

Exiting Well

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Abstract

Central bank operations with government securities do not alter the size of the consolidated sovereign balance sheet. Consequently, any impact stemming from Federal Reserve purchases of US Treasury securities has resulted not from a change in the *size* of sovereign liabilities but from changes in their *composition*. That is, from operations conventionally called “debt management”. Fed purchases of long duration US sovereign debt have been financed with a massive issuance of several “new” short-term interest-bearing Fed instruments, two of which, overnight and term deposits, are available only to banks. These instruments, combined with new legislation aiming to reduce bank leverage and reliance on short term financing, have had the unintended consequence of segmenting and fragmenting the US money market. Replacing the new instruments available only to banks with Treasury bills would allow the Fed to exit better than the FOMC currently plans, and indeed, to exit well.

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I. Introduction

Both the composition and size of the consolidated balance sheet of the Federal Reserve Banks (FRBs) have undergone dramatic changes since 2006². This transformation has witnessed three main phases.

Between end-2006 and prior to the Lehman Brothers insolvency, the Fed provided a significant amount of credit against dodgy collateral. These new lending programs were added without expanding the size of the balance sheet owing to compensating sales of US Treasury securities held by the FRBs. The euphemism in the market for this period was “treasuries for trash”.

The second phase began the third week of September 2008. At that time the Fed provided even more credit against dodgy collateral but ceased sales of Treasuries. Consequently, the liability side of the Fed balance sheet—in the form of bank reserves—was allowed to rise in line with the increased credit provided. The new market euphemism was “cash for trash”.

As financial markets slowly stabilized, Fed lending programs shrank, as they were designed to do, and their place on the balance sheet was taken during the third phase by a more than compensating increase in securities held as a consequence of Large Scale Asset Purchase (LSAP) programs—comprising Fed purchases of US Treasury and Government Sponsored Entity (GSE) guaranteed mortgage backed securities (MBS) and GSE and Agency debt³. LSAPs ended in October 2014.

A fourth phase has recently been initiated. It differs from the previous three in that the *liability* side of the balance sheet will be transformed and restructured while the *asset* side remains largely unchanged. This paper focuses on the fourth phase of the transformation—the liability management phase.

While much has been written about the evolution of the size and composition of the *assets* acquired by central banks during the crisis, comparatively little analysis has been undertaken of the *liabilities* issued to finance those assets and their consequences for financial markets.

Moreover, most analysis to date of the growth of central bank liabilities has had a traditional monetarist tint—focused on the impact of policy on the monetary base, money velocity, the money multiplier and current and future monetary aggregates—all concepts that play little to no role within the modern macroeconomic paradigm⁴. The Fed has never, during the crisis, explicitly aimed to influence the economy through changes in bank reserves.

The remaining analysis has been cursory—frequently expressed in no more than a footnote. Starting from the correct premise that the aim of LSAPs has been to reduce the supply of long duration securities in the market—the argument has been that since “central bank money” (used to purchase assets or fund loans) is zero duration it is not materially different from short term treasury securities and can be

² This balance sheet will be denoted the “Fed” balance sheet elsewhere.

³ For ease of exposition I will refer to these securities simply as “MBS”. MBS constitute the vast bulk of the total.

⁴ See McLeay, Radia and Thomas (2014), Sims (2013), Carpenter and Demiralp (2012), Kydland and Prescott (1990), and Fama (1980), for various perspectives on the demise of the traditional monetarist paradigm.

ignored when assessing the impact of policy on the overall duration of sovereign liabilities⁵. That is, since overnight interest earning deposits at the Fed can be considered “equivalent” to one day Treasury bills, the impact of Fed policy on the overall duration of sovereign debt can be measured by looking at the duration of the securities withdrawn from the market only—since the duration of the liabilities issued to fund the acquired securities is zero.

Although the assumption that bank reserves are equivalent to treasury bills when viewed across the duration dimension is valid, bank reserves differ in a material way from short term treasury securities in that interest-bearing reserves can only be held by banks and must be funded by banks. This difference, combined with crisis-related regulations designed to reduce US bank leverage and dissuade short term financing, has introduced material wedges among US money market rates that heretofore had been insignificant. With banks now holding reserves close to \$ 3 trillion—compared with pre-crisis daily average levels of about \$ 20 billion—and with prospects that the Fed will retain the size of its balance sheet for an extended period, the economic significance of market fragmentation has escalated.

Should the Fed not shrink its balance sheet, it will join the large number of central banks who have been confronted with the challenge of managing a large stock of interest-bearing liabilities for an extended period of time. Those countries who have most successfully met this challenge—Brazil, Israel, Singapore and Mexico—have all adopted solutions that replaced central bank crisis-introduced debt with government debt. That is, they have all harmonized the sovereign domestic debt market by replacing central bank debt with treasury debt in the hands of the market⁶.

This paper will have four sections following this introduction. The first will review the first three phases of the transformation of the Federal Reserve balance sheet and the associated impact on the monetary operations framework. The second will discuss central bank liability management during the exit and its efficacy. The third will explain why a prolonged period of Fed reliance on its new instruments will impose deleterious unintended consequences on the US financial system. The fourth will conclude with suggestions as to how the US Treasury and Fed could reach a superior cooperative solution during the exit from unconventional balance sheet policies. An appendix provides information on how other countries have successfully managed coordinated sovereign liability management solutions.

II. The Three Phases of the Transformation of the Balance Sheet

The Pre-Crisis Balance Sheet

The pre-crisis Fed balance sheet is shown in Table 1. US Treasuries and banknotes outstanding constituted about 90 percent of total assets and liabilities respectively. Overnight bank deposits at the Fed, also known as bank reserves, comprised a very small portion of the balance sheet—less than two percent. Bank reserves, compared with total US bank assets at end 2007, were miniscule—0.15 percent⁷ and actually less, in nominal terms, than at end 1951. The liability “reverse repos” reflect transactions

⁵ See Gagnon, Raskin, Remache, and Sack (2010) and Greenwood, Hanson, Rudolph, and Summers (2014).

⁶ Nyawata (2012) contains a general discussion of the merits of t-bills vs. central bank bills.

⁷ Total US bank assets at end-2007 were \$10.888 trillion. (FRB Release H.8).

that were conducted almost exclusively with foreign central banks and multilaterals⁸. These daily operations allowed the Fed to effectively pay interest on foreign official deposits. Treasury deposits, at \$5 billion, reflected a long-standing agreement whereby the US Treasury committed to hold close to that amount in its Treasury General Account, so as to minimize disruptions its cash management activities might otherwise have had on the supply of bank reserves.

Table 1: Consolidated Balance Sheet of the Federal Reserve Banks
December 5, 2007
(in US\$ billions)

Assets		Liabilities	
US Treasuries	780	FR Notes Outstanding	782
Liquidity Providing Repos	47	Bank Deposits (Overnight)	16
Net Other Assets	50	Reverse Repos	37
		US Treasury Deposits	5
		Equity	37
Total Assets	876	Total Liabilities	876

Source: Federal Reserve Board Release H.4.1 and Author's calculations

Prior to the crisis, the only actively used policy instruments were short term liquidity supplying repos. In essence the Fed operated similarly to its advanced country counterparts—keeping the market “short” reserves and influencing the overnight rate via lending operations. In the aggregate, banks were compelled to rely on small amounts of credit from the central bank to obtain their desired reserve balances. This facilitated the attainment of central bank interest rate targets even with small operations.

As of December 5, 2007, the Fed was providing \$47 billion in 7-day and 14-day repos to enable the market to meet its demand for \$16 billion in overnight deposits. The then current FOMC target for the fed funds rate was 450 bps and the daily effective fed funds rate on December 6, 2007 was 449 bps.

Within this operating system, which allows the *market* to determine both the quantity of currency in circulation and bank reserves (the monetary base), increases in the target interest rate are not achieved—as is often misleadingly stated in textbooks—necessarily by a reduction in liquidity providing

⁸ The four one day reverse repos conducted with the market in 2007 were the first such draining operations since 2004. FRBNY (2008), page 20.

repos nor by “open market sales of securities”⁹. More simply, the interest rate on repos is raised and this guides the market overnight interest rate.

It is also worth noting that this monetary operations framework can function with a very small balance sheet. If we subtract from the Fed balance sheet “currency in circulation” and the US Treasuries “backing” the note issue, neither of which play any material role in the monetary framework, the Fed balance sheet pre-crisis was less than one percent of US GDP. A very similar picture is obtained in the UK by considering separately the Bank of England “Issue Department” and “Banking Department” balance sheets. The former is a currency board, the latter the locus of monetary operations¹⁰.

The ability of monetary operations to function in normal times with small operations is a reflection of the efficiency with which modern real time gross settlement systems economize on low yielding reserves. In the US, pre-crisis, the daily average level of reserves held overnight was about \$ 20 billion compared with average daily gross payments over Fedwire of \$ 2.5 trillion and assets under custody at the three largest US custodians—Bank of New York, State Street, and JP Morgan of \$ 71.8 trillion¹¹.

The Crisis Balance Sheet: Pre-Lehman

As the crisis developed and deepened, the Fed introduced a series of innovative liquidity programs prior to the Lehman insolvency, including 28 day single-tranche liquidity providing repos¹². Nevertheless, there was little change in the rate of growth of the Fed balance sheet during this period.

In other words, prior to Lehman, the FRBNY increased lending to banks (assets) and bank reserves (liabilities) with one hand and immediately reduced excess reserves by selling Treasuries with the other. This altered only the asset composition of the FRB balance sheet, not the size. Equilibrium in the market for overnight balances at the Fed was thereby preserved at the FOMC target rate.

Banks obtained Fed financing for their portfolios of now dodgy assets (trash) that they could no longer finance in the market¹³. Nonbanks withdrew bank funding and, seeking safety, bought Treasuries. The US sovereign became an intermediary, borrowing from nonbanks and lending to banks.

The net result for bank reserves was very little change. Reserves were neither needed nor desired by banks. From the standpoint of their balance sheets, banks retained their high yielding assets and merely substituted—on the liability side—nonbank financing for financing from the Fed. Nonbanks—on the asset side—withdrew financing from banks, in many cases refusing to roll over short term repos, and replaced those claims with Treasury securities purchased from the Fed. Thereby the Fed effectively

⁹ “The outright sale of U.S. Treasury securities that commenced on March 7 [2008] were the first sales in nearly two decades”. FRBNY (2009), page 13, footnote 12. Bindseil (2004) explains the theory behind modern monetary operations while Potter (2013) discusses specifically the US operational framework.

¹⁰ An in-depth consideration of the requisite size of central bank balance sheets is found in Stella (2011).

¹¹ Source for data on assets under custody—Institutional Investor’s 2014 Ranking of Custodians.

¹² The Fed announced its Term Auction Facility and ECB and SNB swap lines only on December 12, 2007.

¹³ The historical norm for the one month repo spread between Treasuries and Agency MBS pre-crisis was 20 bps. An increase of this spread up to 140 bps led the FRBNY to introduce the single-tranche repo. In this repo, the pricing was the same for Treasury and MBS collateral, so MBS was largely provided. FRBNY (2009), page 11.

provided liquidity to markets and institutions without creating reserves as did, at the same time, the Bank of England, Norges Bank, and the US Treasury with its GSE asset purchase program¹⁴. In all those cases the market obtained treasury securities, rather than deposits at the central bank¹⁵.

Table 2 provides the last pre-Lehman published balance sheet. Liquidity providing repos rose with the introduction of the \$80 billion single-tranche 28 day repos. The Term Auction Facility (TAF) contributed \$150 billion to the \$263 billion rise in Net Other Assets, while the ECB and SNB swap lines and Maiden Lane facilities contributed \$62 billion and \$29 billion respectively. Fed holdings of Treasury securities fell by \$300 billion, largely counteracting the introduction of the new instruments since December 2007.

Table 2: Consolidated Balance Sheet of the Federal Reserve Banks
September 10, 2008
(in US\$ billions)

Assets		Liabilities	
US Treasuries	480	FR Notes Outstanding	798
MBS and Federal Agencies	0	Bank Deposits (Overnight)	32
Liquidity Providing Repos	127	Reverse Repos	44
Net Other Assets	313	US Treasury Deposits	5
		Equity	40
Total Assets	920	Total Liabilities	920

Source: Federal Reserve Board Release H.4.1 and Author's calculations

On the liability side, the balance sheet expansion was largely reflected in a \$32 billion increase in the monetary base, split evenly between banknotes outstanding and bank reserves—both rising \$16 billion. Although the FOMC reduced the fed funds rate target five times over this period, the monetary operations framework remained unchanged. Equilibrium in the market for bank reserves was preserved by selling and redeeming Treasuries to absorb excess reserves created through the other facilities¹⁶.

The Crisis Balance Sheet: Post-Lehman and Pre-LSAPs

The liquidity injection associated with the turmoil surrounding the Lehman insolvency and AIG rescue could not be absorbed by sales of US Treasuries. The Federal Reserve Banks simply did not hold sufficient Treasuries freely available to do so. The FRBs held only \$480 billion in Treasuries on September 10, 2008 whereas it was to increase its nonconventional assets by over \$850 billion by

¹⁴ See the appendix to this paper for more information on “reserve-less” liquidity providing measures.

¹⁵ Hrung and Seligman (2015) conclude “...the proper policy response to a financial crisis can involve options beyond an increase in the level of bank reserves”.

¹⁶ This period represented the first time in almost two decades that the Fed had sold Treasuries from its portfolio.

October 22, 2008 (Table 3). Furthermore, the Fed had earmarked \$200 billion of those Treasuries for its securities lending program, the TSLF¹⁷.

Table 3: Consolidated Balance Sheet of the Federal Reserve Banks

October 22, 2008

(in US\$ billions)

Assets		Liabilities	
US Treasuries	491	FR Notes Outstanding	820
MBS and Federal Agencies	14	Bank Deposits (Overnight)	227
Net Other Assets	1293	Reverse Repos	96
		US Treasury Deposits	615
		Equity	40
Total Assets	1797	Total Liabilities	1797

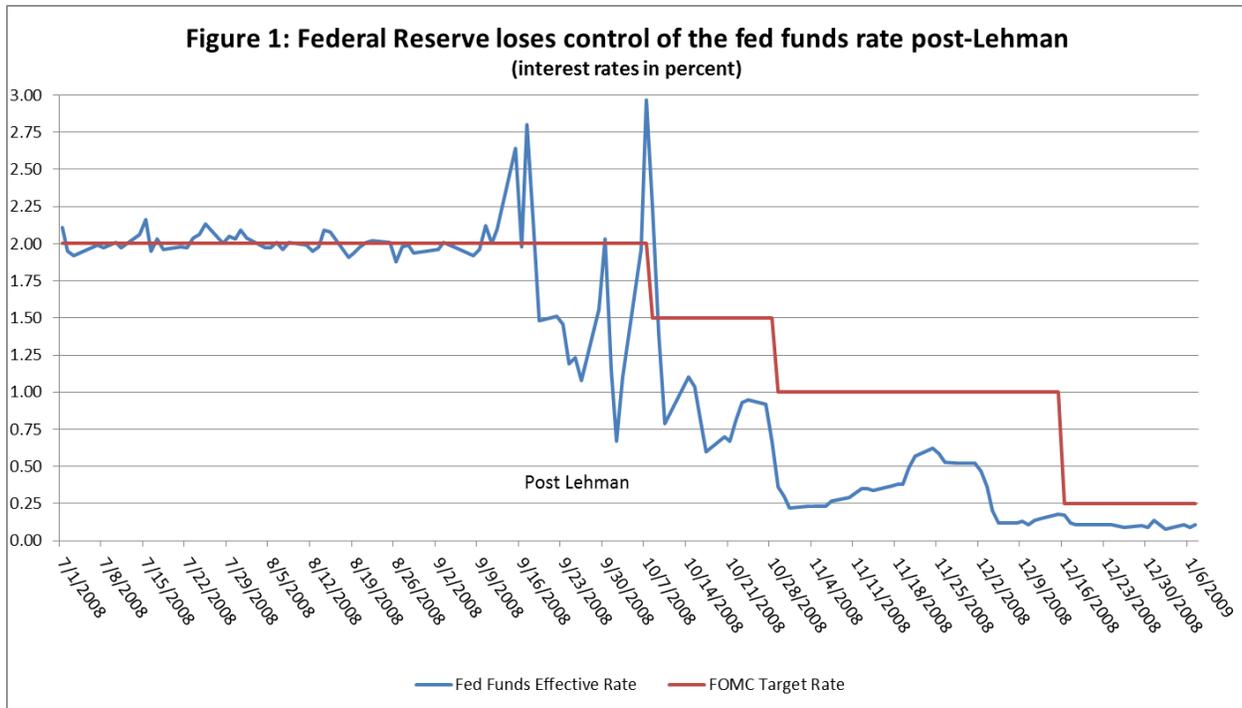
Source: Federal Reserve Board Release H.4.1 and Author's calculations

The FRBNY considered issuing its own debt instruments to absorb liquidity but decided against this option to avoid fragmenting the US money market—similar Treasury and Fed instruments would have been circulating simultaneously. However, it knew that failure to absorb the excess reserves would undoubtedly lead the fed funds rate to fall below the then 2 percent target. Consequently, the FRBNY requested assistance with liquidity absorption from the US Treasury. On September 17, 2008, the Wednesday after the Lehman insolvency, Treasury announced its Supplementary Financing Program (SFP). The idea behind the SFP was for the Treasury to auction short term debt instruments—cash management bills (CMB)—in excess of what was needed to finance the fiscal deficit, and to deposit the proceeds into a special account at the FRBNY. This would drain bank reserves from the system.

Although the US Treasury issued over \$550 billion net in CMB during the first six weeks of the SFP, it was not enough to keep the fed funds rate at the FOMC target—as shown below in Figure 1. Bank reserves increased by 7 times, from \$32 billion on September 10 to \$227 billion on October 22¹⁸. The fed funds rate has subsequently traded at or below 25 bps for more than six years.

¹⁷ See FRBNY (2009), page 28.

¹⁸ That is a compound annual rate of increase in excess of 500 million percent.



The Crisis Balance Sheet: Post-LSAPs

The pricing of most of the innovative liquidity programs introduced by the Fed during the crisis were designed so that they would phase out automatically as markets stabilized and normalized. Apart from a small residual balance remaining from the Maiden Lane facilities, there is currently little trace of these programs. In contrast, clearly apparent is the impact of the LSAPs.

Compared with the pre-crisis balance sheet, the Fed's holdings of US Treasuries and MBS have risen by \$1787 billion and \$1832 billion respectively (since December 2007). Bank reserves rose by \$2805 billion over the same period. The residual, \$814 billion, is largely explained by increases in banknotes outstanding (\$470 billion), reverse repos (\$184 billion), and Treasury deposits (\$96 billion).

Owing to its enlarged balance sheet, the Fed has witnessed a marked increase in profitability yet no increase in equity beyond the minimum required by law. All Fed net income has continued to be transferred in cash to the US Treasury on a weekly basis despite suggestions by some that the FRB should set aside provision against interest rate risk.¹⁹

The Fed balance sheet toward the end of the LSAP is shown in Table 4 below.

¹⁹ See Stella (2009) and Goodfriend (2014).

Table 4: Consolidated Balance Sheet of the Federal Reserve Banks

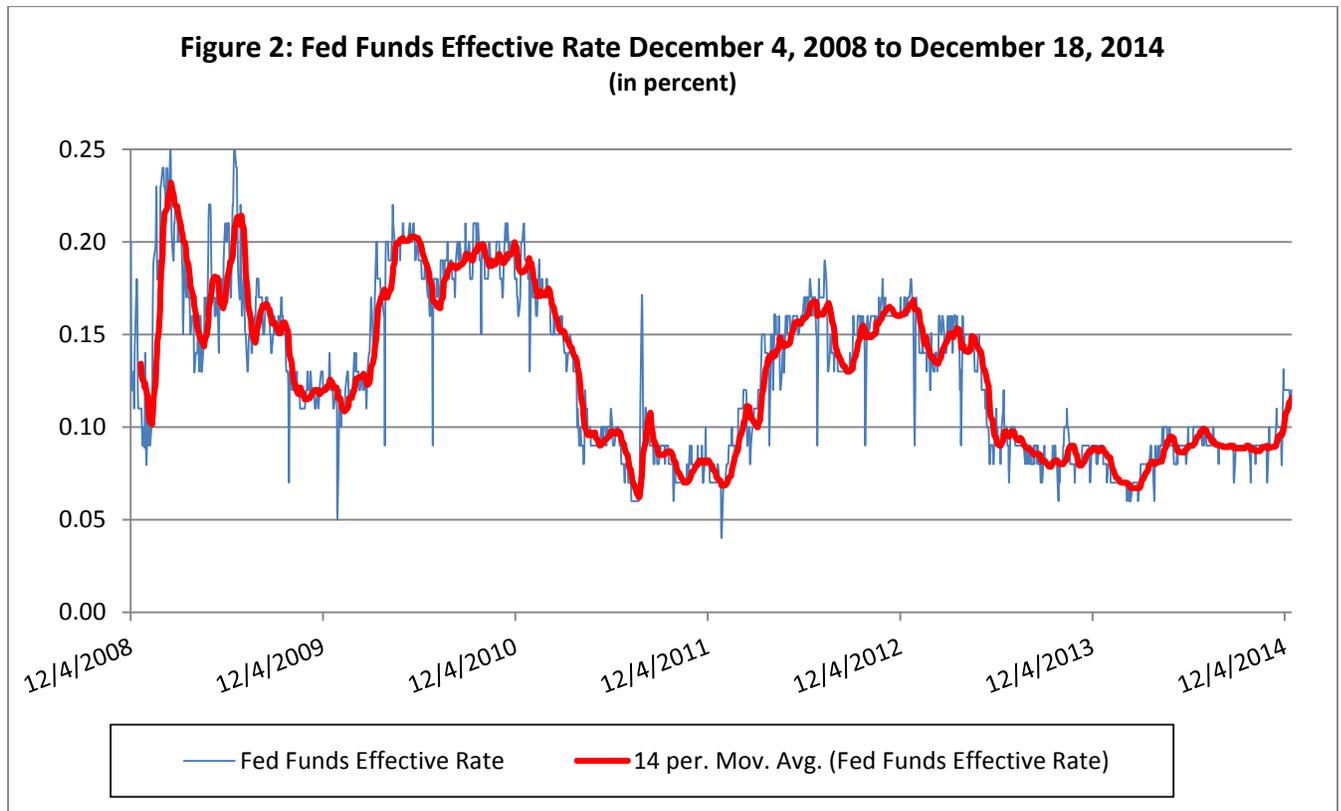
October 15, 2014

(in US\$ billions)

Assets		Liabilities	
US Treasuries	2567	FR Notes Outstanding	1252
MBS and Agencies	1832	Bank Deposits (Overnight)	2821
Net Other Assets	53	Bank Deposits (Term)	0
		Reverse Repos	221
		US Treasury Deposits	101
		Equity	56
Total Assets	4452	Total Liabilities	4452

Source: Federal Reserve Board Release H.4.1 and Author's calculations

Owing to the enormous level of excess reserves, it is no surprise that fed funds have been trading at close to zero for more than 6 years—over 1,500 consecutive trading days. See Figure 2.



III. Fed Liability Management During the Exit: Strategy and Operational Challenges

The FRBNY lost control of its operational target—the fed funds effective rate²⁰ in the context of the massive market disruption associated with the application of Lehman Brothers for bankruptcy protection in September 2008. The behavior of the fed funds effective rate was a significant source of concern between September 16, 2008 and December 16, 2008. During that time the Fed was still attempting to target a nonzero policy rate. However, once the decision was taken to adopt a target band including the zero lower bound (0 – 25 bps), the Fed’s inability to control the operational rate became immaterial. But with exit—raising the fed funds rate—now on the horizon, the Fed knows that it will need to regain control over its operational target. In other words, the operational arm of the Fed, the FRBNY, is preparing to receive the eventual call from the FOMC in Washington to raise rates.

Laying the ground for the exit essentially involves action to bring the overnight money market back into equilibrium. The situation in which the Fed finds itself is somewhat akin to a driver who realizes her brakes no longer work just prior to beginning a difficult drive uphill for an extended period of time. While the objective is to climb the hill, the condition of the brakes is largely irrelevant—but before the *descent* begins, something must be done to ensure that the brakes will function smoothly.

Strategy

The FOMC has outlined its exit strategy. The first step has been taken, to curtail and then eliminate the LSAPs which had been the source of continued bank reserve augmentation.

During the second step of the balance sheet normalization process, overnight bank deposits at the Federal Reserve, “fed funds”, are to be *reduced* in overall magnitude by:

- increasing term deposits
- increasing reverse repurchase agreements or “reverse repos”
- ceasing to roll over securities maturing in the Fed’s portfolio

The first two operations would convert bank overnight deposits (fed funds) into longer term deposits and collateralized loans to the Federal Reserve, respectively. Neither would shrink the balance sheet.

Ceasing to reinvest the proceeds of maturing Treasury, GSE, or Agency debt would shrink the balance sheet and drain reserves. The Treasury, GSE or Agency would need to issue more debt to the market than otherwise would be the case and use the proceeds obtained to redeem their debt held by the Fed. Ceasing to reinvest the proceeds of maturing MBS would have an identical impact on bank reserves.

²⁰ The “fed funds effective rate” is the daily transaction-value weighted average interest rate on brokered trades for unsecured overnight fed funds—overnight deposits at one of the 12 Federal Reserve Banks. A “trade” is an agreement between two parties wherein the lender transfers FRB balances it holds through FEDWIRE to the borrower in expectation that the later will reverse the transaction next day plus interest. The FRB is neither a lender nor borrower in a trade. It merely collects data from brokers, calculates and publishes the effective rate.

Once the Fed had reestablished control over the fed funds rate, it would begin to exit by raising the rate on all its instruments including primarily the IOR rate.

Sequencing

The FOMC has indicated clearly its intention to raise the fed funds target before ceasing to roll over its securities holdings, i.e. shrinking the balance sheet. Why, rather than introduce untested and novel policy instruments, does the FOMC simply not sell assets to reduce reserves? That is, exit operationally the same way it entered into LSAPs but in reverse? In order to answer this question it is necessary to understand the motivation for the LSAPs and how their effectiveness has been perceived.

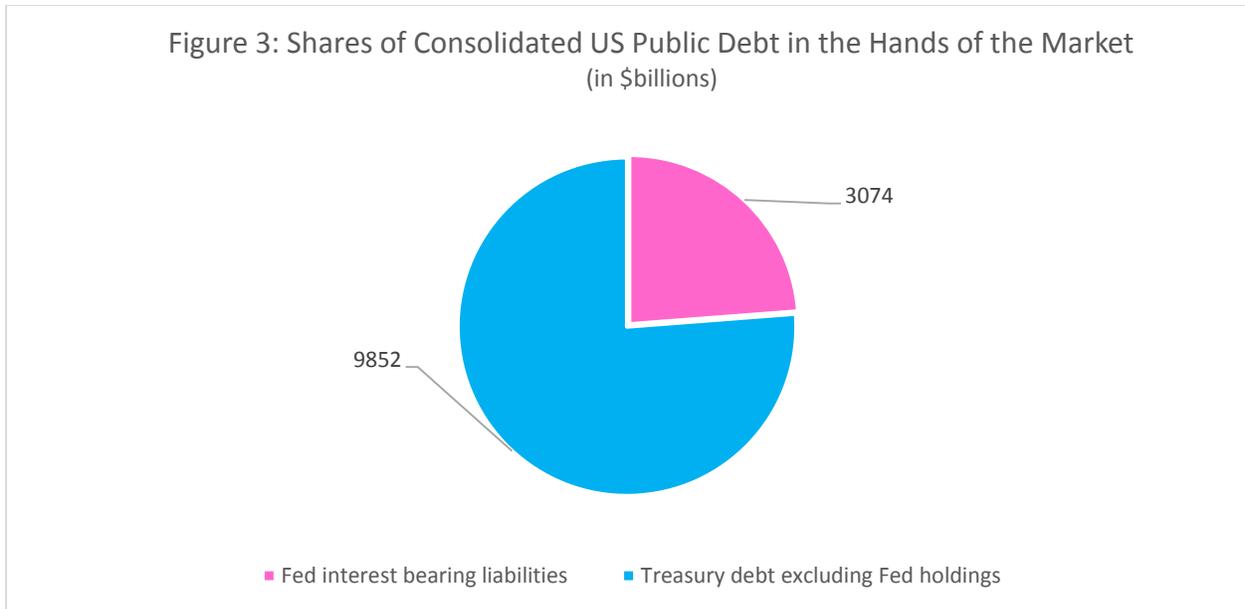
Gagnon, Raskin, Remache and Sack (2010) argue that the primary objective of the LSAPs was to lower long term interest rates through the “portfolio balance” channel. Interest rate risk, also known as the term premium, was reduced by removing long duration securities from the market. In addition to directly raising the prices of the assets purchased and lowering yields among assets remaining in the same category in the market, investors were expected to subsequently rebalance their portfolios leading other asset prices to rise and their yields to fall. There was no expectation that the addition to bank reserves would be a material factor—consistent with the role—or lack thereof—of the bank reserve channel in modern macroeconomics alluded to earlier as well as contemporary research being published at the same time originating from the NY Fed²¹.

Consequently, FRB NY’s efforts to reduce the amount of reserves are motivated by a technical, rather than major policy, objective—to improve its ability to control the fed funds rate prior to exit. As will be explained later, FRBNY can easily reduce reserves by swapping them for alternative instruments. It may also directly place upward pressure on the fed funds rate by raising the IOR rate without reducing the quantity of reserves at all. Therefore it is not necessary to reverse the LSAPs (and reverse the decline in term premia) in order to raise the fed funds rate and exit gradually from the zero lower bound.

Outright sales of the Fed’s securities holdings would no doubt be disruptive. If we consider the Fed’s interest-bearing liabilities as part of the consolidated US sovereign debt it is evident that the cumulative impact of LSAPs has been large.

Interest-bearing liabilities of FRBs comprise about 24 percent of total US consolidated public debt in the hands of the market, i.e. US Treasury debt in the hands of the public minus the Treasuries held by the FRBs plus the interest bearing debt of FRBs. See Figure 3.

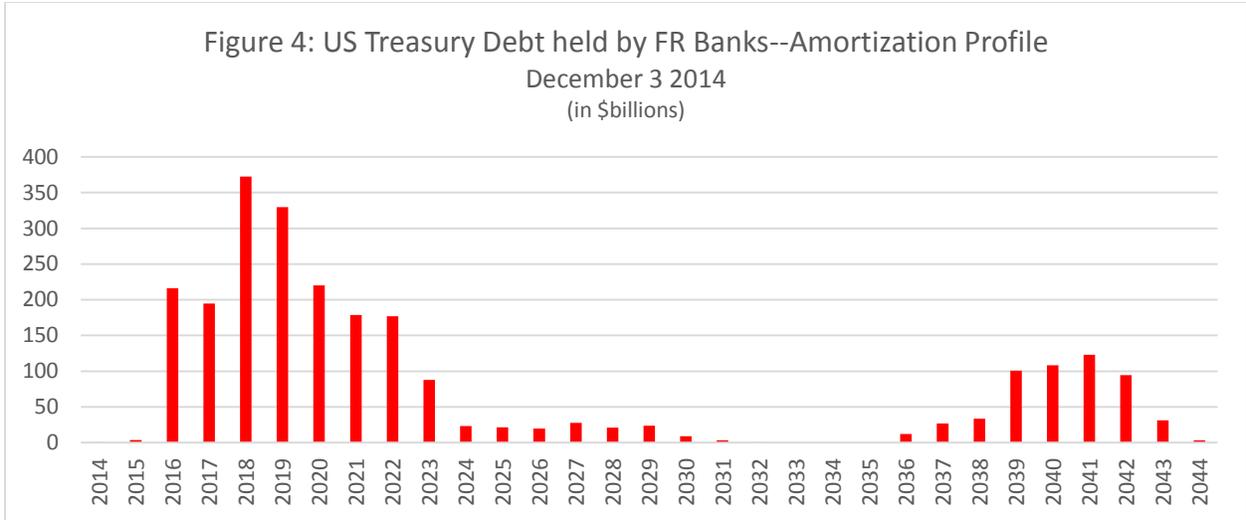
²¹ See, for example, Keister and McAndrews (2009) and Martin, McAndrews, and Skeie (2011).



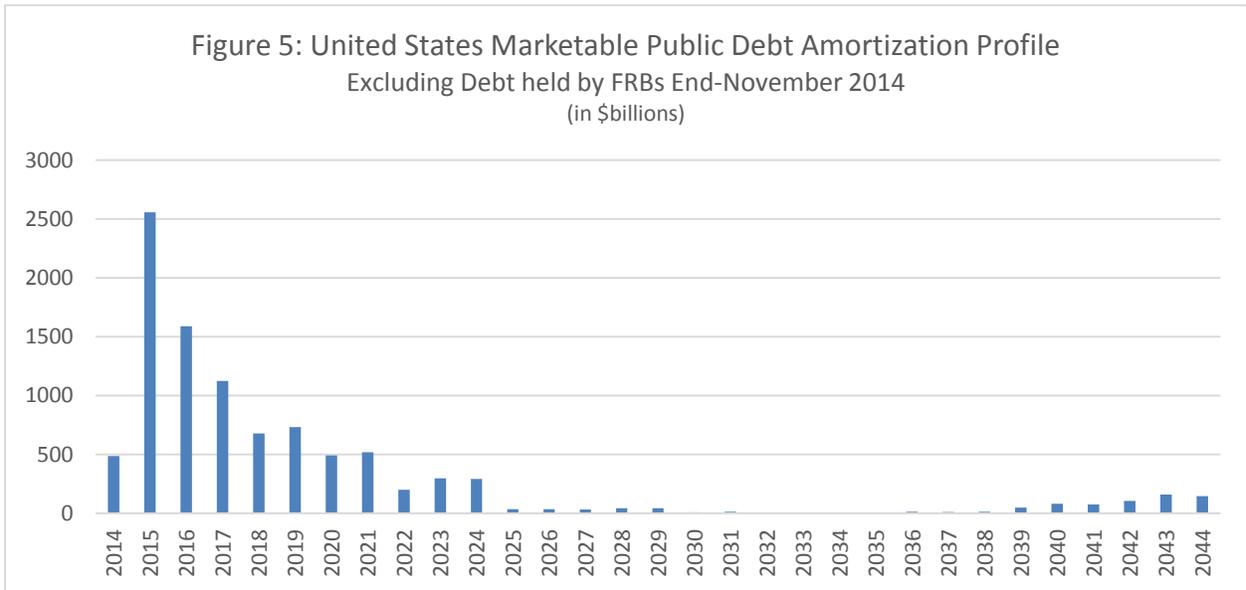
Naturally, the *average duration* of the Fed holdings of Treasuries is different from that in the market. Indeed, the point of the Treasury LSAP was precisely to shorten the duration of the market portfolio. That is, long run rates have been suppressed as a matter of policy²². In order to achieve this, the Fed had to buy securities of more than average duration²³. Compare Figures 4 and 5.

²²See Greenwood, Hanson, Rudolph and Summers (2014) for a discussion of the extent to which US Treasury issuance strategy—to lengthen the average maturity of the debt—has countered the FOMC’s intentions.

²³ Christensen, Lopez and Rudebusch (2014) report that as of June 25, 2014, the FRBs held 237 different Treasury securities and 68,557 MBS, of which 43,859 were individual securities of less than \$5 million.

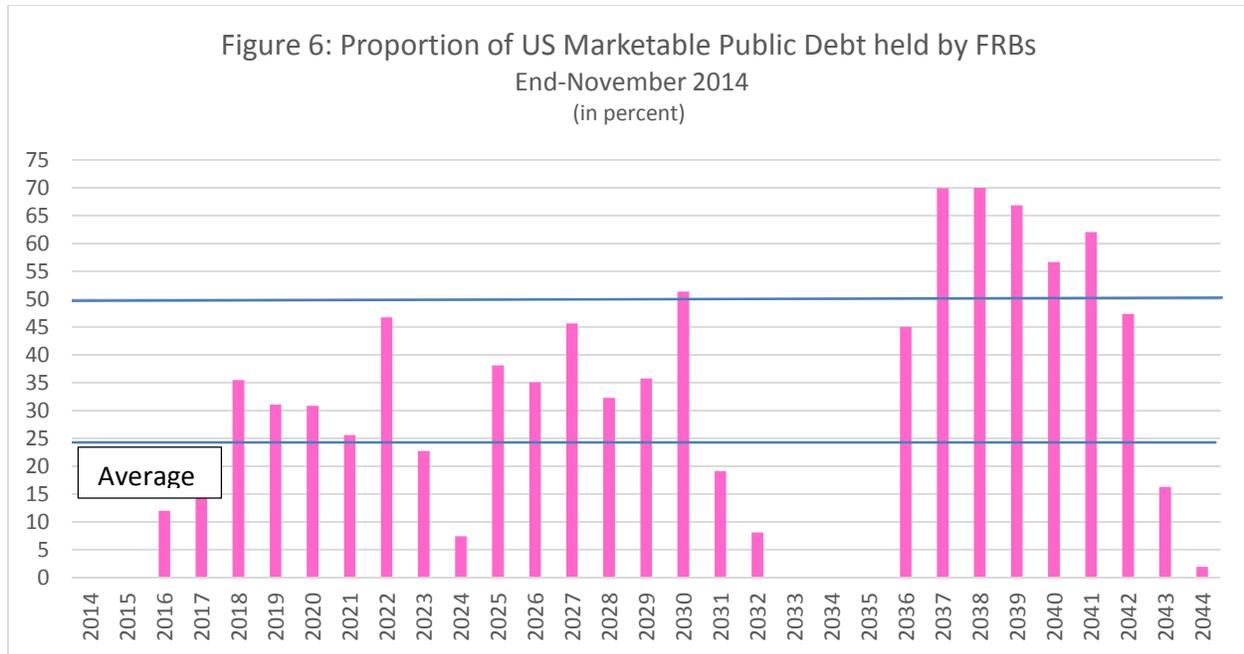


Source: FRBNY and author’s calculations.



The securities purchased by the Fed have a longer term-to-maturity than what remains in the market. For example, 47 percent of the Treasuries held by the market will mature by end-2016 compared with less than 9 percent of those held by FRBs. So it would be virtually impossible to sell securities from the Fed’s portfolio without increasing the average duration in the market.

Furthermore, the Fed has a rather concentrated portfolio of Treasuries (Figure 6).



Source: US Monthly Statement of the Public Debt, November 2014 and author's calculations. Note that there are no US debt amortizations 2033-2035 owing to the hiatus in 30 year issuance circa 2001-2006 when the US was running budget surpluses.

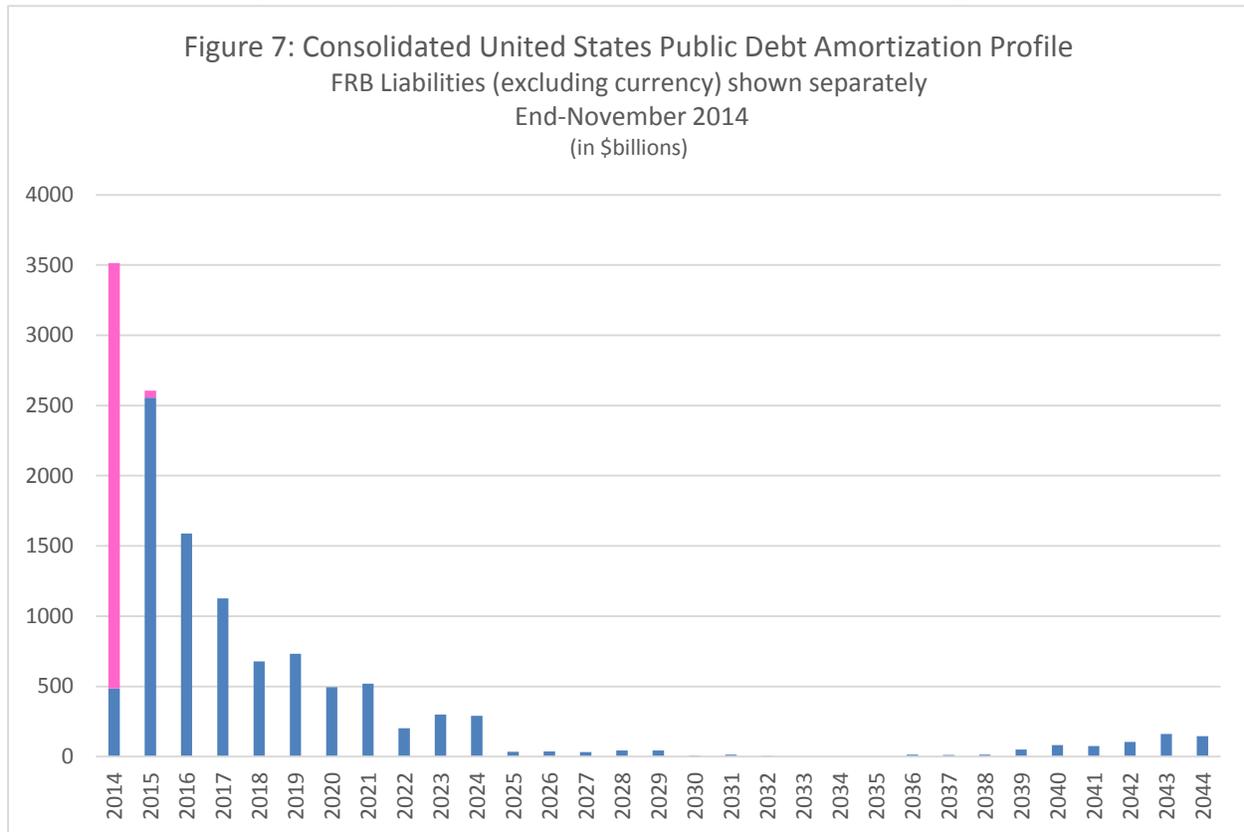
The clearest illustration of the impact of LSAPs on the structure of US sovereign liabilities is obtained by consolidating the Treasury and FRB balance sheets. In the financial consolidation, all Treasury debt held by the Fed disappears as well as any Treasury deposits at the Fed²⁴. In their place, FRB interest-bearing liabilities appear on the consolidated balance sheet. Although an unconventional perspective, an influential past Fed Chairman also held this view (FRB liabilities are sovereign debt):

Central banks can issue currency, a non-interest-bearing claim on the government, effectively without limit. They can discount loans and other assets of banks or other private depository institutions, thereby converting potentially illiquid private assets into riskless claims on the government in the form of deposits at the central bank²⁵

²⁴ In most countries, central bank equity would also disappear since the Treasury is the legal owner. In the US, each FRB is owned by the commercial banks chartered in its geographical district.

²⁵ Greenspan (1997). See Sims (2013) for a theoretical perspective.

The consolidated US public debt profile as of end-November 2014 is shown in Figure 7.



A key insight from the consolidated sovereign asset liability approach is that it makes plain that the *composition of the Fed's holdings of US Treasury securities is completely irrelevant*.²⁶ The peculiarities of the particular securities the FRBs hold impact only intra-sovereign cash flows. Only debt *in the hands of the market* matters²⁷. Therefore, we will focus on the structure of *those* liabilities in what follows.

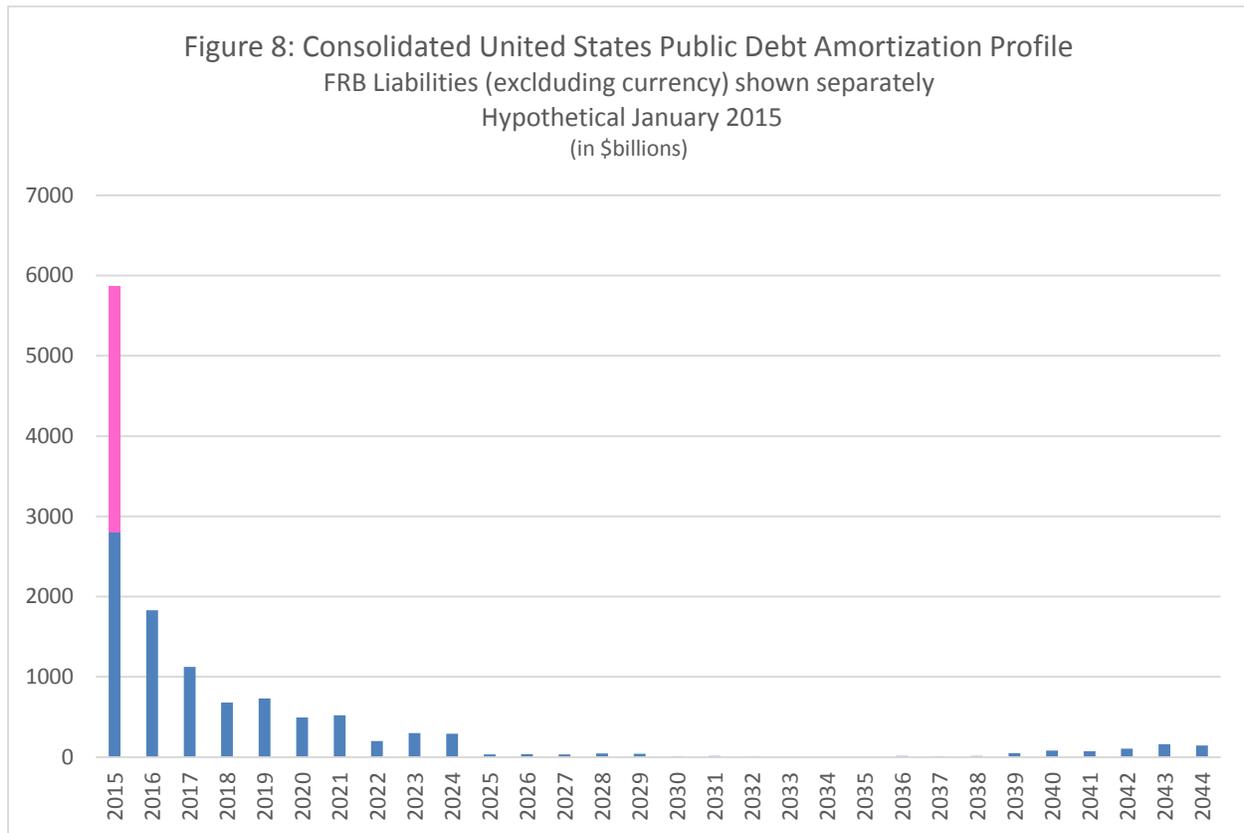
Note that the consolidated debt is highly subject to interest rate risk—tied directly to FOMC policy rates. Note also that the amortizations shown for 2014 apply to December, that is, are one month or less. The slight pink tip shows the term reverse repos that matured on January 5, 2015.

There is no doubt that the LSAPs shortened the term structure of the consolidated debt in the hands of the market compared with the “no LSAPs” counterfactual. Nevertheless, Greenwood, Hanson, Rudolph and Summers (2014) point out that the duration of the consolidated public debt has decreased only from 4 to 2.9 years during the period between December 2007 and July 2014 despite the LSAPs with Treasuries (LSAPTs) owing to the US Treasury’s efforts to lengthen the maturity of the debt it has been issuing to finance large fiscal deficits in recent years. They conclude that the Treasury has offset part of the impact of Fed LSAPTs.

²⁶ The situation with holdings of MBS will be discussed later.

²⁷ Compare Stein (1952).

The consolidated US public sector debt projected into 2015 is shown in Figure 8.



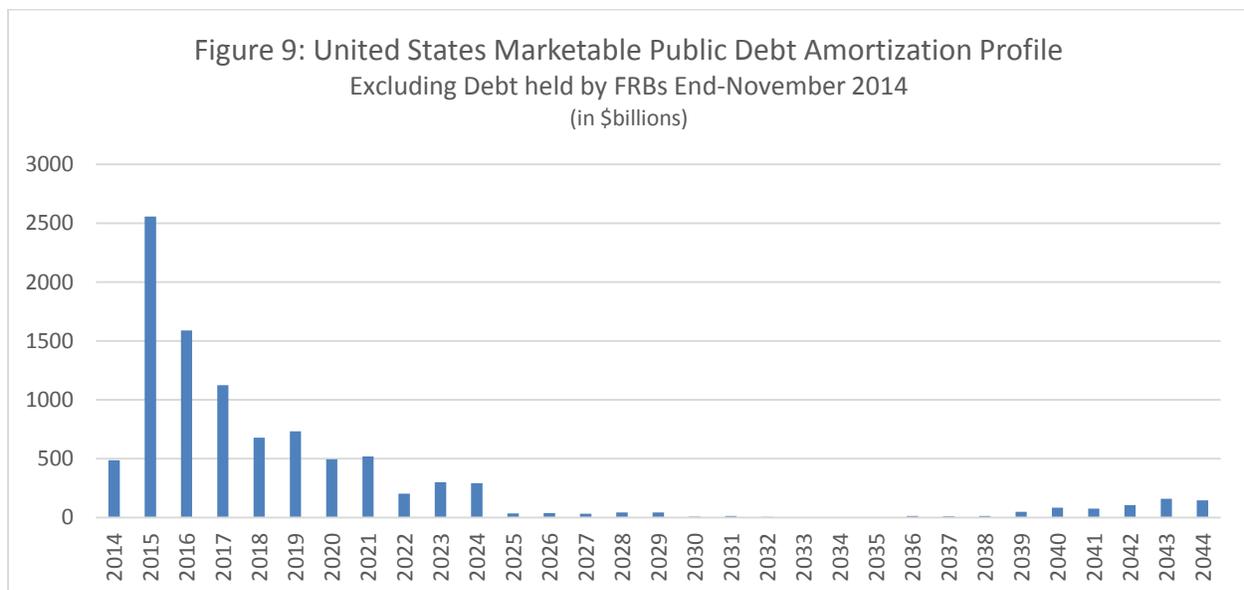
The \$3 trillion question is how to manage the pink bar above. The FOMC appears to believe there are only two choices—to sell securities from its portfolio and reduce the pink bar and/or continue to refinance its liabilities for an extended period of time—years, using overnight and term deposits and short term reverse repos. Selling from its portfolio of long term securities—particularly during a period when policy rates are rising, risks a sharp surge in long term rates—a more violent repeat of the 2013 “taper tantrum”. Yet this view—that there are only two choices—is actually a very peculiar perspective if one takes the consolidated view. As noted earlier, from the standpoint of consolidated US liabilities, the composition of debt held by the Fed is completely irrelevant. The US Treasury may issue whatever instruments it chooses to finance the debt. It certainly is under no restriction to “sell first” from the “box” of securities sitting in the figurative vaults of the Federal Reserve. To think that a debt manager would first have to sell instruments it had bought back from the market some time ago (in the “box”) before issuing new instruments is absurd. Consequently, cooperation with the Treasury to restructure the liabilities that are on the Fed “subaccount” of the sovereign balance sheet is highly desirable.

Indeed, were the Fed to sell treasuries outright, as it did during phase two of the crisis, there would arise immediately the question of how the sales would be *distributed* over the yield curve. In 2008 that was not an issue as the distribution of the portfolio of securities held by the Fed was essentially similar to that held in the market. But that is no longer the case.

In other words, even if the Fed were to sell off representative slices of its portfolio it would have an uneven impact on the market. Nor is it obvious that a proportional sale of each security class would be optimal. For example, the FOMC might reasonably consider it less disruptive to the market to sell its \$23 billion in holdings due to mature in 2024 and none of its holdings due to mature in 2037. A sale of \$23 billion in the 2024 space would add only 8 percent to the amount of those maturities in the hands of the market while an identical sale in the 2037 space would more than triple those maturities outstanding. The FRBs currently hold 7.4 and 69.9 percent of total marketable Treasuries due to mature in 2024 and 2037 respectively. Looking across the full span of maturities, it is clear that the proportion of total marketable US Treasury securities held by the Fed is not uniformly distributed across time.

However, viewing this problem from the perspective of the US Treasury, one might come to a very different conclusion. Indeed, it is not impossible for the securities that the Treasury would like the Fed to sell first to be the ones the Fed would consider selling last.

Considering the stock of Treasury debt in the hands of the market (Figure 9), the US Treasury might very well wish to fill in the current void in the yield curve in the 2030-2038 space²⁸. In order to do this it might begin in 2015 to develop benchmark issues that mature in 2030 and 2035, with 15-year and 20-year bonds respectively. Those issues could very well meet with strong demand and yield attractive pricing—provided that the Treasury announces its intentions and strategy to fill in the curve. In general, one would wish the central bank to sell issues (shrink its balance sheet) in a way that contributes to market liquidity in that part of the yield curve the Treasury wishes to develop.



There are two sorts of problems that arise for Fed cooperation with this sort of a strategy. The most fundamental is that the FRBs hold no Treasuries maturing in 2035. It is therefore impossible for it to add

²⁸ This gap is largely the result of the US Treasury's winding down and suspension of 30-year bond auctions in the first half of the 2000s. The future impact on the amortization curve was foreseen and discussed in Barclays (2001).

to market liquidity at this maturity. Contrast this with the situation for the 2025-2029 maturities—the Fed holds, on average, \$23 billion out of \$61 billion of the outstanding, or 38 percent.

Turning to the 2030 maturity, there is only one bond in this space, CUSIP 912810FM5, which was issued on February 15 and August 15, 2000 (i.e. it was originally a 30 year bond)²⁹. The FRBs currently own \$8.8 billion of this security, or 51.4 percent of the amount issued. If the Treasury wished to build up an issue size of \$60 billion—similar to the amount maturing on average during the previous 5 years—it could do so by issuing about \$43 billion in new securities—effectively a reopening of the 30-year bond—and have the Fed sell its holding of \$9 billion. This, added to the amount already in the market—\$8 billion—would result in achieving the \$60 billion target. In other words, the FOMC action would be easily absorbed by the market and assist in developing that part of the yield curve in a fashion consistent with Treasury’s objective. However, if the FOMC merely takes into account the impact of its action in a “vacuum”, i.e. ignoring the Treasury’s objective, it would be highly reluctant to rock the boat by selling its holdings of 912810FM5—as from their perspective it would be very difficult for the market to digest this volume without a spike in interest rates—Fed sales would add more than double the amount outstanding in the market. If it were to sell \$9 billion from its portfolio, it might decide, for reasons discussed above, to do so in the 2024 space—not an obvious point on the curve where the Treasury would choose to have more securities in the market, i.e. not a particular “gap” in the yield curve.

Consequently, it appears the FOMC will be content to live with an extended balance sheet for a period of time that is dictated by the maturity of the securities that it has purchased (securities in the “box”). It may also find this “new” tool—*balance sheet size* difficult to surrender. Particularly if monetary operations and control are well established. However this will signify an extended period of time that the FOMC will manage a large fraction of US public sector debt with inefficient instruments.

The FOMC decision to persist with an expanded balance sheet for an extended period of time therefore raises two problems that have been faced by many other central banks exiting a crisis—the bifurcation of sovereign balance sheet management between two actors unlikely to have the same objectives and perspectives—and the segmentation of the sovereign domestic debt market into multiple, usually inefficient instruments. The solution to the instrument problem is usually to rely on treasury instruments within a comprehensive strategy articulated by the treasury to deepen markets.

Cochrane (2014), an example of strategic thinking toward market deepening, argues that the US Treasury should adopt a “21st century” approach to debt management, in particular by completely revising the nature of the securities it issues. He suggests the Treasury issue annuities of various kinds—floating rate and fixed rate; inflation-indexed and nominal—none of which currently exist. In such a world there would be no role for Fed instruments, particularly those that are inferior to already extant Treasury instruments—on which Cochrane wishes to improve.

Experimenting with the new tools—tapping the brakes

²⁹ This was the penultimate 30-year bond issued by the US Treasury before it announced the suspension of 30-year bond auctions on October 31, 2001.

With cooperation with the Treasury not seemingly on the table, it is important to consider how the Fed envisions handling its liabilities on its own.

As seen in Table 4, the Fed will have approximately \$3 trillion in interest-bearing liabilities to manage with a combination of three instruments: overnight deposits, term deposits, and reverse repos. It is important to note that only banks (depository institutions) may hold interest-earning deposits at the Fed. That is, the fed funds market comprises the trading of deposits at FRBs among entities allowed to hold deposits at the Fed—the GSEs, Federal Home Loan Banks, Foreign and Multilateral institutions, and banks. Only depository institutions are eligible to receive interest on overnight and term deposits.

Reverse repos, in contrast, are available also to nonbanks, the primary class being money market funds. In order to participate in a reverse repo, the money market fund issues instructions to its clearing bank to transfer funds it holds at the clearing bank to the FRB. The clearing bank executes the instruction, debiting the MMF account with it and remitting the equivalent amount in reserves to the FRB via FEDWIRE. Thus, even though a *nonbank* has participated in the trade with the Fed, the decline in bank reserves is the same as it would be had a bank participated directly.

In December 2008, it was believed that introducing “interest on reserves” (IOR) would enable the Fed to re-establish control of the fed funds rate relatively easily. Although it was understood, even at that time, that certain non-depository holders of reserves were not eligible under the legislation to receive IOR, it was believed that competitive arbitrage would raise the fed funds rate close to the IOR rate or that a relatively small quantity of reverse repos directed toward the ineligible institutions at the IOR rate would take them out of the fed funds market and establish equilibrium at a rate close to IOR³⁰.

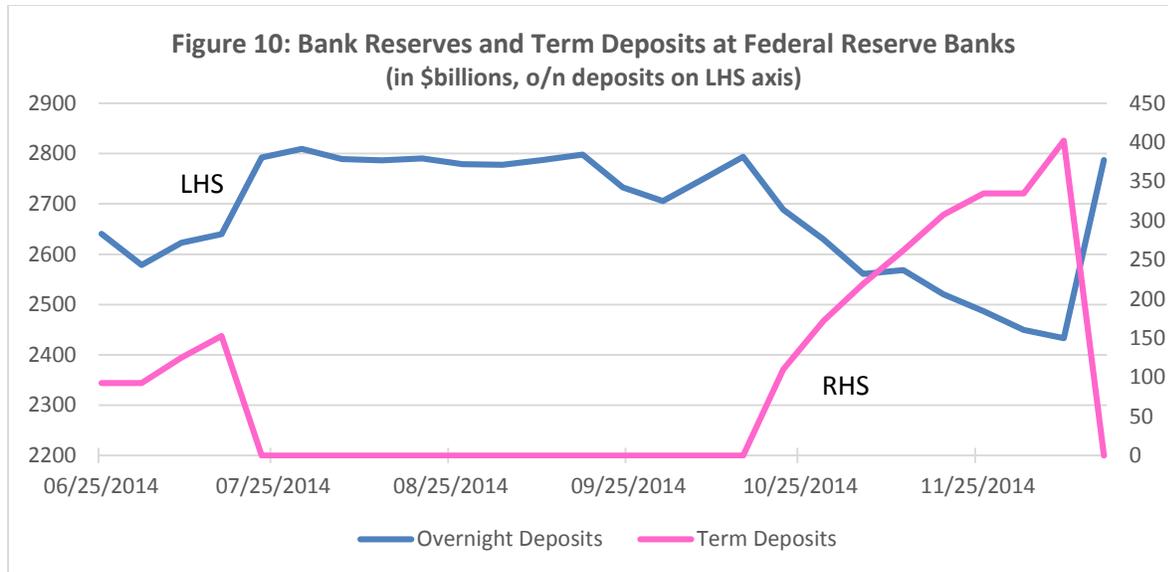
Several important developments were unforeseen at the time IOR was introduced, including the rise of excess reserves from about \$200 billion to \$2.7 trillion and the impact of certain provisions of legislative efforts to reduce financial market leverage and enhance financial system stability. Of particular relevance is the application of FDIC insurance fees to all non-equity liabilities of insured banks; higher charges for systemic institutions; for short term financing; and a tighter capital leverage ratio³¹.

Since the Fed will raise its operational target for the fed funds rate before it begins to reduce the size of the balance sheet, the exit process will begin with increases in the amount of TDs and RRP—with offsetting declines in overnight balances—and increases in the rates paid on all three instruments. Since the TD rate is available only to banks able to obtain the IOR rate, the TD rate should trade above the IOR rate and the fed funds rate, in turn, should trade above the RRP rate. Not only is lending under the guise of RRP “sweeter” in the sense that one obtains collateral, nonbanks may supply funds in that “market” but not in the other two. Consequently the fed funds rate should trade higher than the RRP rate.

In essence, the Fed will exit with the fed funds rate within a corridor—the ceiling being the TD rate and the floor the RRP rate. However neither of those instruments is strictly comparable with the fed funds

³⁰ See Bech and Klee (2011).

³¹ The leverage ratio is calculated as regulatory capital divided by total assets. It therefore includes in the denominator deposits at the central bank.



Source: FRB of St. Louis, FRED database.

The impact of the TD experiment on the balance sheet is evident comparing Tables 4 and 6. Overnight bank reserves fell by \$392 billion compared with mid-October while TDs increased by \$402 billion.

Table 6: Consolidated Balance Sheet of the Federal Reserve Banks

December 10, 2014

(in US\$ billions)

Assets		Liabilities	
US Treasuries	2572	FR Notes Outstanding	1277
MBS and Federal Agencies	1847	Bank Deposits (Overnight)	2429
Net Other Assets	43	Bank Deposits (Term)	402
		Reverse Repos	247
		US Treasury Deposits	49
		Equity	57
Total Assets	4462	Total Liabilities	4462

Source: Federal Reserve Board Release H.4.1 and Author's calculations

Following the redemption of \$402.153 billion in 7 day term deposits on December 11, 2014, bank reserves increased sharply, notwithstanding a \$112 billion increase in US Treasury deposits. (Table 7).

Table 7: Consolidated Balance Sheet of the Federal Reserve Banks
December 17, 2014
(in US\$ billions)

Assets		Liabilities	
US Treasuries	2571	FR Notes Outstanding	1283
MBS and Federal Agencies	1860	Bank Deposits (Overnight)	2739
Net Other Assets	49	Bank Deposits (Term)	0
		Reverse Repos	230
		US Treasury Deposits	171
		Equity	57
Total Assets	4480	Total Liabilities	4480

Source: Federal Reserve Board Release H.4.1 and Author's calculations

The FRBNY also conducted an interesting series of experiments with both overnight and term reverse repos beginning in November 2014, the results of which are shown below:

Table 8: Overnight Reverse Repo Experiment

in USD billions				
Settlement dates		Max Amount	Rate	Amount
30-Oct-14	31-Oct-14	300	5	117
3-Nov-14	14-Nov-14	300	3	106<->153
17-Nov-14	28-Nov-14	300	7	121<->154
1-Dec-14	12-Dec-14	300	10	86<->166
December 15–31		300	5	16<->41

Table 9: Term Reverse Repo Experiment

in USD billions				
Settlement date	Maturity Date	Bid/Offer Amount	Rate	Duration
8-Dec-14	5-Jan-15	101.9/50	8	4 weeks
15-Dec-14	5-Jan-15	75.1/50	7	3 weeks
22-Dec-14	5-Jan-15	49.5/49.5 (100)	10	2 weeks
29-Dec-14	5-Jan-15	76.1/76.1 (100)	10	1 week

Target total amount maturing 5 January 2015 300

The Fed raised the overnight RRP rate to 10 bps for the first two weeks of December at the same time promising to lower the rate to 5 bps subsequently. That set up a decision for money managers...whether to accept 10 bps overnight until December 15 and then 5 bps afterward or to bid for a longer term RRP

at a rate somewhere in the middle. As illustrated in Tables 8 and 10, the amount being placed in overnight RRP declined significantly after the rate was reduced to 5 bps on December 15, 2014.

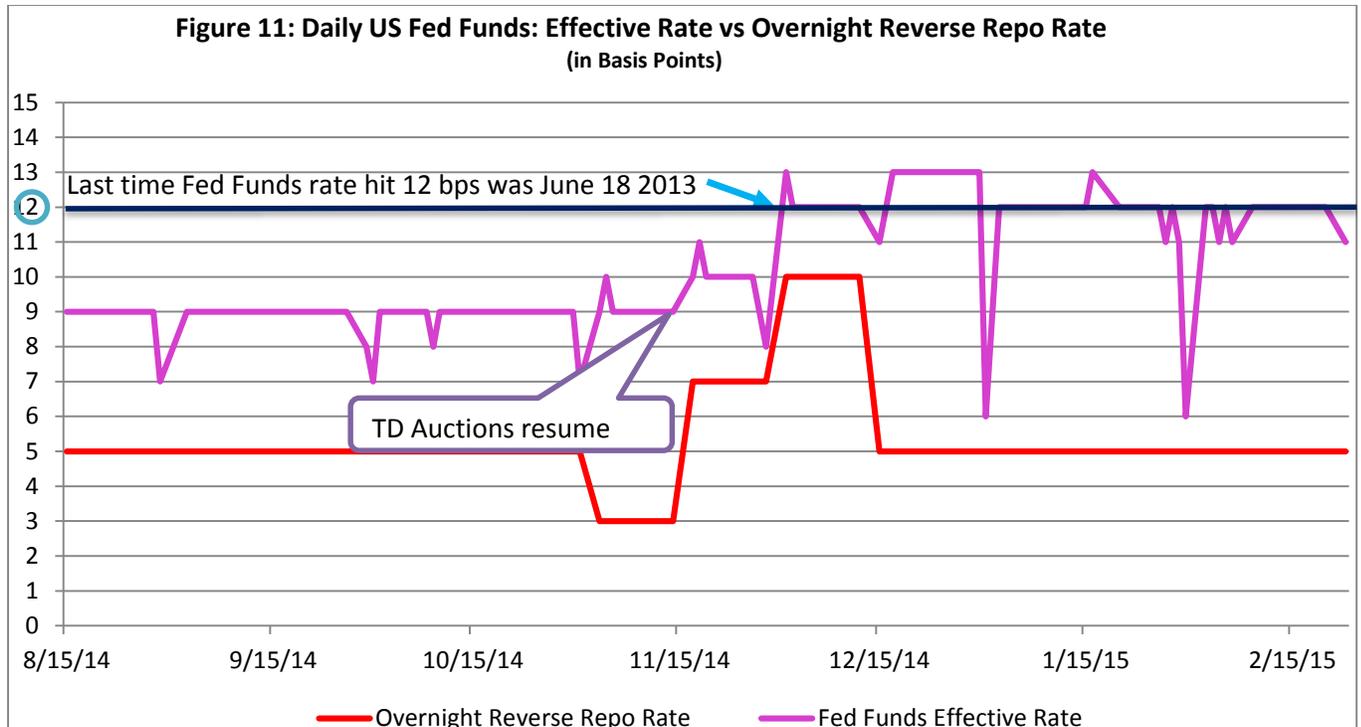
Table 10: Overnight Reverse Repo Operations December 1-16
(Amount in \$billions, Rate in bps)

	Amount	Participants	Rate
1-Dec-14	154.6	58	10
2-Dec-14	153.5	64	10
3-Dec-14	166.3	59	10
4-Dec-14	142.6	49	10
5-Dec-14	145.5	56	10
8-Dec-14	104.2	56	10
9-Dec-14	94.4	49	10
10-Dec-14	105.3	46	10
11-Dec-14	99.8	44	10
12-Dec-14	86.4	39	10
15-Dec-14	34.6	26	5
16-Dec-14	40.7	29	5

The FRBNY experiments appear to have been broadly successful. The fed funds rate has traded close to 12 bps or above since December 1, 2014³⁴. (Figure 11 below). It had not been consistently that high since June 2013. Exploiting its new instruments, the FRBNY has managed to raise the fed funds rate to its highest level in 18 months and kept it there despite the cut in the overnight RRP rate on December 15, 2014 and the maturing of \$225.6 billion in term repo on January 5, 2015³⁵.

³⁴ With the exception of December 31, 2014 owing to the customary end-quarter window dressing.

³⁵ The fed funds effective rate was 12 bps January 5 – 8, 2015.



The demonstrated ability of the FRBNY to influence the fed funds rate using TD and RRP, combined with the expressed willingness of the FOMC to accept higher volatility in the fed funds rate (than historical pre-crisis norms) will likely place shrinking the balance sheet on the back burner. Furthermore, the composition of FOMC voting members changed in January 2015, dropping two members who had been vocal advocates of shrinking the balance sheet. Consequently the Fed may manage a large balance sheet using TD, IOR, and RRP for a long time.

That issue will occupy the remainder of this paper.

IV. Inefficiencies associated with large excess bank reserves

In terms of the sheer size of reserves, comparisons with the pre-crisis numbers are astonishing. Prior to the crisis, reserve balances held at FRBs averaged about \$20 billion and the critical level below which FEDWIRE was deemed fragile, \$10 billion. Reserves are now about 150 times larger.

JP Morgan Chase (JPM), the largest US bank, held \$2.2 billion in deposits at FRBs at end-2006 compared with total assets of \$1,352 billion³⁶. Wells Fargo, the third largest US bank, held \$1.7 billion in deposits at FRBs at end-2006 compared with total assets of \$482 billion³⁷. In other words, JPM and Wells Fargo held 0.16 percent and 0.35 percent of their assets, respectively, at the Fed in 2006—not too dissimilar from the average US bank (0.12 percent). As of end-September 2014, JPM held reserves equal to \$357 billion compared with total assets of \$2,009 billion, or 17.8 percent, while Wells Fargo held \$218 billion at FRBs compared with total assets of \$1,483 billion, or 14.7 percent. The displacement of bank balance sheets

³⁶ JPMorgan Chase and Company (2007), Note to the Accounts #25, page 129.

³⁷ Wells Fargo and Company (2007), Note to the Accounts #3, page 78.

engendered by the Fed has been monumental. More than half of the growth in JPM's assets since 2006 can be explained by the increase in deposits held at the Fed.

The impact on bank holding companies devoted primarily to wholesale clearing and asset custody services is likely to have been even greater. State Street, the second largest global asset custodian as of 2014 (Institutional Investor's ranking), held deposits averaging \$ 103 million at FRBs during 2006. As of end-September 2014, those deposits had risen to \$ 76 billion, an astonishing increase of 74,000 percent. Figures for Bank of New York, the world's largest global asset custodian, were similar to State Street before the crisis. Following BONY's merger with Mellon Financial (2007), the combined entity held \$ 66 billion in reserves at Federal Reserve Banks as of end-September 2014.

		(in \$ Billions & percent)		
Date	Bank	Reserves	Total Assets	Reserves/Total Assets %
Average 2006	JP Morgan Chase	2.2	1352	0.16
Average 2006	Wells Fargo + Wachovia	2.1	597	0.35
Average 2006	Bank of NY + Mellon	0.3	145	0.22
Average 2006	State Street	0.1	107	0.10
9/30/2014	JP Morgan Chase	357	2009	17.8
9/30/2014	Wells Fargo	218	1483	14.7
9/30/2014	Bank of NY Mellon	66	305	21.8
9/30/2014	State Street	76	270	28.2
9/30/2014	Bank of America	72	1525	4.8
9/30/2014	Citibank	75	1378	5.4
9/30/2014	PNC	26	324	8.0
9/30/2014	Total (7 banks above)	891	7293	12.2

Why are banks holding such large reserves now at Federal Reserve Banks? Reading the popular financial press and the musings of certain seasoned central bankers one might think it is to fund future lending—that somehow “reserves” become transformed into loans. Nothing could be further from the truth. Reserves are bank assets. As a matter of simple balance sheet arithmetic, an addition to reserves requires some combination of a *decrease* in other assets (lending) and an *increase* in liabilities (funding).

Banks are not choosing to hold this large amount of reserves, they are essentially being compelled to hold them on the balance sheet as an unintended consequence of central bank asset purchases.

Viewed from the global financial sector perspective, Fed LSAPs have withdrawn approximately \$3 trillion of US Treasury, Agency, and MBS from the market in exchange for \$3 trillion of US bank reserves. Since, by law and definition, only banks may hold reserves at the Fed, banks have wound up with the reserves

regardless of whether they sold the securities—and research suggests that nonbanks were overwhelmingly the source of the sales to the Fed³⁸.

Therefore it would not be surprising that banks specializing in custodial, clearing and settlement services are likely to have borne the brunt of the impact of LSAPs³⁹. Their customers sold assets out of custody to FRBNY, directing FRBNY to credit their account at their designated custodian/settlement bank. The settlement banks did so and received—in return—an equivalent credit to their account at the FRB NY. The ultimate investor, say “A”—in line with the intent of the LSAPs—presumably then purchased other securities with their new deposits. Whoever sold those securities to A, say “B”—equities, corporate bonds, or even MBS or Treasuries—received payment from A at their (B’s) settlement/custodian bank. If the custodian banks are the same for A and B, no transfer of reserves takes place, the custodian bank simply transfers the ownership of the securities in custody and makes a corresponding adjustment in its depository (or other) liabilities. At some point, certainly, reserves will be transferred from custodial/settlement banks to retail and other banks, but the essential point is that for the banking system as a whole, if reserves rise, then either other assets fall or liabilities increase.

The impact of LSAPs on the aggregate US banking system is shown in Tables 12 and 13. Table 12 shows the change in selected balance sheet items for the aggregate US banking system between December 5, 2007 and November 26, 2014. Table 13 rearranges Table 12 to make it clearer that the \$ 2.8 trillion in deposits at the Fed that banks have acquired through LSAPs has been financed by an equivalent increase in depository liabilities. In other words, 2/3rds of the growth of US bank assets since the crisis consists of increased deposits at FRBs and 2/3rds of the growth of US bank liabilities during the same period consists of deposits necessary to finance the growth in bank deposits at the Fed.

Table 12: Change in Simplified Aggregate Balance Sheet of US Commercial Banks

From 12/5/2007 to 11/26/2014

(in US\$ billions)

Assets		Liabilities	
Loans and Leases	1156	Deposits	3719
Treasury and Agency securities	869	Borrowings	-324
Other Securities	-75	Other Liabilities	373
Deposits at FRBs	2798	Total Liabilities	3768
Other Assets	-483	Equity and Residual	497
Total Assets	4265	Total Liabilities and Equity	4265

Source: Federal Reserve Board Release H.8, H.4.1 and Author's calculations

³⁸ I am excluding the nonbanks mentioned above who may hold deposits at the Fed. See Carpenter, et. al. (2013).

³⁹ For simplicity I assume the investor uses the same bank holding company for clearing, settlement and custody.

Table 13: Change in Simplified Aggregate Balance Sheet of US Commercial Banks
From 12/5/2007 to 11/26/2014

		(in US\$ billions)	
Assets		Liabilities	
Deposits at FRBs	2798	Deposits to Finance Reserves	2798
Loans and Leases	1156	Other Deposits	921
Treasury and Agency securities	869	Equity and Residual	497
Net Other Assets	-607		
Total Assets	4216	Total Liabilities and Equity	4216

Source: Federal Reserve Board Release H.8, H.4.1 and Author's calculations

Table 13 is nothing other than simple balance sheet arithmetic. If deposits at FRBs rise by \$ 3 trillion, the combination of increased liabilities and decreased other assets must sum to \$ 3 trillion. In the US case, depository liabilities and equity have risen by more than enough to finance the increase in deposits at the FRBs, allowing some growth in other assets, mainly “loans and leases”.

Considering a slightly more disaggregated view of US banks, we would find that the growth in reserve holdings of US branches and agencies of *foreign* banks has been even greater than that of US chartered-banks reflecting the differential impact of changes in the US regulatory framework (Table 14).

Table 14: US Bank Reserves and Assets (in \$billions and percent)	End June 2008			End September 2014		
	Reserves	Total Assets	R/TA	Reserves	Total Assets	R/TA
US Chartered Banks	12.8	9725	0.13	1624	12355	13.1
US Branches and Agencies of Foreign Banks	0.6	2081	0.03	1082	2696	40.2

Source: FR Bulletin Table 4.3 November 2008; FRB Releases H.8, H.4.1 and author's calculations

Two particular revised regulations are worthy of mention.

In April 2011, the US changed the definition of the base on which the FDIC levies charges—from insured bank deposits to assets minus equity, i.e. all non-equity liabilities. This has increased the cost of non-deposit financing for US insured banks but not for foreign banks. Although the calculation is complicated, it is believed that the FDIC insurance fee alone “...added 2.5 to 45 basis points to the costs of large and complex US chartered banks’ short-term wholesale funding...the rate for the largest US

bank was said to be 8 basis points.”⁴⁰ This has given branches of foreign banks a competitive advantage vis-à-vis US chartered banks in the market for arbitraging the gap in the fed funds rate and IOR rate.

The second relevant regulatory change (effective January 1, 2015) is the requirement that the largest US “advanced approaches banking organizations” meet the “enhanced supplementary leverage ratio” (eSLR) minimum threshold of 5 percent by January 1, 2018. The eSLR is the ratio of regulatory capital to all balance sheet assets plus certain off-balance sheet items including the effective notional principal amount of credit derivatives through which a banking organization provides credit protection. Were the eSLR binding for, say, JPM, the latter would need to hold additional capital equal to 5 percent of reserves held at the FRBs or \$17.85 billion at the current level. At an equity cost of capital of 12 percent, this would amount to \$2.14 billion, and add 35 bps to the cost of financing its reserves holdings.

Non-reserve assets of US branches and agencies of foreign banks have *decreased* by \$466 billion while their FRB deposits have *increased* in excess of one trillion dollars. Consequently, 40 percent of the excess reserves at the Fed obtaining 25 bps are being held by branches of foreign banks even though those banks hold only 13 percent of all US banks’ assets (excluding deposits at the Fed). Nonbank funding of banks has shifted toward those foreign banks to avoid the newly enhanced regulatory restrictions and charges on US chartered banks’ short term funding⁴¹.

Returning to our discussion above of the custodial/settlement banks, those banks are actively trying to entice customers to move funding to other banks so as to avoid the enhanced FDIC and capital charges that make the intermediation of deposits at the Fed a low or even negative margin business. Bank of New York Mellon and JP Morgan have imposed fees and/or negative rates on certain depositor accounts⁴². For example, JP Morgan announced on February 24 2015 plans to shed \$ 100 billion in depository liabilities during 2015. These funds are evidently winding up at US branches and agencies of foreign banks who have a clear competitive advantage in this business line currently.

The implication of this for monetary operations is clear. Even though the Fed might be able to take the non-depository institutions not eligible for IOR out of the market with reverse repos, regulatory arbitrage opportunities—among US chartered and foreign banks—may continue to drive a wedge between the fed funds and IOR rate absent other policy measures. As the current SOMA manager said in 2013 “...competitive conditions in the unsecured money markets haven’t proven strong enough to narrow the spread between the fed funds rate and the IOER rate to very small and stable levels...”⁴³

The implications for long run financial stability and risk also seem clear. Incentives are in place to move certain financial services and intermediation to nonbanks—the regulatory “shadow”.

⁴⁰ McCauley and McGuire (2014).

⁴¹ Obviously, banks will finance overnight assets at the Fed with *short term* liabilities.

⁴² “JP Morgan to Start Charging Some Big Clients Deposit Fees” Wall Street Journal, February 23, 2015.

⁴³ Potter (2013), page 4.

V. Conclusion

The FOMC appears to have decided to keep the Fed balance sheet larger for longer than is necessary. This decision seems to be based on two erroneous related beliefs. The first is that the size of the Fed balance sheet, independent of the size of the consolidated sovereign US balance sheet, matters for monetary policy. This belief is akin to the belief that debt management operations have a different impact on interest rates whether the treasury notionally keeps the debt instruments that are purchased before maturity in a “box” until they mature (maintains them as gross liabilities on a ledger) or simply wipes them off the treasury accounting system as a current liability as is the practice in the majority of countries. The second mistaken belief is that the only scope for sovereign liability management is to sell instruments “in the box” or sell new instruments that fragment and segment the money market. Relying instead on the Treasury to execute a single financing strategy for the entirety of the US balance sheet would enable a more efficient and less costly exit from extraordinary balance sheet policies.

The probably that the current distribution of FRB holdings of securities exactly matches the securities that an unconstrained sovereign debt manager would issue to finance the consolidated balance sheet—and future deficits—is zero. In other words, the Fed, as “debt manager”, is restricted to issuing from a pre-defined “box” of securities that happen to be on its balance sheet at the present time. In practical terms, the Fed is constrained never to issue debt maturing in the years 2033-35, no more than \$1 billion maturing in 2032, \$3 billion maturing in 2031 and \$7 billion maturing in 2030. The Treasury is subject to no such arbitrary constraints.

Faced with these constraints, the FOMC is likely to hold on to its assets for an extended period of time. This raises the second problem, the inefficiencies incorporated into the structure of its liabilities.

Segmentation of the money market is virtually guaranteed as only banks may hold two of the Fed instruments—reserves and term deposits. This has compelled the Fed to introduce an unorthodox “maglev” monetary operations system and to exit within a target band. It also means that the US banking system will be burdened for an extended period with a bloated balance sheet. Were overnight interest rates where they were in 2006 and the regulatory framework similarly unchanged, this would pose no problems. However, with interest rates low; and US chartered banks now required to pay FDIC insurance charges on all non-equity liabilities and to keep capital to back reserves according to eSLR, the inefficiencies associated with using Fed instruments to manage one quarter of US sovereign debt—rather than US Treasuries—will be material both to the sovereign and the markets.

Conceptually, one could imagine several solutions to these problems.

One would simply be to resume the Treasury Supplementary Financing Program combined with a deposit arrangement similar to that used with great success in Mexico and Israel. The advantage of this arrangement would be that Treasury would run no rollover risk even if it issued only short term instruments to substitute for Fed instruments in the same maturity bucket. The downside, from the political optics, would be that it would increase gross debt outstanding “in the hands of the public” (but, of course, not net debt). Consequently, the Treasury might wish to use some of the funds raised in a resumed SFP to buy back debt held by the Fed. This would shrink the Fed balance sheet and provide the

Fed more space to resume LSAPs at a later date should that become necessary and, in addition, remove any market uncertainty that it might start selling outright from its long term debt portfolio. The Treasury could also use the funds raised to “clean up” the Fed balance sheet by purchasing the remaining equity in the Maiden Lane LLCs (effectively promised in 2009); the Fed’s modest holdings of foreign reserves to supplement the Treasury Exchange Stabilization Fund⁴⁴; and/or redeem nonmarketable gold certificates held by the Fed since 1934. This last measure would not require Congressional authorization.

An alternative to the SFP resumption would be to allow the FRB the option to swap, in agreement with the Treasury, any or all of its holdings for alternative Treasury securities⁴⁵. In other words, if the FOMC thought it best to shrink the balance sheet by issuing a basket of 1, 3 and 6 month t-bills, it could not currently do so as it has no securities of this maturity on its balance sheet. Under a free swap regime, the FRBs could agree to trade a current FRB holding, say \$100 billion of securities maturing in 2040-44 for an equal amount of t-bills. The Treasury would then refinance those bills in the market as they mature with the optimal set of instruments from a consolidated perspective.

Whatever the particular mechanism agreed, the US should aim to curtail the period of time during which it has two sovereign debt managers and two different sets of debt instruments.

The following appendix provides more detail on how other countries have resolved this situation and, in other cases, avoided the program of fragmented markets altogether.

Appendix: Alternative treasury central bank financial arrangements

Many central banks have had to experiment with managing large interest-bearing liabilities after financial crises or extended foreign exchange intervention. In other cases, they have avoided the need to issue interest-bearing debt from the outset through reliance on treasury sterilization support.

Consequently, the Fed experience during the first two phases of its crisis-related operations has hardly been unique. Many central banks have witnessed phase one and two transformations during major financial market interventions. In most cases, their balance sheets remained stuck in phase two for an extended period of time—sometimes decades.

On the asset side, crisis-involved central banks often acquire illiquid, virtually worthless assets from failed institutions—assets which cannot be sold and hence remain on the balance sheet. The Fed has managed to advance beyond this phase and holds, in contrast, valuable liquid assets.

On the liability side, most central banks emerge from crises with expensive liabilities—often own-debt instruments bearing high rates of interest and/or indexed to inflation or “hard” currencies⁴⁶. In the case of the Fed, its liabilities are currently very inexpensive, albeit floating rate.

⁴⁴ Canada, the UK, and Japan are examples where the entirety of the nation’s reserves are held by the Treasury.

⁴⁵ Naturally the swap would leave the amount of securities in the “hands of the public” as defined by US debt limit legislation unchanged.

⁴⁶ One of the last pre-Great Recession financial crises erupted in the Dominican Republic in 2004. The central bank issued 14.6 percent of GDP in certificates of deposits to absorb liquidity related to an increase in its liquidity

Hungary, circa 1995, is a classic case of phase two (Table 1A). The asset side of the balance sheet is dominated by worthless “fictitious” assets (accumulated central bank losses) and illiquid loans to government neither of which were available to service foreign debt.

Table 1A: Balance Sheet of the Central Bank of Hungary (Magyar Nemzeti Bank)
December 31, 1995
(in percent of GDP)

Assets		Liabilities	
Foreign Exchange	32.2	Foreign Liabilities	51.8
Credit to Government	20.1	Resident Deposits	26.1
Revaluation Losses	36.2	Banknotes and Coins	8.6
Net Other Assets	8.1	Other Liabilities	9.1
		Equity	1.0
Total Assets	96.6	Total Liabilities	96.6

Source: Magyar Nemzeti Bank Annual Report 1995, and Author's calculations.

Being frozen in phase two, other central banks have had to confront two serious problems the Fed does *not* have; an inability to reduce the size of the balance sheet by selling assets—since assets are worth far less than liabilities and/or are illiquid; and significant income and policy credibility problems—the loss making central bank may need to resort to “printing money” to meet its obligations to an extent inconsistent with low inflation.

Chile experienced an extreme banking crisis in the 1980s. The financial responsibility for dealing with the crisis fell largely on the Central Bank of Chile (CBC)⁴⁷. Massive amounts of credit were provided to banks in exchange for nonperforming loans. The central bank also set up a preferential exchange rate for dollar debtors⁴⁸. Part of the liquidity injected into the system was sterilized through CBC sales of foreign exchange; part by the issuance of central bank securities, with the remainder allowed to persist in the system as base money. Similarly, the subsidies involved in the preferential exchange rate for dollar debtors were first paid in cash by the central bank and later with six year central bank promissory notes.

providing facility (by 17 percent of GDP). Nevertheless, the monetary base increased by 7.1 percent of GDP owing primarily to currency issue to finance the interest on the CDs—the average interest rate paid on the CDs in 2004 was 59 percent. Central bank losses rose to 4 percent of GDP, the exchange rate depreciated by 126 percent over two years and inflation rose from 5 to 52 percent per annum.

⁴⁷ Restrepo, Salomó, and Valdés (2009) estimate total CBC losses from the banking crisis at 15 percent of GDP.

⁴⁸ Velasco (1991), page 148.

The stock of central bank notes outstanding rose almost 1000 percent in real terms during 1982-1985⁴⁹. International reserves, after rising from US\$ 56 million in 1975 to US\$ 3.2 billion in 1981, fell to US\$ 1.8 billion by end-1982. The debt issued by the CBC to sterilize its liquidity injections and the associated central bank losses led to a serious weakening of its balance sheet. “A large share of the Bank’s long-term debt originated from the banking system rescue during the financial crisis of the 1980s and the foreign exchange interventions of the 1990s. In both episodes, the Bank purchased a large amount of assets which today are mostly invested in international reserves at a lower interest rate than the yield on the bonds issued for their monetary sterilization. This action has given the Bank an equity deficit that has yet to be closed.”⁵⁰ In other words, the policy driven expansion of the asset side of the balance sheet has led to central bank debt and negative equity.

The impact on Chile’s public debt resulting from intervention during the 1980s banking crisis is hardly unique. As documented in Reinhart and Rogoff: “One striking finding is the huge surge in debt that most countries experience in the wake of a financial crisis...”⁵¹ The twist in Chile’s case—and in many others—is that the crisis was reflected primarily in the debt of the central bank, not the treasury. In the 1980s, in Chile, as well as in most of Latin America, domestic public debt markets were largely nonexistent. In the crisis, the central bank was the only institution with the credibility and operational capacity to tap domestic financial markets, particularly in light of concurrent severe fiscal stress.

Some twenty years after the start of the banking crisis, the CBC balance sheet remained enlarged owing to the debt issued during the crisis; debt issued to finance CBC losses; and debt issued to finance the accumulation of foreign reserves. At that time the CBC decided to embark on a plan to rationalize and improve the structure of its debt, in part along guidelines issued by the IMF and World Bank intended primarily for sovereign treasuries.

During the period 2002-2007 CBC liability management strategy aimed to reduce and eventually eliminate USD denominated debt and to substitute for it peso denominated debt. By end-2007, the CBC had reduced USD denominated debt by more than USD 5 billion and by end-2008 had eliminated it entirely. (See Table 16). Long term peso debt rose from less than USD 1 billion (equivalent) at end-2002 to USD 3.85 billion (equivalent) at end-2007⁵². Coupled with an overall decrease in CBC long term debt by the equivalent of USD 7.7 billion (34 percent) during this period, peso denominated debt rose from 3 percent of total long term debt to 26 percent with US dollar-denominated debt experiencing an exactly offsetting decline in importance. Long term debt denominated in UF (inflation indexed) comprised 71 percent of CBC total long term debt at end-2002 and end-2007.

Significant progress was also made in consolidating CBC debt into fewer instruments (there were 14 different instruments outstanding at end-2002) in order to improve market depth in selected issues and

⁴⁹ Velasco (1991), Table 20 page 164.

⁵⁰ *Liquidity Management of the Central Bank of Chile*, page 9.

⁵¹ Reinhart and Rogoff (2009), page 172.

⁵² *Liquidity Management of the Central Bank of Chile*, Table 3, page 26.

instruments. The share of BCUs (Bonds in UF) among total UF denominated debt rose from only 4 percent to 54 percent from end-2002 to end-2007.

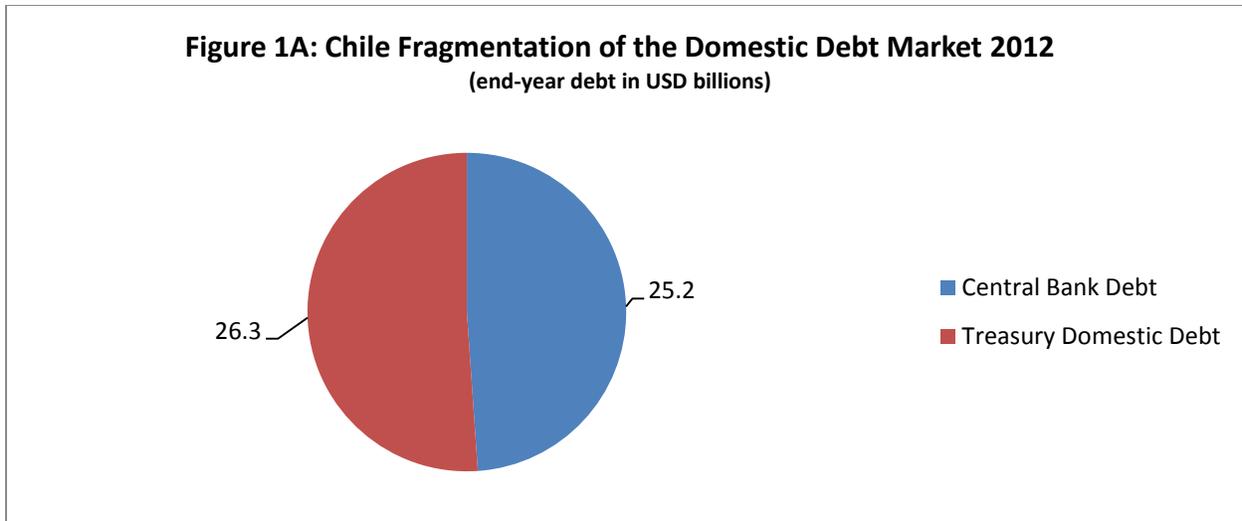
Broadly speaking, the CBC debt management strategy and execution was in line with best practice trends in Latin America such as in Mexico during that time—reducing reliance on USD debt, improving domestic market liquidity and building a nominal local currency sovereign yield curve.

Table 2A: Central Bank of Chile Debt Composition (in billions of pesos)	2012	2011	2007	2002
Discountable Promissory Notes (PDBC)		985	852	2983
Bonds in UF (BCU)	8535	8055	2556	227
Bonds in Pesos (CBP)	3906	3533	1935	374
Indexed Promissory Notes (PRC)	234	300	1488	4606
Optional Indexed Coupons in UF (CERO)	230	313	663	1149
Bonds in US Dollars (BCD)			198	1026
Indexed Promissory Notes USD (PRD)				2622
Optional Indexed Coupons in USD (CERO)				592
UF Promissory Notes Restructured (Res. 990)				327
Redenominated Forex Commercial Notes				112
CB Indexed Promissory Notes (PRBC)				60
USD CDs				4
UF Promissory Notes (Res. 1836)				1
Floating Interest Rate Promissory Notes (PFT)				1
Exchange Differential Notes	.021	.021	.021	.021
Total	12905	13186	7694	14084

Source: Central Bank of Chile Annual Reports, various issues.

At the same time the CBC began to implement a gradual exit from long term debt with the intention that the Treasury would eventually occupy that space. The Treasury began to issue long term in UF while the CBC would concentrate its issuance in the shorter maturities and in nominal peso instruments.

Had the reduction in overall CBC indebtedness witnessed during the period 2002-2007 continued apace during the following 5 years, total CBC debt would have fallen to the equivalent of USD 4.54 billion by end-2012, an amount approximately USD 1 billion less than the combined sum of short term debt (PDBCs) and peso debt (CBP) outstanding at end-2007. This would have allowed the CBC to reduce the number of its instruments to only two (one “monetary” and one “debt”) with a good chance to eliminate its debt entirely by the end of the 2010s, particularly in light of the scope given to the Treasury in the 2006 Fiscal Responsibility Law (Law # 20,128) to recapitalize the CBC. The latter mechanism could be employed to accelerate the reduction in CBC debt were the CBC to use the recapitalization resources obtained from the Treasury to buy back its own debt rather than, for example, to add to its foreign reserves.



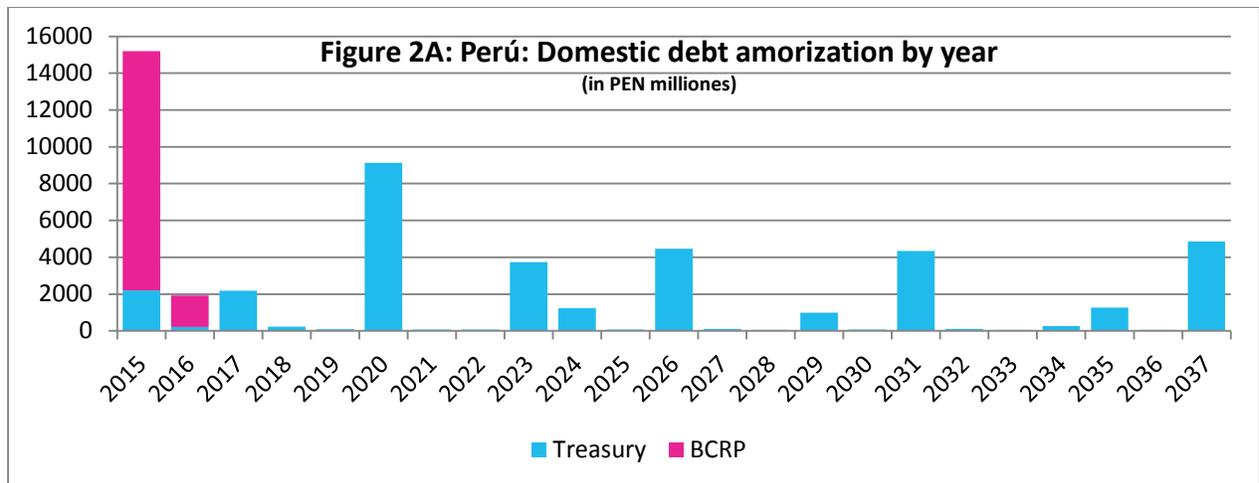
Source: *Reporte Trimestral Deuda del Gobierno Central* (June 2013), *CBC Annual Reports* (various).

Although the Ministry of Finance and Economy (MFE) of **Perú** has steadily improved the risk profile of its debt—reducing foreign currency risk and lengthening maturities, the secondary market remains relatively illiquid owing to market segmentation and fragmentation. Of the five major Latin American markets, Perú is viewed as far less liquid than Chile and Colombia and in a different class completely from Mexico and Brazil. Market illiquidity is a particularly acute weakness during turbulent times as the ability of the market to absorb downward shocks to demand is limited. Price volatility feeds into a withdrawal of risk capital by market makers leading to a potential self-reinforcing process magnifying the deleterious impact of shocks⁵³. The fragmented offering of treasury and central bank securities is a primary cause for the domestic sovereign debt market to function below potential.

The MFE has almost completely ceded the short end of the yield curve to the central bank (CBP) which reduces the interest of local banks in government securities. In practice this issuance pattern has created three segments: a short-term (3 to 18 months) with CBP issuing according to the needs of monetary policy mainly to local banks, a 2-5 year sector where MFE primary market issuance is relatively small and the long-term where the MFE issues regularly to satisfy the needs of pension funds and non-residents. Since non-resident access to CBP securities is expensive, the yield curve is discontinuous.

The CBP has taken an opportunistic, rather than strategic, approach to market development. It currently offers six month, one year, and eighteen month certificates of deposits in PEN on a weekly basis, and—more irregularly—certificates of deposit that are linked to inflation. Each auction is of a different security, i.e. there are no reopenings of previously issued CDs. Consequently, there are approximately 200 different securities in the short term space each with small outstanding amounts. Not surprisingly, there is virtually no secondary market trading in these instruments.

⁵³ For a theoretical discussion, see “The Limits to Arbitrage”, Shleifer and Vishny, *Journal of Finance*, March 1997.



Market fragmentation extends beyond multiple issuers and securities issued across the yield curve encompassing also segregation among market participants, particularly between foreign and local investors. Commercial banks can satisfy their needs by trading directly with the CBP and in the absence of a complete yield curve find it difficult/expensive to arbitrage long vs. short tenors.

In the absence of a liquid treasury securities market, many central banks have been compelled to issue their own securities to absorb increases in the monetary base associated with foreign exchange purchases or financial market intervention. Several have successfully transitioned to the use of government securities once the domestic treasury market reached a critical mass and appropriate legislative and operational arrangements were made (Brazil, Mexico, and Israel). Not only did this eliminate domestic debt market fragmentation, it led—particularly in the cases of Brazil and Mexico—to a significant deepening of the treasury debt market along the yield curve. It is in the interest of both the central bank and treasury to develop deep money and debt markets through the implementation of sound liability management techniques such as selecting benchmark issues.

Although Banco de **México** has adopted a floating exchange rate regime, by law it must buy all of the foreign exchange earnings of the state petroleum company, PEMEX. The increase in petroleum product prices that began 15 years ago led to a large increase in foreign exchange inflows and, on the other hand, generated high peso liquidity in the Mexican financial system. The Banco de México used to issue its own bonds, “BREMES” to conduct monetary policy, that is to say, to absorb the excess liquidity caused by the foreign exchange purchases.

Since the interest rates the central bank paid on its debt were much higher than the yield obtained on its foreign reserves, the central bank made large losses and suffered from negative equity. In June 2006, the Ministry of Finance bought US\$12.4 billion from the Banco de México using pesos that it had obtained from a special auction of a series of its main domestic financing instrument (known as BONDES D). The Ministry of Finance used the foreign exchange obtained to prepay debt owed to the World Bank, the Inter-American Development Bank (US\$9 billion) and to buyback sovereign debt trading in the international capital market (US\$3.4 billion).

Simultaneously, the Banco de México used the pesos obtained from the Ministry of Finance to buy back an equivalent amount of its monetary policy bonds (BREMS), which had very similar characteristics to the Treasury's BONDES D. Furthermore, the central bank announced that going forward, it intended to use only government debt in its monetary operations.

The central bank realized a reduction in its sterilization costs greater than the reduction in interest income caused by its lower foreign reserves (sold to the treasury). Consequently, its losses fell. That is to say it saved the difference between the interest rate it paid on its domestic debt and the rate it received on its foreign reserves (multiplied by US\$12.4 billion). The Ministry of Finance obtained a superior debt profile (in terms of exposure to exchange rate risk) and a reduction in the cost of its debt—the rates on its external debt were higher than the rate paid on its domestic debt (BONDES D).

Although the Mexican operation handled the bifurcation of the stock outstanding, a new mechanism had to be introduced to prevent future issuance of BREMS while allowing the central bank an unfettered ability to sterilize future foreign exchange purchases from PEMEX. The scheme is outlined below.

The Banco de México is provided with Treasury bonds and bills (CETES) to conduct sterilization operations. Every quarter the treasury and central bank hold a joint meeting announcing their issuance strategy for CETES and BONDES D. The bonds are used for sterilizing “long term” central bank foreign exchange purchases while the bills are used for short term liquidity management.

The proceeds of the central bank auctions of government debt are deposited in a government account at the Banco de México. The government deposit is “frozen”...i.e. cannot be used to finance expenditure...only to redeem the corresponding government debt when it becomes due. The government account is paid by the central bank the exact interest rate the government pays on the debt issued.

In February 2003, the government of **India** executed an operation very similar to Mexico's, prepaying external debt with an average maturity of 9.3 years amounting to US\$ 3 billion. The foreign exchange was obtained by the government from the central bank (RBI) in exchange for an equivalent amount of marketable domestic debt through a private placement

The RBI received a significant stock of domestic debt thereby enhancing its power to sterilize foreign capital inflows while also achieving a reduction in its exposure to foreign exchange risk⁵⁴.

In **Israel**, the Short Term Debt Law allows the government to issue short term bills (Makam) to the Bank of Israel (BOI) for use in monetary operations. When sold by the BOI, the entire proceeds—the funds received by government—must be deposited at the BOI. These funds may be used only for the redemption of the Makam. In 2002, the ceiling imposed on the volume of Makam that could be issued was removed thereby enabling the BOI to rely primarily on this instrument for liability management.

⁵⁴ Other countries where the Treasury finances central bank holdings of foreign reserves include Sweden, Denmark and New Zealand.

The BOI pays interest on the government's deposit equal to the interest government must pay on the Makam. Since Makam are short term discounted instruments, the BOI merely credits the government account with the difference between the par value of the debt and the proceeds received at auction.

In other countries, the potential bifurcation of the domestic debt market associated with an expanded central bank balance sheet was avoided. See boxes 1 and 2.

Box 1: Norway Government Asset Swap Scheme

- *At the outset of the crisis the Norwegian Parliament approved a government financed auction of treasury bills for mortgage backed securities held by Norwegian banks.*
- *Although the scheme was suggested as necessary by the Norges Bank, the government assumed the risk of these extraordinary liquidity operations onto its own balance sheet:*
- *"...funding support for banks came from the government's balance sheet, not as loans from Norges Bank. This provided transparency...The Norwegian measures were designed in such a way that Norges Bank's balance sheet has not increased to the same extent as that of a number of other central banks."*

Source: Norges Bank Governor Svein Gjedrem, "Experiences with the financial crisis", presentation given at the Norwegian School of Management, 30 September 2009.

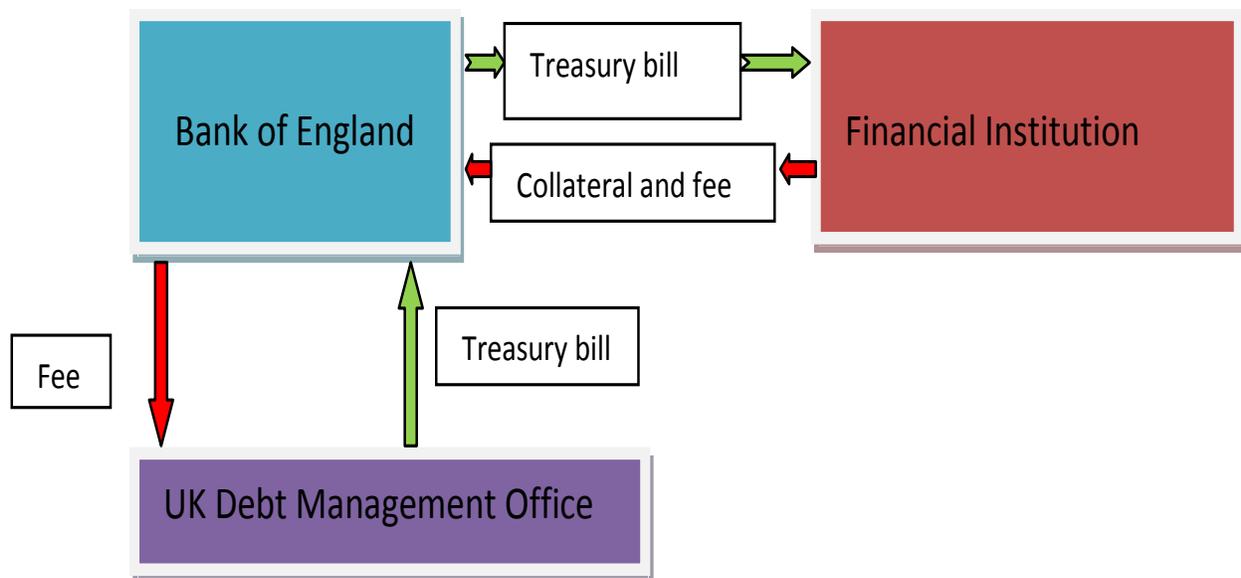
The Norwegian arrangement implies the government assumes any financial risk associated with the intervention as was also the case in the **UK**...

Box 2: Alternative UK Arrangements

- **UK Special Liquidity Scheme**—The Bank of England, acting as an agent for the UK Treasury (HMT), swapped treasury bills borrowed from HMT for mortgage backed securities held by the market. HMT indemnified the Bank for any losses that might result. This was a collateral swap and was entirely off balance sheet. (April 2008)
- **UK Asset Purchase Scheme**—In cooperation with the Treasury, the Bank of England established the Bank of England Asset Purchase Facility Fund Limited. The BEAPFF was designed to undertake outright purchases of private sector assets funded by a loan of cash and treasury bills from the Bank of England. Treasury indemnity was again provided for any losses. (January 2009). Loan is on the BOE balance sheet.

The Special Liquidity Scheme, as designed, impacted neither the BOE nor HMT balance sheet.

The Special Liquidity Scheme was particularly interesting in that it was not only entirely off the Bank of England balance sheet but also the Treasury's. After considerable discussion, Eurostat agreed to accept the UK authorities' argument that the transaction was merely a loan of securities to the Bank of England and consequently neither deficit financing nor additive to the Treasury's marketable debt outstanding. Similarly, the Bank of England argued that the transaction was simply a collateral swap and not a loan. Consequently the SLS impacted neither the Treasury accounts nor the Bank of England accounts.



The Bank of England Asset Purchase Facility Fund (APFF) is a separate company established by the Bank of England in agreement with HM Treasury (HMT) to purchase private sector assets (and later government debt in the secondary market) to support market liquidity. The purchase of corporate bonds, commercial paper, syndicated loans and asset backed securities is to be financed by issuance of Treasury bills and government cash deposits. BOE lending to the APFF was initially financed with borrowing of cash and Treasury bills from HMT (interest payable at Bank Rate). Later, authority was given to finance purchases of private sector and UK government debt with central bank money. When BOE financing is obtained from HMT, borrowing from the UK Debt Management Office appears as the BOE balance sheet liability. When financing consists of central bank money, bank reserves appear as the balance sheet liability.

In the **United States** there was a mixture of operations with differing implications for the balance sheet of the Federal Reserve. Indeed, at some point in 2008 the Treasury and Federal Reserve were undertaking identical transactions on their separate balance sheets—selling Treasury securities and using the proceeds to purchase mortgage-backed securities to provide liquidity to the market for housing financing.

Box 3: Alternative US liquidity programs

- US Treasury GSE Purchase Program: The Treasury purchased asset-backed securities issued by or guaranteed by the GSEs. The purchases were financed by the issuance of US Treasury debt. Consequently US Treasury debt outstanding increased.
- The US Treasury program was identical in form to policy being followed by the Federal Reserve at the same time known as “credit easing” or later LSAPs—but the Treasury was subject to Congressional oversight and budgetary restrictions while the Federal Reserve was not....a different governance structure entirely.
- In neither the US Treasury program nor the Federal Reserve program was there a change in the monetary base—securities were sold from the central bank portfolio to sterilize the purchases of MBS. US Treasury holdings were liquidated in 2011.

“The Housing and Economic Recovery Act of 2008 (HERA) gave Treasury the authority to purchase agency-guaranteed MBS to provide stability to financial markets, prevent disruption to the availability of mortgage finance, and protect taxpayers...Treasury purchased agency-guaranteed MBS between October 2008 and December 2009. As of March 15 [2011], the current value of Treasury’s holding was approximately \$142 billion....Starting in March 2011, the Treasury plans to sell up to \$10 billion in agency-guaranteed MBS per month, subject to market conditions”⁵⁵.

While cooperation between the Federal Reserve and the Treasury has in general been good during the crisis the handling of the most controversial interventions—the assistance provided to JP Morgan to rescue Bear Sterns and the direct aid provided to the global insurance giant AIG—has been less than ideal.

Although the Treasury recognized its fiscal responsibility to cover the structures set up to handle these interventions (known as the “Maiden Lane LLCs”) and pledged to either remove them from the FR balance sheet or liquidate them, it has not done so as of December 2014:

“Government decisions to influence the allocation of credit are the province of the fiscal authorities....Actions that the Federal Reserve takes, during this period of unusual and exigent circumstances, in the pursuit of financial stability, such as loans or securities purchases that influence the size of its balance sheet, must not constrain the exercise of monetary policy....In the longer term and as its authorities permit, the Treasury will

⁵⁵ US Treasury (2011).

seek to remove from the Federal Reserve's balance sheet, or to liquidate, the so-called Maiden Lane facilities made by the Federal Reserve as part of efforts to stabilize systemically critical financial institutions.”⁵⁶

The **Brazil** Fiscal Responsibility Law (Law 101 of 4th of May 2000) fundamentally changed the financial relationship between the Central Bank of Brazil (CBB) and the Brazilian Treasury. The law defined “public debt” to include CBB debt (Article 29.5.2) and the CBB was prohibited from issuing public debt in the primary market two years following passage of the Law (Article 34). Until that time the central bank had been a heavy issuer of its own debt to absorb quasifiscal losses and sterilize foreign exchange purchases.

Following the passage of the Law, the Treasury became responsible for management of all public debt. In order to allow the CBB to exit from the issuance of its own instruments in the primary market, the Treasury became responsible to cover any CBB deficit with marketable Treasury securities (semi-annually) and also to provide CBB with government securities when necessary for sterilization (monetary policy) purposes. The CBB moved to reliance on using reverse repos with government securities from its own portfolio as the main policy instrument.

Since CBB losses are automatically covered with government securities, and further securities are provided against an equity injection as needed for monetary policy purposes, the CBB is effectively recapitalized “on demand”, or at least every six months if necessary. Similarly, if the CBB generates profits, these are provided in full to the Treasury every six months

The key financial provisions in the Brazilian Law are contained in Article 7:

- Art. 7º The financial result of the Brazilian Central Bank, after the constitution or reversal of reserves, will be considered a revenue of the National Treasury and will be transferred before the 10th day after the approval of the semi-annual balance sheet.
- § 1º A negative result will be an obligation of the Treasury to the Central Bank of Brazil and will be assigned a specific allotment in the budget.
- § 2º The impact and the fiscal cost of the operations undertaken by the Brazilian Central Bank will be documented quarterly, in terms consistent with the budgetary nomenclature of the Federal government.
- § 3º The quarterly balance sheet of the Brazilian Central Bank will contain explanatory notes on costs of the remuneration of the deposits of the National Treasury and the maintenance of the foreign exchange reserves and the yield of its securities portfolio, separate from the emission of Federal securities.

The Fiscal Responsibility Law effectively consolidates the operations of the central bank into the rest of the public sector. The CBB actively uses reverse repos to manage its liabilities⁵⁷. See below.

⁵⁶ US Treasury and Federal Reserve (2009).

⁵⁷ See Stella (2014).

Central Bank of Brazil: Distribution of Liquidity Absorbing Repos at end 2013							
(in billions of Reais)							
	Up to 1 month	1-6 months	6-12 months	1-5 years	> 5 years	Total	
Maturity of Repos	481.7	76.3	11.3			569.3	
Maturity of Underlying Instruments (collateral provided)		63.7	103.6	230.6	138.6	536.5	
<i>Source: Banco Central do Brasil Financial Statements December 31, 2013</i>							
Central Bank of Brazil: Distribution of Liquidity Absorbing Repos at end 2013							
(in billions of US\$)							
	Up to 1 month	1-6 months	6-12 months	1-5 years	> 5 years	Total	
Maturity of Repos	205.6	32.6	4.8			243.0	
Maturity of Underlying Instruments (collateral provided)		27.2	44.2	98.4	59.2	229.1	
<i>Source: Banco Central do Brasil Financial Statements December 31, 2013 and author's calculations</i>							
Central Bank of Brazil: Distribution of Liquidity Absorbing Repos at end 2013							
(in percent of GDP)							
	Up to 1 month	1-6 months	6-12 months	1-5 years	> 5 years	Total	
Maturity of Repos	9.9	1.6	0.2			11.7	
Maturity of Underlying Instruments (collateral provided)		1.3	2.1	4.8	2.9	11.1	
<i>Source: Banco Central do Brasil Financial Statements December 31, 2013; Economic Indicators; and author's calculations</i>							

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