Evaluating Quantitative Easing using Event Studies

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Abstract

Starting in late 2008 the United States Federal Reserve used Quantitative Easing as a policy tool. Two recent studies use the event study method to investigate the impact of Quantitative Easing announcements on financial markets. This research critiques the event study methods used in these studies and calculates daily cumulative abnormal percentage changes in interest rates around five announcement dates. The results of this research are consistent with and strengthen the results of the other two studies.

Keywords: Quantitative Easing, Event Studies.
JEL codes: E43, E44, E58

1. Introduction

In general, Quantitative Easing, QE, is the attempt by a central bank to inject more money into the economy and to keep long-term interest rates low. This is done through the purchase of large amounts of financial assets which are often held by financial institutions. The event study method is used to study the impact of QE announcements on interest rates and other market variables.

2. Quantitative Easing Channels

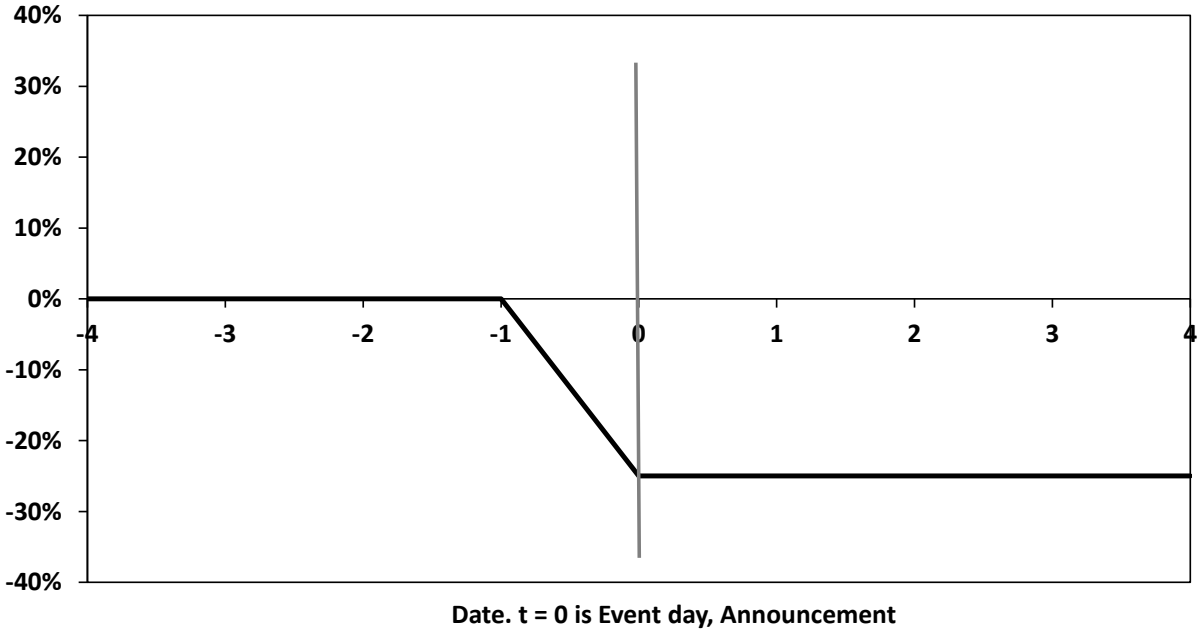
Krishnamurthy and Vissing-Jorgensen (2011) discuss the channels through which QE can be expected to impact interest rates in general and yields on government bonds specifically. They are: duration risk channel, liquidity channel, safety premium channel, signaling channel, prepayment risk premium channel, default risk channel, and inflation channel. Each channel has a prediction of how QE should move interest rates. They are: duration risk channel predicts that QE decreases treasury yields, liquidity channel predicts that QE raises treasury yields, safety premium channel predicts that QE lowers treasury yields, signaling channel predicts that QE would signal that Federal Reserve wants to lower treasury yields, prepayment risk premium channel predicts that QE lowers riskier debt instruments, such as mortgage back securities relative to treasury securities, default risk channel predicts that QE would primarily impact riskier debt instruments such as mortgage back securities, and inflation channel predicts that QE may increase or decrease interest rate volatility.

3. Event Study Method

MacKinlay (1997) reviews the event study method. Basically, 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. If financial markets are efficient and the event announcement is unexpected the impact on the value of financial assets should be quick and should persist. To illustrate, 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. Figure 1 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 there, the percentage drop in interest rates is greater than expected. In Figure 1, the unexpected percentage drop in interest rates is greater than 20 percent. After the announcement date the cumulative percentage change persists. That is, as indicated in to Figure 1, the cumulative percentage change remains at less than minus 20 percent, it does not move back toward the zero percentage change value

Figure 1: Illustration of pattern of cumulative daily abnormal percentage changes for interest rates when an announcement is unexpected and implies interest rates should fall.



4. Literature Review

Two recent studies investigate the impact of Quantitative Easing announcements on financial markets. They are: Gagnon, Raskin, Remache, and Sack (2011), henceforth GRRS and Krishnamurthy and Vissing-Jorgensen (2011), henceforth KVJ.

The GRRS study looks at 23 QE announcements. The first is on 25 November 2008 and the twenty third is on 17 February 2010. Of these 23 announcements eight are considered baseline. According to GRRS the baseline announcements contained new information concerning the potential or actual expansion of the size, composition, and of timing of the large-scale asset purchases. KVJ look at five of these eight baseline announcements. Table 1 contains the five baseline dates and briefly describes each announcement. These announcement dates are considered to be part of QE1, the first phase of QE.

Table 1: Five announcement dates used in both studies (GRRS and KVJ)

Number	Announcement Date	Announcement
1	25 November 2008	Initial large scale asset purchase announcement
2	01 December 2008	Chairman speech
3	16 December 2008	Federal Open Market Committee Statement
4	28 January 2009	Federal Open Market Committee Statement
5	18 March 2009	Federal Open Market Committee Statement

Source: Gagnon et al. (2011, page 49)

Both studies look at the impact of the five QE announcements on interest rates for various debt securities. Table 2 shows the QE announcement impact on the basis point change for 10 year U.S. Government bonds and basis point change in interest rate volatility on the event day and the subsequent trading day. For instance, on 25 November 2008 the market interest rate on 10 year U.S. Government bonds fell by 22 basis points and on this day and the next trading day the interest rate volatility increased 1 basis point. KVJ used Barclays implied swaptions volatility index, BBOX, to measure interest rate volatility.

Table 2: Basis points, bps, change in 10 year U.S. Government Bond on announcement date and 2 day basis point change in interest rate volatility on days t = 0 and t = 1.

Announcement Date	Change 10 year U.S. Government Bond, bps, HRRS	Interest Rate Volatility 2 day change, bps, KVJ
25 November 20081	-22	+01
01 December 2008	-19	-07
16 December 2008	-26	-20
28 January 2009	+14	+/-0
18 March 2009	-47	-11

Sources: HRRS and KVJ

The HRRS and KVJ studies look at what happened on the event or announcement day or a two day event window, event day and following trading day. They did not study the non-announcement dates, say for a benchmark. The changes they report are basis point changes of the interest rate and of the volatility index. They are not changes relative to what was expected. This research adjusts for these research flaws.

5. Event Method

This research uses data for 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&P 500 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. The daily abnormal percentage change is the actual percentage change minus the expected percentage change. The proxy for the expected percentage change is the average for all 63 days of the estimation period. For instance, for 25 November 2008, which is the first of the five announcement days, the daily abnormal percentage change 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.

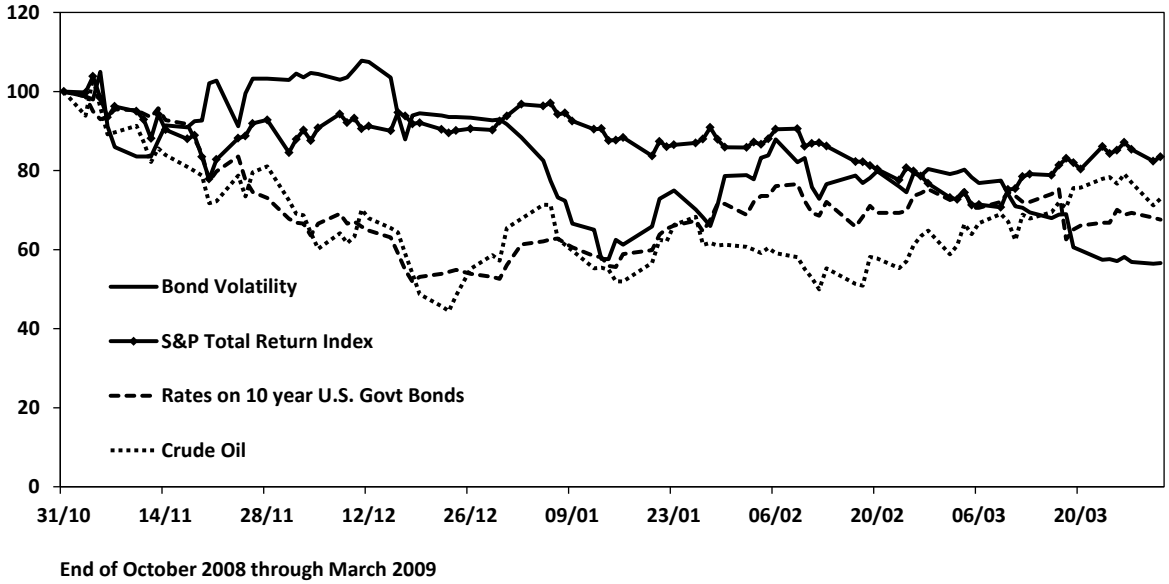
For each announcement day the test period is from four trading days before the announcement to four days after or a total of nine test days. One exception is the first and second announcement dates. There are only two trading days between the first announcement on 25 November 2008 and 01 December 2008. Thus, these two announcements are combined and have 12 trading days during the test period.

5. Results

Figure 2 shows the general pattern of four economic and financial variables over the 103 trading days, from end of October 2008 through end of March 2009. The variables are the MOVE bond volatility index, the Standard & Poor's total return index, interest rates on 10 year U.S. government bonds, and price of West Texas Intermediate crude oil. The S&P total return index

includes both price movement and dividends. All four variables are scaled to start at 100. In general, all of the variables fall during this time period. Rates on10 year U.S. government bonds and crude oil fell the most in November and December 2008. The S&P total return index had the smallest percentage decrease.

Figure 2: Scaled values for Bond volatility, S&P 500 total return index, interest rates on 10 year U.S. Government bonds, and West Texas Intermediate Crude Oil



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

Table 3 contains the statistics for the actual daily percentage change of the interest rate on 10 year U.S. government bonds for all 63 non-event days, the estimation period, all 39 event or test period days, and the 5 announcement days. The average or mean percentage change is positive, 0.1760%, for the 63 event days, goes negative, -1.0840%, for the 39 event days, and is most negative for five announcement days, -6.5819%. This is consistent with what hypothesis that QE announcement would lower interest rates.

Table 3: Statistics for daily percentage change of interest rate on 10 year U.S. government bonds

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%

Table 4 contains the statistics for the actual daily percentage change of interest rate volatility, the MOVE index for all 63 non-event days, the estimation period, all 39 event or test period days, and the 5 announcement days. The average or mean daily percentage change of the MOVE index is negative for the 63 non-event days, -0.6985, the 39 event days, -0.0422%. and the 5 announcement

days, -0.6822. This indicates that volatility trended downward from end of October 2008 through end of March 2009.

Table 4: Statistics for daily percentage change of interest rate volatility, MOVE index

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%

Figures 3 through 6 show the cumulative daily abnormal percentage change of the interest rate on 10 year government bonds around the five announcement dates, t = 0.

Figure 3: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement dates 25 November 2008 and 01 December 2008

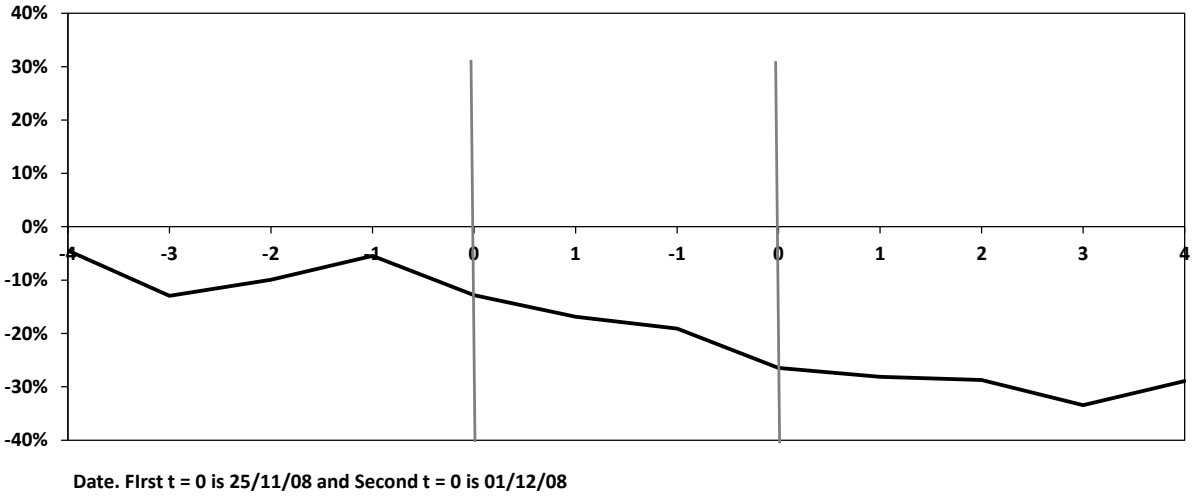


Figure 4: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement date 16 December 2008

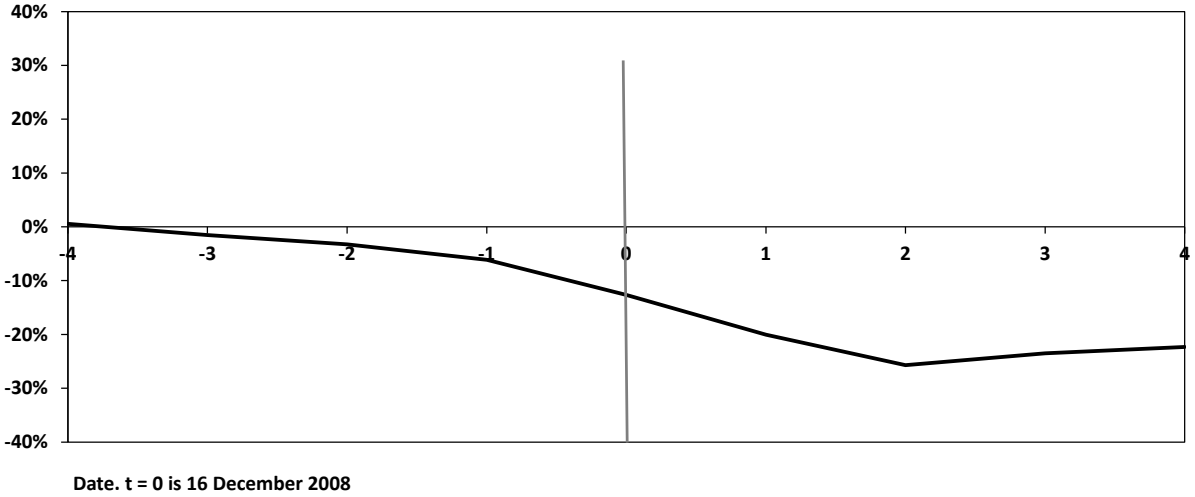


Figure 5: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement date 28 January 2009

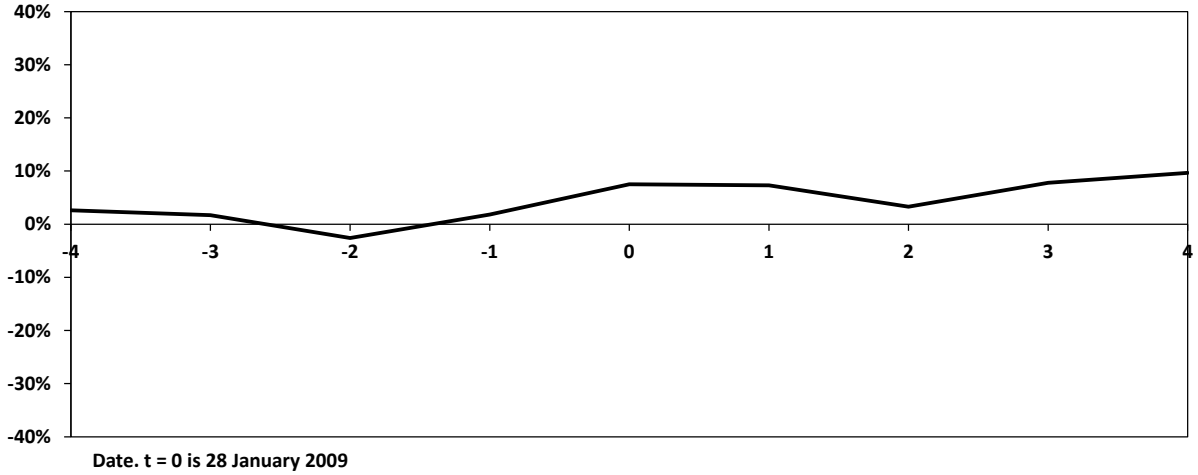
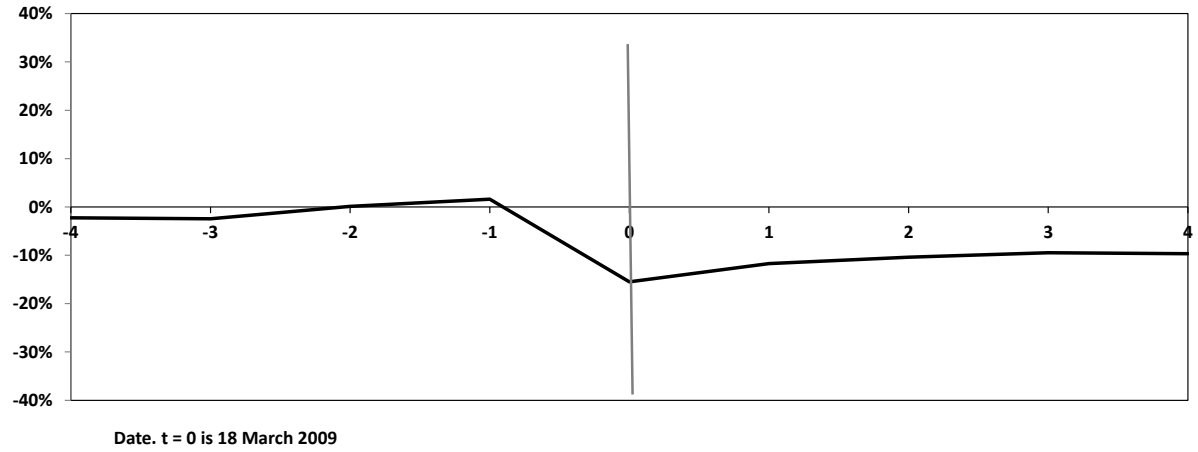


Figure 6: Cumulative daily abnormal percentage change in interest rates for 10 year government bonds around announcement date 18 March 2009



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

Table 4 contains statistics for the abnormal daily percentage change of the MOVE index. The average abnormal daily percentage change of the MOVE index is negative, -0.1042, and is positive for all 39 event days, 0.5358%. This is consistent with KVJ's result using another volatility index, BBOX.

Table 5: Statistics for daily abnormal percentage change of interest rate volatility, MOVE index

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%

6. Conclusion

This research reviewed and critiqued two studies that used the event study method to measure the impact of QE announcements on interest rates. 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 obtains are consistent with and strengthen the results of the GRRS and KVJ studies.

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