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Authors	Daniel L. Thornton
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Federal Reserve Bank of St. Louis, Research Division, P.O. Box 442, St. Louis, MO 63166

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The Federal Reserve's Response to the Financial Crisis: What It Did and What It Should Have Done

Daniel L. Thornton

Federal Reserve Bank of St. Louis

thornton@stls.frb.org

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Abstract

This paper analyzes the Federal Reserve's major policy actions in response to the financial crisis. The analysis is divided into the pre-Lehman and post-Lehman monetary policies. Specifically, I describe the pre- and post-Lehman monetary policy actions that I believe were appropriate and those that were not. I then describe the monetary policy actions the Fed should have taken and why those actions would have fostered better financial market and economic outcomes. Had these actions been taken, the Fed's balance sheet would have returned to normal and the FOMC's target for the federal funds rate would be a level consistent with a positive real rate and an inflation target of 2 percent.

JEL classification: E50, E52, E58

Keywords: financial crisis, monetary base, quantitative easing, operation twist, forward guidance, the natural rate of interest.

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The financial crisis began on August 9, 2007, when BNP Paribas, France's largest bank, halted redemption of three investment funds. The federal funds rate spiked about 13 basis points on the day only to fall by nearly 75 basis points the next. The Fed's initial response was anemic: On August 10, the Fed announced that the discount window was "open for business;" on August 17, the primary credit rate (the discount rate) was cut by 50 basis points. As evidence mounted that difficulties in financial markets were intensifying, the Fed took bolder steps: The Federal Open Market Committee (FOMC) decreased the federal funds rate from 5.25 percent to 2 percent in a series of seven moves between September 18, 2007, and April 30, 2008; the primary lending rate was reduced to 25 basis points on December 11; and Term Auction Facility (TAF) was introduced on December 12.¹ The Fed's next major policy actions did not occur until Lehman Bros. filed for bankruptcy protection on September 15, 2008. The Fed responded by injecting massive amounts of credit into the market, mostly through its lending facilities. Between September 15, 2008 and January 2009 the monetary base doubled. In mid-March 2009 the FOMC initiated what is commonly referred to as quantitative easing 1 (QE1), announcing that it would purchase up to \$1.75 trillion in mortgage-backed securities, agency debt, and longer-dated Treasuries. QE1 was followed by QE2, the purchase of an additional \$600 billion in longer-term Treasuries, and Operation Twist, the purchase of \$400 billion in longer-term

¹ The Term Securities Lending Facility (TSLF) on March 11, 2008; the Primary Dealer Credit Facility (PDCF) on March 16, 2008; and lending in support of the acquisition of Bear Stearns by JPMorgan Chase on March 24, 2008; and authorizing lending to Freddie Mac and Fannie Mae on July 13, 2008. A complete time line of the financial crisis can be found at <http://timeline.stlouisfed.org/>.

Treasuries while simultaneously selling the same amount of short-term Treasuries.² These actions were intended to stimulate aggregate demand by reducing longer-term yields.

I discuss which of the Fed's primary monetary policy actions were appropriate and which were not. I also discuss what the Fed should have done, along with reasons why the economic recovery would have been stronger had the FOMC followed these suggestions. Indeed, Lehman might not have failed, and even if the output response would not have been stronger, the FOMC would at least not be mired in a Japanese-style zero interest rate policy.

My analysis begins with a discussion of "conventional" versus "unconventional" monetary policy. I then discuss the Fed's pre-Lehman monetary policy, followed by a discussion of its post-Lehman monetary policy. I present my analysis of how the Fed should have responded to the financial crisis and the reasons why my approach would have likely resulted in better financial market and economic outcomes. I conclude with some thoughts about the direction that policy should now take.

2.0 Conventional Versus Unconventional Monetary Policy

At a fundamental level, the Fed has done one thing historically: It has expanded or contracted its balance sheet through its lending and investing activities. These activities increase or decrease the monetary base and the supply of credit. Given the structure of the banking system and reserve requirements, changes in the monetary base are linked to changes in the supply of money. Indeed, the effect on the money supply is thought to be the reason that Fed actions affect interest rates: The demand for money is a function of interest rates so that an increase in the supply of money causes interest rates to decline via the so-called *liquidity effect*. I have noted

² Operation Twist was tried previously in 1961 and determined to be unsuccessful (Modigliani and Sutch, 1996). For some new evidence on the 1961 experiment see Swanson (2011).

elsewhere (Thornton, 2012a), however, that monetary policy actions can affect interest rates even if the money demand was not a function of the interest rate. The reason is that the Fed's lending and investing activities affect the supply of credit. This is true even if the demand for money was independent of the interest rate, or if, as Woodford (2000) has suggested might happen, money did not exist. Until the 1990s, it was believed that the Fed controlled the federal funds rate by adjusting the supply of reserves (credit) in the funds market through daily open market operations—increase the monetary base and the federal funds rate falls; decrease the base and the federal funds rate rises.³ Indeed, this mechanism continues to appear in textbook descriptions of how the Fed controls the federal funds rate. However, since at least the mid-1990s, the Fed has controlled the federal funds rate through open market operations; the FOMC simply announces its target and the federal funds rate immediately adjusts to the new target level. This mechanism works because the market believes that the Fed has the power and willingness to achieve and maintain the new target level. Elsewhere (Thornton, 2010d) I show that greater control over the federal funds rate has been accompanied by a marked deterioration in the relationship between the federal funds rate and longer-term Treasury yields.

The important point is any action the Fed takes to change the supply of credit—either by making loans or purchasing assets—is conventional monetary policy. The Federal Reserve Act gives the Fed the authority to purchase a wide variety of assets, other than those which it has purchased historically (Thornton, 2009, p. 18).⁴ Hence, quantitative easing *per se* is not

³ It is interesting to note that despite the widespread belief in this mechanism, evidence of the “liquidity effect” in the federal funds market has been remarkably difficult to find, see Hamilton (1997), Thornton (2001a, 2004, 2007, 2010a), and Carpenter and Demiralp (2006, 2008).

⁴ The average annual increase in the monetary base over the period 1980-2007 was just \$25 billion, nearly all of which was required to accommodate the increase in the currency component of the money supply over the period.

unconventional. What is unconventional is the magnitude of the purchases and the reason for doing so.

The Federal Reserve Act limits who the Fed can lend to under normal circumstances. However, Section 13(c) of the Act gives the Federal Reserve Board the authority to make loans and provide financial assistance to whomever in “unusual and exigent” circumstances. Hence, loans made to any institution other than depository institutions are unconventional in the sense that “unusual and exigent” circumstances arise very infrequently.⁵

What are the FOMC’s truly unconventional policies? There are two: (1) the use of forward guidance, whereby the FOMC attempted to reduce longer-term interest rates by publically committing to keep the policy rate at zero for an extended period of time; and (2) Operation Twist, whereby the FOMC attempted to reduce longer-term rates by purchasing long-term securities and simultaneously selling an equivalent quantity of short-term securities, thereby leaving the total supply of credit unchanged.

3.0 Pre-Lehman Monetary Policy

There were just two major policy actions prior to Lehman: The 325-basis-point reduction in the federal funds rate target between September 18, 2007 and April 30, 2008, and the Fed’s lending primarily through the TAF. The reduction of the federal funds rate target was appropriate but largely ineffective. For one thing, the *interest rate channel of monetary policy* is relatively weak and has long been considered so for a variety of reasons (Bernanke and Gertler, 1995, and Thornton, 2010c). The interest rate channel will be particularly ineffective during economic crises because the expected return on capital spending is typically marked down so low that

⁵ See Mehra (2010) for a discussion of the legality of the Fed’s operations under Section 13(3) of the Federal Reserve Act.

investment is unattractive at virtually any interest rate. This is particularly true for residential and commercial investment in the current economic crisis because of the enormous overhang in residential and commercial real estate capital. Finally, the ability of central banks to affect longer-term rates that matter for economic activity is thought to be limited (Bernanke and Gertler, 1995; Greenspan, 1993; and Thornton, 2012a,b).

The consensus that the interest rate channel of monetary policy is relatively ineffective was the primary motivation for the *credit channel of monetary policy*. However, the credit channel is also of questionable strength. Bernanke and Gertler (1995) point out the credit channel has two distinct parts—the *net worth channel* and the *bank lending channel*. Thornton (1994) shows that the ability of banks to obtain funds for lending in the certificate of deposit (CD) market significantly mitigates the effectiveness of the bank lending channel and presents evidence that this channel is weak at best.

The net worth channel is based on the idea that the larger the net worth of the borrower, the more likely the borrower will have access to external finance. This provides a mechanism whereby changes in interest rates can affect borrower's net worth. There are two possibilities. First, a rise in interest rates will increase a borrower's interest expense to the extent that the borrower has short-term debt on the balance sheet. This will reduce the cash flow and the ability to secure credit. Second, rising interest rates may cause a decline in asset prices, which reduces the borrower's net worth, and thereby, collateral. These effects are second order and would vary considerably depending on the structure of the balance sheet of individual borrowers. Moreover, the direct effect on a borrower's net worth should be large only if the borrower is holding relatively long-dated assets and then only if the change in the overnight policy rate was accompanied by a change in longer-term rates; this is very doubtful, at least since the late 1980s

(Thornton, 2010d). In any event, the empirical support of the credit channel is weak (Kashyap and Stein, 2000; Carpenter and Petersen, 2002; Ashcraft, 2006; Holod and Peek, 2007; and Bernanke, 2007).

3.1 Sterilized Lending

During a financial crisis, risk premiums rise and credit markets freeze up because of uncertainty and the corresponding increase in credit risk. Considerable uncertainty arose this time because financial institutions were holding large quantities of mortgage-backed securities (MBS). The quality of most of these MBS was largely unknown even to the financial institutions holding them. The existence of large quantities of these so-called *toxic* assets made it difficult to assess the credit-worthiness of borrowers. Financial institutions were forced to spend considerable time and resources to determine the quality of their MBS portfolios. In such an environment, the Fed could have facilitated the adjustment process by massively increasing the supply of credit through open market operations and direct lending (Allen and Gale, 2008).

The Fed made significant loans to depository institutions, primarily through the TAF. However, the Fed sterilized the effect of its lending activities on the supply of credit (i.e., the monetary base) by selling an equivalent quantity of government securities. Sterilized lending is not unconventional. The Fed has historically sterilized discount window lending. Indeed, it has an incentive to do so when it is attempting to control either the federal funds rate or the money supply (Thornton 2001b).⁶

The volume of lending during the pre-Lehman period was sufficiently large that, had it not been sterilized, the FOMC would have had to reduce the federal funds rate target

⁶ This approach consistent with Bernanke and Blinder's (1988) analysis of the special role of banks, i.e., monetary policy will matter even in a liquidity trap. For a good discussion of this and other emergent theoretical issues associated with the financial crisis, see Chadha and Holly (2011).

significantly more than it did. This does not appear to be the reason the FOMC sterilized its pre-Lehman lending, however. The apparent motive for sterilizing the lending was unconventional. Chairman Bernanke (2009) argued that it is the composition of the balance sheet that matters, not its size, pointing out that the Fed's approach was different from quantitative easing where the "focus of policy is the quantity of bank reserves, which are liabilities of the central bank; the composition of loans and securities on the asset side of the central bank's balance sheet is incidental." He went on to state that "the Fed's approach focuses on the mix of loans and securities that it holds and on how this composition of assets affects credit conditions for households and businesses." Bernanke (2008b) motivated this approach saying "recent research by Allen and Gale (2007) confirms that, in principle at least, 'fire sales' forced by sharp increases in investors' liquidity preference can drive asset prices below their fundamental value, at a significant cost to the financial system and the economy...A central bank may be able to eliminate, or at least attenuate, adverse outcomes by making cash loans secured by borrowers' illiquid but sound assets." Apparently, the idea was to undo the inefficient allocation by the credit market by essentially making the market lend to financial institutions the Fed deemed most in need of liquidity.⁷ This is unconventional. Historically the Fed has argued that it is size and not the composition of the balance sheet that matters: the Fed's job is to supply credit; the

⁷ Goodfriend (2011) mentions that sterilized lending through the TAF—which he calls credit policy—was a mistake. However, his suggestion that TAF lending exposed taxpayers to excessive risk of loss because "central bank lending that is collateralized fully exposes taxpayers to losses if the borrower fails subsequently" is an overstatement. Also, his definition of monetary policy—"open market operations that expand or contract high-powered money (bank reserves plus currency) by buying or selling *Treasury securities*" is too narrow. Actions which increase the size of the adjusted monetary base are monetary policy actions, regardless of their intent. Moreover, this definition would seem to apply only if the Fed were constrained to have zero default risk. However, the Federal Reserve Act allows the Fed to purchase a wide range of assets. Hence, it imposes no such requirement. The desire to be self sustaining motivates the Fed to minimize default risk on its balance sheet. The Fed accomplishes this by only purchasing high-grade securities and by making highly collateralized loans. Hence, I agree with Goodfriend (2011) that the Fed's decision to add \$29 billion in "toxic assets" to its balance sheet, in order to rescue of Bear Stearns, was a mistake for this reason.

market's job is to allocate the credit to its most efficient use. Before Lehman, the Fed apparently believed that the market's ability to allocate credit efficiently was impaired, so it took on the job of reallocating credit (Thornton, 2009).

I view the Fed's decision to reallocate the existing quantity of credit to particular financial institutions a major policy error. Friedman and Schwartz (1963) argued convincingly that the Fed made a major policy error at the start of the Great Depression by contracting the monetary base. The FOMC did not contract the supply of credit as it did at the outset of the Great Depression, but it did not increase it as it should have.

Temporarily increasing the monetary base to better enable the normal adjustment process would have been the appropriate action. Indeed, this is what the Fed did in advance of Y2K and immediately following the 9/11 terrorists attacks. In expectation that there would be a marked increase in the need for liquidity (credit) in the financial market at the turn of century because of a large number of computer failures, the Fed significantly increased the monetary base. Concern about Y2K turned out to be unwarranted and the additional funds were withdrawn quickly so that the monetary base returned to its pre-easing level. The Fed also significantly increased the monetary base immediately following the 9/11 terrorist attacks. Given these actions, I find it puzzling that the Fed decided not to increase the monetary base even though it was increasingly clear that the difficulties in the financial markets and the economy were intensifying and financial markets were in need of additional credit. Increasing the monetary base would not have been a panacea, but increasing the availability of credit to the market would have facilitated the adjustment process significantly. In any event, not increasing the supply of credit by sterilizing the effect of the Fed's lending on the monetary base produced no noticeable results. Financial

market and economic conditions continued to deteriorate, risk spreads remained high, and on March 14, 2008, the Fed participated in a bailout of Bear Stearns.

4.0 Post-Lehman Monetary Policy

Immediately following Lehman's announcement, primary credit borrowing and TAF lending—which had increased significantly during the months prior to Lehman's announcement—exploded. The Fed ceased sterilizing lending. Was this a shift in monetary policy philosophy or merely something that happened because the Fed lacked the ability to sterilize such lending? By the time of Lehman's bankruptcy announcement, the Fed's holdings of Treasuries had shrunk to about \$475 billion, of which about \$200 billion was pledged under the Fed's Term Securities Lending Facility (TSLF) which was introduced on March 11, 2008. Consequently, the Fed's ability to continue its sterilization policy was significantly impaired.

Whatever the rationale, the action was appropriate. The effectiveness of this action is reflected in risk spreads. Figure 1 shows the 1-month Libor/OIS and CD/Treasury spreads over the period January 3, 2006 through April 23, 2012. These spreads, which had increased markedly with the onset of the financial crisis, and more dramatically following Lehman's announcement, had fallen below their post-financial-crisis/pre-Lehman levels by early 2009. Longer-term and private security spreads, shown in Figure 2, also declined markedly but remained at their post-financial-crisis/pre-Lehman levels.

4.1 The Federal Funds Rate Target and Forward Guidance

Figure 3, which plots the monetary base, the federal funds rate, and the FOMC's federal funds rate target weekly over the period January 2006 through April 2012, shows that the massive increase in the monetary base was accompanied by a decline in the federal funds rate to near zero long before the FOMC reduced its federal funds rate target to that level. Indeed, the

last three reductions in the FOMC's federal funds rate target were the endogenous responses of the FOMC to a supply-induced decline in the federal funds rate. This is illustrated in Figure 4 which shows the effective federal funds rate, the federal funds rate target, and the 1-month OIS rate daily from January 2, 2007 through February 28, 2009. The vertical line denotes September 15, 2008. Prior to that date, the federal funds rate declined immediately on the announcement of a target change—reflecting the open mouth operations discussed in Section 2. Moreover, the 1-month OIS rate declined ahead of the target change, reflecting the fact that target changes were anticipated somewhat before they occurred. After Lehman, however, the federal funds rate declined in advance of target changes and the OIS rate lagged rather than led changes in the federal funds rate. This reflects the fact, as suggested in Section 3.1, that a massive increase in the supply of credit by the Fed would cause the federal funds rate to decline significantly. The fact that the FOMC did not immediately reduce the target to zero indicates that the FOMC did not appreciate this fact. This suggests that the decision to sterilize its pre-Lehman lending was not because the FOMC believed it would be unable to maintain its federal funds rate target had it not sterilized its lending, but rather because it was pursuing a credit reallocation policy as Bernanke's (2008a,b, 2009) statements suggest.

The decision to reduce the federal funds rate target to between zero and 25 basis points was accompanied by the adoption of forward guidance. The FOMC had briefly experimented with forward guidance between 2003 and 2005 (Kool and Thornton, 2012). The first attempt at forward guidance was likely motivated by a January 2003 FOMC discussion of Woodford's (1999, 2001, 2003) suggestion that the efficacy of central banks' interest rate policy could be increased if the central bank committed to keep its policy rate at a given level for a longer period of time. Governor Bernanke noted, "I'm very interested in this basic point that the Fed should be

more predictable in order to use the short-term rate to influence long-term rates...” Following up on a suggestion that the Fed’s behavior was not inertial, Bernanke suggested the Fed’s behavior should be more inertial “in order to get more effect on long-term rates.” In any event, after reducing the federal funds rate target to the then historically low level of 1 percent in June 2003, the FOMC announced that it “believes that policy accommodation can be maintained for a considerable period.” When it began increasing the target in June 2004, the Committee announced “that policy accommodation can be removed at a pace that is likely to be measured.”

After reducing the federal funds rate target to between zero and 25 basis points in December 2007, the FOMC noted that it “anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.” The Committee became more aggressive in its use of forward guidance at the August 2011 meeting by announcing that it “anticipates that economic conditions...are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.” The period of forward guidance was lengthened to “late 2014” at the January 2012 meeting.

The theoretical justification for forward guidance is the Expectations Hypothesis (EH) of the term structure on interest rates. The EH asserts that a rate on a long-term security with maturity n at time t is equal the average of the time- t expectation for the rate on an otherwise equivalent security with maturity m ($m < n$) plus a constant term premium. The EH has been massively rejected (e.g., Sarno, et al. 2007, and the references therein) using a wide variety of interest rates, sample periods, and monetary policy regimes. While a variety of explanations for the failure of the EH have been advanced, Guidolin and Thornton (2012) show that a likely

reason is short-term interest rates are essentially unpredictable beyond their current level.⁸ In any event, there is little evidence that forward guidance improves central banks' control over longer-term rates (Anderson and Hoffman, 2010; Goodhart and Lim, 2008; Kool and Thornton, 2012).

The massive empirical failure of the EH and the lack of empirical support for the effectiveness of forward guidance policies generally suggest that the FOMC's forward guidance policy may have been unsuccessful. This conclusion is intensified by the lack of support for the interest rate channel of monetary policy. The interest rate channel of policy is likely to be particularly weak during economic crises. Hence, it seems particularly unlikely that the FOMC's current forward guidance policy will be effective in facilitating an economic recovery.⁹

4.2 Quantitative Easing

Quantitative easing (QE) is a policy of purchasing a large quantity of longer-term assets and maintaining a very large portfolio of government and private debt. The objective of QE and forward guidance is the same—to reduce longer-term yields and thereby increase the efficacy of monetary policy. I have noted elsewhere (Thornton, 2010c, 2012b) that the simultaneous pursuit of QE and forward guidance is confusing because their theoretical justifications conflict.¹⁰

While not termed QE, the Fed's first LSAP occurred when the Fed announced on November 25, 2008, that it would purchase up to \$100 billion in agency debt and up to \$500 billion in MBS to “support housing markets and foster improved conditions in financial markets

⁸ The failure of the EH is frequently attributed to a time-varying risk (term) premium. However, that is simply an alternative way of saying that the EH fails: If EH held, the risk premium would be constant.

⁹ Fuhrer (1996) has suggested that the EH survives because alternatives to replace it are “weak.”

¹⁰ Several economists have suggested to me privately that the market might not be characterized by perfect substitutability or by market segmentation, suggesting that somehow forward guidance and QE could have the desired effects on longer-term rates. While I don't know for sure that this is impossible, it seems unlikely because there is considerable evidence suggesting that financial markets are very efficient. In any event, given the theoretical conflict between the two policies, the FOMC could increase transparency and improve the public's understanding by simply telling us why they are pursuing what appear to be contradictory strategies.

more generally.” The announcement made no mention of reducing longer-term rates. However, in a speech on December 1, 2008, Chairman Bernanke (2008b) pointed out that even though the FOMC’s policy rate was effectively zero, “the Fed could purchase longer-term Treasury or agency securities on the open market in substantial quantities. This approach might influence the yields on these securities, thus helping to spur aggregate demand.” This was the first hint that the Fed might consider a QE policy. The possibility of QE actions was reinforced in the FOMC statements of December 16, 2008 and January 28, 2009, when the FOMC indicated that it “stands ready” to increase its purchases of securities “as conditions warrant.”

QE1 occurred on March 18, 2009, when the FOMC announced that “to provide greater support to mortgage lending and housing markets” it decided to expand its large-scale asset purchases program by purchasing an additional \$1.25 trillion in MBS, agency debt, and longer-term Treasuries over the next six months. On August 10, 2010, the FOMC announced that it would maintain its balance sheet at its current level by reinvesting principal payments on MBS and agency debt in longer-dated Treasuries. A second program of quantitative easing (QE2) was announced on November 3, 2010, when the FOMC announced its decision to purchase an additional \$600 billion of longer-term Treasury securities at the pace of about \$75 billion per month.

I believe the FOMC’s decision to increase the size of the Fed’s balance sheet to unprecedented levels and to maintain it at those levels was unnecessary and largely, if not completely, ineffective in reducing longer-term real rates and stimulating aggregate demand. QE was unnecessary because financial markets had already stabilized significantly; as I noted above, prior to March 18, 2009, risk spreads declined significantly; in some cases, they were below their

pre-financial-crisis levels. Moreover, other financial stress indices, such as the St. Louis Financial Stress Index, had declined significantly from their post-Lehman peak.

Primary credit borrowing had also declined from a peak of \$112 billion to \$63.5 billion by the week ending March 12, 2009, TAF auctions were under subscribed, and the demand for TAF loans peaked at the February 12, 2009 auction. There were other signs of economic recovery. Default risk spreads, such as the spread between the yields on AAA-rated corporate industrial bonds and 10-year Treasuries, shown in Figure 5, had declined considerably. This credit risk spread increased dramatically following Lehman's announcement from about 110 basis points to a peak of about 195 basis points, but had fallen to its pre-Lehman level by early February 2009. From February 6, 2009, through March 3, 2009, the spread averaged 108 basis points. The spread increased again beginning in early March; however, 24 basis points of the 25-basis point net change in the spread from March 3, to March 17 occurred on three days when there were announcements that could have increased credit spreads.¹¹ The spread increased by 7 basis points on the March 18 announcement. Particularly noteworthy is the fact that the recession, which intensified up to and especially following Lehman's announcement, ended just three months after QE1 (i.e., June 2009). Of course, it could be that the recovery began in June because of the FOMC's decision to purchase large amounts of longer-term securities. However, as discussed below, this would appear to be inconsistent with the fact that long-term yields had risen significantly above their March 18 level. A more likely explanation is that the recovery was facilitated by what I would call conventional monetary policy, i.e., the massive injection of credit following Lehman's announcement.

¹¹ On March 3, 2009, the Treasury and the Fed announced the Term Asset-Backed Securities Loan Facility; on March 6, the Treasury announced that it had purchased \$284.7 billion in preferred stock from 22 banks; and on March 13 the Treasury announced that it had purchased an additional \$1.45 billion in preferred stock from 19 banks.

There are several reasons for believing that the LSAP programs had little, if any, effect on longer-term rates. For one thing, most of the evidence supporting the effectiveness of LSAP in reducing interest rates comes from event studies (Gagnon, et al., 2011; Krishnamurthy and Vissing-Jorgensen, 2011; Neely, 2011; and Joyce, et al., 2010) which show that there was an unusually large decline in longer-term yields on the days of certain LSAP announcements—i.e., there was an announcement effect. However, to be convincing, the announcement effect should be persistent. However, Wright (2011) shows that these announcement effects were short-lived.

More generally, it is virtually impossible to infer a causal relationship between announcement effects and more persistent or permanent movements in longer-term yields that matter for spending decisions. Figure 6 shows the daily 10-year Treasury yield over the period from June 13, 2008 (the peak in the 10-year Treasury yield prior to Lehman) to December 30, 2011. The 7 vertical lines denote seven important LSAP announcement dates: November 25, December 1, and December 16, 2008, January 28 and March 18, 2009, and August 10, and November 3, 2010, respectively. The three 2008 announcements were associated with drops in the 10-year Treasury yield of 24, 21, and 16 basis points, respectively. The 10-year yield began trending down in mid-to-late October. Consequently, it is difficult to know how much of these responses are due to the announcement and how much is a continuation of the trend that began earlier. For example, over the three days, November 18, 19, and 20, 2008, the 10-year Treasury yield declined 58 basis points, with no monetary policy announcements.¹²

¹² One way to investigate this possibility is to see whether there is a significant change in the trend following key announcements. Because interest rates are highly persistent, this can be done by regressing the change in the 10-year yield on a constant term and dummy variable that takes the value of one after an announcement and zero before the announcement and testing the hypothesis that the coefficient on the dummy variable is zero. The coefficient on the constant term reflects the average daily change in the rate over the period, called the drift. If the coefficient dummy variable is not negative and statistically significant from zero, there is no significant change in the drift. This would

The second FOMC announcement on January 28, 2009, had no effect. The QE1 announcement effect was very large (51-basis-point), but short lived. The yield had recovered 30 basis points of the decline by March 25 and all of it by April 24, 2009. Hence, the March 18, 2009, announcement appears to have only resulted in a pause in the upward trend of 10-year yield, which began in late December 2008. The 2010 announcements had no significant announcement effect. It is sometimes suggested that these two announcements produced no effect because they were expected. However, if this is true, the Treasury yield should have declined in advance of the announcement. There was no such decline. The yield began trending down in early April 2010, well in advance of the October 10 announcement, and was relatively flat in the weeks before the announcement. The 10-year yield was trending up prior to the QE2 announcement and continued to do so for a significant period after. This very simple analysis suggests that these announcements had little or no lasting effect on yields. More generally, statistically significant announcement effects do not provide compelling evidence that LSAP caused longer-term interest rates to decline secularly.

More compelling evidence of a lack of an effect of QE on longer-term yields is the fact that there is no evidence that the LSAPs were effective using lower-frequency, monthly, data. Elsewhere, (Thornton, 2012b) I show that the strongest evidence supporting the portfolio balance channel using monthly data (Gagnon, et al., 2011) is due entirely to a common trend in the data

suggest that the announcements had no additional effect on the 10-year yield apart from what would have occurred otherwise. For the sample period October 14, 2008 through December 30, 2008, the coefficient on the dummy variable is -0.011 with a t-statistic of -0.40 and -0.002 with a t-statistic of -0.07 using November 24, 2008 and December 1, 2008 as the key announcement dates, suggesting no statistically significant change in the drift following either of these dates. However, the estimates of \bar{R}^2 are very small, so this does not constitute strong evidence against the hypothesis that these announcements had an effect beyond the drift which had begun earlier, but there is no evidence that these announcements had a separate effect either.

used.¹³ When the trend is accounted for the evidence of an effect of QE on longer-term rates vanishes. Furthermore, there is no evidence that QE reduced long-term yields or term premiums using a variety of debt measures that are hypothesized to generate a portfolio balance effect on longer-term yields.

Even if QE caused a significant decline in Treasury yields, the effect on economic activity should have been relatively modest. The reason is the effectiveness of QE and Operation Twist on long-term Treasury yields can only occur if the market is segmented. However, if the market for longer-term Treasury debt is segmented from the rest of the credit market, the effect of QE or Operation Twist on Treasury yields cannot spill over to private security yields, which matter for economic activity. Hence, the more effective QE and Operation Twist are in reducing longer-term Treasury yields, the less effective they will be in stimulating aggregate demand; the more segmented the long-term Treasury market, the smaller the effect these actions on private long-term yields.

Given the massive failure of the EH and the weak theoretical underpinnings and empirical evidence of the portfolio balance channel, I believe that neither forward guidance nor QE accounts for a significant amount of the recent decline in longer-term yields. Consistent with the classical theory of interest (Thornton, 2010d), the decline in longer-term yields since early 2011 most likely reflects weakening expectations for economic growth in the U.S. and globally and, in the case of Treasuries, a flight to safety in response to the sovereign debt crisis.¹⁴

¹³ I also discuss the theoretical foundations for the effectiveness of LSAP and suggest several reasons for skepticism.

¹⁴ See Thornton (2010d) for a discussion of the EH versus the classical theory of interest and evidence supporting the classical theory. Also see Swanson and Williams (2012) for some additional evidence consistent with the classical theory.

4.3 Are QE and Operation Twist Counterproductive?

Proponents of QE frequently suggest that even if it has little or no effect on longer-term yields, it should be done because it does no harm. I question this belief. Had the FOMC not pursued QE, the Fed's balance sheet would look pretty normal today and the federal funds rate would be closer to a rate consistent with a positive real rate of interest and the FOMC's 2 percent inflation objective, i.e., closer to the 4 percent natural rate that is characteristic of a standard Taylor rule. Had the FOMC pursued this path, I believe economic growth and employment would be higher than they currently are.

How could the FOMC's aggressive balance sheet and zero interest rate policy make things worse? My one-word answer is "expectations." It is sometimes said that if you ask 10 economists a question you will get 11 opinions. There is one area where there has been a convergence of views; the importance of expectations for economic activity. Most economists agree that if important policymakers were to tell the public that we could be facing the next Great Depression, consumption would fall like a rock, pushing the economy closer to another Depression. In a similar vein, I believe an "extreme" policy stance, such as the one the FOMC has pursued since late 2008 and indicates that it will continue until late 2014, generates expectations that the economy is much worse than it might otherwise appear. This expectations effect will be particularly important when the actions are taken at a time when there are significant signs that financial markets are stabilizing and the economy is improving. This adverse expectations effect of QE is extremely difficult to document. Nevertheless, it is possible, even likely, the Fed's extreme policies have worked against the goal they were intended to achieve.

This possibility is supported by Thornton's (2011a) finding that the marked increase in Christensen et al.'s (2009) Libor factor, following the Fed's TAF announcement and the simultaneous announcements of other central banks that additional actions were being undertaken to mitigate the effects of the financial crisis, is almost completely accounted for by credit risk spreads. The marked increase in credit risk is consistent with the hypothesis that announcements signaled that policymakers believe the crisis was intensifying. Hence, rather than having the beneficial effect of reducing liquidity premiums, as Christensen et al.'s (2009) contend, these announcements had the detrimental effect of increasing credit risk.

The FOMC's balance sheet and zero interest rate policies are so extreme that it is virtually impossible for anyone to believe that the economy has or is returning to "normal" while such policies are in place. A variety of financial and economic facts deny the need for such extreme policies, e.g., risk spreads are relatively low and stable, and the economy fully recovered its previous level of output in the third quarter of 2011. The extreme policy stance causes consumers and investors to be more cautious than they might be otherwise. Savers are finding it difficult to get a reasonable return, and incomes of the retired have declined drastically. Such an environment is not conducive to rational economic decision making and, consequently, economic growth.

There are other adverse effects of the FOMC's policy. Principal among these is the fact that the Fed's massive balance sheet and the FOMC's concomitant low interest rate policy enables the government to avoid dealing with its deficit/debt problem. The FOMC's zero interest rate policy has reduced the burden of the debt—the average interest rate paid on interest-bearing public debt declined from 4.2 percent in September 2008 to 2.7 percent in April 2012. The Fed's revenue from its massive portfolio reduce has also reduced the debt burden. For reasons that I

have discussed elsewhere (Thornton, 2010b, 1984), I don't believe that the FOMC is monetizing the debt per se. Nevertheless, the Fed's balance sheet of \$2.8 trillion—more than 3 times its pre-Lehman level—makes it easier for the government to finance the debt.

What are the benefits from maintaining such an easy policy for such a long period of time? To answer this question it is useful evaluate monetary policy since January 1990. The stance of monetary policy is measured by the difference between the FOMC's target for the federal funds rate and the natural rate of interest, i.e., the interest rate consistent with the long-run real rate of interest and the FOMC's inflation objective. I assume the natural rate of interest is 4 percent, consisting of a 2 percent real interest rate and the FOMC's 2 percent inflation target. Figure 7 shows the difference between the FOMC's federal funds rate target and the 4 percent natural rate from January 1990 through 2014. Monetary policy was somewhat restrictive by this measure from January 1990 through June 2001. In contrast, policy has been relatively easy since June 2001 and is expected to remain so until late 2014.

What was the effect of these markedly different long-run policies? Table 1 shows the average rate of inflation, output growth, and unemployment over two periods. The first data column for each period presents the average of these variables for the entire period. The second data column shows the averages when recession months or quarters are removed. The third data column, which applies only to the second period, shows the averages for the period ending June 2007 to remove the effect of the financial crisis. These markedly different monetary policies had little effect on the average inflation rates over the two periods. The average rates of inflation are very similar over both periods whether or not the recession months are removed or if the second period ends in June 2007.

There are differences in the average rate of economic growth and the unemployment rate, but not in the way that one might expect given the relative stance of monetary policy. Output growth was twice as high during the period when monetary policy was tight than when it was easy. Some of this difference is due to the fact that the 2007 – 2009 recession was much more severe and protracted than the 1990-1991 and 2001 recessions. When the recessions are accounted for, the difference is much smaller. The difference is not improved, however, if the period of the financial crisis is removed. The unemployment rate is higher during the easy monetary policy period, but all of the difference is attributed to the financial crisis and its aftermath. The average unemployment rates for 1990-2001 and 2001-2007 are essentially the same. This simple analysis suggests that monetary policy appears to have had little effect on output growth or the unemployment rate. This is consistent with the idea that monetary policy is neutral in the long run and evidence that the interest rate channel of monetary policy is weak. Whatever the explanation, these very different monetary policies appear to have little or no effect on real variables over the two decades.

Why was the stance of policy so different over these decades? A simple analysis suggests it was because the FOMC was responding to inflation and unemployment during the first period, but only unemployment during the second. It is well known that policymakers care about both inflation and output growth. This basic fact is reflected in monetary policy rules, such as the Taylor rule. While there is no evidence that the FOMC has ever followed a policy rule, it is useful to see how the stance of policy is related to inflation and output growth. This is done by estimating a simple policy reaction function of the form

$$ps_t = \alpha + \beta gap_{t-1}^{ur} + \delta gap_{t-1}^{inf} + \varepsilon_t ,$$

where ps denotes the stance of monetary policy given by the difference between the FOMC's federal funds rate target and 4 percent, gap^{ur} denotes the unemployment rate gap measured by the difference between the unemployment rate and 5.5 percent, and gap^{inf} denotes the inflation gap measured by the difference between headline PCE inflation and 2 percent. The unemployment rate is used rather than output because output is available only quarterly. The equation is estimated over the periods January 1990 through June 2001 and July 2001 through December 2008.¹⁵

The results are presented in Table 2. For the first period, either gap^{ur} or gap^{inf} alone are highly statistically significant; each accounts for about 20 percent of the variation in the stance of policy. However, when both are included in the regression, each remains highly statistically significant and together account for nearly 75 percent of the variation in the stance of policy. Both coefficients are near unity and the point estimate of δ is slightly higher than 1.0, suggesting that the FOMC followed the Taylor/Friedman principle.

In contrast, for the second period, gap^{inf} alone is marginally statistically significant and accounts for only 7 percent of the variation in the stance of policy. In contrast, gap^{ur} alone is highly statistically significant and accounts for nearly 85 percent of the variation in the stance of policy. When both variables are included, gap^{inf} is not statistically significant, and the estimate of \bar{R}^2 is the same as with gap^{ur} alone.

The reaction function estimates indicate that the FOMC was attempting to stabilize both inflation and unemployment in the first period, but only the unemployment rate in the second.

¹⁵ The qualitative conclusions are the same if the equation is estimated over the period July 2001-March 2012; however, there is no variation in the dependent variable after December 2007.

The focus on the real side of the economy since mid-2001 is likely a consequence of inflation being controlled by inflation expectations during the second period. With inflation expectations anchored by inflation expectations, the FOMC focused its attention on the real economy. Given the theoretical and empirical evidence that monetary policy has little-to-no effect on real variables in the long run and evidence that the interest rate channel of policy is weak more generally, it is reasonable to question the wisdom of such a policy and the FOMC's commitment to maintaining such an uncharacteristically easy policy for such a long period of time.

5.0 How the Fed Should Have Responded to the Financial Crisis

Having been critical of the Fed's monetary policy response to the financial crisis, I need to suggest how the Fed should have responded. Like many economists, I was not that concerned on August 9, 2007.¹⁶ However, as more information became available it was clear that an immediate problem was that most mortgage lending was securitized based on general characteristics of the borrowers and the loans. This meant that financial institutions did not know the real value of their MBS portfolios. Consequently, lenders would be understandably concerned about making loans to institutions with large MBS portfolios, i.e., risk premiums would increase significantly.

It was also clear that the 5 percentage-point increase in home ownership that occurred between 1994 and 2006 was likely to be unsustainable and that home prices would continue to

¹⁶ I have not discussed the issue of the Fed's role in the financial crisis and what if anything the Fed should have done to help prevent it. My view is that the financial crisis is the consequence of home prices getting too far from their fundamental value. The causes are many, but much of the blame must be placed on governmental policies to encourage home ownership by extending homeownership to those who would not qualify for it under conventional lending standards. The Fed policy undoubtedly contributed to the problem during the period between 2002 and early 2005 by keeping the federal funds rate far below the rate consistent with existing economic circumstances (output grew at a 3 percent rate and inflation averaged 2.2 percent). It is difficult, if not impossible, to determine the degree to which the FOMC's federal funds rate policy contributed to the financial crisis. However, I am inclined to believe that only a very restrictive interest rate policy would have had a significant effect in curbing the home-price bubble.

fall causing a further deterioration in financial markets and the economy more generally. More importantly, the bursting of the home-price bubble was going to be considerably more serious than the bursting of the dot-com bubble in the 2001 recession. The reason is that few, if any, physical assets were created during the dot-com bubble. This would not be the case for the home-price bubble. The bursting of the home-price bubble would be accompanied by a large overhang of residential real estate. There was also going to be significant overhang in commercial real estate. The equilibrating process associated with the dot-com bubble was relatively painless and quick because there was no excess of physical capital—only flows needed to adjust. As a consequence, the recession was relatively mild and short lived. Economic theory shows that stock-flow adjustments are more difficult and take much longer. Hence, this recession would be much larger and more protracted. Equilibrium would require a very large reduction in the real value of the stock of housing. This would require very large reductions in house prices since the physical quantity of houses can change only slowly. Moreover, the wealth effect on consumption would be large.

The appropriate monetary policy in this circumstance is to significantly increase the monetary base, i.e., the supply of credit, to facilitate the adjustments required to achieve a new equilibrium. Consequently, I advocated that the Fed purchase large quantities of securities to increase the supply of credit. There is no formula to know exactly how much the monetary base should be increased in such a circumstance. I recommended \$600 billion, but suggested that more should be done if markets did not stabilize sufficiently. When asked by colleagues whether the Fed should restrict its purchases to Treasuries, I responded that what the Fed purchased was less important than the amount purchased. The only requirements were: (a) high-quality securities are purchased in order to minimize the Fed's credit risk, and (b) the public be informed

that the increase in the monetary base is temporary and that the composition of the Fed's balance sheet and the size of the monetary base would be returned to normal as financial markets and economic activity began to normalize.

By this time, the Fed had already been supplying funds to banks via the TAF. The TAF was a good idea, but the fact that TAF loans were made at subsidized rates was troublesome. The big mistake, however, was the decision to sterilize the lending. It would have been a better course of action to announce that the FOMC would suspend targeting the federal funds rate and significantly increase the supply of credit to the market by making loans and purchasing assets. I would have announced that the additional funds would be removed and the FOMC would return to federal funds rate targeting as soon as financial markets began to stabilize. Announcing that the actions are temporary is necessary to allay concerns that the FOMC might renege on its commitment to long-run price stability.

I would have taken these actions and given them time to work. Only if it was clear that providing additional credit to the market was not helping the market would I have considered taking more extreme actions. Moreover, I would have pursued more extreme actions only if there was strong theoretical or empirical evidence (say from the experiences of other countries) supporting the effectiveness of such actions.

I thought it dangerous to translate experiences from previous U.S. financial crises to the current one. Financial markets today are just too different from those of the late 1800s or early 1900s. My working hypothesis was that information gleaned from those financial crises may not be useful for understanding or solving the current one.

I would have steadfastly declined to engage in activities that might significantly impair the Fed's independence, such as participating in the bailout of Bear Sterns, or providing credit to

particular segments of the market at the expense of others. It is Congress' prerogative to decide if a firm is too-big-too fail, not the Fed's. The Fed should supply the liquidity, i.e., short-term credit, the government should provide capital if it deems it necessary to do so. If the administration or Congress wants to prevent the failure of a large "systemically significant" financial institution, for whatever reason, it must justify the action to the public and determine how to finance it. The Fed's decision to purchase \$29 billion of Bear-Sterns assets of questionable quality was a huge mistake—one of many subsequent actions that may have seriously compromised the Fed's independence.¹⁷

Of course, it is impossible to prove that my approach would have resulted in a better outcome than the actions the Fed has taken. We don't get to construct controlled experiments in economics. Moreover, there is no model of the economy sufficiently good enough to construct useful simulations of alternative policy actions. Hence, the usefulness of my approach must be evaluated based on existing theory and empirical evidence.

Nevertheless, I believe that providing massive amounts of credit is effective only during the early stages of a financial crisis, when financial market turmoil and uncertainty are high. When financial markets have stabilized considerably, supplying additional credit is relatively ineffective. This was the experience in Japan. The Bank of Japan provided no additional liquidity at the outset of its recession. It did, however, reduce its policy rate to zero and massively increase the monetary base in early 2001. The effectiveness of these actions appears to have been weak and highly uncertain (Spiegel, 2006; Bowman et al. 2011). Moreover, financial markets (and other markets) were largely controlled by the Japanese government. Indeed, the extent of the

¹⁷ See John Cochrane's Blog, The Grumpy Economist, "Fed Independence 2025," for a discussion of other Fed actions that may have compromised its independence.

government's interference in the economy significantly reduced the likelihood that monetary policy actions would have a significant effect.

There is some evidence that the course of action I have outlined would have produced a more favorable outcome. After Lehman, the Fed took a course of action similar to what I had recommended. The size of the monetary base doubled between August and December of 2008. While Lehman's announcement was catastrophic for financial markets and economic activity, there was a significant improvement in financial markets by early 2009 and the recession ended in June 2009. Of course, these improvements could have been due to the Economic Stimulus Act of 2008, which was signed into law on February 13, 2008, or the Troubled Asset Relief Program (TARP), which was signed on October 3, 2008. Consequently, it is impossible to know the extent to which the FOMC's response to Lehman alone was responsible for the marked improvement in financial markets and the economy.

It appears that the Fed's actions prior to Lehman did little to improve financial markets or the economy. The unemployment rate rose to 6.1 percent by August 2008 and the industrial production index declined from 100.7 in December 2007 to 96.2 in August 2008. Moreover, the continued deterioration in financial and economic conditions led first to the failure of Bear Stearns and eventually Lehman. Much of the FOMC's actions since Lehman have been motivated by a macro-finance term structure nexus that appears to be flawed and has little empirical support. The FOMC's zero interest rate policy is motivated by the EH, which has been repeatedly rejected on an empirical basis. The theoretical basis for QE or Operation Twist is questionable and there is little evidence that these policies have reduced longer-term yields significantly. The evidence using lower frequency data is weak at best and the magnitude, statistical significance, and permanence of the high-frequency effects on longer-terms yields is

far from compelling. Nor is there compelling evidence that central bank forward guidance policies have had a significant or lasting effect on longer-term yields.

Evidence that these policies have increased economic growth and employment is essentially nonexistent; the public's perception of the FOMC's ineffectiveness is growing (Wall Street Journal, 2012). My own research (Thornton, 2010d; Thornton 2012c) suggests that the FOMC's low interest rate policies of the last decade have had little effect on longer-term Treasury yields or economic activity. With banks holding nearly \$1.5 trillion in excess reserves, businesses with massive holdings of cash, and long-term rates significantly below any reasonable estimate of the natural rate, it is difficult to see how additional central bank asset purchases could have a significant impact on economic activity or employment.

It is also important to note that the goal of these policies is to effect economic decisions by distorting asset prices. Such distortions can have effects that hinder growth and create potential problems in the future. For example, the FOMC's zero interest rate policy has dramatically reduced the incomes of retirees and others who are dependent on their prior saving for current income. Moreover, the inability to generate reasonable income on safe short-term assets provides an incentive for both individuals and pension funds to take on more risk in their portfolios. There is evidence that the FOMC's low interest rate policy may be inflating commodity prices (Thornton, 2011b) and contributed to the housing bubble.

Given these facts, I suggest it is time for the FOMC to turn the page in its monetary-policy playbook. My recommendation is that the FOMC announce that a continuation of the zero interest rate and unconventional policies will promote excessive risk taking and are likely to impede economic growth. Moreover, a persistent zero nominal interest rate policy is inconsistent with a positive long-run real rate of interest and the FOMC's 2 percent inflation objective. To

bring interest rates more in line with the natural rate of interest, the Fed should shrink its balance sheet close to its pre-financial-crisis level. This can be accomplished through outright sales, with the pace of the sales being determined, in part, by the market's ability to absorb the securities. When the balance sheet has shrunk sufficiently, the federal funds rate target will be increased to a level that is more consistent with the long-run natural rate of interest. The FOMC anticipates that the net effect of moving the stance of monetary policy back to "normal" will be beneficial: investor outlook will improve, interest income will increase, and the distortionary effects of a prolonged zero interest rate on asset prices and risk taking will be eliminated.

If done carefully, with proper communication, and strong leadership I believe the new policy can be implemented with no significant effects on economic activity or financial markets. My policy recommendation stems from a number of facts: the zero interest rate, QE, and Operation Twist policies are based on the EH (a theory of the term structure that has virtually without empirical support); evidence (Thornton, 2010d) that increased control over very short-term rates by the Federal Reserve, the Bank of England, and Reserve Bank of New Zealand resulted in a significant breakdown of the relationship between the long-term sovereign debt yields and the rate that central banks targeted; evidence from that same research that the classical theory of interest rates (which hypothesizes that long-term yields are driven by economic fundamentals and short-term rates linked to long-term yields by arbitrage) appears to be a better description of the behavior of interest rates along the term structure than the EH; the fact that existing evidence on central bank forward guidance policy shows no increased ability of such policies to affect longer-term yields in a manner consistent with the EH; the fact that a persistent zero nominal interest rate is inconsistent with a positive real rate of interest and a 2 percent inflation objective—such a policy will achieve one or the other but not both; my belief that it is

essentially impossible to have both significant positive economic growth and a long-term real rate of interest that is zero or negative; and the fact that there is no evidence of a statistically significant or economically meaningful liquidity effect.¹⁸

6. Conclusions

I have argued that the Fed didn't massively increase the monetary base in early 2008 when it should have but did following Lehman Brothers' bankruptcy announcement because it had no choice, and also took steps to maintain the monetary base at the post-Lehman level rather than allowing the monetary base decline passively as it should have as financial market stabilized and the recession ended. Faced with unacceptably high unemployment and anemic economic growth, the FOMC tried to stimulate aggregate demand by attempting to reduce longer-term rates using forward guidance, QE, and Operation Twist. The FOMC's behavior was motivated by policymakers nearly religious faith in the EH, the fact that the Fed only make loans and investments or controls the federal funds rate either through open mouth operations or by engaging in large-scale open market operations, and the increased emphasis on "financial market frictions" to account for what some see as the apparent historical effectiveness of monetary policy. The last of these helps explain the FOMC's failure to significantly increase the monetary base in early 2008. The first two account for the zero interest rate policy, QE, and Operation Twist. The Fed's response to the financial crisis would have been much better had policymakers taken the massive empirical rejections of the EH seriously, considered the fact that long-term Treasury yields were unresponsive to the 425 basis point increase in the federal funds rate target from June 2004 through June 2006, and believed, as I do, that real long-term rates are largely

¹⁸ Moreover, the evidence of a statistically significant liquidity effect was subsequently shown to be the consequence of the endogenous behavior of the Fed or idiosyncrasy of the federal funds market (Thornton 2001a,b).

driven by economic fundamentals, such as the rate of economic growth and are therefore and are effectively independent of countercyclical monetary policy. Moreover, policymakers should take the Fisher equation seriously. If they did, they would realize that a zero nominal interest rate policy is inconsistent with 2 percent inflation and positive economic growth, i.e., a positive real long-run interest rate. While a zero nominal policy rate might be defensible for a relatively short period of time, it is totally indefensible as a long-run policy.

Finally, I believe that the FOMC's extreme actions likely reflect Friedman's (1970) suggestion of a central bank's version of the natural human tendency to say, 'For God's sake, let's do something,' when faced by unpleasant developments. The action is its own reward, even if it has consequences that make the developments still more unpleasant."¹⁹ Unfortunately, extreme actions can have negative consequences for growth and longer-run economic and financial market stability. The long-run economic consequences of such a policy are difficult to predict. However, such policies can have long-run consequences for the Federal Reserve monetary policy; namely, the loss of credibility and influence as the increasingly extreme policy actions generate smaller and perhaps worse outcomes (Wall Street Journal, 2012; Bank for International Settlements, 2012).

¹⁹ Friedman (1970), p. 18.

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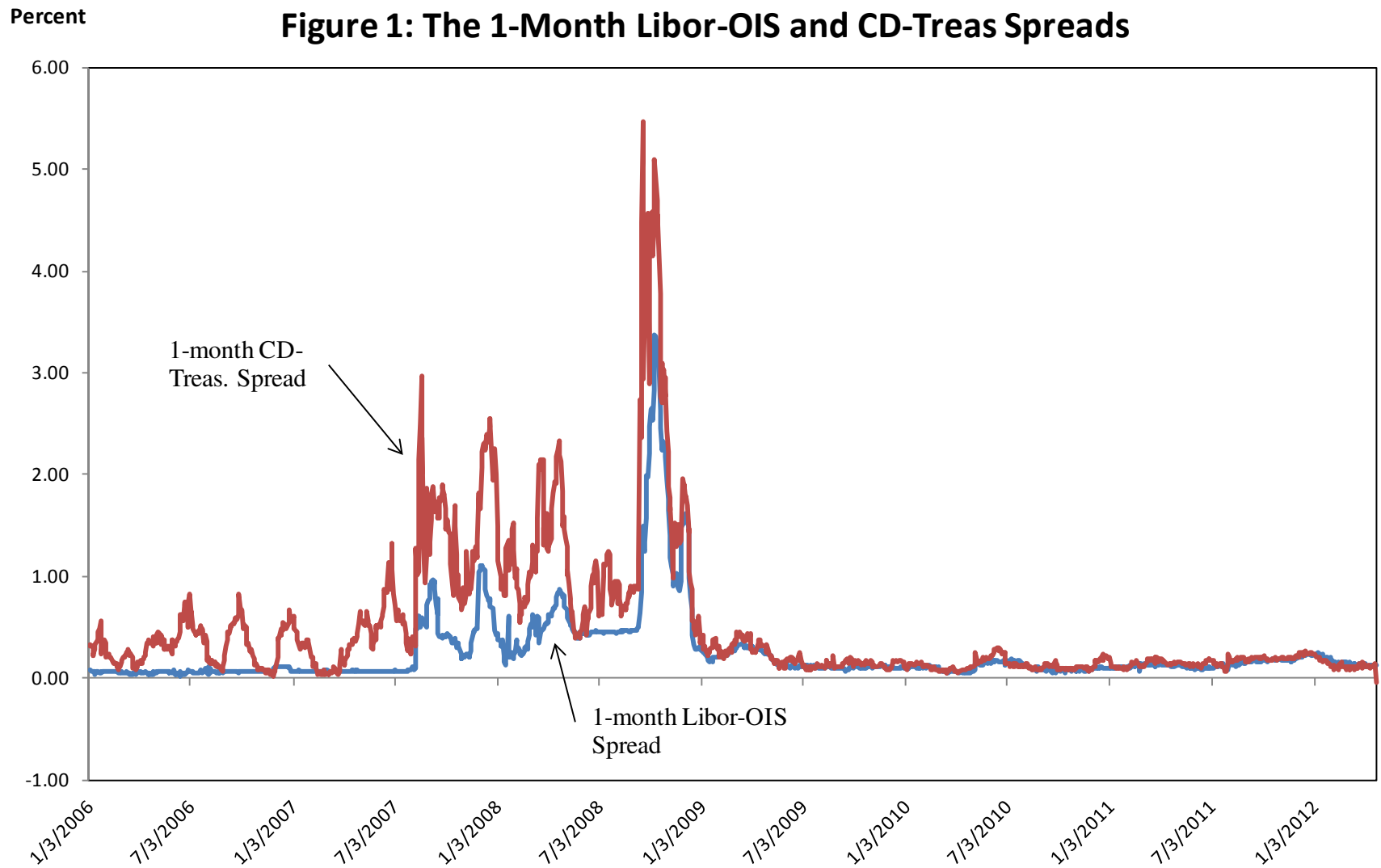
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Table 1: Average Annual Rates of Inflation, Output Growth, and Unemployment			
	Full Sample	Less Recessions	Less Financial Crisis
	January 1990 – June 2001		
Headline PCE Inflation	2.40	2.30	--
Growth Rate of Real GDP	3.20	3.70	--
Unemployment Rate	5.54	5.54	--
	July 2001 – March 2012		
Headline PCE Inflation	2.21	2.47	2.36
Growth Rate of Real GDP	1.65	2.66	2.50
Unemployment Rate	6.50	6.54	5.31

Table 2: Estimates of the equation $ps_t = \alpha + \beta gap_{t-1}^{ur} + \delta gap_{t-1}^{inf} + \varepsilon_t$						
	January 1990 – June 2001			July 2001 – December 2008		
α	1.222 (0.000)	0.953 (0.000)	0.807 (0.000)	-1.714 (0.000)	-1.477 (0.000)	-1.741 (0.000)
β	-0.590 (0.000)		-0.959 (0.000)	-2.502 (0.000)		-2.474 (0.000)
δ		0.564 (0.000)	1.024 (0.000)		0.540 (0.045)	0.069 (0.573)
\bar{R}^2	0.258	0.170	0.736	0.846	0.073	0.845

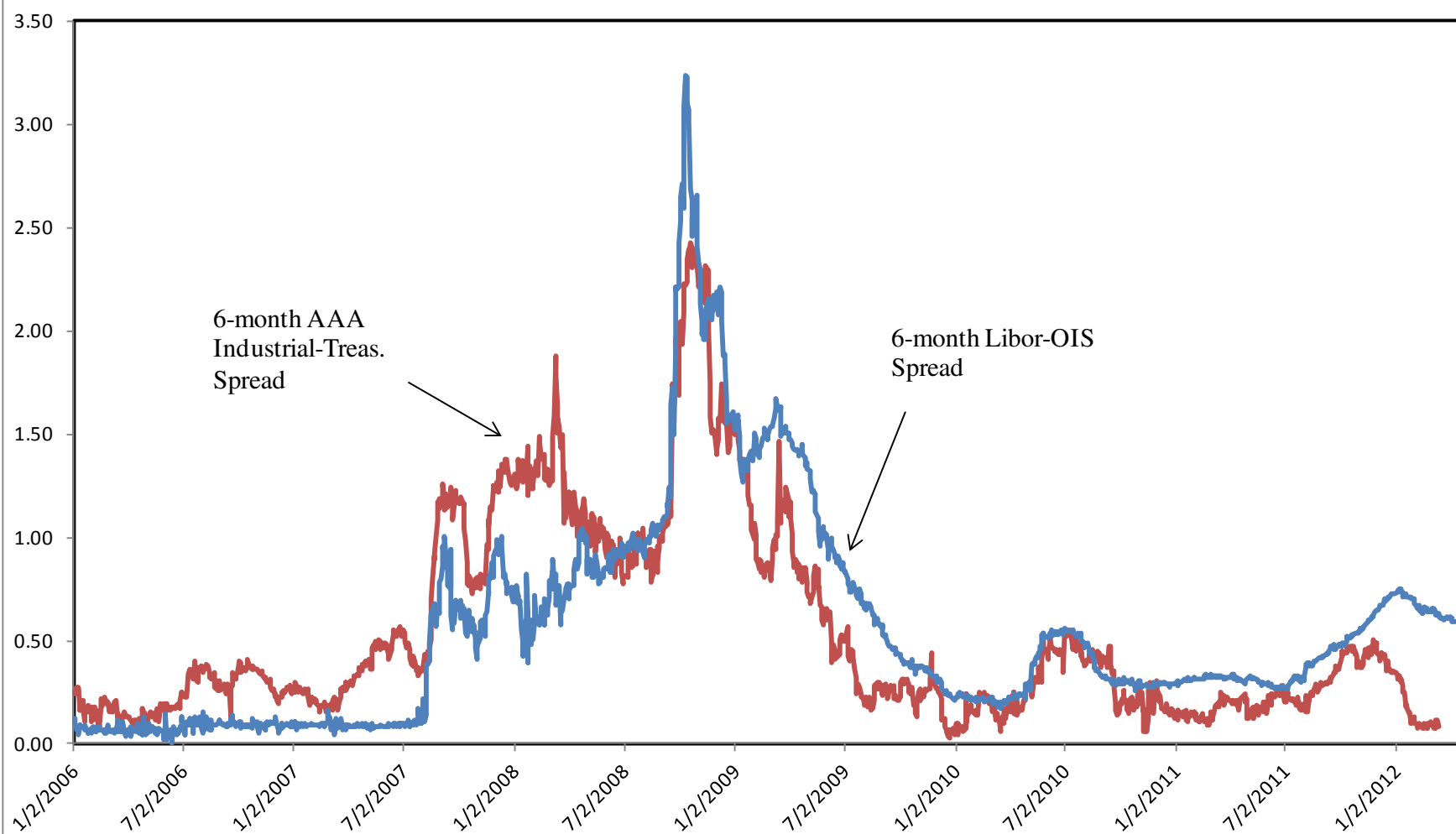
Figure 1: The 1-Month Libor-OIS and CD-Treas Spreads



Source: Federal Reserve Board/Haver Analytics, British Bankers Association/Haver Analytics

Percent

Figure 2: The 6-Month Libor-OIS and AAA Industrial-Treas Spreads

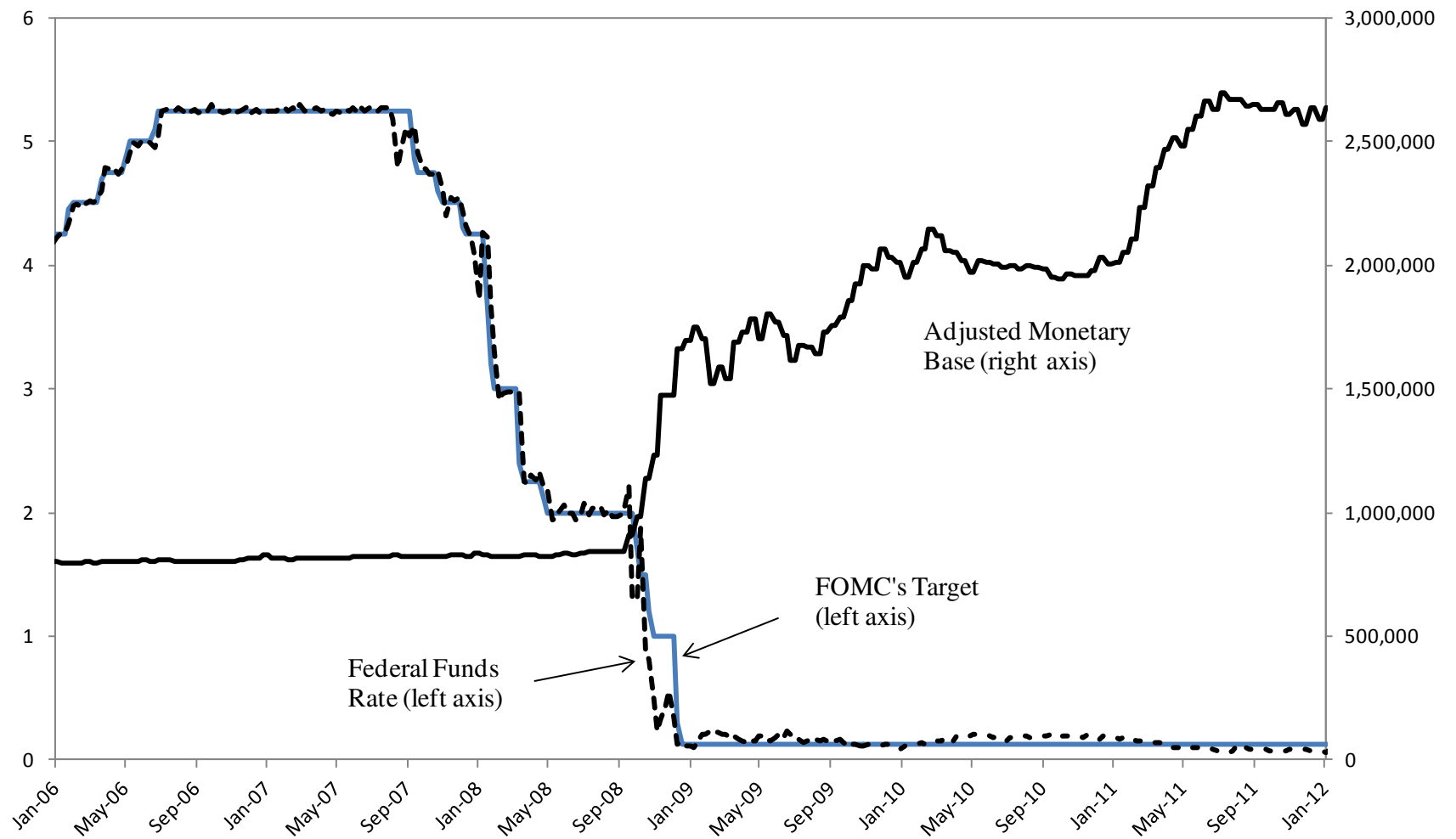


Source: Federal Reserve Board/Haver Analytics, British Bankers Association/Haver Analytics, Bloomberg

Percent

Figure 3: The Monetary Base and the Funds Rate and Funds Rate Target

Millions of
Dollars



Source: Federal Reserve Board/Haver Analytics

Figure 4: The Funds Rate, Funds Rate Target and 1-Month OIS Rate

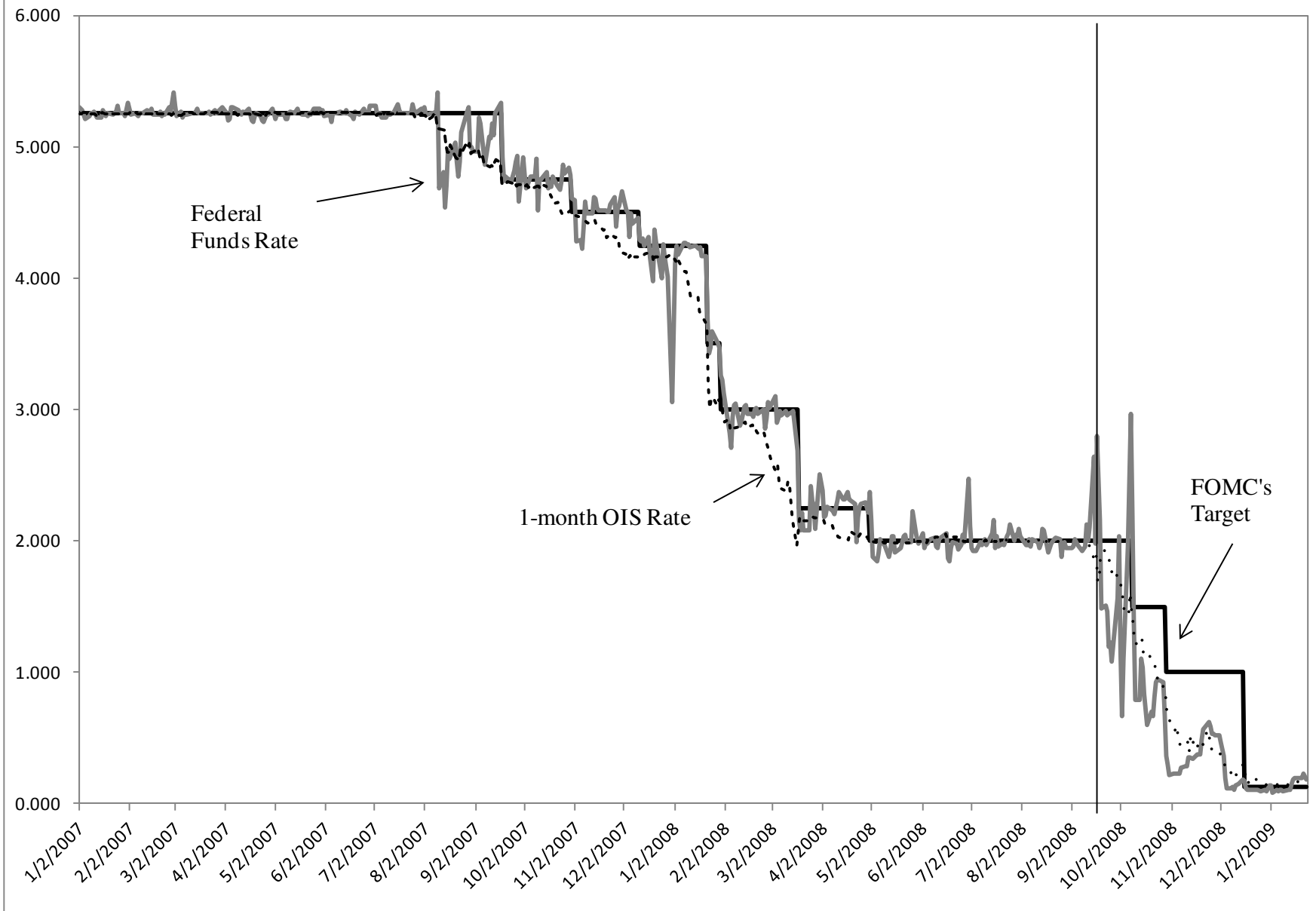
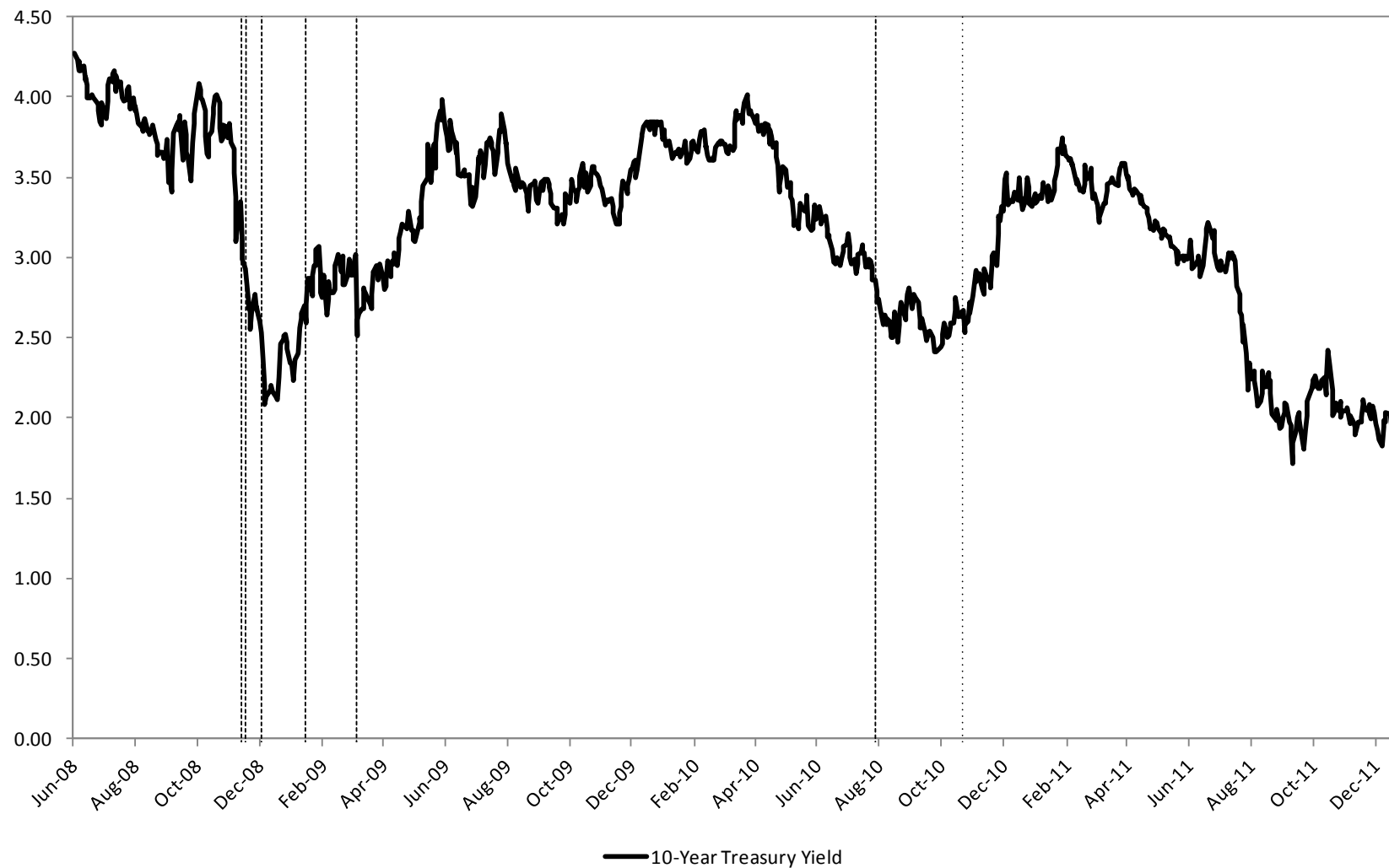


Figure 5: The Spread Between 10-Year AAA Industrial and Treasuries



Average Percent
Per Annum

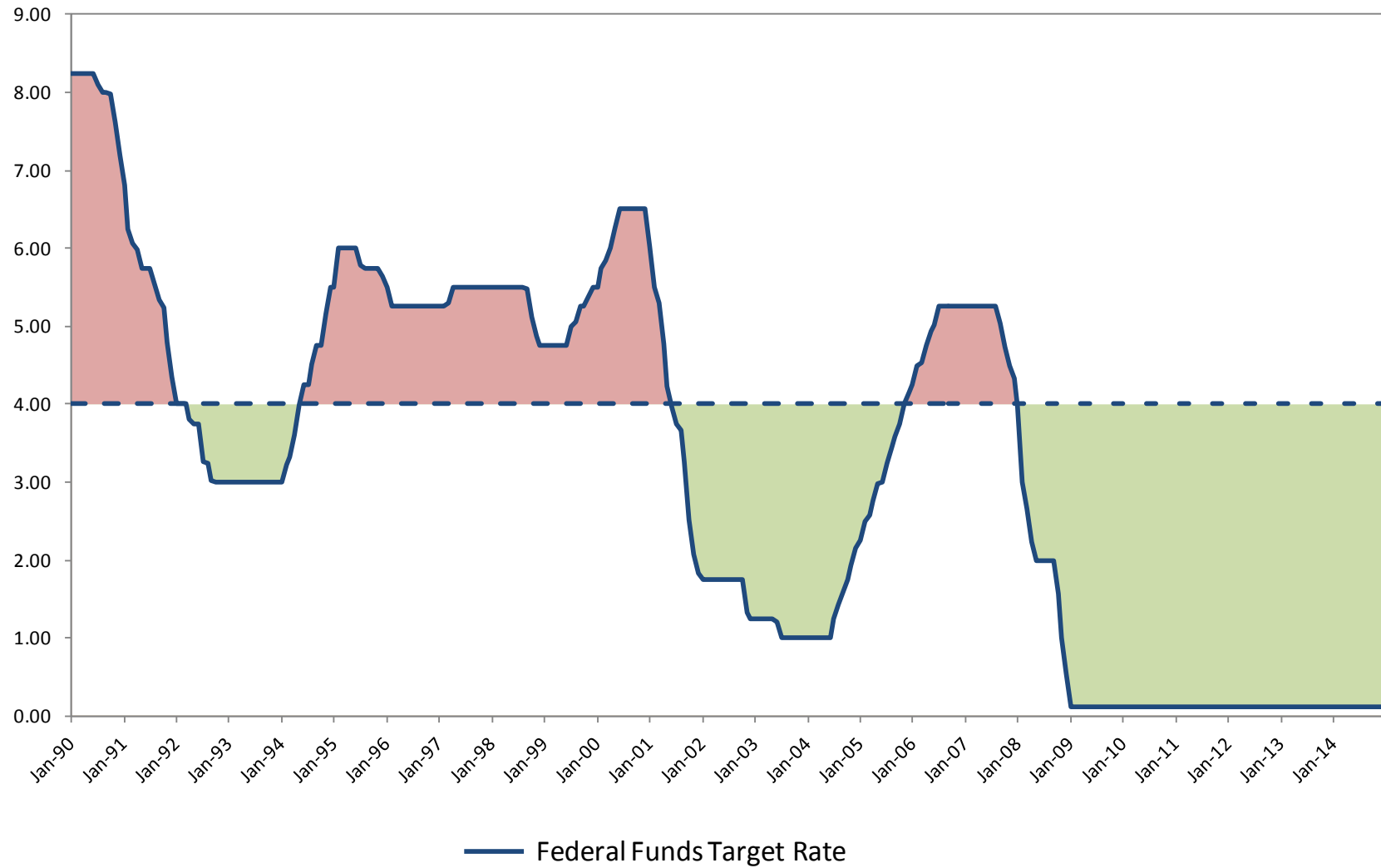
Figure 6: The 10-Year Treasury Yield



Source: Federal Reserve Board/Haver Analytics

Percent

Figure 7: The Federal Funds Rate Target



Source: Federal Reserve Board/Haver Analytics