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The \$13 Trillion Question

David Wessel

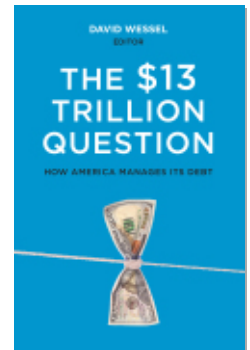
Published by Brookings Institution Press

Wessel, David.

The \$13 Trillion Question: How America Manages Its Debt.

Brookings Institution Press, 2015.

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DEBT MANAGEMENT CONFLICTS BETWEEN THE U.S. TREASURY AND THE FEDERAL RESERVE

**Robin Greenwood, Samuel G. Hanson,
Joshua S. Rudolph, and Lawrence H. Summers**

In this chapter, we discuss conflicts between the U.S. Treasury and the Federal Reserve in their debt management operations. Our use of the term “debt management operations” is not a conventional way to describe Federal Reserve policy, but we use it here to recognize the role that the Fed has in influencing the net supply of debt held by the public.

We start by documenting empirically the extent to which monetary and fiscal policies have been pushing in opposite directions in recent years. We show that, despite successive rounds of quantitative easing (QE), the stock of government debt with a maturity over five years that is held by the public (excluding the Fed’s holdings) has risen from 8 percent of GDP at the end of 2007 to 15 percent at the middle of 2014. Pressure on bond investors to absorb long-term government debt has actually increased rather than decreased over the last six years!

We find that between two-thirds and three-quarters of the increased supply of longer-term Treasuries is explained by the dramatic growth in outstanding debt due to the large deficits associated with the Great Recession.

The remaining one-quarter to one-third is due to the Treasury's active policy of extending the average maturity of its debt.

In discussions of its QE policies, the Federal Reserve has focused on the effects that its bond purchases were expected to have on long-term interest rates and, by extension, the economy more broadly. However, in doing so, it completely ignored any possible impact on government fiscal risk, even though the Federal Reserve's profits and losses are remitted to the Treasury. Treasury's debt management announcements and the advice of the Treasury Borrowing Advisory Committee (TBAC), a committee of investment managers and bankers who meet regularly to advise the Treasury debt managers, have focused on the assumed benefits of extending the average debt maturity from a fiscal risk perspective and largely ignored the impact of policy changes on long-term yields. To the extent that the Federal Reserve and Treasury ever publicly mention the other's mandate, it is usually in the context of avoiding the perception that one institution might be helping the other achieve an objective. The Fed does not want to be seen as monetizing deficits. The Treasury has been reluctant to acknowledge the role that the Fed has in debt management—the Treasury effectively treats the Fed as nothing more than a large investor.

We then place the current tension between Federal Reserve-led debt management and Treasury-led debt management in historical perspective. Before 2008, changes in Federal Reserve holdings of long-term bonds had only a tiny impact on the amount of long-term Treasury debt held by the public—that is, Fed policy had little direct impact on the consolidated debt management strategy of the U.S. government. However, we describe a few historical examples in which the Federal Reserve and the Treasury agreed to coordinate policy for the purpose of achieving a common set of objectives with regard to debt management. Thus, history suggests that greater cooperation on debt management is possible.

We argue that improved cooperation between the Treasury and the Federal Reserve in setting debt management policy would be in the national interest. We outline the principles that would form the basis for such cooperation. In sketching this framework, we draw on the arguments we developed in chapter 1, where we laid out a trade-off model for the management of the *consolidated* government debt. According to this model, optimal debt maturity trades off objectives of financing the government at the lowest cost and at a suitable level of refinancing risk (typically considerations taken up by the Treasury) with considerations related to financial stability and aggre-

gate demand management (typically considerations taken up by the central bank). Given these objectives, it is straightforward to describe settings in which, under current institutional arrangements, the Treasury may come into conflict with the Federal Reserve because it places different weights on the competing objectives of debt management. While the potential for conflict is greatest when interest rates are at the zero lower bound, we suggest that a lack of coordination can lead to suboptimal policy during ordinary times as well, although the costs are not as great then because the Fed can offset debt management decisions by moving the short-term interest rate.

During normal times conflict can arise because there are only two policy instruments—the short-term interest rate and debt management—but at least four policy objectives. Improved policy coordination could reduce these conflicts, especially when the conflicts are exacerbated when interest rates are very low. At the zero lower bound, a fully coordinated policy—such as the policy the Treasury and the Fed already pursue with respect to currency intervention—should be the norm.

Fed versus Treasury: 2008–14

Starting in 2008, U.S. monetary policy and debt management dramatically changed course in response to the unfolding financial and economic crisis, pulling the government balance sheet in opposite directions.

Table 2-1 shows a stylized depiction of the major financial assets and liabilities of the U.S. government in December 2007 and July 2014. The size of the Federal Reserve's balance sheet has grown fivefold over this period due to its purchases of \$1.8 trillion of long-term Treasuries and \$1.8 trillion of mortgage-backed securities (MBS) and agency securities, financed by an increase in interest-bearing reserves.¹ The duration of the Federal Reserve's

1. The initial surge in the Fed's balance sheet occurred after Lehman Brothers' failure in September 2008 and was due to lending to private intermediaries and firms under various liquidity facilities. Since early 2009, the Fed balance sheet growth has been due to large-scale asset purchases (LSAPs), often referred to as quantitative easing (QE).

Historically, the Fed did not pay interest on reserves and instead controlled short-term nominal interest rates by varying the supply of reserves to target a desired level for the rate on overnight loans between banks (the Federal funds rate). However, central banks in many other countries control short-term rates by paying

Table 2-1. *Consolidated U.S. Government Balance Sheet: 2007 versus 2014*

Assets	December		July		Liabilities	December		July	
	2007		2014			2007		2014	
	FV (\$tr)	Dur (yrs)	FV (\$tr)	Dur (yrs)		FV (\$tr)	Dur (yrs)	FV (\$tr)	Dur (yrs)
Federal Reserve									
Treasury Debt	\$0.7	3.3	\$2.5	7.8	Currency	\$0.8	N/A	\$1.2	N/A
MBS+ Agency Debt	\$0.0	N/A	\$1.8	5.6	Reserves	\$0.01	0.0	\$2.7	0.0
Other	\$0.1	N/A	\$0.1	N/A	Other	\$0.1	0.0	\$0.4	0.0
Treasury									
Taxing Power	N/A	N/A	N/A	N/A	Treasury debt	\$4.5	3.9	\$12.2	4.6
Consolidated balance sheet									
					Treasury debt	\$3.8	4.1	\$9.6	3.8
Taxing Power	N/A	N/A	N/A	N/A	Currency	\$0.8	N/A	\$1.2	N/A
MBS+ Agency Debt	\$0.0	N/A	\$1.8	5.6	Reserves	\$0.01	0.0	\$2.7	0.0
Other	\$0.1	N/A	\$0.1	N/A	Other	\$0.1	0.0	\$0.4	0.0
Total	\$0.1	N/A	\$1.9	N/A	Total	\$4.6	4.0	\$14.0	2.9

Sources: Based on authors' calculations using data from the Treasury's Monthly Statement of the Public Debt, the Federal Reserve System's H.4.1 Release (Factors Affecting Reserve Balances), and the Federal Reserve Bank of New York's System Open Market Account Holdings release.

Note: FV denotes face value of the claim in trillions of U.S. dollars, and Dur denotes the Macaulay duration in years, as estimated by the authors based on the July 2014 yield curve. Consolidation nets out the Treasury debt that is held by the Federal Reserve.

portfolio of Treasury securities increased from 3.3 years to 7.8 years.² At the same time, Treasury debt outstanding rose from 31 percent of GDP in 2007 to 70 percent of GDP in 2014. The duration of the outstanding Treasury debt increased from 3.9 years to 4.6 years. On a consolidated basis, however, the duration of the U.S. government's liabilities has moved very little, from 4.0 years to 2.9 years, as table 2-1 shows.

interest on reserves. The Fed obtained the authority to pay interest on reserves under the Emergency Economic Stabilization Act of 2008.

2. Duration is the weighted average time to receipt of the cash flows on a bond. Duration captures the sensitivity of a bond's price to its yield and is an indicator of how much interest rate risk is being borne by a bondholder.

We isolate the policy-driven component of these changes and assess the net impact of these policies by converting them into common and economically meaningful units of interest rate risk. We start with the Federal Reserve's balance sheet, summarized in panel A of table 2-2 at year-end dates beginning in December 2007. The vast majority of the securities held by the Federal Reserve System are held in the System Open Market Account (SOMA). In December 2007, securities held in the SOMA had a face value of \$750 billion. These securities were comprised of mostly Treasury bills, notes, and bonds, with an average duration of 3.3 years, similar to the duration of outstanding Treasury debt. After falling in 2008, by December 2009 the face value of all securities in the SOMA had reached \$1,839 billion, including \$771 billion of Treasury securities, \$160 billion of debt issued by Fannie Mae and Freddie Mac, and \$908 billion of MBS guaranteed by Fannie Mae and Freddie Mac and the Government National Mortgage Association (GNMA). By July 2014, the securities held by the SOMA had doubled again, reaching \$4,121 billion (58 percent in U.S. Treasuries, 41 percent in MBS, 1 percent Fannie Mae and Freddie Mac debt). Thus, the total increase from 2007 was \$3,371 billion, or 19.4 percent of 2014 GDP.

To estimate the impact of QE—as opposed to the normal growth in the size of the Fed's balance sheet due to the growth in the demand for currency in circulation—we adjust the growth in the SOMA for growth during ordinary times. A simple way to do this is based on the observation that from 2003 to 2007 the SOMA averaged 95 percent of currency in circulation. Thus, we estimate the abnormal growth in the Fed's balance sheet due to QE by subtracting 0.95 times currency in circulation. The third column in panel A of table 2-2 shows that this adjustment implies a cumulative *abnormal* growth in the Fed's balance sheet of \$2.9 trillion between December 2007 and July 2014.

If one's objective is simply to assess the scale of the Federal Reserve's balance sheet, one could simply track the *face value* of its security holdings, as we have just done. However, the goal of QE was to reduce the amount of interest rate risk borne by private investors, thereby lowering long-term interest rates through a portfolio balance channel. Thus, the analysis is more informative if holdings are converted into common units. We do so by adjusting Federal Reserve holdings by their Macaulay duration, which captures the weighted average maturity of the debt.³

3. Vayanos and Vila (2009) and Greenwood and Vayanos (2014) show that bond supply shocks may impact term premia if they change the amount of interest rate risk that must be borne by fixed-income investors.

Table 2-2. Quantitative Easing and Treasury Maturity Extension: Ten-Year Duration Equivalents

Panel A: Impact of quantitative easing										Panel B: Impact of expansion of debt and Treasury maturity extension							
Fed holdings					10-year equivalents					Debt outstanding				10-year equivalents			
SOMA (\$bn)	Currency × 0.95	QE (\$bn)	Dur (yrs)	SOMA (\$bn)	QE (\$bn)	QE (% GDP)	Debt (\$bn)	Dur (yrs)	Total (\$bn)	Cum Δ (% GDP)	Debt expand (% GDP)	Mat extend (% GDP)					
12/2007	750	784	0	3.3	279	0	0.0%	4,537	3.9	2,005	0.0%	0.0%					
12/2008	490	844	0	5.4	299	0	0.0%	5,798	3.5	2,287	1.9%	-1.9%					
12/2009	1,839	883	956	5.4	1,119	744	5.4%	7,272	3.9	3,189	8.1%	-0.2%					
12/2010	2,150	934	1,215	5.3	1,288	941	6.2%	8,863	4.1	4,101	13.8%	1.2%					
12/2011	2,604	1,020	1,584	5.6	1,655	1,276	8.1%	9,937	4.3	4,817	17.7%	2.7%					
12/2012	2,649	1,105	1,544	7.2	2,144	1,733	10.6%	11,053	4.5	5,535	21.5%	4.0%					
12/2013	3,743	1,178	2,564	7.0	2,938	2,500	14.6%	11,869	4.5	6,066	23.8%	4.8%					
7/2014	4,121	1,220	2,901	6.8	3,172	2,718	15.6%	12,163	4.6	6,339	24.9%	5.5%					

Source: Authors' calculations using data from the Federal Reserve System's H.4.1 Release (Factors Affecting Reserve Balances) and the Treasury's Monthly Statement of the Public Debt. GDP is from the Bureau of Economic Analysis.

Note: Panel A describes the impact of QE programs on the Federal Reserve balance sheet, at year-end dates beginning in December 2007. SOMA refers to the System Open Market Account. Between 2003 and 2007, the SOMA was an average of 95 percent of currency in circulation. We define QE impact to be SOMA minus 0.95 × currency in circulation. To convert into ten-year duration equivalents, we multiply face values by the ratio of portfolio duration (denoted by *Dur*) to the duration of a ten-year bond (8.9 years). Duration is computed based on the July 2014 yield curve. Panel B describes the impact of U.S. Treasury's expansion and maturity extension of the public debt. We convert Treasuries outstanding into ten-year equivalents. We further break down the cumulative change in ten-year duration equivalents between December 2007 and July 2014 (estimated) into two components: the expansion of the debt and the maturity extension according to:

$$\Delta \left(\frac{\text{Debt}_t \cdot \text{Dur}_t}{\text{Dur}_t^{10\text{-yr}}} \right) = \left(\frac{1}{\text{Dur}_t^{10\text{-yr}}} \right) \cdot \left(\underbrace{\Delta \text{Debt}_{\text{Dur}_{t-1}}}_{\text{Debt Expansion}} + \underbrace{\Delta \text{Dur}_t \text{Debt}_t}_{\text{Maturity Extension}} \right)$$

Duration of Federal Reserve Holdings and outstanding Treasury debt are computed by the authors as described in the text.

Specifically, we convert the Federal Reserve holdings into “ten-year duration equivalents” by multiplying the face value of the portfolio by its weighted average duration and dividing the result by the duration of a ten-year Treasury note.

$$\text{Debt}_t^{10\text{-yrEquivalent}} = \frac{\text{Debt}_t \cdot \text{Dur}_t}{\text{Dur}_t^{10\text{-yr}}}. \quad (2-1)$$

This calculation recognizes that, from the perspective of private investors, the amount of interest rate risk they are asked to bear would be the same if there were \$1 trillion twenty-year zero-coupon bonds as if there were \$2 trillion ten-year zero-coupon bonds.⁴ Likewise, this calculation treats the purchase of \$1 billion ten-year zero-coupon Treasury bonds as equivalent to \$1 billion MBS with a duration of ten years. Put differently, this calculation implicitly assumes that the relevant policy instrument in the case of QE is the total amount of duration removed from the bond market.⁵ Our conclusions here are not sensitive to methodology; we obtain similar results if we instead convert SOMA holdings and Treasury issuance into common units by simply rescaling by maturity.

To compute the duration of all securities in the SOMA, we combine our estimate of the average duration of the Fed’s Treasury holdings with an estimate of the duration of its MBS and agency holdings. To isolate changes in duration due to changes in the Fed’s holdings—as opposed to changes in the term structure of interest rates—we compute duration based on a constant yield curve on July 31, 2014. Table 2-2 shows that the combined duration impact of the Fed’s QE policies, which is \$2,901 billion in face value

4. This is only strictly true if the yield curve shifts in a parallel fashion.

5. This is a clear simplification because it implies that it does not matter in which market the duration is purchased. In perfectly integrated fixed-income markets, a \$1 purchase of five-year duration MBS has the same policy impact as a \$1 purchase of five-year duration Treasuries. Krishnamurthy and Vissing-Jorgensen (2011, 2012) find strong evidence that the market for Treasury securities is partially segmented from agencies and MBS. At the same time, Hanson (2014) finds evidence that duration supply shocks in the MBS market are transmitted nearly one-for-one to the broader fixed-income market. Greenwood, Hanson, and Liao (2014) formally explore bond pricing dynamics in a setting in which a pair of markets is partially segmented in the short run, but is more integrated in the long run.

terms, was \$2,718 billion in ten-year equivalents, or 15.6 percent of GDP through July 2014.

In panel B of table 2-2, we describe the growth in outstanding Treasury debt since 2007 and the Treasury's decision to extend the maturity of the debt. We focus on marketable Treasury securities held by the public and the Federal Reserve. Data were obtained from the Monthly Statement of the Public Debt. As shown in the table, the weighted average duration of outstanding Treasury debt first fell from 3.9 years in December 2007 to 3.5 years in December 2008, after which it rose to 4.6 years in July 2014. This rise in maturity occurred alongside a dramatic increase in outstanding Treasury debt, which grew from \$4.5 trillion in December 2007 to \$12.2 trillion by July 2014.

To compare the increase in Treasury supply with the growth of the Federal Reserve's balance sheet, we again convert these quantities into ten-year duration equivalents. The adjustment has a large impact because the average duration of outstanding Treasuries is considerably shorter than the duration of the Federal Reserve portfolio, which disproportionately contains long-term bonds as a result of QE. Expressed in ten-year duration equivalents, the debt grew from \$2 trillion in December 2007 to \$6.3 trillion in July 2014. Thus, the total increase from 2007 was \$4,334 billion in 10-year equivalents, or 25 percent of GDP.

The growth in the quantity of ten-year duration equivalents issued by the Treasury reflects two forces: the expansion of the debt and maturity extension. More formally, we can decompose the change in ten-year duration equivalents into two terms:

$$\Delta \left(\frac{\text{Debt}_t \cdot \text{Dur}_t}{\text{Dur}_t^{10\text{-yr}}} \right) = \left(\frac{1}{\text{Dur}_t^{10\text{-yr}}} \right) \cdot \left(\underbrace{\Delta \text{Debt}_t \text{Dur}_{t-1}}_{\text{Debt Expansion}} + \underbrace{\Delta \text{Dur}_t \text{Debt}_t}_{\text{Maturity Extension}} \right) \quad (2-2)$$

The first term reflects the growth of the debt, holding constant the duration of the debt at its initial value. The second term captures the effects of the rise in the average duration. Since debt management policy plays almost no role in driving the short-term growth of the debt stock (which is driven by fiscal policies outside the control of debt managers), the second term captures the impact of active debt management policies.

This decomposition is shown in the last two columns of table 2-2. Roughly a quarter of the increase in ten-year equivalents was driven by the extension of maturity, with the remaining three-quarters driven by the expansion of the debt. Comparing panels A and B of table 2-2, we see that the Treasury's

active maturity extension program offset 35 percent of the duration supply impact of QE, insofar as the proximate goal of QE was to reduce the amount of interest rate risk in private hands. More specifically, QE reduced the supply of ten-year duration equivalents by 15.6 percentage points of GDP, but the maturity extension increased the net supply of ten-year equivalents by 5.5 percentage points of GDP. Because of our choice of a 2007 baseline, these numbers are a conservative estimate of how much the Treasury's maturity extension offset QE; if we use December 2008 instead, 63 percent of QE was "canceled" by the Treasury's maturity extension. Irrespective of which baseline we use, when measured in ten-year equivalents, the *combined* effect of maturity extension and the increased debt stock far outpace QE.

The calculations we have just described are shown graphically in figure 2-1. Panel A shows the cumulative duration supply impact of the rising debt stock and the Treasury's maturity extension. Below the *x*-axis, we show the offsetting duration supply impact of QE, which the figure further breaks into Treasuries, agencies, and MBS. Units are in ten-year duration equivalents, scaled by GDP. Panel B shows the weighted average duration of Treasury debt, both taking account of and ignoring consolidation of the Federal Reserve and Treasury balance sheets.

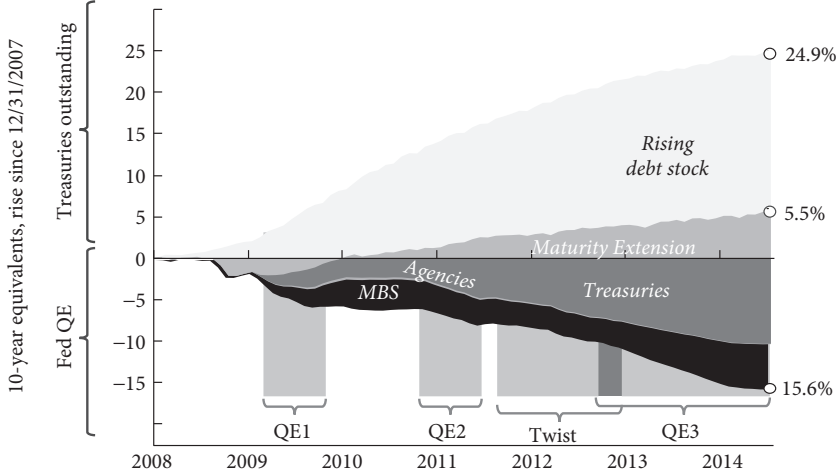
Figure 2-2 provides a back-of-the-envelope estimate of the net impact on long-term yields by combining our duration supply estimates from table 2-2 and figure 2-1 with consensus estimates of the price impact of Fed asset purchases. Specifically, based on the meta-analysis in Williams (2014), we assume that a \$600 billion large-scale asset purchase (corresponding to \$397 billion ten-year duration equivalents) lowers the ten-year term premium by 20 basis points (bps). This suggests that the cumulative impact of QE has lowered the term premium by 137 bps ($= 20 \times [2,718 \div 397]$). At the same time, Treasury's active maturity extension has raised the term premium by 48 bps ($= 20 \times [962 \div 397]$), for a net reduction of 88 bps. While these calculations are crude, they capture the stark difference between Fed and Treasury debt management policy.⁶

6. Specifically, figure 2-2 assumes that the entire impact of LSAPs works through reductions in term premia, which is a simplification. Furthermore, it applies a constant price impact to these supply shocks. In practice, there are good reasons to think that the price impact of supply shifts may be diminishing and that there may be diminishing stimulative benefits to reducing term premia; see Stein (2012). However, there is little evidence on these scores.

FIGURE 2-1. Comparing Quantitative Easing and Treasury Maturity Extension, 2007–14

Panel A: Ten-year equivalents, QE vs. Treasury maturity extension

Percent of GDP



Panel B: Weighted average duration (WAD)

Years

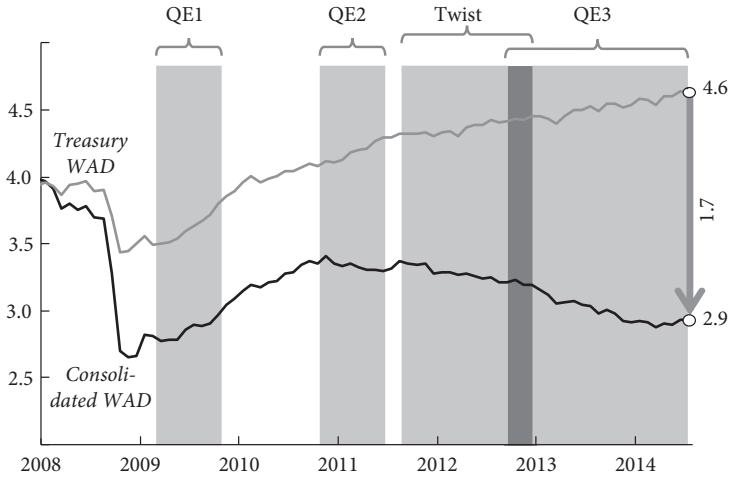


FIGURE 2-1. *Continued*

Sources: Authors' calculations using data from the Treasury's Monthly Statement of the Public Debt, the Federal Reserve System's H.4.1 Release (Factors Affecting Reserve Balances), and the Federal Reserve Bank of New York's System Open Market Account Holdings release.

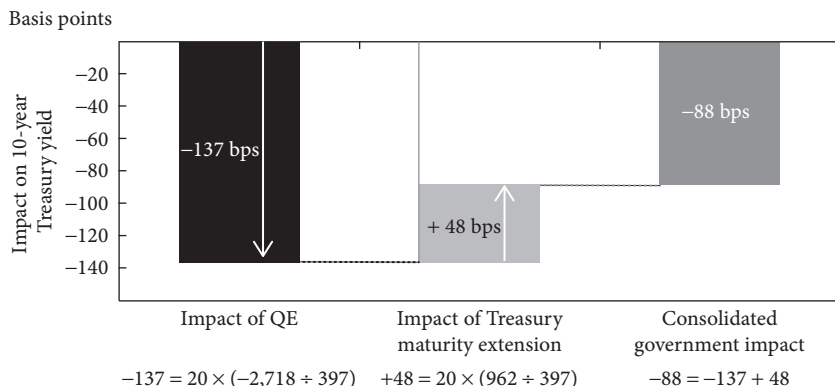
Note: Panel A presents the cumulative change in ten-year equivalents (scaled as a percentage of GDP) associated with the respective balance sheet policies undertaken by the Federal Reserve and the Treasury. Positive values increase the interest rate risk placed in public hands (Treasury policies), while negative values decrease it (typically Fed QE, but also Treasury maturity shortening in 2008–09). Panel B presents the weighted average duration (WAD) of Treasury debt, as well as the WAD of the consolidated government debt position. The difference between the two lines is that Treasuries held by the Fed are excluded from the consolidated duration, and short-term interest-bearing Fed liabilities (excess reserves and reverse repos) are added.

This finding has both positive and normative implications. From a positive perspective, much has been made in recent years of the impact of QE not just on long-term yields (Gagnon and others 2011), but also on stock prices, exchange rates, and foreign asset prices.⁷ A common view is that Fed asset purchases have a *mechanical* downward effect on long-term interest rates through the so-called portfolio balance channel. To the extent that QE is thought to operate through such a direct channel, the argument has to confront the reality that the totality of policy has *raised* rather than reduced the quantity of long-term government debt held by private investors. It is not consistent to believe—as some seem to—that QE primarily works through a direct price pressure effect that reduces yields, but that the crowding-out effect of large prospective deficits (which, of course, leads to increasing the quantity of government debt) can be largely neglected.

But if the direct supply effects of QE have been offset by the massive expansion in outstanding government debt and the Treasury's decision to extend the debt maturity, then what explains the large market impact of QE announcements documented in so many studies, as well as the fact that estimates of term premia on long-term bonds have been steadily driven

7. See, for instance, Neely (2012); Glick and Leduc (2013); Hooper, Slok, and Luzzetti (2013); Bauer and Neely (2014); and Mamaysky (2014).

FIGURE 2-2. Estimating the Market Impact of QE and Treasury Extension



Source: Authors' calculations.

Note: The figure estimates the impact QE and Treasury maturity extension had on the ten-year Treasury term premium. The calculations are based on our ten-year duration equivalents in table 2-2, as well as the price-impact estimates in Williams (2014). Williams summarizes results from a large number of research papers that differ in methodology and data, finding a central tendency that a \$600 billion bond purchase lowers the ten-year yield by fifteen to twenty-five basis points. To convert this \$600 billion face value into ten-year equivalents, we assume bond purchases with a duration of 5.86 years and a ten-year bond duration of 8.84 years. The result is that \$600 billion equates to \$397 billion of ten-year equivalents. Using the Williams price-impact estimates, we reach an impact on the term premium of twenty basis points.

into negative territory and remain miniscule today, as shown in figure 2-3? The most natural explanation is that the Fed's announcements about its intended asset purchases also conveyed information about its future policies, including both the likely path of future short-term rates and the Fed's willingness to undertake further asset purchases in response to evolving economic conditions.⁸ Furthermore, as Stein (2013) argues, there are good reasons to

8. There is strong evidence that the Fed's LSAP announcements moved the expectations component of long-term interest rates by essentially serving as an implicit form of forward guidance about the path of future short-term interest rates. See, for example, Krishnamurthy and Vissing-Jorgenson (2011, 2013) and Bauer and Rudebusch (2014). However, we are skeptical of the view that Fed has used LSAPs in an attempt to *credibly commit* to keeping short rates lower for longer than it other-

think that the Fed's announcements and its accommodative policies may have lowered the term premium on long-term bonds through a number of more indirect channels.⁹

Carrying this logic further, there are reasons to think that announcements of Fed asset purchases may have a greater impact on term premia than comparably sized Treasury supply announcements. Consistent with this, Rudolph (2014) provides event-study evidence suggesting that Fed announcements have about twice the impact as Treasury announcements of a similar size. Rudolph's analysis is reproduced in figure 2-4. Specifically, the figure shows the daily change in the estimated ten-year term premium based on the Kim and Wright (2005) model in response to Treasury's quarterly refunding announcement. The estimated term premium rose by 25 bps cumulatively over the five quarterly refunding dates when the Treasury clarified its intention to extend the average maturity of the debt. As noted previously, this is only half of the price impact (+48 bps) that one would have anticipated based on an extrapolation of large-scale asset purchase (LSAP) price impacts.¹⁰

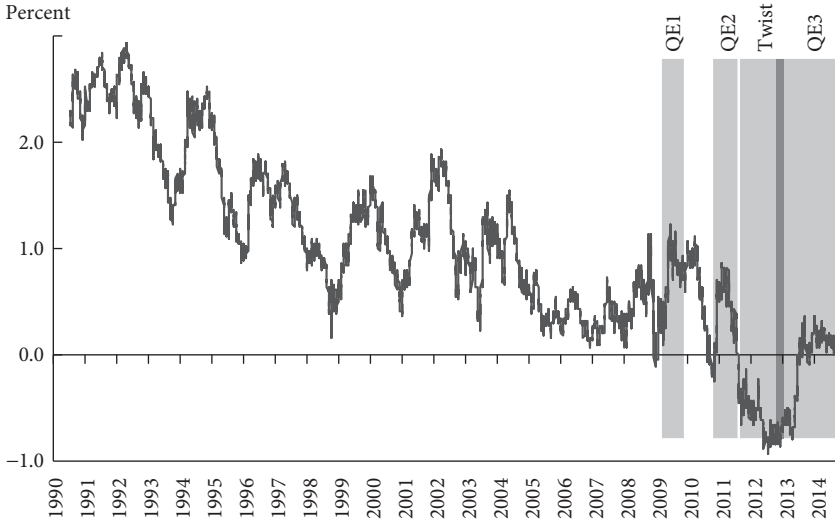
wise might because, say, the Fed is concerned with maintaining a certain level of remittances to Treasury. Indeed, the Fed has repeatedly emphasized that the future evolution of short-term rates will not be limited by the elevated size of its balance sheet and its large holdings of long-term bonds. Nonetheless, Gagnon and others (2011) have used model-based estimates to argue that movements in term premia explain the vast majority of the announcement effect on ten-year yields. However, Bauer and Rudebusch (2014) are skeptical about the ability of such models to accurately disentangle term premia from expected short rates.

9. In particular, the Fed's policies may have boosted investor demand for long-term bonds *holding fixed* the expected path of short-term rates. First, the expectation that the Fed would "do whatever it takes" using both conventional and unconventional measures may have lowered the perceived risk of investing in long-term bonds going forward. Second, a decline in interest rates may boost the demand for long-term bonds from investors who want to maintain the current yield on their portfolios (Hanson and Stein 2015). If such a demand "recruitment channel" is operative, it means that the Fed's total impact on long-term yields may exceed the effect of any forward guidance on the expectations component and the direct effect of asset purchases on term premia (Stein 2013).

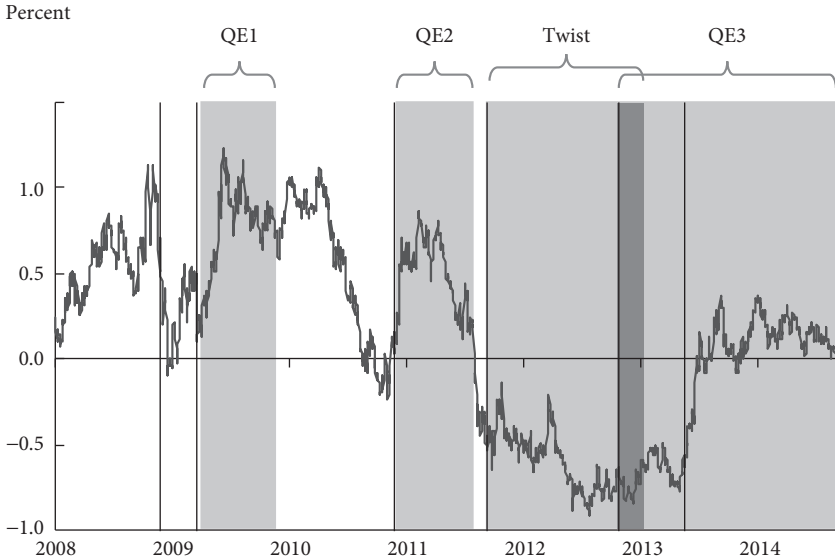
10. An alternative interpretation is that Fed asset purchases and Treasury supply changes have the same price impact, but that it is easier for investors to predict the evolution of Treasury supply than Fed purchases. As a result, much of the supply "news" released on quarterly refundings may already be reflected in term premia. In contrast, investors may have been more surprised by the Fed's LSAP announcements, leading to larger announcement effects.

FIGURE 2-3. Estimated Term Premia on Long-Term Bonds

Panel A: Term premium on ten-year zero-coupon Treasuries (1990–2014)



Panel B: Term premium on ten-year zero-coupon Treasuries (2008–14)

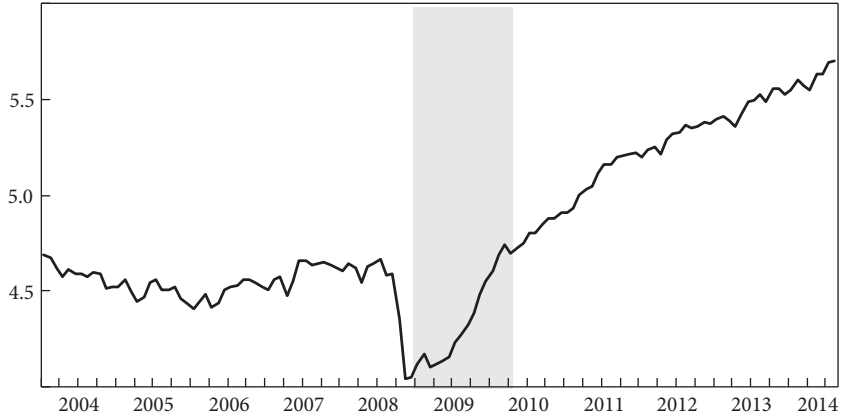


Source: Updated Kim and Wright (2005) data from the Federal Reserve.

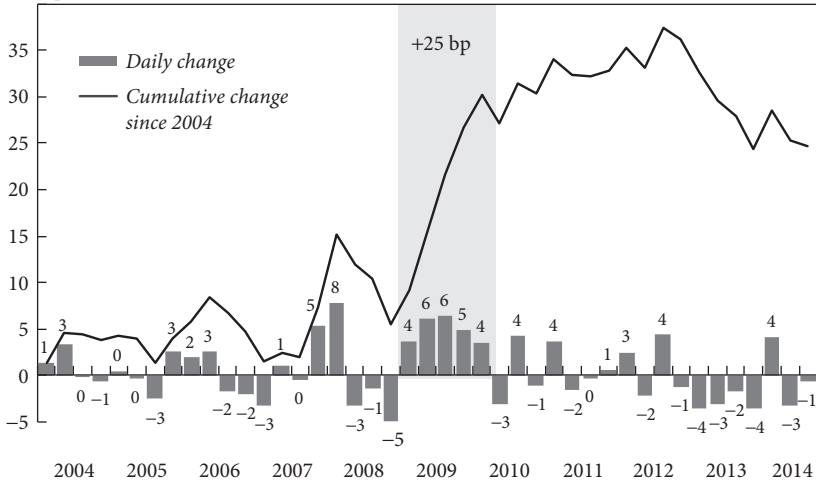
Note: This figure shows estimates of the term premium on ten-year zero-coupon Treasuries based on the Kim and Wright (2005) model. This model decomposes long-term yields into an “expectations component” that reflects the expected short-term interest rate over time plus a “term premium” that investors require for bearing the interest rate risk associated with long-term bonds. Major QE announcements are marked by lines in panel B.

FIGURE 2-4. Event Study: Impact of Treasury Refunding Announcements on Term Premia

Panel A: Weighted average maturity (WAM) of marketable Treasury securities
Years



Panel B: Impact of Treasury refunding announcements on 10-year term premia
Basis points



Sources: WAM data and refunding dates are from the Treasury. Term premium estimates are from Kim and Wright (2005).

Note: Panel A shows the weighted average maturity (WAM) of marketable Treasury debt over the past decade. Panel B adds up the daily and cumulative changes in the ten-year term premium on days when the Treasury’s quarterly refunding announcements were released. Shaded in both panels are the five quarters when the Treasury was telegraphing its intent to extend the average maturity of the debt in its refunding announcements.

Nonetheless, from a normative perspective it seems very odd that the Federal Reserve is taking actions that have the effect of substantially reducing the duration of the debt held by the public at a time when the Treasury is arguing that it is in taxpayers' interest to extend the duration of the debt at a rapid pace. Moreover, the Federal Reserve has done so without formally acknowledging any of the considerations invoked by the Treasury. Similarly, the Treasury is taking steps that in the judgment of the Fed are contractionary, while committing itself in general to expansion of demand as a principal policy (through its stimulus measures postcrisis) without ever addressing the concern about the possibly contractionary impact of debt management. In the next section we consider the merits of lengthening versus shortening the maturity of the public debt and address the question of the process by which a government committed to both democratic control over economic policy and an independent central bank should address this issue.

Precedents for Fed–Treasury Cooperation

Before the 2008–09 financial crisis, it was thought by academics and policy-makers that the Federal Reserve's dual objectives of low inflation and full employment were not in conflict with those of debt managers at the U.S. Treasury, who sought to minimize the cost of managing the federal debt while limiting fiscal risk. This understanding reflected the reality that the Treasury and the Federal Reserve each could independently pursue their respective policy objectives without much formal coordination.

This has not always been the case. Prior to the late 1970s, coordination between the Treasury and the Federal Reserve was commonplace and can be seen in both official communications and the correlation between the balance sheet positions of the two agencies.

Historical Precedents

Figure 2-5 provides an historical perspective on the link between the Federal Reserve holdings of Treasury securities, expressed as a percentage of GDP, and the size of the overall public debt. Over our 1936–2013 sample,¹¹ the correlation

11. There is limited data on the maturity structure of Federal Reserve securities holdings prior to 1936.

between these two series is 66 percent, which mostly reflects central bank balance sheet growth during World War II and the Great Recession. Outside of these two large events, in the 1952–2007 period, the correlation between the size of the Fed’s balance sheet and the ratio of debt-to-GDP is near zero.

Panels B and C show that there is little correlation between the maturity structure of federal debt and the maturity structure of Treasury holdings on the Fed’s balance sheet. Although the figure shows periods when a lengthening maturity of outstanding Treasury debt was also associated with a maturity extension within the Fed’s portfolio (e.g., 1995–2007), the overall correlation is zero. The most discernible variation in the time-series, apart from the postcrisis era (i.e., 2008–13), is the 1940–50 subperiod, when the Fed played an important role in facilitating the rapid growth in national borrowing during World War II.

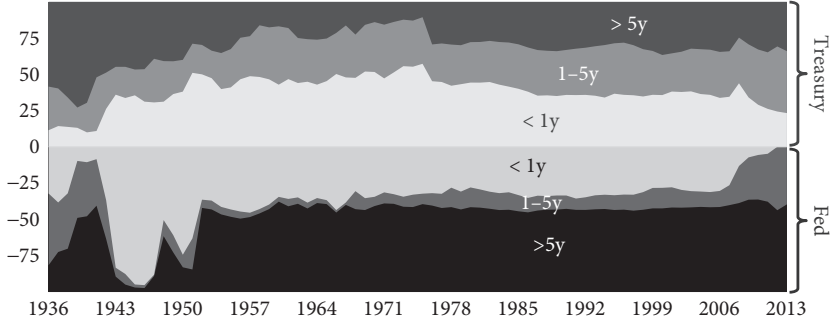
From the long history of debt management, there are a few interesting episodes that suggest debt management can be better coordinated when the circumstances warrant. Consider first the cooperation between the Fed and Treasury on debt management during World War II. A few months after the United States entered World War II, and in the midst of a rapid increase in government spending, the Fed and the Treasury agreed to fix the entire yield curve of Treasury securities. Three-month bill yields were limited to 0.375 percent and bond yields were held at 2.5 percent. The Fed stood ready to buy or sell any amount of Treasury securities necessary to maintain this positively sloped yield curve.

Because long-term rates were fixed, bonds experienced almost no price volatility in the secondary market, a condition that made them more attractive to investors. But while such an increase in the appeal of long bonds might otherwise flatten the yield curve, the Fed had committed itself to enforce a positive slope. The result was that during World War II, private investors bought almost all of the notes and bonds issued by the Treasury, which left the Fed to buy almost all of the bills. This can be seen in panel A of figure 2-5, where the share of long-term Treasury securities on the Fed’s balance sheet plummets. In short, the Federal Reserve and Treasury effectively agreed during World War II that financing the war was the main objective of debt management policy, and they coordinated with each other to reach this outcome. While the nature of the cooperation (the Federal Reserve was acting to support fiscal expansion) does not carry over to the current debate, the fact that they *could* cooperate closely on debt management does have implications for current policy.

FIGURE 2-5. Fed and Treasury Balance Sheets, 1936–2013

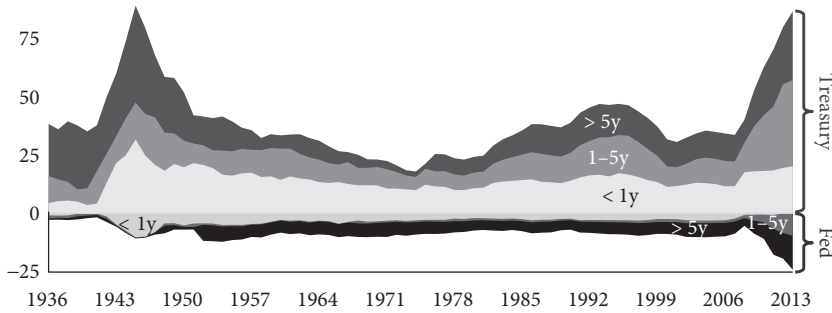
Panel A: Breakdown by maturity

Percent of portfolio



Panel B: Notional values

Percent of GDP



Panel C: Long-term debt share, Fed vs. Treasury

Long-term share/total

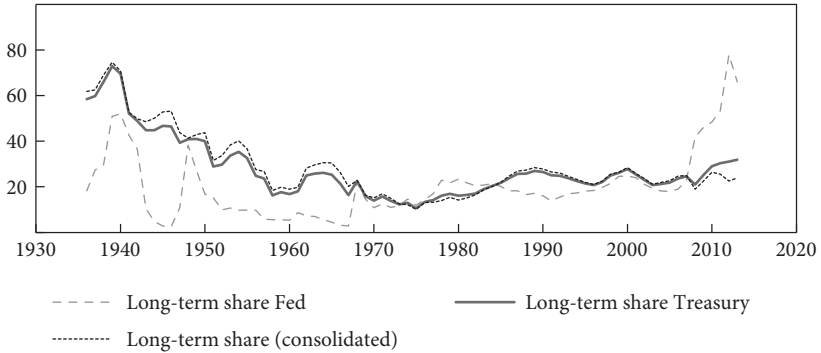


FIGURE 2-5. *Continued*

Sources: Data were compiled from various issues of the Monthly Statement of the Public Debt, *Treasury Bulletin*, Banking and Monetary Statistics, and *Federal Reserve Bulletin*.

Note: Outstanding balances of Federal Reserve (asset) and Treasury (liability) balance sheets are broken down into three buckets of remaining maturity: less than one year, one to five years, and greater than five years. Panel A shows this data expressed as a percentage of total Treasury assets (Fed) or Treasury liabilities (Treasury). In panel B, outstanding amounts are shown as a percentage of GDP. In panel C we show the long-term debt share, computed as the fraction of debt that is of five-year maturity or greater. The consolidated time-series nets out Federal Reserve holdings from Treasury liabilities.

Following the end of World War II, the Federal Reserve sought to assert independence by pushing for greater fluctuations in short-term interest rates. However, as the Treasury faced a large and growing debt burden, it maintained its pressure on the Fed until 1947 (Chandler 1966; Humpage 2014). In this way, monetary policy objectives were secondary to those of debt management. In 1947, the Treasury and Fed jointly agreed to a series of increases in the interest rate on short-term bills, which reached 1 percent in early 1948. This led some individuals and banks to sell their holdings of longer-maturity bonds. In response, the Fed began purchasing these longer-term securities while simultaneously selling an approximately equal value of short-term Treasury bills (Humpage 2014).

Tension between the Treasury and Fed reached a boiling point in January 1951, when the Treasury secretary publicly announced that maintaining a 2.5 percent yield on Treasury bonds was an “integral part of the financial structure of the country.” The Federal Reserve, in a memo to President Harry S. Truman, stated that it did not agree with the directive. Following intervention by the president, the secretary of the Treasury and the chairman of the Federal Reserve released a joint statement in March 1951 that declared, “The Treasury and the Federal Reserve System have reached full accord with respect to debt-management and monetary policies to be pursued in furthering their common purpose to assure the successful financing of the Government’s requirements and, at the same time, to minimize monetization of the public debt” (Hetzl and Leach 2001). This agreement restored

greater independence to the Fed and became known as the 1951 Treasury–Federal Reserve Accord.

A second instance of cooperation—in fact, a series of repeated instances—occurred through the “even keeling” policy the Fed abided by in the years after the 1951 Accord. The Fed agreed to not alter monetary policy during the three-week periods when the Treasury was building up an order book for new debt issues in the primary market. Under the even keeling policy, the Fed would hold rates steady during Treasury offerings, thus avoiding disruptive changes that might endanger the success of the offering process. Wanting to limit the amount of time when monetary policy was unable to change, the Treasury began concentrating its issuance into four annual mid-quarter refundings (Garbade 2007). But overall, the even keeling process was meant to ensure that central bank objectives did not interfere with debt management.

The third and most prominent example of Fed and Treasury cooperation in the domain of debt management comes from the Operation Twist program of 1961. At the time, the Fed wanted to adopt a more accommodative policy but was reluctant to further reduce short-term interest rates because of concerns that this would impair the nation’s balance of payments and result in gold outflows under the Bretton Woods system. In response, the Fed and Treasury tried to lower long-term interest rates by reducing the term premium on long-term bonds while holding short-term interest rates constant. Specifically, the Fed agreed to buy longer-term securities while the Treasury would sell predominantly short-term securities. Studies conducted shortly thereafter used quarterly interest rate data and found no meaningful impact of the 1961 program (Modigliani and Sutch 1966). However, more recent studies that make use of a modern event-study methodology have found a significant impact (Swanson 2011).¹²

Operation Twist is perhaps the best example of the potential for Fed and Treasury cooperation, because the circumstance was, much like the zero

12. Long-term interest rates fell on most dates in early 1961 when the initial information about Treasury and Fed policies was released. The only exception was when the Treasury surprised both the White House and the Fed by issuing longer-term bonds on March 15, 1961. This made James Tobin (then a member of Kennedy’s CEA) “furious.” Treasury continued to extend its maturity thereafter and within a year the average maturity had increased by 3.5 months (Swanson 2011, 203).

lower bound today, that the Fed was constrained in its use of the short rate as a policy instrument. However, unlike in the more recent period, during Operation Twist the Fed was able to complement its own actions with the secured cooperation of the Treasury to alter the maturity structure of new debt issuance.

International Precedents

Beyond the historical evidence of cooperation in the United States, another relevant benchmark is practice across the major economies.

Table 2-3 compares debt management practices across the Group of Seven (G-7) countries. The table highlights the wide variety of institutional arrangements adopted to coordinate debt management with monetary policy. In all countries in the G-7, debt management resides in the Treasury or a debt management office (DMO) controlled by the Treasury. While the comparison to Germany, France, and Italy is muddled by the fact that those countries do not have central banks that determine monetary policy, the experience of the other large countries is illustrative.

The table describes, in brief, the pre-2008 arrangement for coordinating debt management between the central bank and Treasury. The “QE era” column describes how debt management has evolved in the years since the financial crisis. The rightmost column lists the average debt maturity in 2014. Upon hitting the zero lower bound and venturing into QE, two different paths emerge for policy coordination. One alternative is shown by Japan and the United States, where debt managers extended maturity more aggressively than in any other G-7 country. Both countries lack any formal avenues for policy coordination between debt managers and central bankers. The other alternative is exemplified by the United Kingdom, where policymakers have a clearer record of coordinating debt management and monetary policy, perhaps because of the historical roles the Bank of England has played in both policy areas. The U.K. DMO is mandated to “ensure that debt management is consistent with the aims of monetary policy.” As the Bank of England was getting ready to begin QE in early 2009, its governor sent a public letter to the chancellor of the Exchequer. The Bank of England claimed that in order to ensure consistency between debt management and monetary policy, the government should not alter its issuance strategy as a result of QE. The government confirmed that it would not alter its debt issuance strategy

Table 2-3. *Debt Management in the G7: Coordination between the Central Bank and Treasury*

<i>Country</i>	<i>Pre-2008 debt management arrangement</i>	<i>QE era</i>	<i>Average maturity in 2014</i>
United States	<p>There are no formal institutional arrangements to coordinate with monetary policy. Treasury has full authority over U.S. debt management. The Fed tends to mimic Treasury issuance patterns and only target short rates (with some exceptions, such as World War II and 1961 Operation Twist).</p>	<p>Treasury extended its debt maturity to reduce rollover risk and catch up with other countries. The side effect was to counteract a portion of Fed's QE effects. It is not clear which agency controls the U.S. government maturity policy.</p>	5.7 years
Canada	<p>Debt management resides in the Ministry of Finance. The Canadian Finance Department formally consults with the Bank of Canada on debt management decisions and issuance schedules are announced on the Bank of Canada's website. In policy reports, there is discussion of the shared responsibilities and joint efforts of the Ministry and the Bank.</p>	<p>In the decade before the crisis, Canada's average maturity moved very slowly within a range of 6.0 years to 7.0 years. During the crisis, however, average maturity fell from 7.0 years in 2007 to 6.0 years in 2009, as bills were used to fund both fiscal deficits and the government's MBS purchase program. In 2012 the government announced that it would reallocate issuance toward long-term bonds to reduce refinancing risk.</p>	6.0 years
France	<p>There are no institutional arrangements to coordinate with monetary policy. In 2000, the Agence France Trésor was created within the Finance Ministry to manage the debt. The idea of an independent office was rejected on the grounds of democratic accountability and linkages to fiscal policy.</p>	<p>Maturity of French debt is currently at approximately the same level as it was in 2006 and 2007.</p>	7.0 years

Germany	<p>There are no institutional arrangements to coordinate with monetary policy. From 1997 to 2011, Germany's debt managers held the government's average maturity near 6.0 years. In 2001, debt management was taken out of the Finance Ministry and given to a private company to be wholly owned by the Finance Ministry.</p>	<p>In 2012, Germany's debt managers joined the international trend toward lengthening, increasing the average government debt maturity by nearly one full year since then (from 5.6 years in 2011 to 6.5 years in 2014). This has been the largest 3-year shift in Germany's average maturity seen in the past 15 years.</p>	6.5 years
Italy	<p>The Italian Treasury has the authority over debt management. However, the Bank of Italy advises the Treasury on debt management. In its advisory capacity, the Bank of Italy takes into account monetary conditions.</p>	<p>The average maturity of Italian government bonds has decreased by nearly one year since 2009. However, this may be due more to sovereign credit pressures than an attempt to ease monetary conditions. In 2014, the Italian Treasury has been trying to issue longer-term.</p>	6.3 years
United Kingdom	<p>In 1997, when the government gave the Bank of England independent control over interest rates, debt management policy was also taken out of the Bank of England to avoid any perceived conflicts with monetary policy. Debt management was assigned to the newly established U.K. Debt Management Office (DMO), an executive agency of Treasury. However, the DMO must "ensure that debt management is consistent with the aims of monetary policy."</p>	<p>As the Bank of England began its quantitative easing program in early 2009, the governor of the Bank of England sent a public letter to the chancellor of the Exchequer that in order to ensure consistency between debt management and monetary policy the government should not alter its issuance strategy in response to QE. The directive was accepted by the chancellor.</p>	14.9 years

(continued)

Table 2-3. *Continued*

<i>Country</i>	<i>Pre-2008 debt management arrangement</i>	<i>QE era</i>	<i>Average maturity in 2014</i>
Japan	An office within the Ministry of Finance determines which maturities to issue, with a goal of ensuring smooth and cost-effective issuance. The central bank acts as fiscal agent but the Ministry announces all issuance plans and auction results. There is no special committee or working group to ensure coordination between debt management and monetary policy, despite both being actively involved in bond markets.	Bank of Japan has been engaged in a large quantitative easing program since 2010. Debt management since 2009 has been aggressively extending maturity to reduce rollover risk associated with large debt levels. The conflicting tactics of monetary policy and debt management are similar to the United States, except that in Japan, rollover risk may loom larger than refinancing risk.	7.7 years

Sources: Data compiled by authors from various sources, including the Organization for Economic Cooperation and Development (OECD); the International Monetary Fund (IMF) Fiscal Monitor; Sundararajan, Dattels, and Blommestein (1997); and national finance ministry websites.

based on the Bank of England's asset purchases. Indeed, the DMO shortened the average maturity by one year between March 2009 and March 2010.

The Optimal Division of Labor between Treasury and Fed

Given the target structure for the consolidated government debt, how should this be operationalized by the Fed and Treasury? And how should decision making authority shift—if at all—between the Treasury and the Fed as economic conditions change?

Optimal Debt Maturity and the Monetary Policy Cycle

In chapter 1 we described a series of trade-offs that the consolidated government must make to determine the maturity structure of the debt. For simplicity, our discussion treated these trade-offs as static in nature. However, if the trade-offs shift over time—leading to a time-varying optimal debt structure—who should be in charge? For instance, how should the government respond if heightened concerns about fiscal risk suggest a longer average maturity at the same time that a desire to bolster aggregate demand suggests a shorter average maturity? The consolidated debt maturity generated by independent Treasury and Fed action may differ substantially from the maturity structure that would result from a coordinated policy. Under the current arrangement, neither the Federal Reserve nor the Treasury is caused to view debt management on the basis of the overall national interest.

Table 2-4 describes the current division of labor between the Treasury and the Fed. Over the past thirty years, the two traditional objectives of debt management—achieving low-cost financing and minimizing fiscal risk—have been handled by Treasury. The two nontraditional objectives of modern debt management include managing aggregate demand and promoting financial stability. The former has been the exclusive domain of the Fed, while the latter has involved cooperation between the Fed and the Treasury, with the Fed taking a lead in bank regulation.¹³

13. For example, see the joint statement by the Federal Reserve and Treasury, “The Role of the Federal Reserve in Preserving Financial and Monetary Stability: Joint Statement by the Department of the Treasury and the Federal Reserve,” news release, March 23, 2009.

Table 2-4. *Debt Management over the Monetary Policy Cycle*

		<i>Traditional policy objectives</i>	
		<i>Achieving lowest cost financing</i>	
Objectives and tactics	Weight on objective	??	
	Agency historically charged with objective	Treasury Department	
	Key market friction(s)	Investors derive money-like services from holding short-term debt	Long-term bond market partially segmented from other markets
	Main policy instrument	Fraction of debt that is very short-term	Weighted average duration of debt
	Normal implication for debt maturity	Issue more debt that is very short-term	Target a shorter average duration of debt
Conflicts driven by monetary policy	Implications of contractionary monetary policy that raises short-term nominal rates	→ Rise in premium on money-like assets → Increase amount of very short-term debt	
	Implications of recession where deficits rise and zero lower bound is reached	~	~

The columns list the four objectives of debt management as outlined in chapter 1: achieving lowest-cost financing, managing fiscal risk, managing aggregate demand, and promoting financial stability. For each objective, the table describes which agency is historically charged with the objective, the main policy instrument used to manage the objective, and the normal implication for debt maturity. The bottom rows consider two scenarios,

<i>Managing fiscal risk</i>	<i>Nontraditional policy objectives</i>	
	<i>Managing aggregate demand</i>	<i>Promoting financial stability</i>
??	??	??
Treasury Department	Federal Reserve	Federal Reserve
Convex costs of taxation, budget volatility costs, run-like problems	Long-term bond market partially segmented from other markets	Excessive maturity transformation by private intermediaries
Weighted average duration of debt	Weighted average duration of debt	Fraction of debt that is very short-term
Target a longer average duration of debt	Target a shorter average duration of debt	Issue more debt that is very short-term
→ None, assuming government executes a “barbell” strategy that holds average duration constant	→ None, assuming government executes a “barbell” strategy that holds average duration constant	→ Rise in premium on money-like assets → Increase amount of very short-term debt
→ Extend average duration since fiscal risk looms large	→ Shorten average duration to bolster aggregate demand	~

one expansionary and one contractionary, and the implications for debt management.

To tackle the question of who should be assigned responsibility over debt management (and whether this assignment should change with economic circumstances), we start by describing more precisely the circumstances in which debt management objectives, as they are currently interpreted by the

Treasury, conflict with the traditional output-inflation trade-off objectives of the central bank, and how easily this conflict can be overcome.

*Conflict between the Fed and Treasury
Due to Variation in Liquidity Premia*

Consider the stylized description of the monetary policy objectives embodied by the Taylor rule (Taylor 1993), in which the central bank raises interest rates when inflation is above target and lowers interest rates when output is below potential. Furthermore, suppose that the central bank uses the short-term interest rate as its only policy instrument. How might the optimal maturity structure of the consolidated debt be expected to vary over the monetary policy cycle, and how might this interact with the central bank's traditional objectives of promoting both full employment and stable prices?

Consider first the case in which the central bank raises interest rates to rein in aggregate demand to head off an incipient rise in inflation. With higher short-term rates, the opportunity cost of holding paper money and non-interest-bearing deposits increases, which in turn increases demand for money-like short-term debt such as Treasury bills (Nagel 2014). If the Treasury places weight on issuing "cheap" money-like securities to minimize the cost of the debt, the government should partially accommodate this greater demand by issuing more short-term T-bills. This motive may be further enhanced if the Treasury seeks to lean against the possibility that elevated demand for money-like debt may lead to excessive private liquidity transformation—that is, to avoid a surge in short-term debt issuance by financial intermediaries seeking to capture the heightened liquidity premium.

In this case, the conflict between the Fed and the Treasury arises because the Treasury's effort to shorten its debt results in unintended consequences from aggregate demand. As argued earlier, shortening the debt might reduce the duration-weighted supply of debt held by the public, thereby depressing the term premium component at long-term rates at precisely the same moment when the central bank is trying to tighten monetary policy.¹⁴

14. This assumes that expanding the supply of very short-term bills forces the Treasury to lower the average duration of the debt. However, as noted by Green-

Is there a way out in which both Treasury and central bank objectives could be accomplished without explicit coordination on debt management? In the case described, this could be accomplished by the central bank raising the short rate by more than it might otherwise have done, absent the Treasury's debt management response. Through this form of "sterilization"—although a strict second best to a joint decision on debt management—the central bank can undo aggregate demand consequences of debt management.

The opposite case—in which the central bank lowers rates while the Treasury lengthens debt maturity—poses more difficulty. If nominal interest rates are positive, then the central bank can sterilize a rise in the average maturity by lowering rates. However, if interest rates are at or near the zero lower bound, debt management limits the central bank's ability to pursue its traditional dual mandate.

*Fed and Treasury Conflict Due to Changes
in Outstanding Government Debt*

A second reason why optimal debt maturity may vary over the monetary policy cycle has to do with fiscal risk. When the debt rises as a percentage of GDP, the Treasury will prudently want to extend the average maturity of the debt to reduce refinancing risk. In ordinary circumstances, the debt-to-GDP ratio evolves slowly, reflecting the gradual accumulation of deficits or surpluses over time. During ordinary circumstances, we wouldn't expect the debt-to-GDP ratio—and thus the optimal maturity structure of the debt—to be tightly linked with monetary policy objectives, which vary more rapidly at a business cycle frequency. However, things are different when the economy enters a severe downturn, such as the United States experienced in 2009. In this case, increased fiscal expenditures result in a rapidly growing

wood, Hanson, and Stein (2015), one may be able to expand the supply of short-term bills while holding average duration roughly constant. For instance, to respond to the heightened demand for very short-term debt, the Treasury might increase its issuance of one- and three-month bills and reduce its issuance of six-month and one-year bills. At the same time, the Treasury could expand its issuance of two-year notes in order to hold the average duration constant. In this way, the government might be able to respond to the heightened demand for short-term money-like debt without depressing the term premium component of long-term yields.

debt stock, leading the Treasury to reevaluate the optimal maturity structure of its debt. At the same time, the central bank would like to aggressively use its conventional policy instrument to stimulate aggregate demand.

As we suggested before, the central bank can sterilize the impact of rising Treasury-led debt maturity through further reductions in the short-term rate. At the zero lower bound, this sterilization is impossible, but the Fed can still use its own balance sheet to undo whatever actions Treasury takes. For instance, if the Fed wants to reduce the supply of ten-year equivalents by \$3 trillion to depress long-term rates and the Treasury's precautionary maturity extension raises the supply by \$1 trillion, the Fed can simply perform an additional \$1 trillion of QE to undo the Treasury's maturity extension. In other words, if the Fed is always the last mover, and the Fed has access to the same set of policy tools as the Treasury, it can always undo whatever the Treasury does.

Clearly, such a "solution" is problematic on many fronts. First, it puts all of the weight on the Fed's objective function and thus ignores the Treasury's fiscal motivation for increasing maturity in the first place. Second, it is a roundabout way of achieving the central bank's objective and adds an extra step of intermediation. If the central bank is free to choose the government's consolidated debt structure, then the Treasury should simply hand over the keys. Third, the Fed may already be constrained in its QE operations by the Federal Open Market Committee's (FOMC) perceptions about the size of its balance sheet, and in this case it makes no sense to further constrain the policy by forcing it to additionally undo Treasury action.¹⁵

The Optimal Division of Labor

To sum up, debt management may conflict with monetary policy objectives for two reasons. First, when the government alters the share of its debt that is short-term to react to shifts in money demand, this action may have implications for aggregate demand that differ from the Fed's objectives under its traditional dual mandate. Second, the set of circumstances in which fiscal

15. Rudebusch (2009) suggests that the \$2 trillion Fed balance sheet in 2009 "only partially offset the funds rate shortfall." Relatedly, Rudolph (2014) argues that the Fed asset purchases would need to reduce long-term rates by 200 basis points to offset the shortfall implied by a standard Taylor rule.

risk looms large—leading the Treasury to lengthen the average maturity of the debt—are also circumstances in which the central bank faces the zero lower bound.

Where does that leave us? In the case of positive short-term interest rates, we favor an arrangement under which the central bank can manage the inflation output trade-off as it sees fit and can sterilize the aggregate demand impact of any policies that change the maturity composition of the debt using the short-term interest rate. Debt policy can be made by the Treasury on grounds of optimal public finance broadly understood to include financing the government at least cost over time, managing fiscal risk, and promoting financial stability. But because of the importance of debt management for the functioning of financial markets and because of its relation to financial stability, the Federal Reserve should have a more significant advisory role than it does currently.

If the central bank is able to sterilize the effects of debt management on aggregate demand using the short-term interest rate, then is there any reason for the Fed and Treasury to cooperate? Suppose that, following Treasury's decision on the maturity structure of the debt, the Fed can precisely fine-tune the short-term interest rate to achieve a desired level of aggregate demand. Absent cooperation on debt management, policy outcomes will be at second best, because they necessarily reflect the central bank's weights on the output-inflation trade-off over Treasury debt management objectives. More broadly, using two instruments sequentially to achieve four policy goals is inferior to choosing the two instruments simultaneously. This conclusion is further reinforced when we recognize that policy instruments map to policy outcomes with long and variable lags and with considerable uncertainty.

How do we see cooperation between the Fed and the Treasury occurring in practice? A natural solution would be for the Fed and the Treasury to annually release a joint statement on the strategy for managing the U.S. government's consolidated debt. This would establish a plan for the maturity structure and composition of debt issued by the Treasury and supported by the Federal Reserve. The Fed would be given the flexibility to make interim adjustments to debt management policy to engage in large-scale outright purchases or sales in response to economic or financial developments if such policies were needed to pursue its dual stabilization mandate. At the same time, annual coordination of this sort would make it unlikely that the Fed and the Treasury would be working at cross-purposes for long periods of time.

At the zero lower bound, this arrangement would cause the Treasury to internalize the Federal Reserve's desire to shorten maturity in order to stimulate aggregate demand. Similarly, the Federal Reserve would have to recognize the Treasury's precautionary fiscal motive for lengthening the maturity. In such situations a fully coordinated policy that the Treasury and Fed pursue with respect to currency intervention should be the norm.

There is also the question about which agency should accommodate shifts in the demand for money-like short-term debt that may arise over the business cycle as well as higher-frequency demand shifts due to "flight to quality" events. For instance, consider the large increase in demand for liquid short-term debt during the 2008–09 global financial crisis or during the fall 1998 crisis. Should such a demand shock be accommodated by the Treasury quickly issuing a large amount of bills? Or should it be accommodated by the Fed purchasing longer-term Treasuries financed either through an increase in interest-bearing reserves or reverse repurchase agreements (i.e., via Fed balance sheet expansion) or by selling T-bills (i.e., via an Operation Twist)?

Because Treasury bills, reverse repurchase (RRP) agreements with the Fed, and interest-bearing reserves are all very close substitutes, in principle either the Fed or the Treasury could take the lead in accommodating shifts in the demand for money-like short-term government debt. And regardless of whether the Treasury or Fed played the lead role, greater coordination is called for on this front since the Treasury and the Fed share responsibilities for promoting the stability of the financial system.

On balance, it seems most natural to delegate this role to the Fed because of its operational expertise in open market operations and its expertise in communicating with participants in funding markets.¹⁶ In a sense, respond-

16. Blommestein and Turner (2012) reach a similar conclusion. Such high-frequency accommodation would likely pose significant operational challenges for the Treasury. For instance, it would be difficult to quickly contract the supply of bills in response to a change in market conditions (i.e., it would need to issue long-term notes or bonds to repurchase bills). In contrast, the Fed would simply contract the size of the SOMA by open market sales of long-term Treasuries, unwinding the associated RRP funding. It can also be argued that the Fed has a comparative advantage at managing any "rollover" risk associated with short-term debt: there cannot be a destabilizing "run" on the monetary base, but there could be a run on the T-bill market.

ing to shifts in the demand for money-like short-term debt is central banking in the classic sense of elastically supplying a special asset that supplies liquidity services and impacts financial stability. For instance, by using its RRP capability, the Fed could expand and contract the size of SOMA's holdings of long-term Treasuries backed by reverse repo funding in order to target a constant convenience premium on short-term money-like debt, which would be accomplished through standard open market operations. Of course, if this liquidity provision and financial stability role were delegated to the Federal Reserve it would likely need to maintain a balance sheet that was larger than its precrisis balance sheet.¹⁷

Summary

From 2008 to 2014, the U.S. Treasury deliberately worked to extend the average maturity of the consolidated public debt in order to limit the fiscal risk posed by the government's rapidly expanding debts. At the same time, the Federal Reserve actively worked to reduce the average maturity of the consolidated debt in order to lower long-term interest rates and, thereby, boost aggregate demand. Since both agencies use the same tool—the maturity structure of the net consolidated public debt—to achieve separate objectives, the nation faces an inescapable trade-off between these two conflicting policy goals.

Under current institutional arrangements, both the Federal Reserve and the U.S. Treasury tend to view debt management through the lens of each institution's narrow objectives and neither sets policy based on the overall national interest. We suggest new arrangements to promote greater cooperation between the Treasury and the Federal Reserve in setting debt management policy. Such coordination is especially important when conventional monetary policy reaches the zero lower bound, leaving debt management as one of the few policy tools to support aggregate demand.

17. Cochrane (2014) and Gagnon and Sack (2014) also argue in favor of maintaining a permanently larger Fed balance sheet in the new era with interest-bearing Fed liabilities.