRP remains as asset on the Fed’s balance sheet and within the Triparty system.

Figure 3. Non-Banks Use of Reverse Repo Program (RRP) with Fed—An Illustration

Federal Reserve	
Assets	Liabilities
No change	Excess Reserves ↓ \$ 1.3 trillion  RRP with Non-Bank ↑ \$ 1.3 trillion

At present, bids for use of collateral within the ON RRP are capped at \$300 billion, subject to a cap of \$30 billion per counterparty per transaction.<sup>7</sup> But even if bids for RRP were uncapped, the collateral of the RRP would remain on Fed’s balance sheet and not freely available to the financial system.<sup>8</sup> Within the present Triparty structure, none of the collateral can be used to post at central clearinghouses, in the bilateral derivatives markets, in the bilateral repo market, or delivered against short positions—note, however, that there exists a sizable pledged collateral market that is not constrained by Triparty structure (see Box 1).

The constraint noted above implies that, regardless of the size of the bids on RRP, the Fed’s balance sheet will not decrease as a result of the “use” of excess reserves. Let’s assume that the RRP’s ceiling were to be increased from the present cap of \$300 billion to \$1.3 trillion (Figure 3). Only the excess reserves will go down by \$1 trillion; the corresponding entry will also be on the liability side of Fed balance sheet (“RRP with the Fed”). Papers on this subject are generally silent on this aspect—that RRP is more akin to “accounting drainage” since the \$3.4 trillion of asset purchased remain on the Fed’s asset side, with RRP only reshuffling line

<sup>7</sup> The rationale for the present cap of \$300 billion is unclear, but it has proven to be sufficient. (see Annex I, right hand axis)

<sup>8</sup> See for Bernanke (2015) and Gagnon and Sack (2014).

items on the liability side.<sup>9</sup> In fact Simon Potter's (April 15, 2015) speech includes current balances of RRP within the measure of excess reserves.<sup>10</sup>

The Fed is expanding the universe of deposit-takers that have direct access to its balance sheet—a “short-circuit” via the RRP. For example, for each \$100 million of RRP, typically a nonbank removes \$100 million deposits from a bank, and places it with the Fed. So the Fed becomes the new counterparty to the nonbank, while the bank (e.g., Citibank or JPMorgan) gets “balance sheet space”—a scarce commodity due to regulations and asset purchases related deposits—as the \$100 million deposits move from a bank to the Fed.

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<sup>9</sup> There is a key difference between selling assets from the Fed's balance sheet to shrink the balance sheet, and reshuffling Fed liabilities between line items called “excess reserves” and other items on the liability side such as like RRP. Rearranging the Fed's liabilities gives rise to changes in someone else's balance sheet at every stage of the process; selling assets in contrast allows those assets to move directly to their final holder. An example: suppose the Fed sells U.S. Treasuries to Goldman Sachs, who sells them to a hedge fund, who sells them to Bank of America (BoA), who sells them to an insurance company. The insurance company balance sheet asset is a substitution of the securities for cash deposit at its bank—for example BoA. BoA's liabilities (the insurance company deposit) and assets (the Fed's reserve deposit) both go down.

<sup>10</sup> <http://www.ny.frb.org/newsevents/speeches/2015/pot150415.html> (footnote 2).

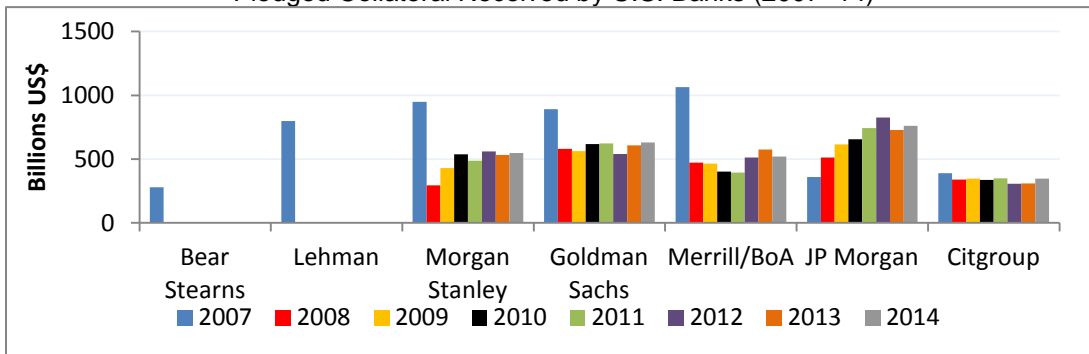


**Box 1. The Financial Plumbing: Pledged Collateral that can be Reused by Global Banks**

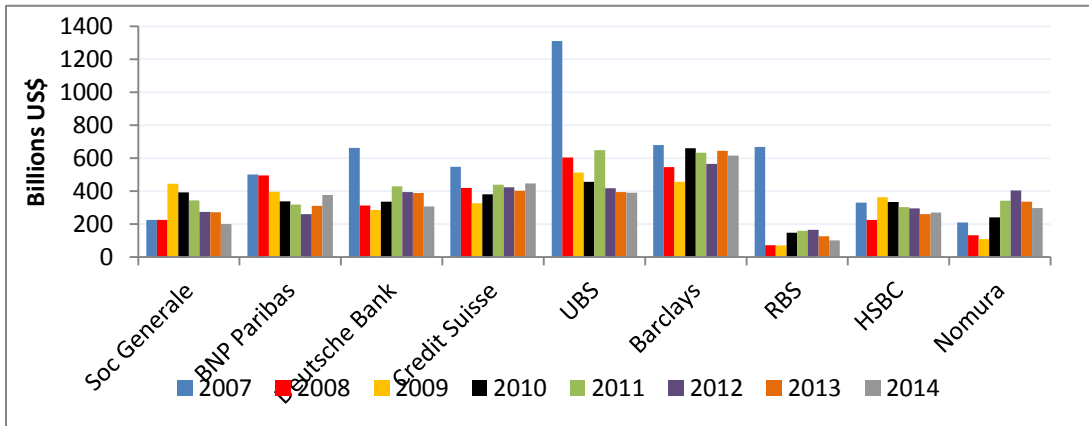
Financial agents that settle daily margins may post cash or securities, whichever is “cheapest to deliver” from their perspective. These settlements form the core of the financial plumbing in markets that require debits/credits to be settled continuously. These securities are generally received by the collateral desks of the banks not only via reverse-repo but also from securities borrowing, prime brokerage agreements, and over-the-counter (OTC) derivative positions. The largest suppliers of pledged collateral are the hedge funds; other sources include insurers, pension funds, central banks, and sovereign wealth funds.

The “fair value of securities received as collateral that is permitted to be sold or re-pledged” by global banks was approximately \$10 trillion in 2007 but has declined in recent years to about \$6 trillion (see figures below). Before its decline, the pledged collateral metric are of the same order of magnitude as money metrics such as M2 in the U.S. or the Eurozone. Securities that are pledged, at mark to market values, may be bonds or equities, are cash-equivalent from a legal perspective (i.e., with title transfer) and do not have to be AAA/AA rated. The underlying economics of pledged collateral reuse is similar to reuse of deposits in the banking system (Singh and Stella, 2012). Following the methodology of Singh (2011), ESRB (2014), DTCC (2014), and incorporating the amount of “source collateral,” the collateral reuse rate (or collateral velocity) can be approximated, and it has declined from about three as of end-2007 to about two as of end-2014. Central banks should be cognizant of collateral reuse rate in the bilateral pledged collateral market along with money metrics to gauge the short-term rate environment.

Pledged Collateral Received by U.S. Banks (2007–14)



III. Pledged Collateral Received by European Banks, and Nomura (2007–14)



Sources: Hand-picked data by author from annual reports; see also Singh (2011).

#### IV. LIFTOFF CHOICES—SOME SCENARIOS

What will happen at liftoff when the Fed Funds target moves from its current level of 10–15 basis points to, say, 25–50 basis points? Will the GC rate move broadly in line? Let's examine some scenarios. Let us assume that “good collateral” such as U.S. Treasuries in the hands of the market is  $x$  trillion—i.e., the market can slice and dice a 10-year U.S. Treasury into three month or one week repo, etc. Some of these bonds are reused but most of them (about 80–85 percent) are parked either with central banks, sovereign wealth funds, insurers and pension funds etc.<sup>11</sup> For simplicity, assume that the rest of the outstanding U.S. Treasuries are with the Fed; because of constraints like RRP, those U.S. Treasuries will not be accessible fully by the market. Furthermore, regulatory proposals such as the liquidity ratio or no rehypothecation of initial margins in OTC derivative contracts, are leading to a higher demand for good collateral.<sup>12</sup>

The liftoff can take place in two ways. In the *first* route, if RRP is sizable, enough money (or excess reserves in the financial system) will be drained primarily from nonbanks; this would make collateral in market domain less expensive (relative to money) and will raise the GC rate (Figure 4). Intuitively, the FF is the price of money, and GC is the price of collateral (when plumbing works). In normal times, (e.g., pre-Lehman), the two rates were broadly aligned. When the Fed lifts-off the FF target rate move has to be passed on to other short-term rates; hence, the need for FF and GC to move in tandem.

As shown in Figure 4, if the FF target rate was  $B$ , GC rate will equate FF rate by targeted draining via RRP, while keeping the collateral in market's domain unchanged at  $x$  trillion; however both FF and GC will depend on actions by the Fed.<sup>13</sup>

Note that repo curve shows the rate at which money is lent for given collateral (and tenor). Thus the more scarce the collateral, lower will be the repo rate—thus the bold repo line is downward sloping.<sup>14</sup> The money curve is upward sloping and depicts lower interest rates when money is not scarce (bold line), and higher interest rates when money is scarce (dotted line).

So if money is absorbed directly to the Fed's balance sheet, the market has less money relative to collateral, since market's holding of collateral (i.e., ownership and possession) remains at  $x$  trillion; collateral rate will be pushed up by market forces.

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<sup>11</sup> Hedge Funds and dealer banks actively reuse collateral. Some central banks, SWFs, pension funds (especially in the U.S.) will lend their securities to augment return.

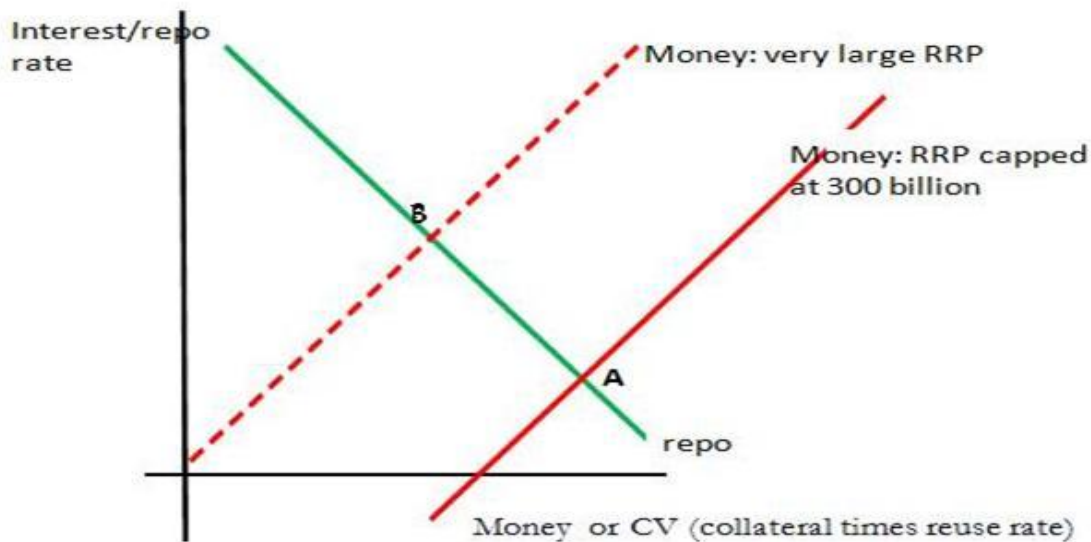
<sup>12</sup> The term good collateral is synonymous with high quality liquid assets (HQLA) in the regulatory parlance. These are generally AAA/AA securities such as U.S. Treasuries, German Bunds, French Oats, etc.

<sup>13</sup> In this case GC will be a fiat rate and not a market rate.

<sup>14</sup> Thus, if repo rates are negative (like some German bonds in recent times), the money provider is willing to lend money at negative rate for the Bunds.

In other words, the inward move in the money curve (from the bold line to the dotted line) is a reflection of the fact that implies that the bilateral pledged collateral market becomes illiquid as money moves to the Fed balance sheet and deprives the bank/nonbank nexus of the means to do the plumbing. This in turn reduces demand for collateral from (i) hedge funds who need financing; or (ii) other collateral suppliers who want to augment returns on their securities via securities lending activities by pledging collateral.

Figure 4. Large Reverse Repo Program (RRP) and Shifts in Money Curve



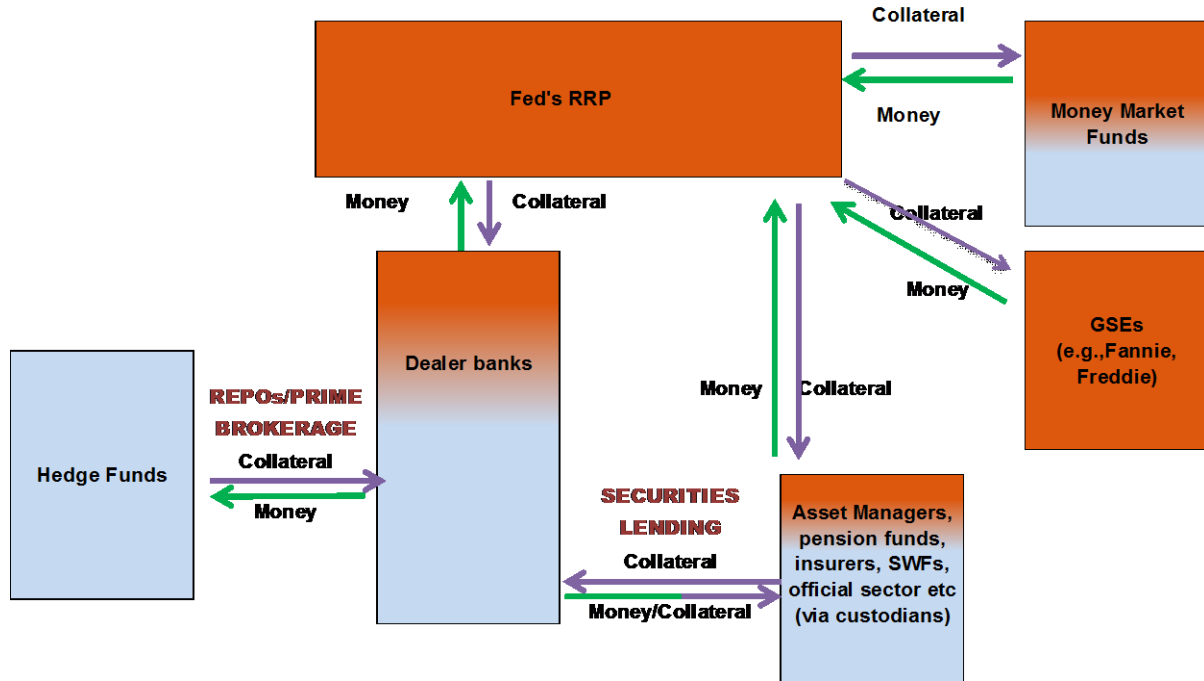
Source: Author's estimates.

With a large RRP, say if the Fed takes money from Fannie/Freddie and the money market mutual funds (MMMFs), then those nonbanks will withdraw money from the dealer-banks. The dealer banks will in turn return the U.S. Treasuries and agency mortgage backed securities (MBS) back to the securities-lenders in exchange for corporates/equities (that securities lenders swapped to enhance returns). The dealer banks will also give back securities to the hedge funds, or real-estate investment trusts (REITs), as banks will not have funding from the money pools. This implies that the cost of funding long positions for non-dealers like hedge funds in the bilateral pledged collateral market will go up, and the demand for (and price of) securities will go down. As a result, the value of the Fed assets will fall—whether Fed sells them, or does a large RRP.

Figure 5 depicts the bilateral plumbing that is exhibited as blue (and partially blue) boxes corresponding to the various financial agents. The figure depicts the exchange of money (shown by green arrows) for collateral (shown by purple arrows) among the financial agents. The impact of the Fed's RRP is represented by the red coloring of some of the boxes. The red replaces part of the blue boxes that denote the market's bilateral plumbing components. Without the RRP, there would be no red color and all boxes would be blue. The market

would do all the plumbing and would price the rate at which money and collateral are exchanged (typically via repo, securities lending, prime brokerage, and derivative activities).

Figure 5. The New Plumbing: Large RRP and Rusting of the Plumbing



Source: Author's illustration.

Also note that the horizontal axis of Figures 4 and 6 are labeled M (money) or CV (collateral x velocity). This is because the Fed's RRP only can exchange money (M) and collateral (C) on a one to one basis. However U.S. Treasury sales to the market can do M: CV where  $V \neq 1$  (and the average velocity so far has been  $> 1$ ).<sup>15</sup>

The *second* route to undertake the liftoff would be for the Fed to sell U.S. Treasuries to the market.<sup>16</sup> This would increase the collateral in the market domain. In this scenario, will the GC rate move in line with the Fed Funds rate? Collateral in possession of the market has a reuse rate (that is not in Fed's control) so the GC rate may not coincide with FF rate (Figure 6). However controlled selling can be used to ensure that the GC rate is close to FF rate. Unlike a large RRP, sales of \$100 million U.S. Treasury can release effectively more than \$100 million in collateral depending of the reuse rate (around two presently, from about three in 2007).

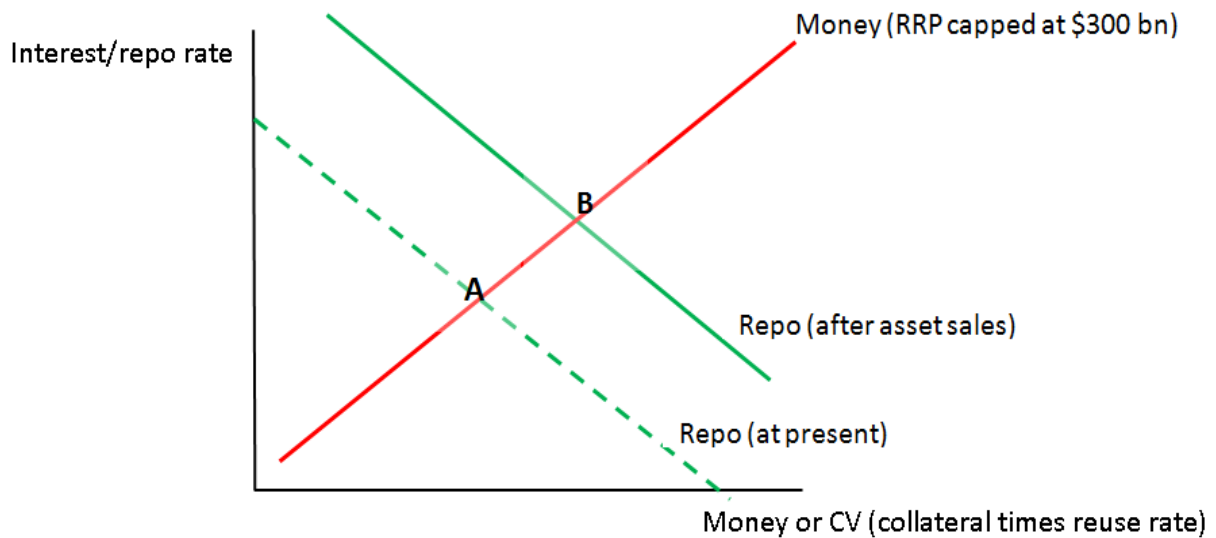
<sup>15</sup> Average collateral velocity calculated by Singh (2011; 2013) from annual reports of the key banks may not equal *marginal* collateral velocity as proposed regulations will result in more silo-ing of good collateral.

<sup>16</sup> Assuming MBS sell-off adversely impacts the housing market (in line with recent Fed speeches and minutes).

We can look at the second scenario from another perspective: If Fed sells U.S. Treasuries, nonbanks would withdraw deposits from banks to purchase Treasuries from the Fed (i.e., the reverse of Fed's asset purchase program). In this scenario, banks, that are carrying constant dealer inventory due to the new regulation, will also get balance sheet space. Thus banks should be at least indifferent—in the context of balance sheet space—to Fed's asset sales or a large RRP (see Box 2 for demand for high quality collateral). However, some of the large global banks, that are the primary conduits for plumbing in the global markets, would prefer asset sales as it does not rust plumbing relative to a large RRP scenario.

In summary, the Fed can reach its monetary policy liftoff objectives with minimal footprint on plumbing—in fact the plumbing would provide useful information on key short-term rates like the GC rate.<sup>17</sup> In this scenario, GC will be a market rate; the plumbing does not get rusted by a large RRP. Under this modality, sales of \$100 million of U.S. Treasuries will release effective collateral that will be a multiple of \$100 million; the multiple will be a function of collateral needs stemming from regulations, duration of bonds sold, etc.

Figure 6. Asset Sales and No Change in Size of Reverse Repo Program (RRP)



Source: Authors illustration.

<sup>17</sup> Here it is useful to make the distinction between *ownership* and *possession*. The Fed will be careful to let the market have possession of these securities that is in market's domain—as collateral since reuse rate will be an exogenous variable. However, the Fed's mandate is about monetary policy liftoff and Fed Funds rate, and not about cushioning duration related volatility at the long-end of the U.S. Treasury curve. In this context, it would be useful for Fed to be cognizant of collateral reuse rate in the bilateral pledged collateral market along with other money metrics to gauge the short-term rate environment.

### Box 2. Demand for High Quality Liquid Assets

This box highlights that the demand for high quality liquid assets (HQLA) stemming from regulations is substitutable between banks and nonbanks. Furthermore, in the aftermath of quantitative easing, monetary policy tools such as RRP will impact the plumbing and thus reshuffle HQLA between the needs of the banks and nonbanks.

At present, the banks' demand for RRP is negligible as reservation price is much higher than the 3–5 bps offered by the RRP (i.e., banks receive interest on excess reserves of 25 bps for their own funds, or around 5–15 bps via client's funds after split with client and netting for FDIC fee—in fact foreign banks who are exempt from FDIC fee are the most active in this market). The current RRP rate is a non-market price that set a floor that prevents the repo rates from going below zero. The Fed has designed the RRP as a temporary tool, and the present cap of \$300 billion is sufficient to meet the demand from nonbanks (see Annex 1, right hand side axis). More importantly, banks continue to provide liquid collateral (or HQLA) via the financial plumbing (e.g., repos, securities lending, etc.) by making a market between various nonbanks (e.g., hedge funds with collateral and MMMFs with money). Box 1 shows that the bilateral plumbing is presently estimated at \$6 trillion (end-2014), down from pre-crisis level of \$10 trillion.

For example, from a regulatory angle, the liquidity coverage ratio and leverage ratio is designed to ensure that financial institutions have access to the amount of high quality liquid assets (HQLA) like cash, Treasuries, etc., on hand to ride out short-term liquidity disruptions. From the lens of monetary policy and the RRP, the T accounts below provide a stylized summary of how a large RRP at \$1.3 trillion, beyond the present \$300 billion cap, would look like. In this scenario, the demand for HQLA from banks will decline as nonbanks withdraw deposits from banks and increase their position in the Fed's RRP. In other words, there is substitution between nonbank and bank demand for HQLA.

Federal Reserve		Nonbanks		Banks	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	Excess Reserves ↓ \$ 1.3 trillion	Deposits with Banks \$ 1.3 trillion ↓		HQLA \$ 1.3 trillion ↓	Deposits of Nonbanks \$ 1.3 trillion ↓
No change	RRP with Non-Bank ↑ \$ 1.3 trillion	RRP with Fed \$ 1.3 trillion ↑		other non-HQLA (balance sheet shrinks)	Equity demand for HQLA decreases)

Market sources that continue to ask for a large RRP should note that RRP is a monetary tool for lift off (and not a conduit to supply safe assets). The size of RRP does not change the Fed balance sheet but the plumbing between banks/nonbanks will be rusted in favor of a larger Fed footprint (Figure 5 in main text). Since a deep and liquid plumbing market provides pass-through price signals (like the GC rate), it remains unclear why RRP's size (i.e., quantity) should be expanded to include more counterparties and/or increase the individual caps for the present 165 eligible counterparties.

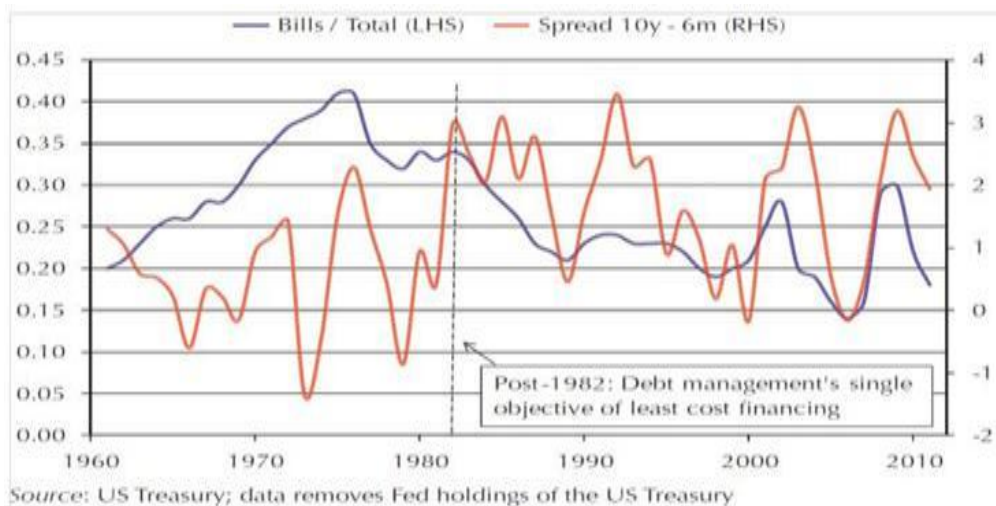
Collateral reuse encompasses aspects of the use of collateral that are different from what the academic literature calls “moneyness.” These aspects include (a) acceptability to counterparties; (b) ease of use—how likely is it to suddenly become special, how much is floating around, and (c) how volatile is the price (i.e., frequency of posting margins).

Everyone will accept short term T-bills for everything, but not everyone will accept long bonds—so T-bills will be preferred to bonds on (a). A collateral possessor will have to replace the one week T-bill every week, but renewing a maturing security entails a larger and more costly operation than a non-maturing security—long tenor bonds are preferred on metric (b). Long bonds will face a margin call at least once a week, but not bills: so bills win again on metric (c). Thus, a bill or short coupon with 6 months to 2 years to maturity is a “sweet” spot where everyone will accept it and it's easiest to deal with. The next security in high demand will be 2–5 year notes, then longer notes (up to 10 years), then shorter bills, and then longer tenor bonds (over 10 years). Such collateral, generally speaking, contributes most to collateral velocity (and the overall plumbing of the financial system). Good collateral such as U.S. Treasuries also incentivizes reuse of other non-so-desirable collateral since most collateral in the bilateral plumbing market is exchanged (for money) as a portfolio of securities, and not as individual securities.

## V. SHORTAGE OF SAFE ASSETS—SHOULD THE FED HELP?

Before 1982, the U.S. Treasury issued debt on a “tactical” basis without following a predictable pattern. This often caught investors off guard and had an adverse impact on debt markets. For example, in the early 1960s, the Treasury issued debt every quarter to retire maturing debt. Maturities were selected after surveying market participants’ demand for various tenors. Treasury issuance at that time also was influenced by the desire to increase short-term interest rates to keep the U.S. dollar within the Bretton Woods regime. During the 1970s, the large fiscal deficits resulted in substantially larger tactical offerings, which disrupted the market. Prior to 1982, there was no discernible relationship between issuance of U.S. T-bills relative to total debt issuance and the cost of long-term/short-term funding (see Garbade (2007)). Since 1982, issuance of U.S. debt became “regular and predictable” and at least-cost; in fact the correlation between the ratio of U.S. T-bills/total debt issuance and the relevant funding costs is above 0.6 (see Figure 7; also Singh and Stella, 2012).

Figure 7. U.S. Treasury Issuance Since 1960s and Structural-Break in 1982



During the early 2000s, when the 30-year bond was discontinued due to large and persistent federal budget surpluses, the pension/insurers managed their portfolios that demand long tenor bonds for duration. In other words, for over three decades, Treasury's debt issuance costs have been mindful of the associated pricing in the U.S. Treasury curve market.

Following Lehman, the supply of safe assets changed. For example, in 2012, under the rubric of monetary policy, short-term debt was supplied via "Operation Twist" (when intra-day repo rates went negative). Although some studies have argued that there is a need to increase supply of "safe assets", the models used to reach this conclusion tend to ignore the re-use rate of safe assets. (e.g., Gourinchas and Jeanne, 2012). In fact, it is quite possible to increase the supply of safe asset by increasing the re-use rate:

$$\text{Demand} = \text{Supply} * \text{re-use rate}$$

One way to make the case for a higher re-use rate is the following: is there a case for the U.S. to supply new debt for a public good reason? What is the role of the trillions of U.S. dollars in "good collateral" that are never re-used (i.e., zero velocity) because they are mostly parked with custodians/central banks/insurers/pension funds etc? Furthermore, two-thirds of U.S. Treasuries outstanding are held by a "rest of the world." Emerging market countries are generally not aggressive in re-using their good collateral holdings relative to say U.S. Treasury holdings by the Reserve Bank of Australia. In summary, safe assets should be genuinely supplied to market with *ownership* and *possession* that allows making a market in these assets to (a) get a market rate; and (b) not rust the plumbing.

The RRP rate during liftoff and in a rising rate environment is likely to be higher than the present 5 bps; this is more expensive relative to the cost of issuing short tenor T-bills (Stella, 2015; Duffee 1996) that are presently near zero for the shortest tenor. Thus, aside from the plumbing aspects of collateral, should RRP— a temporary monetary policy tool—be considered as a conduit to issue safe assets? Even if financial stability argument for the supply of HQLA gets traction, another constraint to a large RRP may be the lower issuance cost of T-bills (relative to the cost of RRP) in a rising rate environment.

Also, a large RRP would be orthogonal to proposed regulations from 2016 that will require prime MMMFs to maintain a floating NAV (net asset value).<sup>18</sup>

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<sup>18</sup> In line with regulatory intent, the push towards a floating NAV is resulting in deposits moving to banks away from MMMFs, as RRP is capped at \$300 billion. On the other hand, a large RRP will result in a larger "put" from the Fed to MMMFs, and less deposits at banks (and thus "more balance sheet space" for banks). Note that government and retail funds will still be allowed to carry the "par NAV" label.



## VI. MONETARY POLICY AND THE NEW FINANCIAL PLUMBING

In recent years, many money and repo rates in the U.S. have been between zero and 25 basis points. As liftoff approaches, the question of the level of these rates (and the markets that determine them) becomes increasingly important.

This paper highlights the financial plumbing connecting bank and nonbank balance sheets, and the changes to those balance sheets stemming in part from proposed regulations such as the leverage ratio and liquidity coverage ratio. Central banks were not cemented to pre-existing conditions where they were forced to act as a dealer-of-last resort to avoid market meltdown. Monetary policy is about facilitating output and price stability. The financial system in the U.S. is in private hands and central banks need to create conditions and incentives under which markets can operate. The U.S. Fed's exit from the prolonged period of low interest rates and expanding balance sheet needs to be mindful of disruptions to the financial plumbing that has been impacted by asset purchases and other unconventional practices. In this context the paper argues that a well functioning market plumbing is useful to extract market signals and should not be compromised.

Market signals such as repo rates are crucial to understand since these have traditionally guided the policy rate (i.e., the FF rate). If Fed increases its footprint on the market plumbing, market signals will be weaker and may result in reduced correlation between the policy rate and other short-term rates (e.g., GC rate). A normal liftoff assumes that all short term rates will move in line with the policy rate; otherwise monetary policy transmission may be compromised. Specifically, the existence of a larger RRP will reduce market signals, rust the normal market plumbing as money moves to the Fed balance sheet, and keeps the Fed's footprint in plumbing for a long time. After liftoff, the FF and GC rates need to move together for monetary policy transmission. In the aftermath of Fed's asset purchases that has withdrawn good collateral from the market, the paper argues for asset sales by the Fed to lubricate the plumbing and increase the collateral re-use rate.

Furthermore, there is also apparently no obligation on the part of either the Fed or U.S. Treasury to supply safe assets under the monetary policy "rubric" at higher cost than warranted. Coordination with Treasury on debt issuance will be useful.

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## Annex I. Some Key Rates Between Zero and 25 Basis Points

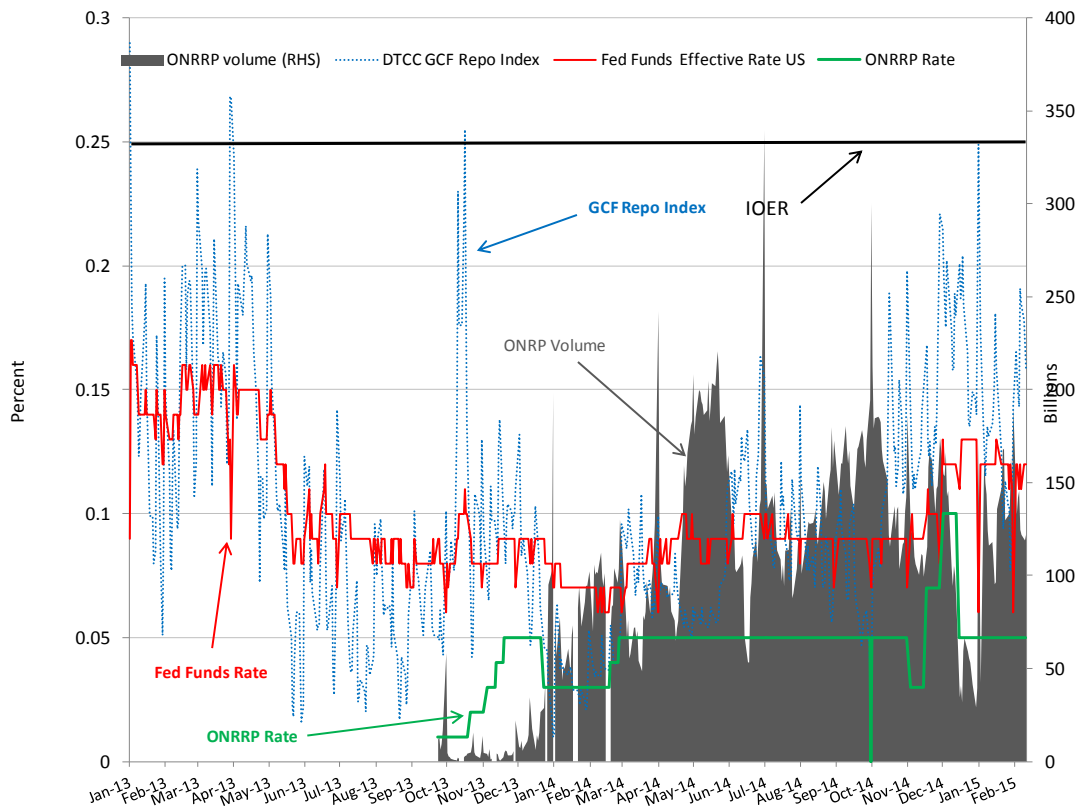
**Left-hand side axis measures four rates that are regularly discussed in Fed speeches and FOMC minutes:**

- ONRRP, or overnight reverse repo program, rate (green line), presently capped at 5 bps (basis points).
- IOER, or interest on excess reserves, rate (bold black line) at 25 bps, available to banks only.
- GCF or general collateral finance, repo index or repo rate (dotted blue line) that approximates the collateral rate in the market when the financial plumbing is normal.
- FF or federal funds, effective rate (red line), or policy rate target of the Fed.

**Right hand side axis measures volume in the RRP market:**

The volume (in billions of U.S. dollars) reflects the highest bids accepted by the Fed via Dutch auction. Aside from quarterly-end demand, the RRP cap of \$300 billion has been adequate.

Figure 8. Relevant Rates and Volumes Between Zero and 25 Basis Points



Source: DTCC, Fed, Bloomberg.