



WP/14/111

IMF Working Paper

Financial Plumbing and Monetary Policy

Manmohan Singh

IMF Working Paper

Research Department

Financial Plumbing and Monetary Policy

Prepared by Manmohan Singh

Authorized for distribution by Stijn Claessens

June 2014

This Working Paper should not be reported as representing the views of the IMF.

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

Abstract

This paper focuses on how changes in financial plumbing of the markets may impact the monetary policy options as central banks contemplate lift off from zero lower bound (ZLB). Under the proposed regulations, banks will face leverage ratio constraints. As a result of quantitative easing (QE), banks want balance sheet “space” for financial intermediation/ non-depository activities. At the same time, regulatory changes are boosting demand for high quality liquid assets. The paper also discusses the role of repo markets and the importance of collateral velocity and the need to avoid wedges between repo and monetary policy rates when leaving ZLB.

JEL Classification Numbers: G21;G28;F33;K22;G18;G15

Keywords: quantitative easing; collateral velocity; Federal Reserve; monetary policy; repo rate

Author’s E-Mail Address: msingh@imf.org

¹ The author would like to thank Stijn Claessens, Karl Habermeier and several colleagues at the IMF for their input. The paper has benefitted from discussion with market participants. Earlier version(s) were presented in Brussels (Euroclear’s Central Bank Workshop and ICMA’s Repo Conference) and at AIMA’s conference in New York.

Contents	Page
I. Introduction.....	3
II. The Financial Plumbing—Example from U.S. Federal Reserve.....	5
III. Marginal Rate of Substitution in Repo Markets.....	10
IV. Monetary Policy and the New Financial Plumbing.....	12
V. Conclusion	17
 Table	
1. Balance Sheet Impact: Reserves at Fed vs. RRP rate.....	12
2. A Summary of Rates.....	13
 Figures	
1. "Reserves" Drainage vs. "Accounting" Drainage.....	6
2a. U.S. Rates: IOER, RRP Floor and GC Repo (Tri-Party).....	8
2b. Eurozone Deposit and Repo Rates.....	9
2c. Bank of England Bank Rate and Repo Rate	9
3. The Financial Plumbing (before RRP)	11
4. The New Financial Plumbing--An Illustration	14
 Boxes	
1. Bilateral Repo Markets—Some Estimates.....	4
2. General Collateral Rate.....	7
3. Scenario with RRP rate as the Policy Rate	13

I. INTRODUCTION

Increasingly, researchers are focusing on the connection between financial stability and monetary policy. In a February 2014 paper on “Market Tantrums and Monetary Policy,” Feroli et al., show that although financial stability proposals may succeed in limiting leverage, even unlevered positions may impact monetary policy decisions. Subsequently, a recent speech by Fed’s Jeremy Stein discusses how too much monetary accommodation that result in low risk premium on U.S. Treasuries can lead to financial market vulnerabilities that may compromise Fed’s ability to achieve its mandated objectives.² Both these papers focus on Money Market Funds and U.S. Treasury yields but not on the financial plumbing connecting bank and nonbank balance sheets or the changes to those balance sheets stemming in part from proposed regulations. Nor do they focus on the reshuffling of the bank/nonbank nexus due to Fed’s increasing role to intermediate the plumbing.

The critical pieces of the plumbing are the repo markets and the bank deposit market. The U.S. bilateral repo market is a *market for collateral*: securities for possession and use, (incidentally against cash). The Tri-party repo (TPR) market in the U.S. is a *market for funding*: money for broker dealers/banks (incidentally collateralized by securities). The TPR market is currently estimated at US\$1.8 trillion from a peak of almost US\$3 trillion before the Lehman crisis.

The bilateral market is sizable and although no official statistics exist, some recent work by the New York Fed (Copeland et al, 2012) indicate a market over US\$1 trillion.³ If collateral reuse in the bilateral repo market is included, this market may be around US\$ 2 trillion–3 trillion, and larger than the TPR (see Box 1, and Singh 2013a). As background, QE led to sizable nonbank deposits on bank balance sheets as a consequence of nonbanks sale of UST and MBS to the Fed (Carpenter et al, 2013).

This paper highlights some salient aspects of the bilateral repo market relative to the U.S. TPR market that suggests that—similar to pre-Lehman’s crisis—monetary policy rates will need to be aligned to the repo markets (i.e., bilateral and TPR). Section II focuses on what the regulatory/financial plumbing nexus will entail for repo rates going forward. Section III discusses the marginal rate of substitution between bilateral repo and TPR markets and how such substitution can impact collateral velocity (or, the re-use of collateral). Section IV illustrates the increasing nexus between financial plumbing and monetary policy. Section V concludes that going forward central banks active in QE may become as focused on monitoring the drainage of reserves (e.g. high quality liquid assets) relative to money metrics when they liftoff from ZLB.

² Incorporating Financial Stability Considerations into a Monetary Policy Framework, Board of Governors of the Federal Reserve System, March 21, 2014.

³ <http://libertystreeteconomics.newyorkfed.org/2012/06/mapping-and-sizing-the-us-repo-market.html>

Also, via Governor Tarullo (speech, November 22, 2013): “The banks and broker dealers, in turn, use reverse repo to provide more than \$1 trillion in financing to prime brokerage and other clients.”

Box 1. Bilateral Repo Markets—Some Estimates

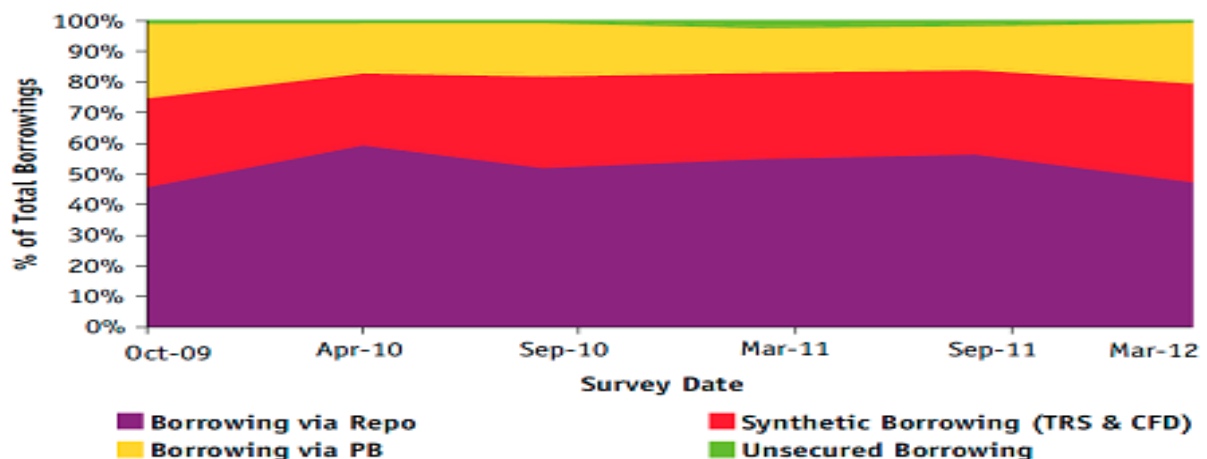
Hedge Funds (HF) largely finance their positions by either (i) pledging collateral to prime brokers (PB) to borrow money, or (ii) repurchase agreements (or repo) with either their PB or another dealer where the repo their collateral for funding. This box estimates the repo financing by HF with the key banks active in collateral markets, as of end-2007 and end-2013.

To estimate repo related collateral from HF for 2007, we take the assets under management (AUM) of \$2 trillion and the 27 percent share of strategies that would use repo (i.e., primarily non-equity related strategies). Aggregate leverage is higher in fixed income, global macro strategies that are funded via repo relative to equity type strategies. Using the aggregate leverage of 4 (source FSA hedge fund surveys, United Kingdom), this would imply that approx US\$540 billion times four or, US\$2.2 trillion pledged collateral could have gone to the banks. However, about 60–70 percent of the strategies are hedged simultaneously so only one-third of US\$2.2 trillion could reach the banks that can be re-pledged onwards—i.e., US\$750 billion pledged collateral that came to the banks could be re-used onwards as of end-2007.

On the 60–70 percent threshold assumption—at the bottom of the rate cycle, there is more hedging so this threshold is higher when compared to top of the rate cycle. In other words, the threshold prior to Lehman’s demise maybe closer to 60 percent and thus more pledged collateral available (i.e., less simultaneous hedging) to the dealers. Present times are close to the bottom of the rate cycle; so threshold may now be over 70 percent (i.e., more simultaneous hedging) and thus, less pledged collateral for reuse passes to the dealers. Doing similar arithmetic for end-2013, with aggregate leverage, including derivative use, lower at 3.5 (relative to end-2007) but AUM much higher at US\$2.6 trillion, and share of HF strategies using repo also higher (around 40 percent) relative to 2007, would put the estimate at US\$900 billion (adjusted downward due to the higher threshold for hedging due to the bottom rate cycle). With collateral reuse factor between 2 and 3 (largely due to inter-dealer collateral moves that link the supply/demand collateral chain), the size of the bilateral global repo market is at par or larger than the TPR in the U.S. [although HFs play a dominant role in bilateral repo, dealers also use collateral from primary issuance to cover shorts in their repo inventory].

To be technical, if about two-third strategies are hedged, the collateral from the remaining one-third may not all be reused/turned to cash by the banks—it depends on their balance sheet space and this issue is getting more traction as proposed regulations will take affect going forward. Also, banks can be very different with UBS bank curtailing balance sheet activities in pledged collateral area while others trying to enter this market.

Source of Hedge Fund Borrowings



Source: FSA HFS

II. THE FINANCIAL PLUMBING—EXAMPLE FROM U.S. FEDERAL RESERVE

As background, QE has greatly increased banks' holding of reserve balances at the Federal Reserve. As the Fed purchased high quality liquid assets (HQLA) for most of QE from nonbanks, nonbank assets were converted to deposit liabilities at banks with a corresponding bank asset of reserves at the Fed. In other words, QE converted good collateral in the market to excess balance sheet at banks. To the extent that banks face leverage ratio constraints as a result of QE, they want balance sheet “space” for higher return financial intermediation/non-depository activities.

Last September, the Fed started a trial program “testing” a repo rate floor via the RRP. In fact even with 25 bps rate (IOER) for banks that pulls repo rates up, Fed “put” a 3 bps to 5 bps floor. This leads to an asymmetry in distribution to the savers in the real economy and benefits short-term investors. RRP helps provide that balance sheet “space”, because the Fed deals with a wider group of institutions, allowing nonbank assets to sit directly on the liability side of the Fed's balance sheet. At the same time, regulatory changes are boosting demand for HQLA. The discussion below focuses on financial plumbing and possible wedges between rates in the Triparty repo and bilateral repo markets.

Interest on excess reserves (IOER) is currently paid at a rate of 25bps. The Fed's reverse repo program currently pays interest at a rate of up to 5 bps. The idea of eliminating the present wedge between Fed's reverse repo program (RRP) floor and the IOER and making RRP full allotment is intriguing because such a change would only allow the Fed to set the price on such operation (P), and would leave the market to determine the quantity of reserves (Q) on Fed's balance sheet ([Gagnon/Sack proposal](#)). Focusing on the liability side of the Fed's balance sheet, for every US\$100 million of reverse repos, the line item RRP on the liability side of Fed's balance sheet will go up by US\$100 million dollars and bank excess reserves, also on liability side, will go down by US\$100 million dollars. The Fed's total balance sheet is unchanged.

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 TPR system of JPM Chase or BNY Mellon could have as an asset a Fed RRP and as a liability a TPR with a customer). Members of the Government Securities Division (GSD) of DTCC can reuse the collateral within the GCF (general collateral finance) Triparty system. So Citi could take collateral from the Fed and give to Fidelity or Citi could take collateral from the Fed and give in GCF to Credit Suisse to give to Fidelity. To be clear, “banks” is loose terminology since 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. But reuse can only end in a Triparty repo, no other use. Of the counterparties the Fed has taken on, only the 'banks' take on Triparty repo liabilities.

The “released” collateral remains as asset on the Fed's balance sheet and within the Triparty system (hence, “capped rehypothecation”—see Figure 1). In other words even if bids for RRP were uncapped, collateral will be contained and not freely available to the financial

system.⁴ 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.⁵ In general, *securities in the market's possession are reused and have velocity; those remaining at the central bank do not.*

Figure 1. “Reserves” Drainage vs. “Accounting” Drainage

a. Non-Banks Use of Reverse Repo Program (RRP) with Fed		b. Banks Use of Reverse Repo Program (RRP) with Fed	
Federal Reserve		Federal Reserve	
Assets	Liabilities	Assets	Liabilities
	Excess		Excess
	↓ 100 Million		↓ 100 Million
	RRP		RRP (if term RRP, rehypothecation may add to collateral velocity)
	↑ 100 Million		↑ 100 Million

The bilateral repo market in the U.S. that is the core of the bank/nonbank nexus is outside the Triparty framework. In a recent speech, Fed Governor Tarullo [mentioned](#) the size of the bilateral repo market at US\$1 trillion, which presumably would be higher if the velocity of collateral is factored in. The bank balance sheet space opened up by nonbank RRP with the Fed should allow banks to be more active in this market than otherwise, enhancing the link between the Triparty and bilateral repo markets. Demand from the bilateral repo market may entice some banks—if they have balance sheet space (after adjusting for HQLA/leverage ratio/ LCR)—to make a market for certain clients, like pension funds/insurers, that are not eligible for access to RRP but would like to obtain high quality collateral. This demand may lead to banks undertaking collateral transformation (including substitution of their balance sheet collateral with RRP collateral), which is at the core of financial intermediation (Singh, 2013b). Without the Tri-party features associated with Fed’s RRP and given the size of the

⁴ Reserve Bank of Australia’s Committed Liquidity Facility (CLF) allows firms that do not have access to HQLA to remain short of their arithmetic requirement, and pay a penalty in line with their shortfall. Thus, there is no use of RBA balance sheet assets but the penalty provides a promise to receive HQLA during crisis in lieu of sub-HQLA at mark to market prices. However, at present, there is no facility that caters to shortfall stemming to meet good collateral needs for posting at CCPs.

⁵ Central clearinghouse or CCPs must hold immediately available wealth – let’s call that ‘deposits.’ By giving the CCPs direct access to the Fed, those deposits come off the balance sheets of the major banks, freeing up bank capital for more non-depository purposes. This is part of the same ‘short-circuit’ via the Reverse Repo program—the Fed is expanding the universe of deposit-takers that have direct access to its balance sheet.

bilateral repo market, collateral velocity could increase, leading to a wedge between bilateral repo rates and the RRP rate.

As an example, a bank that has surplus money could lend to the Fed, collateralized, under the RRP (assume at 25 bps) or lend to a hedge fund at 30 bps, collateralized. Here the bank/hedge fund bilateral repo rate is above the 25 bps RRP. Alternately, this bank may have surplus HQLA earning 25 bps which could be in demand by a pension fund to post at a CCP. The repo rate between pension fund/bank will not likely be more than 20 bps (perhaps even 10 bps, when factoring the FDIC levy to the bank that increases in line with a larger balance sheet), as the bank takes its “cut.” This wedge around the 25 bps RRP (30 bps to 10 bps) could only be removed if hedge funds could deal with the pension fund directly, disintermediating the banks; but they can’t, and this is where financial intermediation and frictions come in.

Box 2. General Collateral (GC) Rate

What is the GC rate to be precise? This is important as the Fed Funds rate trading volumes have been considerably reduced since the crisis (and this rate largely proxies the cash position of Fannie Freddie and other home loan banks that need access to the IOER via a bank).

If one has *surplus* money and wants to 'deposit' the wealth, then this deposit can go to a bank and receive IOER (less bank’s cut); or go to a money fund and receive RRP rate (adjusted for money fund’s overall return). If one needs to *borrow* wealth to fund the ownership of HQLA, then for a *highly rated* borrower there is access to a money fund to get money at IOER/RRP plus some very tiny risk adjustment (1–2 basis points).

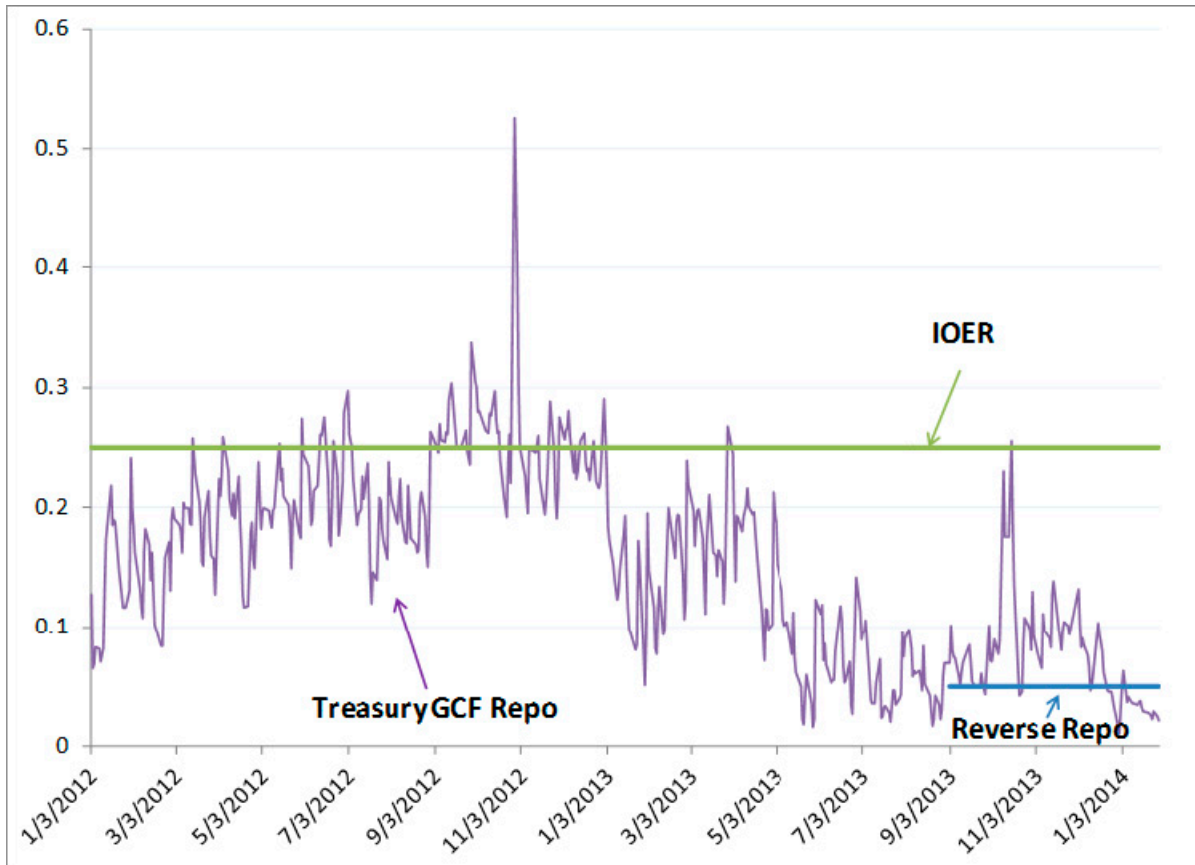
If the borrower is *not highly rated but owns HQLA* (think of a hedge fund or small broker-dealer), then they can borrow money from a bank to fund their HQLA at IOER minus expense (that exceeds that for highly rated borrower). If borrower is *not highly rated and without HQLA*, they will borrow at IOER (plus even higher expense) plus collateral transformation fee, or RRP rate plus collateral transformation with higher fee—relative to borrower with HQLA.

So what, precisely, are we calling the GC rate here? The offer rate that the money fund/bank sees? The bid rate that the high rated borrower sees from the money fund? The bid rate that the unrated borrower sees from the rated borrower? That fuzziness, which is what markets are all about, makes it difficult to set a clear target. For simplicity the GCF (general collateral finance) rate provided by DTCC is used as a benchmark or proxy for the collateral within the Triparty. But there is a lot more in the collateral world of repo than Triparty framework or the TPR rates.^{1/}

^{1/} Think of the bilateral repo market via the analogy for old clothing trade: Typically, merchants in developed countries shrink wrap old clothes in shipping container sized bundles (under pressure) and send the plastic wrapped block to poor countries. There, a clothing broker buys it, and resells it by weight to jobbers. So if the block weighs 500 pounds and they sell it in 10 pound lots, all 50 people gather around. But some people pay slightly more to be at the front of the crowd, and some pay slightly less to be at back. Then the jobber pops the bundle open with a big knife and the shrink wraps literally explodes; everyone gathered around jumps for the best pieces. Collateral desks are a bit like those jobbers. Big lots come in from hedge funds and security lenders, and the large bank’s collateral desk paws through it, searching for gems. Those gems go out *bilateral* to customers who'll pay a premium. The remainders go to the guys in the back of the line (for example, *triparty* repo).

From an international perspective, the ECB did not resort to a floor when repo rates turned negative. Since the ECB cut deposit rate to zero in July 2012, for much of the time, repo rates of good collateral (German Bunds, French Oats) remained below zero. EONIA (the key money market rate) is now in positive territory as excess liquidity declines with LTRO repayments; so good collateral repo rates also move positive. Neither does U.K. provide a floor to repo rates (RONIA); their bank rate, similar to Fed's IOER, is at 50 bps.⁶ [However, Fed provides a floor via RRP].

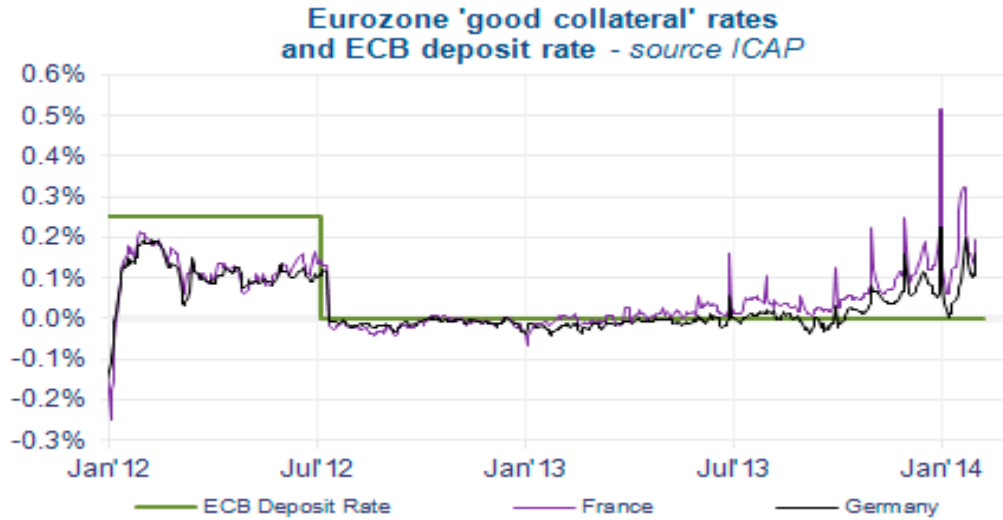
Figure 2a. U.S. Rates: IOER, RRP Floor and GC Repo (Tri-Party)



Source: DTCC and IMF staff estimates.

⁶ RONIA is the Repurchase Overnight Index Average. This index tracks actual market overnight funding rates. Gilt repo rates have not gone negative, excepting December 31, 2013 when a government levy on banks' balance sheets has an unexpected and disorderly impact on funding conditions over the year-turn

Figure 2b. Eurozone Deposit and Repo Rates



Source: ICAP.

Figure 2c. Bank of England Bank Rate and Repo Rate



Source: ICAP.

Before delving into details about the collateral market in Section III (and to be complete), the term deposit facility (TDF) of the Fed allows banks to shift reserve balances to term deposits with the Fed, and might lead to switch of deposits from large banks (e.g., JP Morgan) to small banks (e.g., Suntrust), thereby creating space for the former. The TDF should not have a significant impact on collateral dynamics, and the smaller banks may have the balance sheet capacity to absorb liquidity at rates modestly above 25 bps paid on reserves.

III. MARGINAL RATE OF SUBSTITUTION IN REPO MARKETS

As RRP expands with either larger counterparty limits, or a higher rate, or with more eligible counterparties, this will shift the bilateral repo demand curve inward. This reduces the volume in the bilateral repo market and the marginal rate of substitution—between Tri-party and bilateral repo markets—at any given relative price (see Figure 3 for the nonbank/bank plumbing before RRP).⁷

This can be viewed as part and parcel of the Fed dealing with the supplementary leverage ratio (SLR). For example, Fed's RRP takes the money fund off the bank balance sheet, freeing up the ability (and the HQLA) to provide for example collateral service in support of derivatives. With the other hand, RRP reduces the demand for collateral services and provide bank balance sheet space by taking the central clearinghouse (i.e., CCP) collateral account onto their own liability-side sheet (see footnote 5). At the limit, everything that looks like an immediate draw on wealth, regardless of what creates that need or desire for immediacy, can become a Fed liability without being on a bank balance sheet; in other words, RRP rusts the “old plumbing” between banks and nonbanks shown in Figure 3.

If RRP remains an overnight program, this is not draining of reserves but “accounting drainage.” This will keep collateral velocity muted. In other words, QE created hot potatoes (excess reserves) to use Shin's analogy.⁸ No one wants them as reserves will impact leverage ratio (in the U.S., SLR to be precise). RRP is a way to get rid of hot potatoes, and if this messes up the economics behind the collateral market, so be it.⁹

Here it is useful to make the distinction between ownership and possession. Good collateral has a number of different characteristics (fixed duration, credit-free, liquid, etc.). So these securities can provide many different services (markets can buy 'pure' duration; sell duration short; or transfer possession to provide collateral services, etc.). Some central banks like the Fed have been taking these securities (or good collateral) out of the market for the sound macro reason that they need to take duration out of the economy (the portfolio balance channel), but duration is a function of ownership, not possession. Fed cannot let the ownership of these securities go back to the private market until the economy is strong enough to handle the duration (which is why they leak out slowly). Duration, however, is not the service that the market needs. The economy needs the collateral services that these securities can offer, which transfers with possession, not ownership. By replacing reserves with RRP, the Fed transfers possession back to the market with some velocity (although

⁷ How many institutions are eligible to hold reserve deposits at the Fed, how big do they want their balance sheets to be, how much do they want to hold in short-term assets, and *what are they holding now?* How many institutions are eligible to do reverse repo at the Fed, how big do they want their balance sheets to be, how much do they want to hold in short-term assets, and *what are they holding now?* (Fannie and Freddie are noteworthy here) What's the overlap between the two? It's all about the marginal substitution between one and the other.

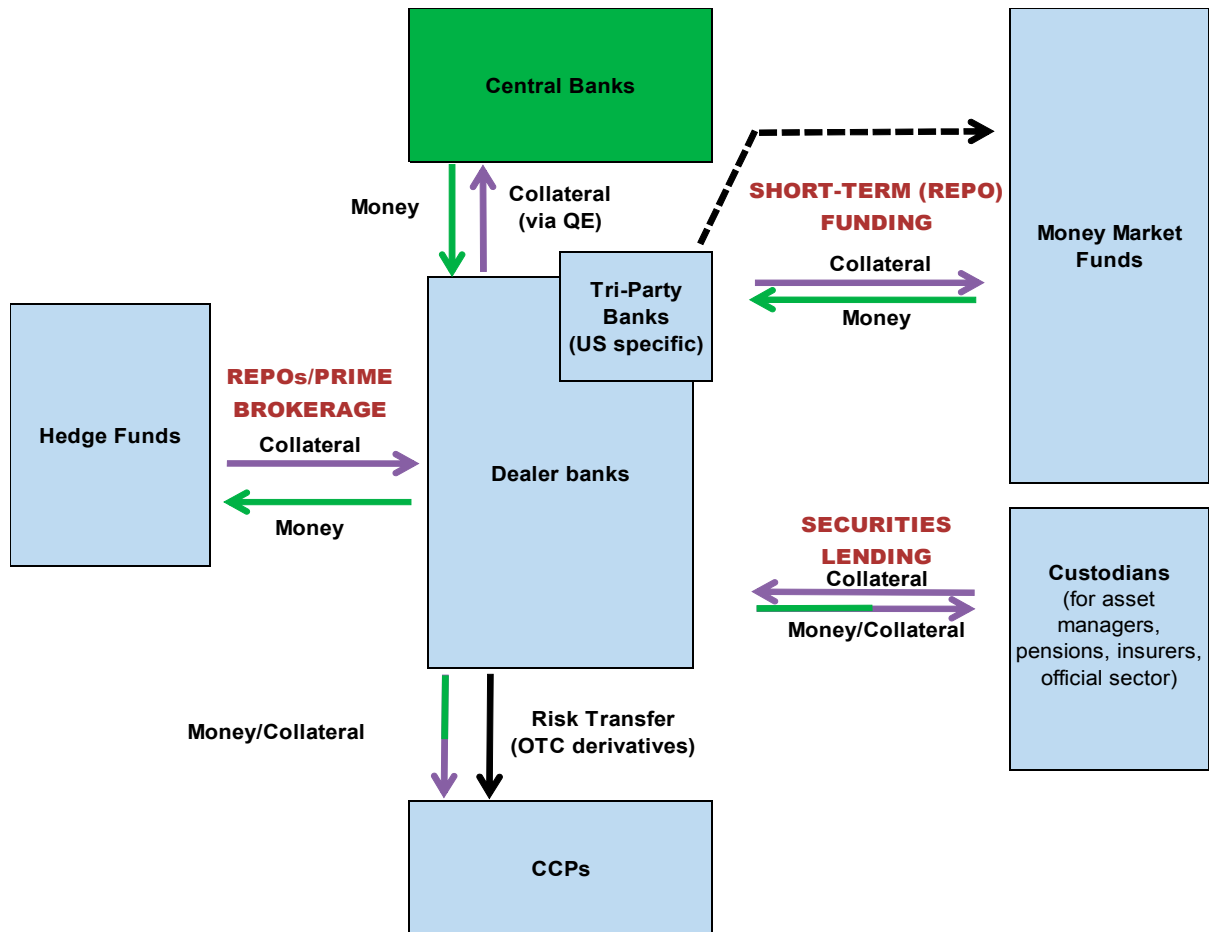
⁸ Shin (2008).

⁹ If RRP moves to longer tenor (e.g., one week, three months or longer), there will be additional collateral velocity generated as banks will have more flexibility of switching RRP into Triparty—see Figure 1.

restricted velocity). Excess reserves do not substitute one-to-one for good collateral and thus there is a net reduction in overall financial lubrication.

Uncapped RRP—as in the Gagnon/Sack proposal— provides principal protection and some return to nonbanks like money funds, GSEs etc, (and more counterparties may be eligible in due course—see Box 3); but not collateral reuse. Banks will also be willing to endorse the RRP since every dollar of RRP that a nonbank does, the bank gets approx a dollar of balance sheet space to do non-depository transactions. This also allows Fed to control collateral velocity in the present overnight RRP framework, *especially if allotment is largely with nonbanks*. [To the extent banks can substitute Triparty collateral by accessing RRP, RRP thus frees up Triparty securities that banks can then use in bilateral market.]

Figure 3. The Financial Plumbing (before RRP)



Source: Singh (2013 a), IMF Working Paper 13/186.

Regulatory Impact on Reserves at the Fed:

Since reserve deposits are now included in the SLR calculation, banks will prefer that the Fed do RRP with their customers rather than take deposits themselves to place at IOER. See illustration in Table 1 below: there are two assets, both with similar credit risk, equal liquidity treatment, Reserves at Fed attract 5 or 6 percent capital, depending on bank size. Both are liquid: the taker of RRP collateral can re-hypothecate the collateral to raise funds, while reserves at the Fed can be delivered as final payment against any obligation.

With sizable use of RRP, the SLR becomes less and less binding on U.S. banks (relative to RWA), as the Fed takes all the low-risk, low-return business out of the banks, so the banks can concentrate on real credit and maturity transformation. (note, SLR is not effective until Jan 1, 2018). The downside is that it will be much more difficult to mobilize society's wealth, as the 'deposit' short-circuits to ground at the Fed. Only wealth without demand for immediacy can be mobilized.

Table 1. Balance Sheet Impact: Reserves at Fed vs. RRP rate

	Reserves included in SLR	RRP
Notional Contract	\$ 1,000,000	\$1,000,000
RoE hurdle rate for a typical Bank	8%-10%	
Leverage Ratio	5%	
Borrow in Fed Funds Market	7 basis points	7 basis points
IOER Rate	25 basis points	bilateral repo market rate > 7 bps
Annual Arbitrage Income	\$ 1,800	
Equity Capital Tied to \$1m Trade	\$ 50,000	No Tied Capital
RoE on Trade (W/ CET1)	3.60%	
	<i>Reserves less than RoE hurdle rate</i>	<i>Return may exceed hurdle rate due to repo netting</i>

Source: IMF staff estimates.

IV. MONETARY POLICY AND THE NEW FINANCIAL PLUMBING:

Monetary policy is not about central banks being cemented to a particular structure of financial plumbing; it is about facilitating output and price stability that provides financial stability. This corresponds to a new (but hypothetical) financial plumbing landscape shown in figure 4. An illustrative scenario of RRP rate as a policy rate is discussed in Box 3. In short, the financial plumbing may have to change in the aftermath of QE to accommodate the (i) "excess" depository market with the money funds, (ii) the demand for collateral/HQLA stemming from proposed regulations, (iii) and the balance sheet cost (or balance sheet space) as excess reserves are included in the SLR. Table 2 summarizes the possible rates discussed in this paper:

Table 2: A Summary of Rates

Rate	Description
IOER	Available to depository institutions <i>only</i> since Oct 1, 2008
Fed Funds	Now, largely the negotiated rate at which nonbanks access IOER available to banks only
RRP	A repo floor; if expanded considerably will rust the market plumbing (figure 3)
GC	GC rate is via the Tri-party repo market and was aligned to Fed Funds rate prior to 2008 crisis. GC rate does not provide any information on bilateral repo market (that may be larger than Tri-party repo market); see box 1 and box 2

Prior to Lehman’s crisis, there was generally a *shortage of reserves* that was met by Fed intervening via repo operations such that the Fed Funds rate was kept aligned with the collateral rate (i.e., GC rate to be specific). In the aftermath of all the QE, *excess reserves* will have an increasing cost to unwind as the Fed lifts off from ZLB to a higher rate. Initially, if RRP is adopted as the policy rate, there will be no market-based collateral rate for the monetary policy to target—they will be the same rate, but may provide the necessary ingredients (but not the ideal solution) for the liftoff from ZLB.

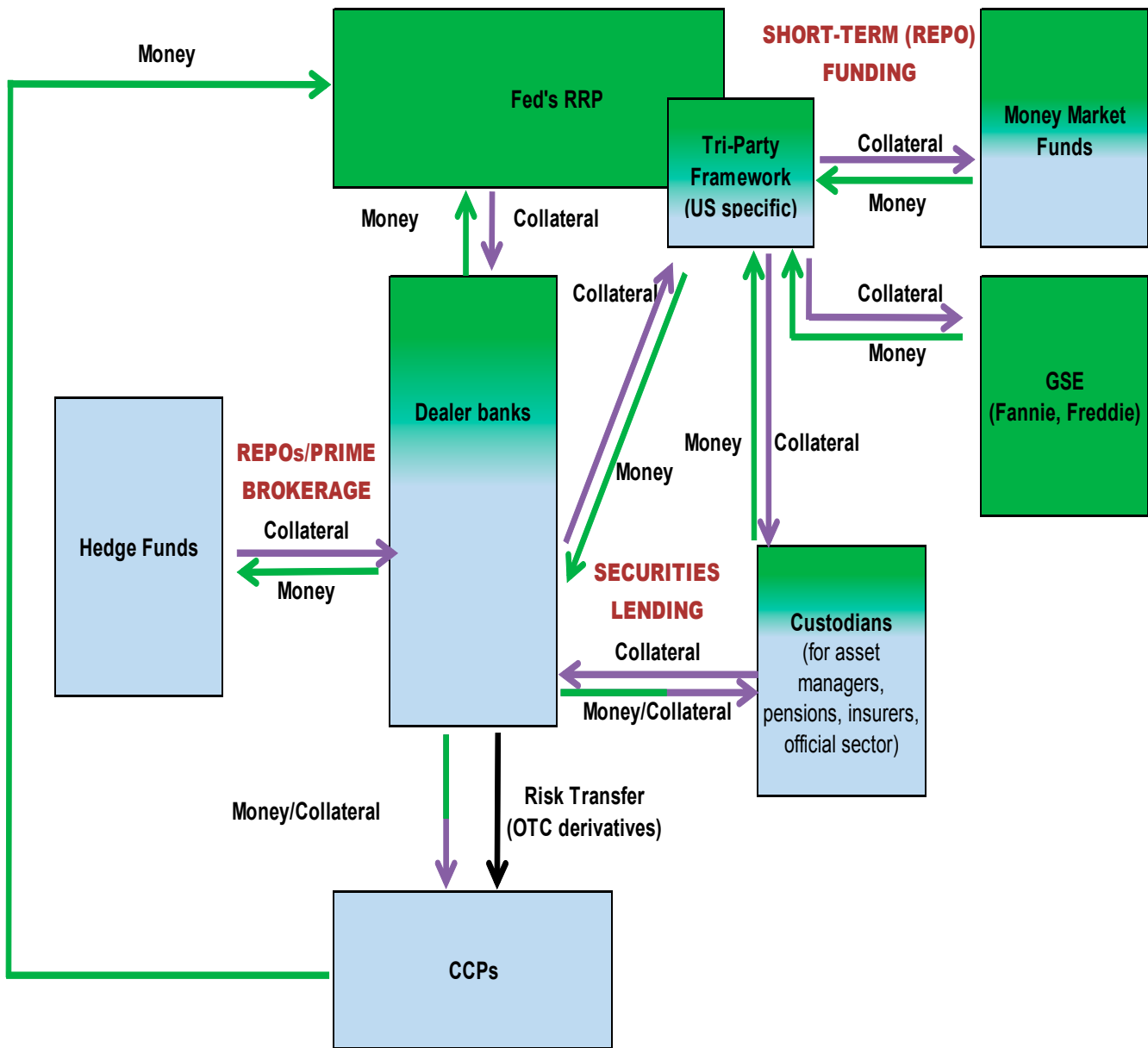
Box 3. Scenario with RRP rate as the Policy Rate

As RRP rate increase, in line with the strength of the economy’s output and inflation constraints, it will cost the Fed more to do reverse repos with the eligible counterparties under the RRP. The increased cost in the new financial plumbing is likely to comprise of higher RRP rates as the economy leaves ZLB towards 25 bps to 50 bps to 75 bps and higher; more eligible counterparties (e.g., asset managers, CCPs etc); and perhaps higher bids (for quantity of collateral) by eligible counterparties. The new landscape will provide principal protection (plus some return) to some counterparties and high quality collateral to others. More importantly from a financial intermediation perspective, as deposits move away from banks they will have the balance sheet space for non-depository activities especially if the lift off from ZLB steepens the U.S. Treasury curve. IOER may become the new floor for those not eligible to bid for the RRP (typically counterparties that are not highly rated) and may increase in line with the increase in RRP. The old plumbing will still exist between hedge funds, dealer banks (and probably security lenders)—see blue boxes in Figure 4.

Until excess reserves are unwound to pre-Lehman level, Fed’s ownership of the QE-related collateral will make it a central player to the new financial plumbing landscape. Since collateral rates and Fed Funds rate were in sync prior to Lehman, RRP allows the collateral rate (*by fiat*) to be in sync to the policy rate, if RRP is also the policy rate. However RRP would not be a clean rate (as the GC rate prior to Lehman’s demise) since the release of collateral under the RRP is not “drainage of reserves” to the market but largely an accounting drainage especially when nonbanks are counterparties (also see Box 2 on limitations on using GC as policy rate). Holding back collateral velocity may be by design to avoid wedges between repo and policy rate, so that repo rates do not front-run policy rate.

Australia, with shortage of HQLA, has also dealt with scarcity of good collateral to meet regulatory requirements. Although different than Fed’s RRP, Reserve Bank of Australia (RBA) has created a CLF (committed liquidity facility) whereby authorized deposit-taking institutions (ADIs) can access RBA for a fee to meet their Basel liquidity coverage ratio requirement.

Figure 4: The New Financial Plumbing—An Illustration



Source: IMF WP 13/186 modified (Singh, 2013 a). This figure assumes that the present Tri-party repo intra-day overdraft will no longer exist.

Deleveraging and the new plumbing:

There is a key difference between selling assets from Fed’s balance sheet to shrink it outright or, rearranging Fed liabilities instead between reserves and other “non-reserves.” Rearranging or passing the Fed’s liabilities from hand to hand to the final investor requires someone’s balance sheet at each step, while selling assets allows those assets to move directly to their final holder. Here is an example: suppose the Fed sells UST/MBS to Goldman Sachs, which sells them to a hedge fund customer, which sells them to Bank of America, which sells them to an insurance company customer. The insurance company balance sheet asset is a substitution of the securities for cash deposit at its bank—for example Bank of America. Bank of America’s liabilities (the insurance company deposit) and assets (the Fed reserve deposit) both go down. It looks like deleveraging in an accounting sense.

If the Fed takes money from Fannie/Freddie and the MMMFs, *the money arteries of the U.S. plumbing*, then such nonbanks will withdraw money from the dealers-banks. The dealer-banks will in turn return the U.S. Treasury and agency MBS back to the sec-lenders in exchange for corporates/equities (that sec-lenders swapped to enhance returns). The dealer-banks will also give back securities to the hedge funds (or REITs), as banks will not have money from the “money arteries”. So cost of funding long positions for non-dealers like hedge funds in the bilateral repo market will go up more than in the GC repo, and demand for (and price of) securities will go down. Thus, the value of the Fed assets falls—whether they sell them, or do reverse repo. The bonds provide several services, including credit-free duration and collateral. Depending on the shape of the duration demand curve, the shape of the collateral demand curve, and the cost to Fed counterparties to intermediate collateral, the price will end up lower. Quantifying the degree to which prices will decline is difficult; if the *marginal price for duration is a levered price, then it could conceivably be more sensitive to collateral services than duration.*

So whether the Fed can re-arrange the balance sheets or not depends on whether the new configuration of balance sheets is acceptable to the participants. Reserve account liabilities require bank balance sheets (or, now, CCP balance sheets for collateral accounts), while RRP liabilities are open to a wider range of market intermediaries. However, selling the asset outright is letting market have possession to use and reuse collateral—but this will increase collateral velocity (and may not be in line with monetary policy lift off from ZLB).¹⁰

V. CONCLUSION

In summary, not knowing the dynamics of links between Triparty/bilateral markets, or demand for money by hedge funds or, demand for collateral by pension/insurers, may lead to wedges that many not be easy to remove. A successful lift off from ZLB should not leave wedges behind. Thus central bank’s exit strategy needs to be mindful of disruptions to the financial plumbing due to the possibility that a sizable (and quick) reduction in reserve balances could lead to wedges between the bilateral repo rate, the GC rate via the Triparty

¹⁰ See New York Times March 21, 2014, [New York Fed Chief Expresses Concern on New Leverage Rule](#)” (and reference to New York Fed President Dudley raising the possibility that the SLR rule could inhibit the Fed’s ability to conduct monetary policy)

repo, and the rate on Fed's RRP operations. Specifically, as balance sheet space is created via RRP, the demand for safe assets from entities *outside* the Triparty system and the potential for non-depository activities of banks should not be underestimated (and neither should the sizable bilateral repo be "rusted" in favor of RRP).¹¹ Going forward, central bank's role may also be focused on drainage of reserves (e.g., high quality liquid assets) along with the money metrics (Dudley, 2014).¹²

¹¹ Interesting, the recent BIS Quarterly (March, 2014) shows that there may have been a US\$1trillion demand for U.S. dollars by non-U.S. banks stemming from swapping euro, yen, sterling. Foreign bank branches held US\$0.96 trillion of the US\$2.25 trillion in reserves at the Fed as of end-2013; or about 43 percent of the total reserves. Foreign bank branches are not levied any FDIC fee on the size of their US balance sheet. Thus foreign bank branches receive 25 bps interest on reserves; U.S. banks receive 25 bps minus FDIC fee (that is proportional to the size of the balance sheet). However, it is not easy to disentangle how such swaps were converted to U.S. dollars and the intermediate steps (or, collateral chains involved).

¹² From Dudley's speech: "*Also, with an exceptionally large balance sheet there will be considerable attention on the methods that the FOMC will likely use in order to exert control over the level of short-term rates.*"

References

- Bank for International Settlements Quarterly Review, 2014, "Non-US banks' claims on the Federal Reserve"—Robert Mcauley and Patrick McGuire.
- Dudley, William, 2014, The Economic Outlook and Implications for Monetary Policy. Remarks before the New York Association for Business Economics, New York City, May 20.
<http://www.newyorkfed.org/newsevents/speeches/2014/dud140520.html>
- Financial Services Authority, U.K. Hedge Fund Surveys (various issues until August, 2012).
- Federal Deposit Insurance Corporation, Summary of Deposits, June 30, 2013.
- Feroli, Michael, Anil K Kashyap, Kermit Schoenholtz, and Hyun Song Shin, 2014, "Market Tantrums and Monetary Policy," February 28. Prepared for the 2014 U.S. Monetary Policy Forum.
- Gagnon, Joseph E, and Brian Sack, 2014, "Monetary Policy with Abundant Liquidity: A New Operating Framework for the Federal Reserve," Peterson Institute of International Economics, Policy Brief # 4-4, January.
- Copeland, Adam, Isaac Davis, Eric LeSueur, and Antoine Martin, 2012, "Mapping and Sizing the U.S. Repo Market," Liberty Street Economics, New York Fed, June 25.
- Shin, Hyun S., 2008, "Securitization and Financial Stability," Economics Journal, Warwick, 18th March.
- Singh, Manmohan, 2011, "Velocity of Pledged Collateral—Policy and Analysis," IMF Working Paper 11/256.
- _____, 2013a, "Collateral and Monetary Policy," IMF Working Paper 13/186.
- _____, 2013b, "The Economics of Shadow Banking," presented at Reserve Bank of Australia's Liquidity and Funding Conference, Sydney, August.
- Stein, Jeremy, 2014, Incorporating Financial Stability Considerations into a Monetary Policy Framework, speech at the International Research Forum on Monetary Policy, Washington, D.C., March 21.
- Tarullo, Daniel K., 2013, "Shadow Banking and Systemic Risk Regulation," At the Americans for Financial Reform and Economic Policy Institute Conference, Washington, D.C., November 22.