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THE CARL AND WINIFRED LEE HONORS COLLEGE
CERTIFICATE OF ORAL DEFENSE OF HONORS THESIS

Aneesha Rai, having been admitted to the Carl and Winifred Lee Honors College in the fall of 2010, successfully completed the Lee Honors College Thesis on April 20, 2012.

The title of the thesis is:

The Impact of Quantitative Easing Measures on Interest Rates, Financial Markets, and Economic Activity: A case study of U.S.A.

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4-20-2012

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Lee Honors College Undergraduate Thesis

**The Impact of Quantitative Easing measures on
Interest Rates, Financial Markets and Economic Activity:
A case study of U.S.A.**

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**The Impact of Quantitative Easing measures on
Interest Rates, Financial Markets and Economic Activity:
A case study of U.S.A.**

- **Section I: Introduction**

Central banking has become a global growth industry. Combined assets of the four world central banks will reach \$9 trillion by the end of March 2012 compared with \$3.5 trillion five years ago. The European Central Bank's (ECB) \$3.93 trillion balance sheet is the largest relative to the economy, which is 32% of the euro-zone's gross domestic product. It is followed by Bank of Japan at 30%, the Bank of England at 21% and the Federal Reserve at 19% with total assets amounting to \$2.9 trillion.

In January 2007, the Fed held \$779 billion of U.S. Treasury securities, of which 52% matured in under a year and only 19% in more than five years. Currently, it holds \$2.5 trillion Treasury securities. Of which 57% mature in **more** than five years. This is reflected in Figure 1. Of the Bank of England's \$400.8 billion of gilts, 72% mature in over five years, with 26% maturing in over 20 years.



Figure 1

In the 1960s during the Kennedy administration, when the U.S. economy was facing a current account deficit, which was putting pressure on the exchange rate, the first round of quantitative easing began under which a program called “Operation Twist” was implemented. The measures consisted of Treasury issuing short-term debt while the Fed bought back longer-term debt. In a study by Alon of the San Francisco Fed (2011), Operation Twist, which caught markets by surprise, may have reduced bond yields by 0.15%—but only for a short period. The **objective** of this Operation Twist was to flatten the yield curve in order to promote capital inflows and strengthen the dollar.

Much later in December 2007, The Global Financial crisis hit due to the collapse of the U.S. sub-prime mortgage market and the reversal of the housing boom in other industrialized economies. This had a ripple effect around the world. After the crisis struck on November 25, 2008, the Federal Reserve announced that it would purchase up to \$600 billion in agency mortgage-backed securities (MBS) and other agency debt. On December 16, the Federal Open Markets Committee formally launched the program. This was done in order to inject liquidity into the financial market. On March 18, 2009, the FOMC announced that the program would be expanded by an additional \$850 billion in purchases of agency mortgage backed securities and agency debt and \$300 billion in purchases of Treasury securities commonly known as ‘Quantitative Easing 1’. A similar program was launched by the Fed in late 2010 till June 2011 called ‘Quantitative Easing 2.’

Finally, the Fed announced another form of Quantitative Easing called “Operation Twist” on September 22nd 2011 as an additional stimulus in order to flatten the yield curve. The word ‘twist’ is named after the Chubby Checker hit and its objective is to twist the shape of the yield curve. This policy was first used in the 1960s during the

Kennedy administration, but for a different intent this time. It involves selling \$400 billion in short-term Treasury bills in exchange for the same amount of longer-term bonds, thereby bringing down the yield on long-term bonds while keeping short-term rates relatively unchanged. When they buy these short-term bonds then they will ultimately end up with higher short-term rates but lower long-term rates, thereby “twisting” the shape of the yield curve. This program started in October 2011 and is expected to end in June 2012. The immediate effect of this twist is that the yield curve, which plots the difference between yields on two-year notes and those on 20-year bonds, is still flat by historical standards, it has steepened from a gap of 2.63 percentage points on Dec 31, 2011 to 2.92 percentage points. Some expect the 30-year bond will sell off more if economic data continue to improve.

All these incentives are intended to give the general public and businesses to borrow and spend more money, thereby boosting the economy. “This program should put downward pressure on longer-term interest rates and help make broader financial conditions more accommodative.” The Fed said in its official statement. (FOMC, September 2011) A larger capital expenditure is predicted, which means that people are encouraged to buy more homes and companies spend more on machinery and other equipment. The Fed already owns more than \$2 trillion in bonds due to Quantitative Easing methods over the past few years in an effort to bring down both medium and long-term interest rates.

This study analyzes the effect of Operation Twists, and the large scale asset purchases(LSAPs) by the Fed; and tries to measure its effectiveness with a focus on its effect on

- 1) Long-term Interest Rates
- 2) Real interest rates and unemployment
- 3) Economic activity (Real growth rate of the economy)

It is an attempt to answer whether these measures taken by the Fed have a lasting impact on the U.S. economy and draws some policy implications from these experiences of QE0 (1960), QE1 (2008), QE2(a) (2009-10) and QE2(b) (2011), and most recent, OT of 2012.

The study has been carried out in a chronological manner, first analyzing literature right from Quantitative Easing measures from the 1960s with the Kennedy administration, its motive and impact, analyzing Quantitative Easing I from 2008-09 post the Global Financial Crisis, Quantitative Easing 2(a) in 2010 with another purchase of \$400 billion in long-term bonds by the government and finally Quantitative Easing 2(b) where the Fed has attempted to twist the yield curve by selling short-term treasuries and buying long-term maturities. Then the data is analyzed and the measurement of the effectiveness of these quantitative easing measures is taken into account.

Section II: Literature Review

In this study we assign the term QE0 to Operation Twist in the 1960s, QE1 to the stimulus of \$1 trillion into the economy by the Fed and U.S. Treasury during the Global Financial Crisis from 2008-09, QE2 representing the purchase of \$600-800 billion worth of long-term bonds in 2010 and finally QE3 which is termed “Operation Twist” in which the Fed wants to twist the yield curve selling short-term maturities and buying long-term maturities to bring down interest rates.

Operation Twist (1960) (QE0)

The purpose behind the Operation Twist in 2011 was quite different from the Operation Twist from the early 1960s. Quantitative Easing first started out on a large scale during the Kennedy administration in 1960. The U.S. economy had been going through a recession starting April 1960. This was around the time President Kennedy got elected. The incoming administration attempted to stimulate the economy with easier monetary as well as fiscal policies, but European interest rates at the time were higher than the United States, leading to an increasing flow of dollars and gold to Europe under the Bretton Woods fixed rate exchange system. As Swanson, 2011 stated: “The objective of the initiative was to **bring down long-term rates of securities to increase capital inflows with no change to short-term interest rates.**” Major outcomes of the Bretton Woods system included the formation of the International Monetary Fund and the International Bank for Reconstruction and Development and, most importantly, the proposed introduction of an adjustable pegged foreign exchange rate system. Currencies were pegged to gold and the IMF was given the authority to intervene when an imbalance of payments arose.

The problem spotted here was that the Federal Reserve was wary of lowering short-term interest rates for fear of worsening these balance of payments and the outflows of gold to Europe, which could potentially have pulled down the economy even more. They therefore came out with the concept of “Operation Twist” by lowering long-term interest rates while keeping short-term rates unchanged thereby offering a solution with the dilemma of the Bretton Woods system. “The idea behind this was that business and housing demand were primarily determined by interest rates while the balance of payments and gold flows were determined by cross-country arbitrageurs who act on the basis of short-term interest rate differentials,”(Swanson, 2011). Therefore if the long-term treasuries could be lowered without affecting short term yields, it could be reasoned that the investment could be stimulated without worsening the balance of payments and gold outflow. Originally the study was called “Operation Nudge”, but then was switched to “Operation Twist” after the Chubby Checker hit and dance craze at the time.

To summarize, in 1961 the US Federal Reserve attempted to flatten the yield curve to bring down long-term rates for an economy that was stalled in recession, yet at the same time, push short-term rates up to deal with a balance of payments crisis. “The fixed exchange rate system meant they were losing gold reserves and desired to stop that drain.” (Mitchell, 2010) Operation Twist was abandoned in 1965. Operation Twist thus aimed to “artificially flatten or twist the typically upward-sloping yield curve.” The empirical outcome according to Adam M. Zaretsky is “ Regardless of this portfolio restructuring, the policy’s success should be measured by its effect on the rate structure of the yield curve... the gradual flattening in the yield curve between 1961 and 1966 might, at first glance, suggest the policy was successful.”

It is held that higher short-term interest rates stem the outflow of gold by inducing a flow of short-term balances to the United States and that lower long-term interest rates stimulate investment, moving the economy closer to full employment. (Ross, 1966) In this case proponents of operation twist argue that aggregate investment will increase, with short-term investment (inventory) being restricted by a smaller amount by higher short-term interest rates than long-term investment (fixed assets) is stimulated by lower long-term rates.

According to Ross (1966), Operation Twist appears likely on balance to have depressed economic activity, because its proponents have underestimated the magnitude and elasticity of inventory demand relative to demand for investment in fixed assets. In addition the twist is likely to be asymmetrical, with short-term interest rates rising more than long-term interest rates fall, reinforcing this conclusion. The policy-maker must make a judgment on whether the “success” of the policy is worth the “failure” of the policy; that is, is an additional outflow of \$154 million worth a decrease of possibly \$6 billion in GNP? The answer depends on whether we have a viable alternative policy. Is it beyond the ingenuity of American policy-makers to find an alternative policy that increases foreign spending in the United States (or reduces American spending abroad) by a miniscule \$154 million without diminishing domestic spending, GNP, and employment.

In order to determine whether the measures taken by the Federal Reserve were successful at this time, we look at the following graph. This graph compares the yield spreads of the US Federal Funds (effective) rate (the overnight rate set by monetary policy) against the market yield on U.S. Treasury securities at 1-year, 3-years, 10-years and 20-years at constant maturity, quoted on investment basis (so the non-indexed

government bond yields). So the spreads are the percentage point difference between the various rates, which of-course define the treasury debt yield curve. We can see that even notwithstanding the relative size of Operation Twist, the spreads flattened dramatically in the period of its operation.

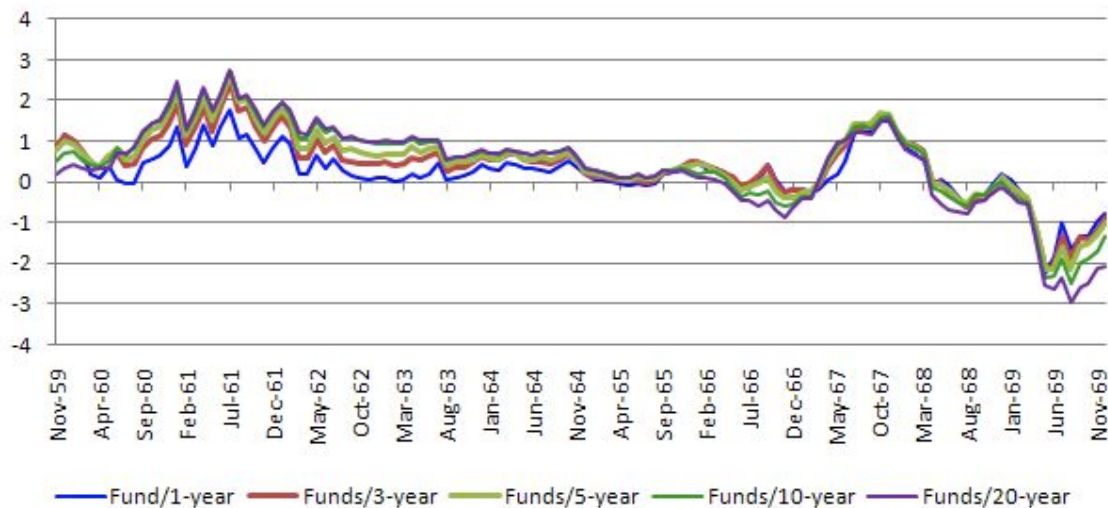


Figure 2- Comparison of yield spreads of US Federal Funds rate (Source: *Mitchell, 2010*)

Therefore, we may conclude that Operation Twist was successful. However, there are some caveats to this. According to a speech made by Paul Volcker in 2002, “Well, to the extent that Operation Twist worked at all- and I must confess I was a little skeptical about it, given the fluidity of the markets even then- it too depended on some degree of markets even then- it too depended on some degree of market imperfection. And I think it became apparent fairly quickly that the market imperfection was not as great as had been assumed.” This indicated that the financial markets may have been imperfect at the time. According to Modigliani and Sutch (1966), the long-short spread was narrowed by amounts that “are most unlikely to exceed some ten to twenty base points- a reduction that can be considered moderate at best.” However, a point to be noted is that Operation

Twist is a smaller operation and over a slightly longer period, the maturity of outstanding government debt rose significantly rather than falling.

Swanson (2011) compares Operation Twist(1960) to recent Quantitative Easing in his study:

- 1) The two operations were **similar** in size.
- 2) Both operations were conducted at times when financial markets were not exceptionally dysfunctional; at the time of QE1, in contrast, markets were illiquid and counterparty was widespread. This is an important observation because in periods of financial stress, policies based on the manipulation of quantities are likely to have larger effects.

In terms of their **differences**:

- 1) Operation Twist started in February 1961, a month in which the economy reached a trough, whereas QE2 was announced 1 year after the beginning of the recovery from the 2007-09 recession and in a period of greater uncertainty about the outlook.
- 2) The funding of the programs was different. Operation Twist was essentially a swap of short-term for long-term bonds implemented by the Federal Reserve and the Treasury in cooperation, whereas only the Federal Reserve funded QE2. These differences have resulted in different inflation expectations and therefor had different effects on long-term rates.
- 3) In terms of communication, QE2 was more of an open-ended policy; interpreted and communicated by some Federal Reserve governors as a commitment to a future low policy rate.

4) After the implementation of Operation Twist, there was an immediate increase in the policy rate. It then decreased sharply while the 10-year yield was flat and inflation increased whereas in QE2, both the 10-year yield and inflation increased while the policy rate remained flat at zero.

An event-study approach using daily data is an ideal strategy to resolve this problem and to attempt to isolate the pure effect of the announcement of Operation Twist. Its announcement lowered yields by about 15 basis points. Mangla (2012) has summarized the effect as follows:

- 1) Yield on long-term 5-30 year maturities fell between 6-14 basis points, which is highly statistically significant.
- 2) Yield on 3-month treasury bills increased by 11-16 basis points.
- 3) U.S. Treasury reversal on March 15 increased long-term rates by 8 basis points.
- 4) The cumulative effect of these 6 announcements for all maturities was between 13-16 basis points at both ends of the yield curve.
- 5) Operation Twist (1965) ended in 1965.

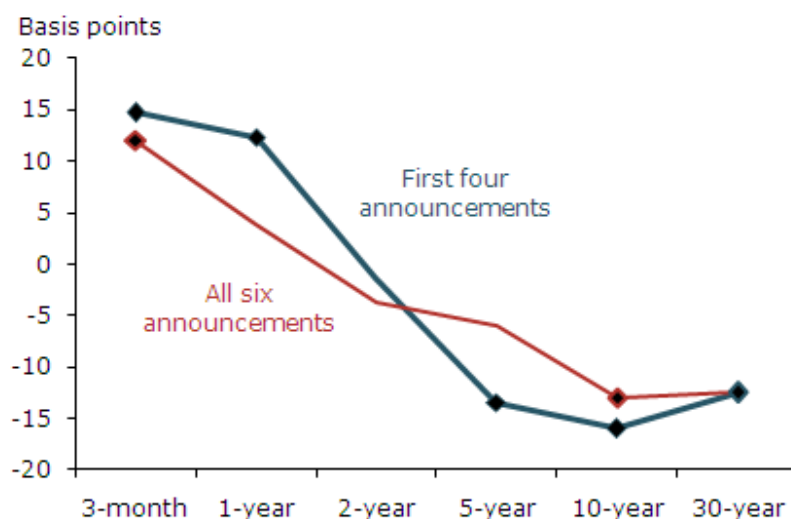


Figure 2: Effect of Operation Twist on securities (*Source: Balik, Mangla, 2012*)

Quantitative Easing 1(QE1)

At the onset of the global financial crisis of 2008, most agreed that the Fed should inject liquidity into the market, i.e., engage in “quantitative easing.” However, the Fed did so in a highly unusual way and went well beyond straightforward monetary expansion.

Under normal monetary expansion, the Fed purchases Treasury securities from banks, which provide them more loanable reserves. But during the crisis, the Fed also initiated many short-term liquidity and credit programs where borrowers were allowed to put up a variety of debt obligations as collateral, including mortgage-backed securities. In effect, the Fed put reserves into banks by purchasing a grab bag of securities, many of which likely were bad assets. Additionally, the Fed began making loans not only to banks but government-sponsored agencies, nonbank financial institutions, foreign banks and nonbank entities (Carey, 2011).

According to the Fed, its short-term liquidity and credit programs fell into three broad categories: –

- 1) Addressing severe liquidity strains in the key financial markets
- 2) Aim at providing credit to troubled systemically important institutions, and
- 3) Aim at fostering economic recovery.”

The second category – providing credit to troubled institutions – is highly unusual. In fact, this is bailing out insolvent institutions.

All of these strategies were designed to ease financial conditions and to support a sustained economic recovery. The large-scale asset purchases (LSAPs) began in November 2008 and continued till March 2009. In November 2008, the Federal Reserve announced purchases of housing agency debt and agency mortgage-backed securities and

to purchase longer term securities at \$1.75 trillion, twice the amount of assets purchased in 2008. (GRRS, 2011)

Though the Fed did succeed in increasing liquidity in the market, much of its “quantitative easing” was offset by other actions. In 2006, legislation allowing the Fed to pay interest on reserves and to reduce the reserve requirement to zero was passed. The Emergency Economic Stabilization Act of 2008 moved up the implementation date to Oct. 1, 2008. The initiation of payment on reserves (with no change in reserve requirements) naturally induces banks to hold more reserves, reducing the money supply. The Fed’s purchases of an assortment of securities expanded the volume of banks’ excess reserves to unprecedented levels.

Another offset to the expansionary nature of QE1 was the U.S. Treasury’s Supplementary Financing Program. Under this program, the Treasury sells securities to the public and supplies the proceeds to the Fed to either lend or hold. Because the action by the Treasury removes banks’ reserves, this allows the Fed to buy troubled assets without creating new reserves. Therefore, this activity of the Fed is not an effort to increase the money supply.

The Fed has been quite successful in removing many mortgage-backed securities off of banks’ books. Until 2008, nearly all its assets were Treasury securities. However, by late 2009, its holding of mortgage-backed securities outstripped that of Treasuries. The Fed’s targeted lending activities included not only nonbank financial institutions such as AIG, Fannie Mae, Freddie Mac, Bear Stearns, but also such “systematically important institutions” as McDonald’s, Harley-Davidson and Toyota.

Despite the actions taken in QE1, the economy remained sluggish with high unemployment, and banks continued a reluctance to engage in more lending. Demand for lending declined as well. Thus, the Fed decided to engage in a second round of quantitative easing.

Quantitative Easing Two (QE2)

The Fed's goal with QE2 was to spur the stagnant economy and was expected to be closer to traditional monetary policy, with a slight variation. Instead of focusing on open-market purchases of very short-term Treasury securities, the Fed purchased \$600 billion of longer-term securities. Because short-term interest rates are so low, the Fed could do little to lower them more, so it is moving to reduce long rates. This may be viewed as the Fed using the last possible weapon in its arsenal. To this point, there has not been much success. (Carey, 2011) To substantiate this, we found "For QE2, which involved only Treasury purchases, we find a substantial impact on Treasury rates, but almost no impact on MBS rates." (Krishnamurthy, Vissing-Jorgenson, 2011)

Critics of QE2, including some Fed members, believe that too much monetary stimulus might lead to runaway inflation that could derail the economy, or future asset bubbles that could endanger economic stability over the long term. "The QE2 program has been controversial, with detractors conjecturing that the risks of the policy are large while the benefits are small." (Swanson, 2011)

The most outspoken voting member of the Fed, Kansas City Fed President Thomas Hoenig, was once again the lone dissent among policymakers, saying he believed the risks of additional securities purchases outweighed the benefits. (Censky, 2010)

QE2 lowered 10-year treasury yields by roughly 25 basis points. The Fed is also trying to help homeowners specifically, targeting mortgage rates by reinvesting proceeds from maturing investments in mortgage-backed securities. Previously, the Fed had been reducing its holdings of mortgage securities to reinvest that money in Treasuries instead. But many economists today view the policy as a failure, arguing that it may have been too small to have a significant impact. All in all, it seems likely that QE2 nudged up both economic activity and inflation at a time when both were so low. But it is hard to see how the effect of QE2 on the configuration of interest rates was large enough to provide substantial support to aggregate demand, unless one appeals to some particularly large nonlinearity.

A simulation run by Hess Chung and others (2011) using the Federal Reserve's FRB/US model suggests that QE2 will expand employment in 2012 by about 700,000. This simulation assumes that QE2 lowered treasury term premiums by 25 basis points but had no direct effect on spreads of corporate and mortgage rates over their treasury counterparts. Meanwhile, in FRB/US, the stronger economic outlook induced by lower term premiums endogenously causes corporate and mortgage rates to fall by more than the drop in treasury yields. In contrast, according to the event-study evidence reported by KVVJ(2011) and Swanson (2011) Federal Reserve purchases of treasuries led private sectors to fall by less than treasury yields. Since it is the private sector that boosts aggregate demand, this would suggest Chung's estimates represent an upper bound on what QE2 could have done. Even though there would be a boost of 700,000 in employment, it represents a very small part of the slack in labor markets and leaves the economy far from being in danger of overheating. Overall, QE2 helped the Federal

Reserve move closer to its employment and inflation objectives but was too timid (or politically constrained) given the extent of the shortfall in aggregate demand.

Comparison of QE0 and QE2

According to the Federal Reserve Bank of New York, the Fed ultimately purchased \$8.8 billion of long-term bonds under Operation Twist. Based on the study by Eric Swanson (2011), the size of Operation Twist is quite comparable to the size of Quantitative Easing 2.

Table 1: Size of Operation Twist in Comparison to QE2

	<u>Operation Twist</u>	<u>QE2</u>
Size of Federal Reserve Program (\$B nominal)	8.8	600
U.S. GDP (\$B nominal)	528	14730
U.S. Treasury marketable debt (\$B nominal)	189.3	8543
U.S. Agency Debt (\$B nominal)	7.4	6449
Size of Federal Reserve program:		
As % of GDP	1.7	4.1
As % of U.S. Treasury Debt	4.7	7.0
As % of U.S. Treasury-guaranteed Debt	4.5	3.7
Additional supporting program by U.S. Treasury	Yes	No

Source: Swanson 2011

Operation Twist 2011 (OT)

The Federal Reserve launched Operation Twist in September 21st 2011. The policy involves selling \$400 billion in short-term Treasuries in exchange for the same

amount of longer-term bonds, starting in October and ending in June 2012. While the move does not mean the Fed will pump additional money into the economy, it is designed to lower yields on long-term bonds, while keeping short-term rates little changed. The intent is to thereby push down interest rates on everything from mortgages to business loans, giving consumers and companies an additional incentive to borrow and spend money. "This program should put downward pressure on longer-term interest rates and help make broader financial conditions more accommodative" the Fed said in its official statement. (Censky, 2011)

But within the Fed, three regional bank presidents Richard Fisher of Dallas, Narayana Kocherlakota of Minneapolis and Charles Plosser of Philadelphia, dissented against the decision. Those same three dissented in the August FOMC meeting in 2011.

In reference to Zhu's and Meaning's study (2011), on average yields may drop 22 basis points for securities with a remaining maturity over eight years, consistent with the estimated stock effects of previous programs. While the launch of Operation Twist was widely expected, experts still question its effectiveness. Interest rates have already been at record lows since 2008, and that has yet to entice consumers to take out loans. One of the concerns with this program is the Fed could lose money on longer-term Treasuries because inflation could outpace the interest rate over time, cutting into the returns on the bonds. This has seemed to occur in the Treasury markets as of February 12th 2012. In an article in the Wall Street Journal, Zeng states:

“ Operation Twist has got the Treasury market in a knot. As times are looking up, investors would normally sell 30-year bonds whose yields move inversely to their price would then rise to reflect firming expectations for growth and inflation. But the promise of continued buying from the Fed has encouraged investors to hoard their bonds which has resulted in the availability to trade shrinking more rapidly than just the presence of the Fed as a buyer would dictate. Ever since the strong pick up in employment coupled with some rising stock prices has economists worried about the sharp spike in yields. Bond yields could remain subdued on their own if economic data in the U.S. start to point

out weakness or if Eurozone turmoil again sends investors clamoring for haven assets.” (Zeng, 2012)

Pessimists think that the U.S. economy faces an extended period of high unemployment and low inflation. If they turn out to be correct, then the Federal Reserve will call for further quantitative easing adjusted in ways that will make them more potent, such as buying longer-duration treasuries or directly targeting 5-year treasury yields. Others anticipate that the rebound will be so strong that the Federal Reserve will need to contemplate asset sales before long.

As of March 2012, the FOMC reiterated that they expect rates to stay low until late 2014. The central bank also made no changes or hints about future changes to its bond-purchase programs. The move pushed Treasury bond yields out of their range and back to levels not seen since October 2011 when the Fed began Operation Twist 2. This has increased the extra yields investors around the world get over their government bonds, boosting the appeal of switching into dollars to buy U.S. assets, thus boosting the dollar. Up until the U.S. credit crisis, those interest-rate differentials were the main driver of currency markets. Since then, “the dollar has mostly reacted to trader’s appetite for risk: falling when riskier assets look more appealing and gaining when safe havens were in demand. (WSJ, March 2012) At the same time, rising U.S. yields also makes the dollar less attractive for a currency to borrow to buy higher yielding assets, known as carry trades.

Impact of Quantitative Easing

International Experience:

Large scale bond purchases made by the U.S. Fed and Bank of England made big impacts on the market according to a study by Jack Meaning of the University of Kent and Feng Zhu of the BIS. (2011) They found that the announcements of the purchase had a strong and immediate impact on government bond yields with five and ten year yields falling the most. The authors also estimate the Fed's current Operation Twist 2011 program of selling \$400 billion of longer-dated maturities it holds and replacing the securities with shorter maturities may have an impact of 22 basis points for maturities over 8 years but raise 3 month to three year maturities by around 60 basis points. They point out that the Fed isn't expecting a big impact on short-term yields from the Twist program, which the authors conclude is a product of the central bank's pledge to keep rates at exceptionally low levels through the middle of 2013.

According to a study by Meaning and Zhu (2011), "Both the Federal Reserve's Large Scale Asset Purchase program and the Bank of England's Asset Purchase announced, but the effects became smaller for later extensions of the programs." US and UK asset purchases appeared to have had an immediate impact and non-negligible impact on sovereign bond yields across the maturity range. Following most of the relevant announcements related to the US and UK asset purchase programs, bond yields declined across maturities, with the largest impact on the five and 10 year yields. The effects were greatest after the initial announcement of each program. The second finding in this program is that US QE1 had a far greater impact on sovereign bonds of different maturities and on corporate bond yields than the later programs. The third impact of the

programs extended well beyond the assets purchased. The announcements led to sizeable reductions in corporate bond yields: US BBB bond yields fell by 63 basis points in one day and almost 100 in two days after the QE1 announcements.

The fourth effect was that the programs brought about a stabilizing effect on financial markets. Implied volatility of stock prices, taken as a proxy for overall uncertainty in financial markets fell after the announcements of QE1. The Fed's \$300 billion Treasury purchases during QE1 lowered yields on average by about 30 basis points across the yield curve with as much as 50 basis points for bonds with 10-15 years of remaining maturity. This is equivalent to a reduction of about 200 basis points in the federal funds rate.

Olivier Blanchard (Swanson, 2011) suggested that looking capital flows might provide useful information about the way QE2 had worked. He found it striking that almost as soon as QE2 was implemented, net capital flows to emerging economies actually decreased, and turned negative in some. Since the Federal Reserve said that it would do whatever it takes to prevent deflation, investors became more optimistic through which QE2 might have affected the US economy.

To date, the Federal Reserve has purchased more than \$2 trillion of securities since the crisis began, part of an effort to spur investment, spending and economic growth to reduce unemployment. Some Fed officials are open to more bond buying if the economy doesn't continue to improve, or if inflation falls much below their objective below 2%. (Hilsenrath, 2012) John Williams, president of the San Francisco Fed said he would support such purchases in the case of low inflation. Other officials suggested flexibility in the policy. Some Fed officials began to differ and oppose more

bond buying, saying it has done very little to support the economic recovery and might be breeding inflation. Right now, with unemployment at 8.5% in December, the Fed is missing the mark on joblessness. Inflation overshot its 2% goal for most of 2011 but shows signs of retreating. Some officials believe that if inflation falls below 2% and shows signs of staying there, more bond purchases would be justified. But if inflation lingers at or above 2%, or unemployment falls faster than expected, then the case for more bond buying will become harder to make.

Kacher and Morales (WSJ, 2012) state that Quantitative Easing has “rendered many tried-and-true market indicators impotent since price/volume action in leading indices and has become somewhat less reliable.” They claim that QE is an effective manner to manipulate the stock market higher, creating the ‘illusion’ of a well-to-do economy. Therefore, investors are then more likely to buy stocks in a stealth bull market environment, creating a further illusion of wealth. Meanwhile, the slow destruction of the dollar and other currencies ensues as central banks around the world print money.

Effect on interest rates

Studies by KVJ (2011) found a large and significant drop in nominal interest rates on long-term assets such as treasuries, agency bonds and highly rated corporate bonds. There are only small effects on nominal interest rates on less safe assets such as Baa corporate rates. The impact of QE on mortgage backed securities (MBS) is large when QE involves MBS purchases, but not when it involves Treasury purchases; therefore indicating the second main channel for QE to affect the equilibrium price of mortgage-specific risk. Evidence from inflation swap rates and Treasury Inflation Protected

Securities (TIPS) show that expected inflation increased due to QE1 and QE2, implying that reductions in real rates were greater than reduction in nominal rates. The analysis implies that:

- a) It is inappropriate to focus only on Treasury rates as a policy rate because QE works through several channels that affect certain assets differently.
- b) Effects on particular assets depend on which assets are purchased.

The limitations to further quantitative easing programs are:

- 1) Government bond yields are already very low.
- 2) Surprise element is lacking ie. the strategy of the government using quantitative easing measures no longer is a surprise to people which impacts the financial markets less which is analyzed in more detail at the end of the study.
- 3) The programs risk inflation expectations

Section III: Data and Research Methodology

Methodology/Data

The data is analyzed through event studies.

The event study method compares the expected percentage change in the value of a financial asset relative to the expected percentage change in its value when an event is announced. (Balik, Mangla, 2011) If financial markets are considered to be efficient and the event announcement is unexpected, then the impact on the value of financial markets should be quick and persists. It rests on two assumptions:

- 1) Only unanticipated policy changes matter
- 2) The news of the policy change is immediately incorporated in prices and its effect is permanent.

For example, if a QE announcement is unexpected and is believed to have an impact to lower interest rates the percentage change in interest rates should be quick and should persist.

Operation Twist (1961)

Announcement Date	Time	Description	Exp. Effect on long-term treas.yields	Event window
Feb 2, 1961 (Thurs)	“early Thursday”	Kennedy announces goals and methods of Operation Twist; announces Federal reserve and Treasury will both participate.	Decrease	1 day (Feb.1-2)
Feb 2, 1961 (Thurs)	“after the end of regular trading hours”	Treasury announces it will auction \$6.9 billion of new debt at only the 18 month maturity, instead of longer maturities.	Decrease	1 day (Feb.2-3)
Feb 9, 1961 (Thurs)	Time not reported	Federal Reserve statistics released show Fed made rare purchase of longer-term Treasury securities.	Decrease	2 days (Feb.8-10)
Feb 20, 1961 (Mon)	2.45pm, “too late for the investment community...to become heavily involved with the market	Federal Reserve releases rare public statement explicitly endorsing Operation Twist; announces a new policy of buying Treasury securities with maturity longer than 5 years.	Decrease	2 days (Feb 27-21)
Mar 15 1961 (Wed)	After the market close	Treasury announces “surprise” refunding using 5- and 6-year notes, longer maturities than expected; markets interpret this as a decrease in Treasury and Fed commitment to Operation Twist.	Increase	1 day (Mar. 15-16)
April 6, 1961 (Thurs)	“After the market had closed”	Federal Reserve statistics are released, shows sharp increase in Fed buying of longer-dated Treasuries on open market, including maturities longer than 10 years. For the first time.	Decrease	1 day (Apr 6-7)

Table1: Significant announcements regarding Operation Twist(Swanson, 2011)

Figure 3, the cumulative percentage change remains at less than minus 20 percent, it does not move back toward the zero percentage change value.

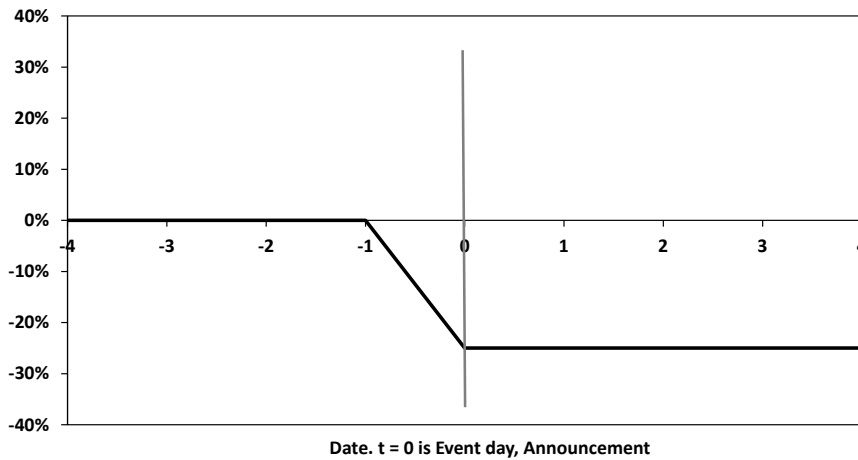


Figure 3 is a graphical illustration. The announcement date is $t = 0$. Prior to the announcement there is no difference between the actual and expected percentage change in interest rates. On the announcement date, the percentage drop in interest rates is greater than expected. After the announcement date the cumulative percentage change persists. (Source: Balik, Mangla, 2012)

Quantitative Easing I

For Quantitative Easing I, Balik and Mangla(2012) use 103 trading days starting on 31 October 2008 and ending on 31 March 2009. These 103 data days are used to calculate 102 daily percentage changes of the interest rate on 10 year U.S. Government Bonds and the MOVE index. The MOVE index is the bond market's equivalent of the VIX, which is the implied volatility index based on options on the S&P500 index

The 102 percentage changes are divided into 63 non-event days or the estimation period and 39 days for the test period. For each day during the test period the daily abnormal percentage change is calculated which is the actual percentage change minus the expected percentage change. The proxy for the expected percentage change is the average for all 63-announcement days of the estimation period. For instance, for 25 November 2008, which is the first of the five announcement days, the daily abnormal

percentage rate is the actual percentage change of the interest rate on 10-year U.S. government bonds minus the average percentage change of the interest rate over the 63 estimation days.

For each announcement day the test period is from four trading days before the announcement to four days after or a total of nine test days. One exception is the first and second announcement dates. There are only two trading days between the first announcement on 25 November 2008 and 1 December 2008. Thus, these two announcements are combined and have 12 trading days during the test period.

Announcement Date	Announcement	Change in 10 year US Government Bond HRRS	Interest Rate Volatility 2 day change, KVJ
25 Nov 08	Initial large scale asset purchase announcement	-22	+01
1 Dec 08	Chairman speech	-19	-07
16 Dec 08	FOMC statement	-26	-20
28 Jan 09	FOMC statement	+14	+/-0
18 March 09	FOMC statement	-47	-11

Table 2: Announcement Dates and changes in US Government Bond HRRS and Interest Volatility Rates (*Sources: Gagnon et al. (2011, page 49), HRRS and KVJ*)

The research uses data for 103 trading days starting on 31 Oct 2008 till 31 March 2009. These days are used to calculate daily percentage changes of the interest rate on 10 year U.S. Government Bonds and the MOVE index. (MOVE index is the bond market's

equivalent of the VIX which is the implied volatility index based on options on the S&P500 index. The test period was nine test days, which is four trading days before and after the announcement. The results of the study show that four of the five announcement dates have cumulative abnormal returns that resemble a persisting fall, which coincides with the Krishnamurthy-Vissing-Jorgensson studies.

Gagnon, Raskin, Remache and Sack (2010) present an event-study of QE1 that documents large reductions in interest rates on dates associated with positive QE announcements. Swanson (2011) presents confirming event-study evidence from Operation Twist (1961) where the Federal Reserve/ Treasury purchased a substantial quantity of long-term treasuries. Apart from the event-study evidence, there are papers that look at lower frequency variation in the supply of long-term treasuries and documents casual effects from supply to interest rates. QE lowers long-term interest rates, the channels through which this reduction occurs are less clear. Event studies help us quantify this.

Krishnamurthy and Vissing-Jorgensen (2011) discuss the channels through which QE can be expected to impact interest rates in general and yields on government bonds specifically. Each channel has a prediction of how QE should move interest rates. The channels used are as follows:

a) Duration risk channel

By purchasing long-term treasuries, agency debt or agency MBS, policy can reduce the duration risk in the hands of investors and thereby alter the yield curve, particularly reducing long-maturity bond yields relative to short maturity yields. (KVJ, 2011) To deliver these results the models departs from

a frictionless asset-pricing model. Recent studies on QE have interpreted the model as being about the broad fixed income market and so under this interpretation, there are two principal predictions:

- i) QE decreases the yield on all long-term nominal assets, including treasuries, corporate bonds and mortgages.
- ii) The effects are proportional to the duration of a bond, with larger effects for longer duration assets.

b) Safety premium channel

KVJ (2010) present evidence for a channel whereby changes in long-term treasury supply work through altering the safety premiums on near zero-default risk long-term assets. QE works particularly to lower the yields of bonds that are extremely safe, such as treasuries or Aaa bonds. But, much economic activity is funded by debt that is not as free of credit risk as treasuries or Aas. However, only a small fraction of corporate bonds are rated Aaa or Aa, with the majority of corporate debt being A, Baa or lower. If the objective of QE is to reduce interest rates paid by the majority of corporations and households, which may then spur spending and economic growth, then examining supply effects on treasury rates could be misleading.

One of the principal findings by KVJ (2011) is that a treasuries-only QE policy will have significant effects on long-term treasury rates and rates on highly rated corporate bonds, but smaller effects on lower-rated corporate bonds, and mortgage rates, both of which are very policy relevant. The large reductions in mortgage rates due to QE1 appear to be driven by the fact that QE1 involved large purchases of agency mortgage backed securities. For QE2,

which involved only treasury purchases, we find a substantial impact on treasury rates, but almost no impact on MBS rates. As default risk rises, price of the bond falls and safety decreases. In the following figure, the distance from the bottom line to the top line is the safety premium. Clientele demand shifts the premium up.

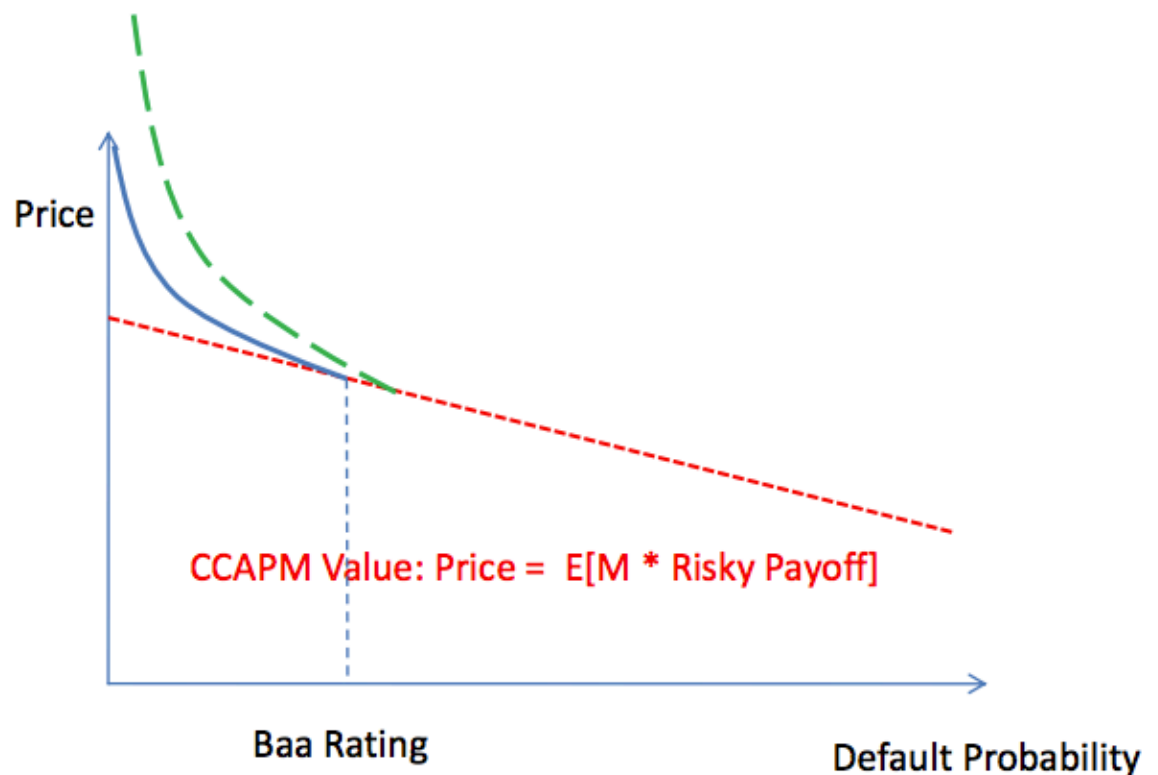


Figure 4: Safety premium on bonds with near-zero default risk (Source: KVJ, 2011)

The safety channel thus predicts:

- i) QE involving treasuries and agencies lowers the yields on safe assets.
- ii) The largest effects should occur for the safest assets, with no effects on low-grade debt such as Baa bonds or bonds with prepayment risk such as MBS.

Baa is taken as a threshold for the boundary between investment and non-investment grade securities.

a) Liquidity channel

The QE strategy involves purchasing long-term securities and paying by increasing reserve balances. Reserve balances are a more of a liquid asset than long-term securities. Thus, QE increases the liquidity in the hands of investors and thereby decreases the liquidity premium on the most liquid bonds. This channel implies an *increase* in treasury yields. (KVJ, 2011) Treasury bonds typically carry a liquidity price premium, and that this premium has been high during particularly severe periods of the crisis. An expansion in liquidity can be expected to reduce such a liquidity premium and increase yields. The channel predicts:

- i) QE raises treasury yields
- ii) QE produces large effects for liquid assets, and no effects for illiquid assets.

b) Signaling channel

Non-traditional monetary policy can have a beneficial effect in lowering long-term bond yields only if such policy serves as a credible commitment by the central bank to keep interest rates low even after the economy recovers. Such a commitment can be achieved when the central bank (ie. the Federal Reserve) to keep interest rates low even after the economy recovers. Such a commitment can be achieved when the central bank purchases a large quantity of long duration assets in QE. (KVJ, 2011) If the central bank raises rates, it takes a loss on these assets. To the extent that the central bank weighs such

losses in its objective function purchasing long-term assets in QE serves as a credible commitment to keep interest rates low. The signaling channel affects all bond market interest rates, since lower future Federal Fund rates, via the expectations hypothesis, can be expected to affect all interest rates. This channel is examined by measuring changes in the prices of the Federal Funds futures contract, as a guide to market expectations of future Federal Funds rates.

c) Prepayment risk premium channel

QE1 involved the purchase of \$1.25 trillion of MBS. Mortgage prepayment risk carries a positive risk premium, and that this premium depends on the quantity of prepayment risk borne by mortgage investors. (KVJ, 2011) The theory requires that the MBS market is segmented and that a class of arbitrageurs who operate predominately in the MBS market are the relevant investors in determining the pricing of prepayment risk. This channel is particularly about QE1 and its effects on MBS yields, which reflect a prepayment risk premium:

- i) QE1 lowers MBS yields relative to other bond market yields.
- ii) QE2, which doesn't involve MBS purchases, does not affect MBS yields.

d) Default risk channels

Lower grade bonds such as Baa bonds carry higher default risk than treasury bonds. QE may affect the quantity of such default risk as well as the price (i.e. risk premium) of the default risk. If QE succeeds in stimulating the economy,

we can expect that the default risk of corporations will fall, and hence Baa rates will fall.

e) Inflation channel

To the extent that QE is expansionary, it increases inflation expectations and this can be expected to have an effect on interest rates. Looking at the implied volatility on interest rate options, since a rise in inflation uncertainty will plausibly also lead to a rise in interest rate uncertainty and implied volatility.

The inflation channel predicts:

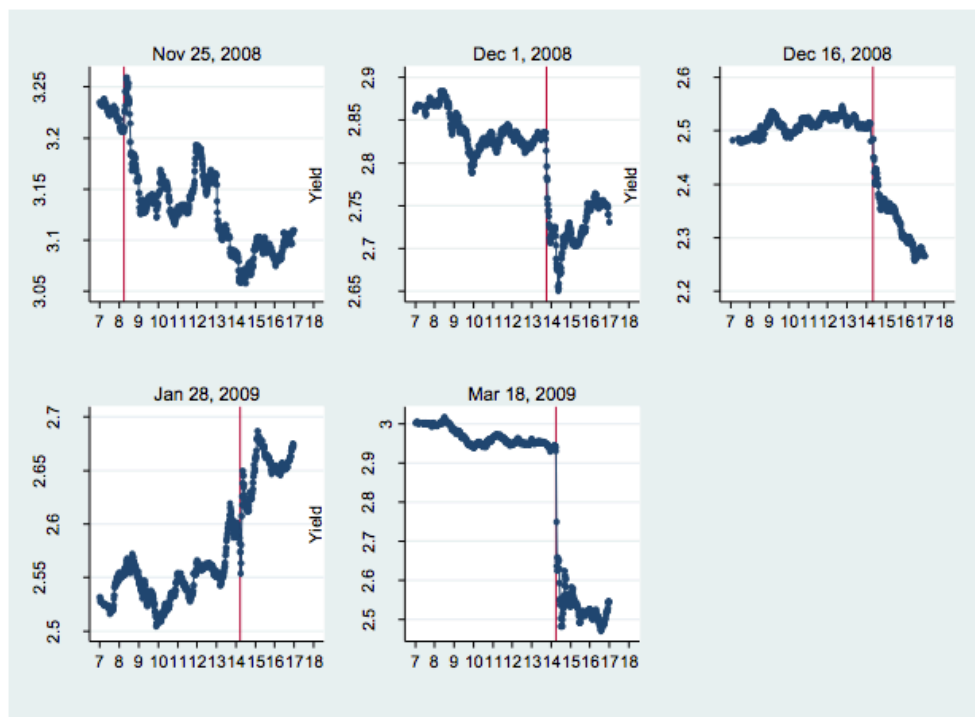
- i) QE increases the rate on inflation swaps as well information expectations as measured by the difference between nominal bond yields and TIPS.
- ii) QE may increase or decrease interest rate uncertainty as measured by the implied volatility on swap options.

Some of the issues that occurred during these event studies are:

- 1) There was considerable turmoil in financial markets in the period from latter 2008 to the beginning of 2009, which makes inference from an event-study tricky.
- 2) Some of the assets considered are corporate bonds and certificate of deposits (CDs) are less liquid. Thus, during a period of low liquidity the prices of these assets may react slowly in response to an argument.
- 3) We cannot be sure that the identified events are in fact important events.

To increase the confidence that QE1 announcements were the dominant news, the following figure presents graphs of intraday movements in treasury yields and trading volume for each for each of the event dates. The data is graphed for on-the-run 10-year Treasury bond at each date. Yields graphed are averages by the minute and trading volume graphed is total volume by minute. The vertical lines indicate the minute of the announcement, defined as the minute of the first article covering the announcement in Factiva. These graphs show that the events identify significant movements in treasury yields and treasury trading volume and that the announcements do appear to be the main piece of news coming out on the event days, especially on 12/1/2008, 12/16/2008 and 3/18/2009. For 11/25/2008 and 1/28/2009, the trading volume graphs also suggest that the announcements are the main events, with more mixed evidence from the yield graphs for those days.

(KVJ, 2011)



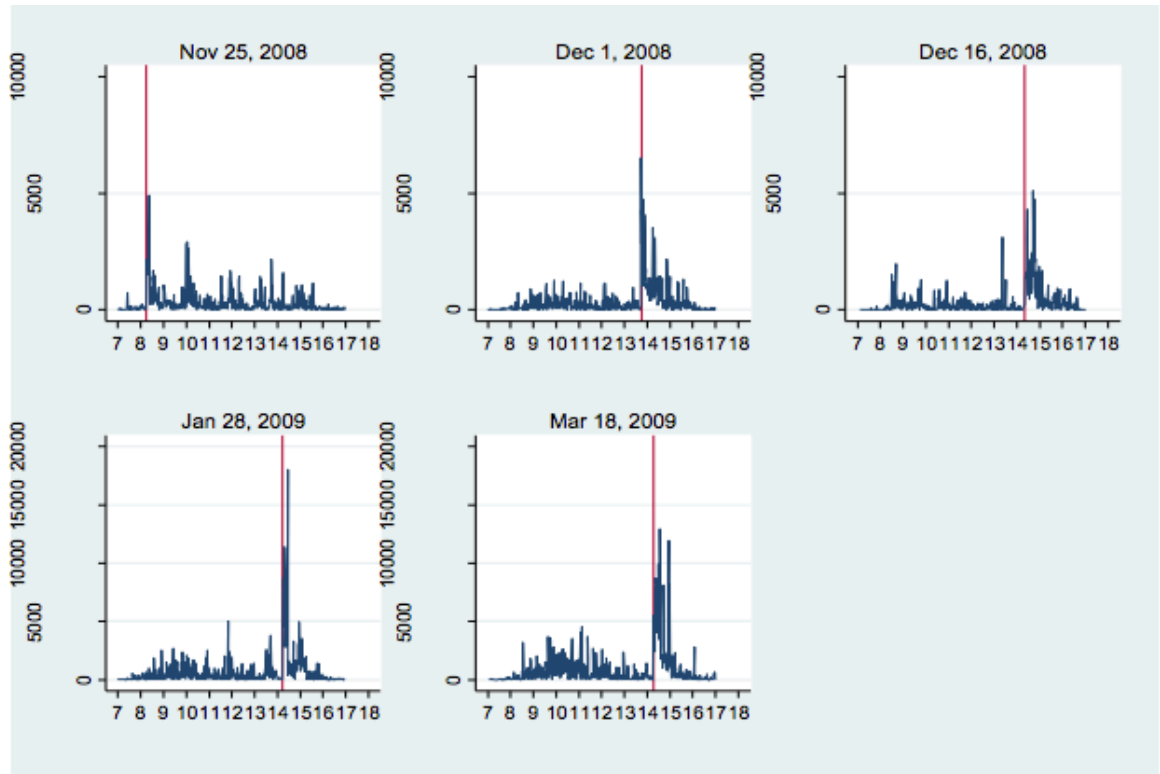


Figure 5 : Intra-Day yields and trading volumes on QE1 event days, (*Source: KVJ, 2011*)

The following table presents data on two-day changes in Treasury, Agency and Agency MBS yields around the main event-study dates, spanning a period from 11/25/08 to 3/18/09. Over this period it became evident from Fed announcements that the government intended to purchase large quantities of long-term securities. Across the five event dates, interest rates **fell** across the board on long-term bonds, consistent with a contraction of supply effect.

<u>Date</u>	<u>Event</u>	Treasury yields (constant maturity)				Agency yields			Agency MBS yields	
		30 year	10 year	5 year	1 year	10 year	5 year	3 year	30 year	15 year
11/25/2008	Initial announcement	-24	-36	-23	-2	-76	-57	-42	-75	-147
12/1/2008	Bernanke speech	-27	-25	-28	-13	-67	-50	-28	-10	58
12/16/2008	FOMC statement	-32	-33	-15	-5	-39	-26	-28	-30	-7
1/28/2009	FOMC statement	31	28	28	4	28	27	16	6	16
3/18/2009	FOMC statement	-21	-41	-36	-9	-45	-44	-38	-19	-18
Above 5 dates	Above 5 events	-73*	-107**	-74	-25*	-199***	-150**	-120***	-128**	-98

Table 3: Treasury, Agency and Agency MBS yields on QE1 event dates two-day changes (in basis points) *Source: KVJ 2011*

Note: The Treasury yields are from FRED (the constant maturity series). The agency yields are for FNMA bonds and the MBS yields are for the current coupon GNMA. Both are from Bloomberg. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level

Section IV: Empirical Findings

Quantitative Easing I results

Balik and Mangla (2012) have estimated the effect of QE1 as following. The following figure shows the general four economic and financial variables over 103 trading days from end of October 2008 till March 2009 (through duration of QE1) The variables used are: -

- MOVE bond volatility index
- S&P's Total Return Index which includes both price movement and dividends
- Rates on 10 year U.S. Government bonds
- Price of West Texas Intermediate crude oil

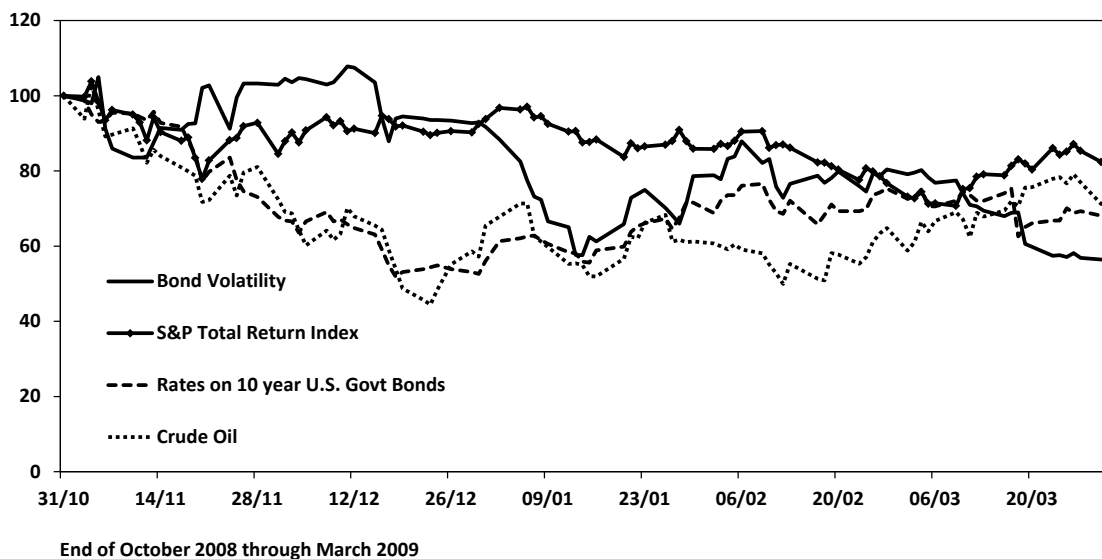


Figure 6: Four Economic and Financial Variables over 103 trading days

Source: Bloomberg, Federal Reserve Bank St Louis, Chicago Board Options Exchange

All four variables are scaled to start at a 100. All the variables fall during this period, the most being rates on 10 year U.S. bonds and crude oil, especially in November and

December 2008. The smallest percentage decrease is the S&P500 total return index.

(Balik, Mangla, 2012)

Effect on 10-year U.S. government bonds

Looking at the statistics for 10-year U.S. bonds, the average mean or percentage change is positive 0.1760% for the 63 event days, but goes negative -1.084% for the 39 event days and is significantly lower at -6.5819%. This is consistent with the hypothesis that QE announcement would lower interest rates. The changes are illustrated in the following table:

Table 4: Statistics for daily percentage change of interest rate on 10 year U.S. government bonds (*Source: Balik, Mangla, 2012*)

Statistic	Non-event days	Event days	Announcement Date
Observations	63	39	5
Mean	0.1760%	1.0840%	-6.5819%
Median	0.0000%	0.0000%	-7.1642%
Max	9.3333%	5.9041%	4.6332%
Min	-8.6505%	-16.8874%	-16.8874%
Standard deviation	3.3247%	4.6462%	7.6278%

Impact on interest rate volatility

The average daily percentage change for the MOVE Index is -0.6985% for the 63 non-event days, -0.0422% for the 39 event days and -0.6822% for the five announcement dates. This indicates that volatility declined from end of October 2008 till the end of March 2009.

Table 5: Statistics for daily percentage change of interest rate volatility, MOVE index
(Source: Balik and Mangla, 2012)

Statistic	Non-event days	Event days	Announcement Date
Observations	63	39	5
Mean	-0.6985%	-0.0422%	-0.6822%
Median	-0.7235%	0.0468%	-0.3271%
Max	10.6227%	10.2165%	9.1005%
Min	-13.1034%	-12.1064%	-9.1375%
Standard deviation	4.3999%	5.0895%	6.6006%

The following figures show the cumulative daily abnormal percentage change on the five announcement dates for the interest rates on 10 year government bonds, $t=0$.

Figure 7: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement dates 25 November 2008 and 01 December 2008 (Source: Balik, Mangla, 2012)

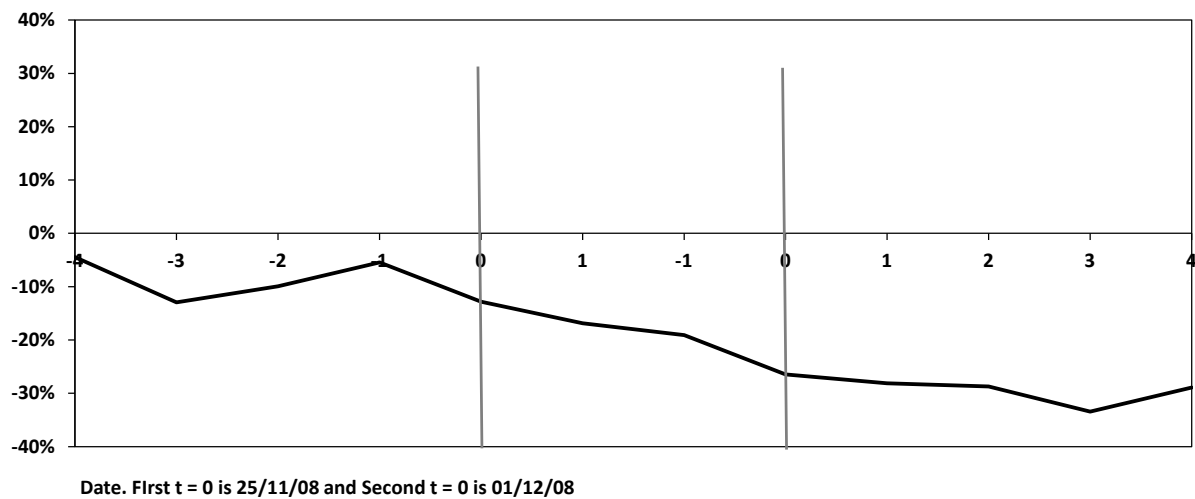


Figure 8: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement date 16 December 2008 (*Source: Balik, Mangla, 2012*)

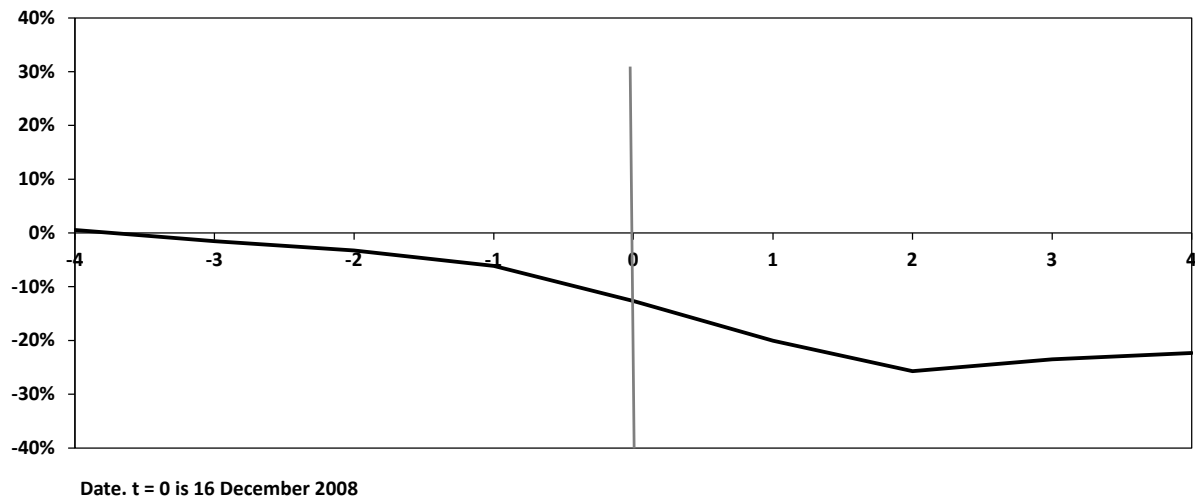


Figure 9: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement date 28 January 2009 (*Source: Balik, Mangla, 2012*)

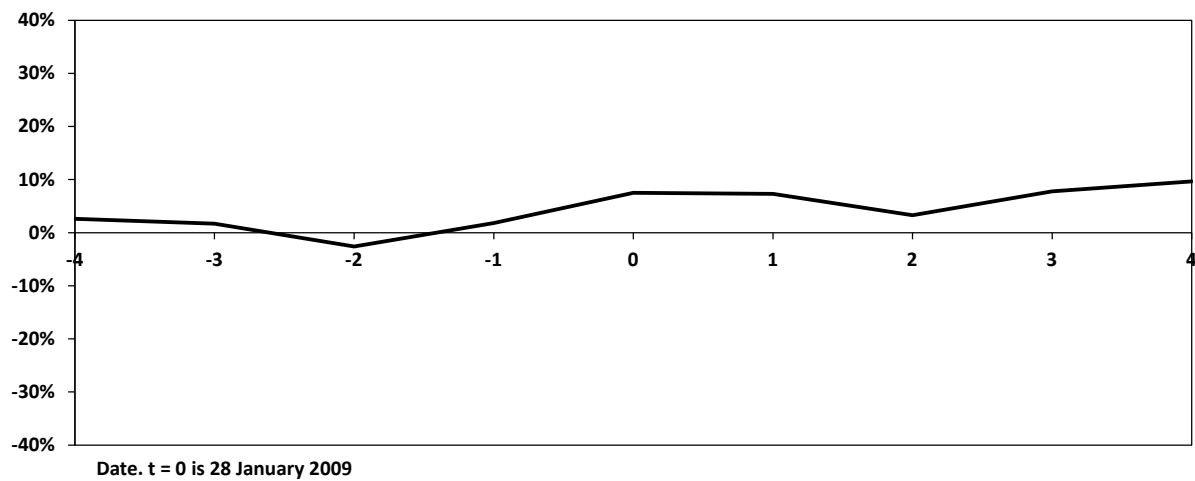
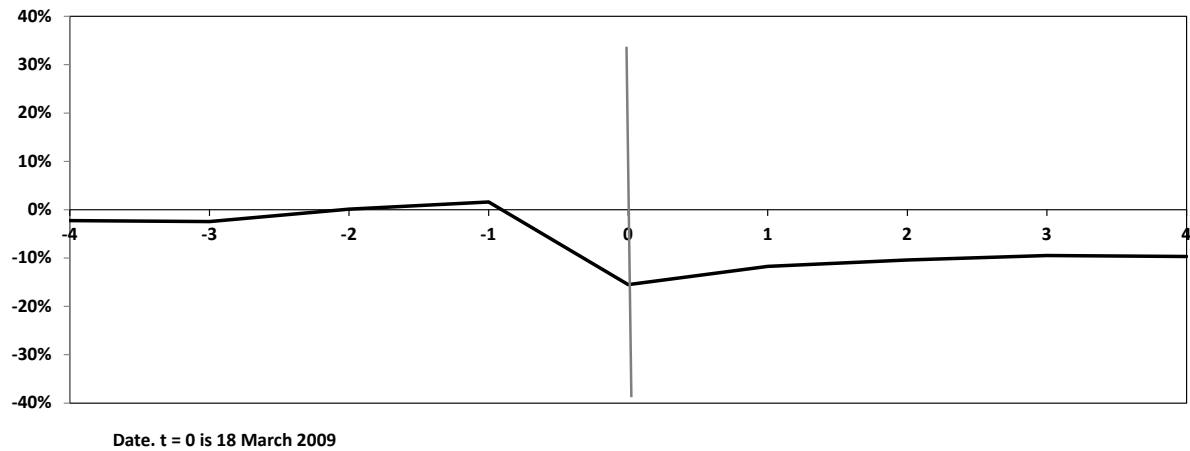


Figure 10: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement date 18 March 2009



Four of the five announcement dates have cumulative abnormal returns that are somewhat like the desired pattern, a fall that persists. The only exception is the QE announcement on 28 January 2009, Figure 5.

To analyze the abnormal returns, the following table was made. The average abnormal daily percentage change of the MOVE index on the announcement dates is -0.0142% and is 0.5358% for the 39 event days. These results are consistent with KJV's result using the BBOX (Barclay's Swaption volatility index.)

Table 6: Statistics for daily abnormal percentage change of interest rate volatility, MOVE index (*Source: Balik and Mangla, 2012*)

Statistic	Event days	Announcement Date
Observations	39	5
Mean	0.5358%	-0.1042%
Median	0.6248%	0.2509%
Max	10.7945%	9.6785%
Min	-11.5284%	-8.5595%
Standard deviation	5.0895%	6.6006%

The findings are:

- 1) For each day of test period, we calculate daily abnormal percentages in yield.
- 2) The daily abnormal percentage change is the **actual** percentage change minus the **expected** percentage change.
- 3) For each announcement day, the test period is from four trading days **before** the announcement **to** four days after, for a total of 9 test days.
- 4) One exception is the first and second announcement dates.

Results of Quantitative Easing 2

Quantitative Easing Channels

The quantitative easing channels discussed through which Quantitative Easing can be expected to impact interest rates in general and yields on government bonds are: duration risk channel, liquidity channel, safety premium channel, default risk channel and inflation channel. (Krishnamurthy, Vissing-Jorgenson, 2011) The following summarized predictions are:

- 1) Duration risk channel predicts that Q.E. decreases treasury yields
- 2) Liquidity channel predicts that Q.E. raises treasury yields
- 3) Safety premium channel predicts that's Q.E. lowers treasury yields.
- 4) Signaling channel predicts that Q.E. would signal that the Fed wants to lower treasury yields.
- 5) Prepayment risk premium channel predicts that Q.E. lowers riskier debt instruments such as mortgage back securities relative to treasury securities.
- 6) Default risk channels predict that Q.E. would primarily impact riskier debt instruments such as mortgage back securities.

7) Inflation channel predicts that Q.E. may increase or decrease rate volatility.

Results

1) Duration Risk Channel

Consistent with the duration risk hypothesis, the yields of many longer-term bonds fall more than the yields of shorter maturity bonds. The exception here is the 30-year Treasury bond, where the yield falls less than the 10-year bond. However, there are dramatic differences in the yield changes across the different asset classes. Agency bonds, for example experience the largest fall in yields. The duration risk channel cannot speak to these effects as it only prescribes effects that depend on bond maturity. The duration risk channel also cannot explain the corporate bond data. Studies by KVJ in 2011 found that there is a large fall in CDS rates for lower grade bonds on the event dates, suggesting that the default risk/risk premium fell substantially with QE, consistent with the default risk channel. Given the CDS adjustment, there is only a small change in the yields of Baa and lower bonds. No patterns across long and intermediate maturities were found in this study.

2) Liquidity channel

The most liquid assets are Treasury bonds. The liquidity channel predicts that these yields should increase with QE. They don't increase, but instead fall much less than the yields on Agency bonds, which are less liquid. The Agency-Treasury spread falls with QE. This is a relevant comparison because 10-year Agencies and Treasuries have the same default risk and are duration matched. Consistent with the liquidity channel, the equilibrium price premium (yield discount) for liquidity falls substantially.

3) Safety channel

The Agency bonds are particularly sensitive to the safety effect. The fall is 199 bps, which is the largest effect in the table. This suggests that the safety channel is one of the dominant channels for QE1. (KVJ 2011) Treasuries fall less than the Agencies because the liquidity effect runs against the safety effect. The corporate bond evidence is also consistent with a safety effect.

4) Signal channel

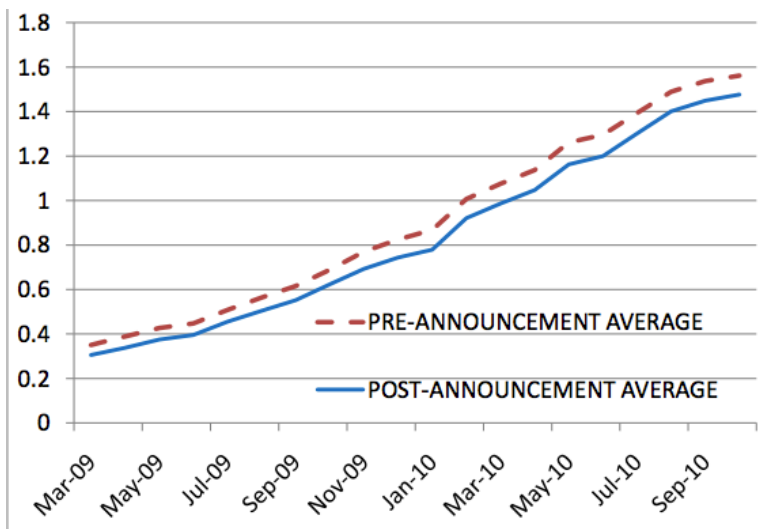


Figure 11: Yield Curves from Fed Funds Futures pre and post QE1 Event Days

Note: The figure graphs the yields (in %) on the Federal Funds futures contract, by contract maturity. The yields are computer the day prior to the QE1 event dates and again the day after the event dates. All of the pre-event yields, and all of the post-event yields, are then averaged across events.

(Source: KVJ 2011)

Section V: Summary and Conclusion

In terms of Quantitative Easing I, we derived through the event study method that the announcement dates have a significant impact on the volatility of the interest rates. This is consistent with the KVJ and GRRS studies. This research reviewed and critiqued two studies that used the event study method to measure the impact of QE announcements on interest rates.

The results of the study show that four of the five announcement dates have cumulative abnormal returns that resemble a persisting fall, which coincides with the Krishnamurthy-Vissing-Jorgensson studies. Gagnon, Raskin, Remache and Sack (2010) present an event-study of QE1 that documents large reductions in interest rates on dates associated with positive QE announcements. Swanson (2011) presents confirming event-study evidence from Operation Twist (1961) where the Federal Reserve/ Treasury purchased a substantial quantity of long-term treasuries.

Alternative event study procedures were used to calculate daily abnormal percentage changes of the interest rate on 10-year U.S. government bonds and the interest rate volatility, MOVE index. The results are consistent with and strengthen the results of the GRRS and KVJ studies. In terms of Quantitative Easing 2, the yields of many longer-term bonds fall more than the yields of shorter maturity bonds. The exception here is the 30-year Treasury bond, where the yield falls less than the 10-year bond. However, there are dramatic differences in the yield changes across the different asset classes. In terms of liquidity, the liquidity channel predicts that these yields should increase with QE. However they don't increase, but instead fall much less than the yields on Agency bonds, which are less liquid.

As for Quantitative Easing 2(b), more research needs to be done to correctly detect the impact whether it will be as effective. This study shows that the effect of Quantitative Easing I was much stronger than Quantitative Easing 2(a), and was more successful in bringing down rates. It looks like the Fed is lacking its “surprise element.” According to a survey by Reuters (2012), “Less than half of the economists polled felt like the Fed’s “Operation Twist” move to further push down long-term interest rates was successful.

To answer the question whether the Fed should pursue another round of quantitative easing, 81% of economists surveyed said it shouldn’t. (Reuters, 2012) The Fed should now look into more “creative” measures into helping boost the U.S. economy. The Fed plans to keep rates low until 2014.

References

Anderson, Leonell C. "The Incidence of Monetary and Fiscal Measures on the Structure of Output," Rev. Econ. And Statis. (August, 1964), p.267.

Arvind Krishnamurthy and Annette Vissing- Jorgensen "The Effects of Quantitative Easing on Interest Rates" [June 22, 2011](#).

Alan S.Blinder, "Ben Bernanke Deserves a Break," WSJ, [Sept 28, 2011](#)P.A.15
Carey Cathy, and Garen John "Economic Commentary: Quantitative easing 1 and 2, January 1 2011, <http://www.lanereport.com/articles/article.cfm?id=1422>

Balik, Robert and Mangla, Inayat "Paper presented at the 37th Annual Conference of Academy of Economics and Finance at Charleston, South Carolina", February 9-11, 2012

Carey "Quantitative Easing 1 and 2" , 2011
<http://www.lanereport.com/2119/2011/01/quantitative-easing-1-and-2-january-2011/>

Censky, Annaryl "Federal Reserve Launches Operation Twist", September 21 2011, http://money.cnn.com/2011/09/21/news/economy/federal_reserve_operation_twist/index.htm

Chung, Hess, Laforte Jean-Phillipe, Reifschneider David and Williams, John "Estimating the Macroeconomic effects of the Fed's asset purchases"
<http://www.frbsf.org/publications/economics/letter/2011/el2011-03.html>

Gehrels, Franz, and Wiggins, Suzanne. "Interest Rates and Fixed Investment," A.E.R. (March, 1957),p. 89.

Hilsenrath, Jon "Fed Holds Off for Now on Bond Buys", Wall Street Journal, January 19, 2012

Jeff Frankel: "The Federal Government Races to the Cliff", Econbrowser: Evaluating quantitative easing using event studies.
http://www.econbrowser.com/archives/2011/07/evaluating_quan.html

Jones, Charles, Owen Lamont, and Robin Lumsdaine. 1998. "Macroeconomic News and Bond Market Volatility." Journal of Financial Economics 47, pp. 315-337.

Jorgenson, Dale. "Capital Theory and Investment Behavior," in American Economic Association, Papers and Proceedings (A.E.R) [May, 1963]], p.258.

Kacher, Chris and Morales, Gil, "Quantitative Easing and the Investor", Marketwatch, March 14, 2012

Levine, Deborah and Watts, William, “Dollar gains on post-Fed yield increases”, Marketwatch, March 14, 2012

Malkiel, Burton G. “The Term Structure of Interest Rates,” in American Economic Association, Papers and Proceedings (A.E.R.) [May, 1964]

Meaning, Jack and Zhu, Feng “The Impact Of Recent Central Bank Asset Purchase Programmes”, December 2011

Mitchell, Bill, “Operation Twist: Then and Now”, March 31 2010,
<http://bilbo.economicoutlook.net/blog/?p=8986>

Ruston, S. “ Mundell: Deflation risk for the dollar,” WSJ May 23, 2011

Joseph Gagnon, Matthew Raskin, Julie Remasche, Brian Sack. 2011. “The Financial Market Effects of the Federal Reserve’s Large-scale Asset Purchases”. International Journal of Central Banking 7(1), pp. 3- 43. <http://www.ijcb.org/journal/ijb11q1a1.thm>

Modigliani, Franco, and Richard Sutch. 1966. “Innovations in Interest Rate Policy.” American Economic Review 56, pp. 178-197

Myron, Ross, 1966. “Operation Twist: A mistaken policy?”, Journal of Political Economy

Reuters, March 2012 “Fed should not pump more money into the economy in 2012:Survey”

<http://www.reuters.com/article/2012/03/26/us-usa-economy-poll-idUSBRE82P10P20120326>

Swanson, Eric. 2011. “Let’s twist Again: A high-Frequency Event-Study Analysis of Operation Twist and Its Implications for QE2.” Forthcoming in brookings papers on Economic Activity, available at http://www.brookings.edu/~media/files/programs/ES/BPEA/2011_spring_bpea_papers/2011_spring_bpea_conference_swanson.pdf. Earlier version with supplemental information available as FRBSF Working Paper 2011-08, <http://www.frbsf.org/publications/economics/papers/2011/wp11-08bk.pdf>

Titon, Alon and Swanson, Eric “Operation Twist and the effect of large scale purchases” April 2011

<http://www.frbsf.org/publications/economics/letter/2011/el2011-13.html>

Wood, John H. “The Expectations Hypothesis, the Yield Curve, and Monetary Policy,” Q.J.E (August, 1964).

Zaretsky, Adam “To boldly go where we have gone before: Repeating the interest rate mistakes of the past”, The Regional Economist, July 1993

<http://www.stlouisfed.org/publications/re/articles/?id=1911>

Zeng, Min “Fed’s ‘Operation Twist’ Tangles Treasury Trade”, Wall Street Journal (February 10th 2012)