Economics 210c/236a
Fall 2018

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LECTURE 8

Monetary Policy at the Zero Lower Bound: Quantitative Easing

October 10, 2018

Announcements

- Paper proposals due on Friday (October 12).
- No class next week (October 17).

I. Overview

Monetary Policy at the Zero Lower Bound: Expectations Effects

What expectations matter?

- Expectations of inflation.
- Expectations of real growth.
- Expectations of future interest rates.

Monetary Policy at the Zero Lower Bound: Expectations Effects

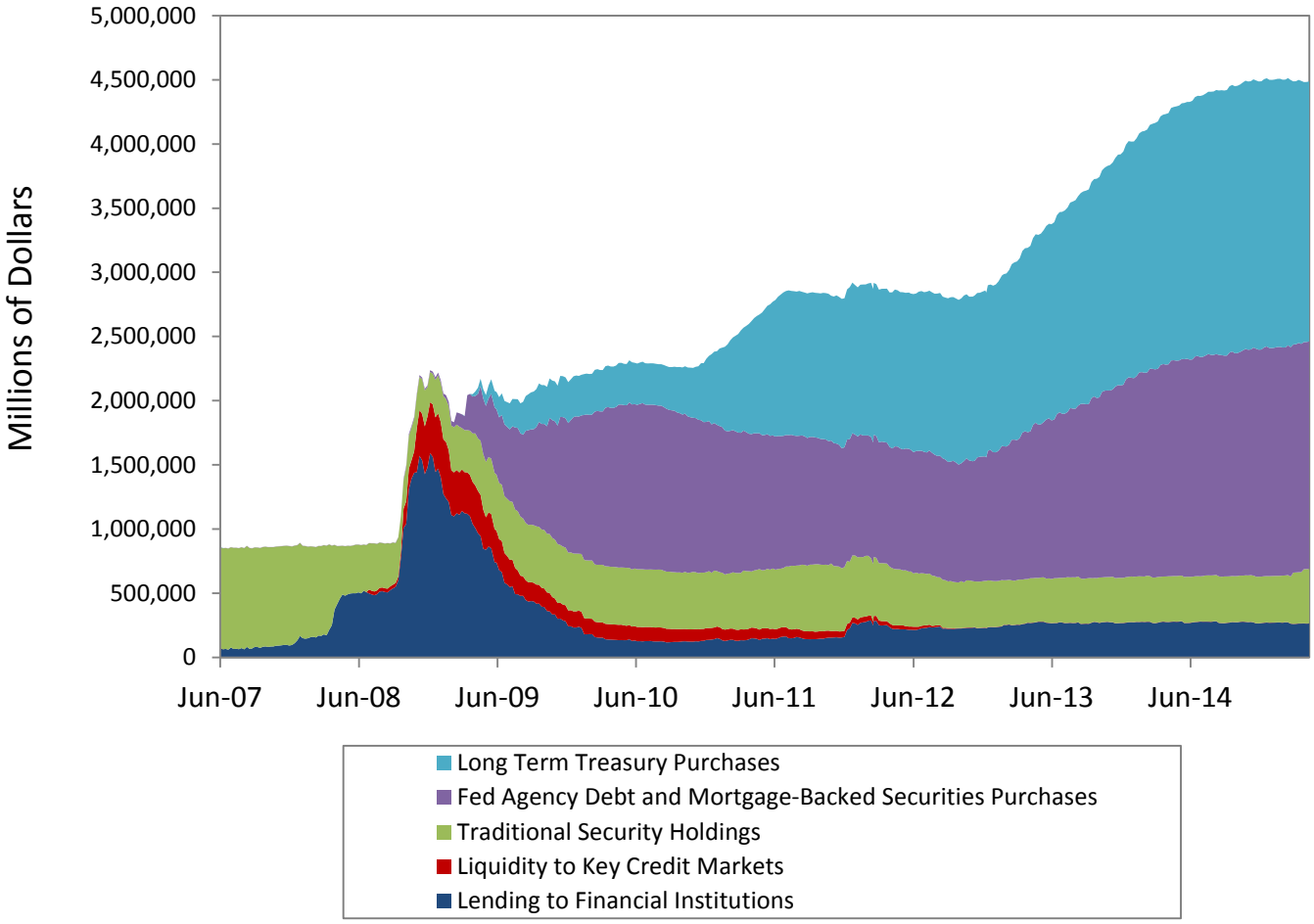
How can monetary policy move expectations at the ZLB?

- Regime shift.
- Money growth affects expectations of future money growth and prices.
- Inflation shocks.
- Forward guidance.

2008/09 As a Regime Shift

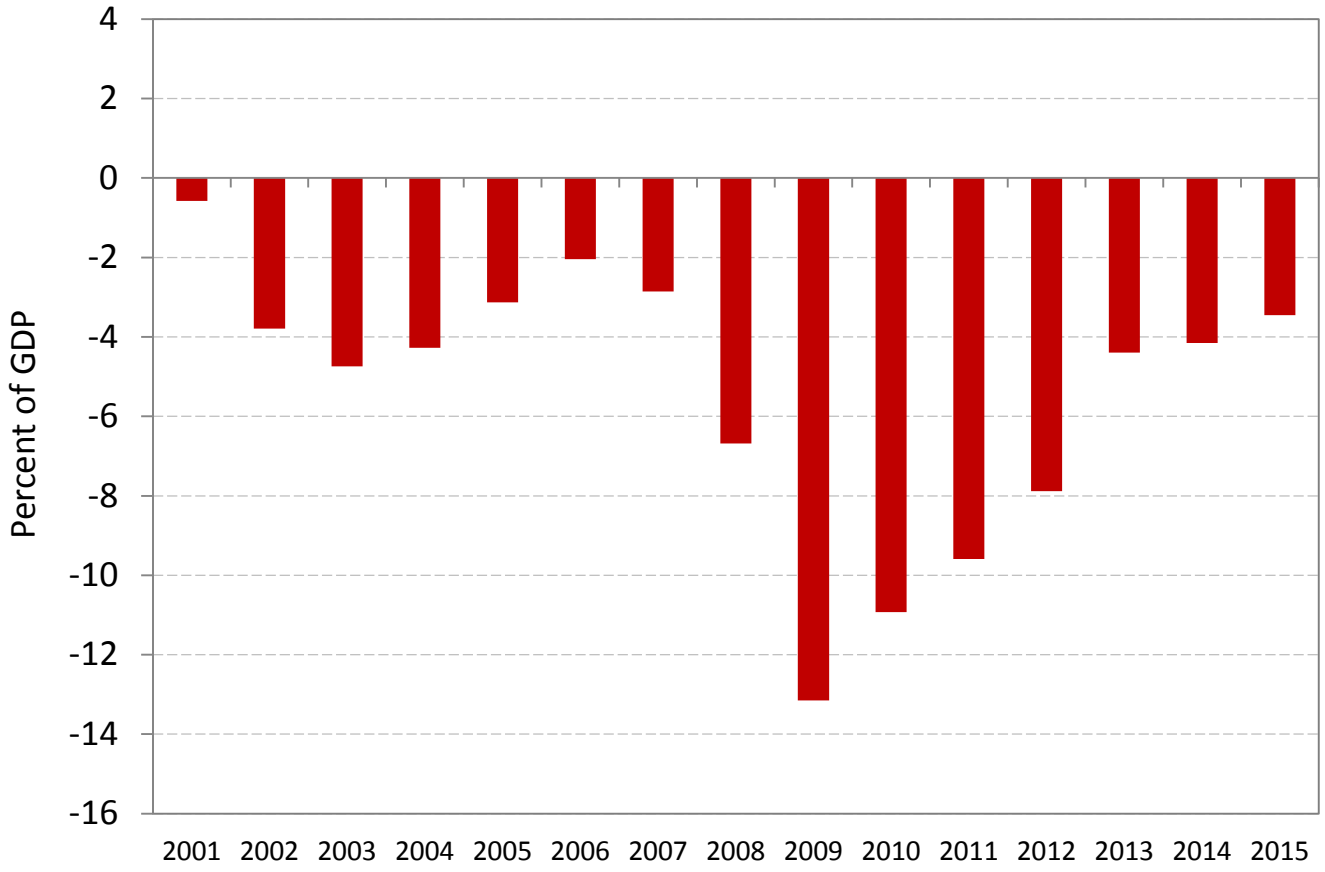
- Was there a regime shift in 2008/09?
- Might it be part of the explanation for the rapid turnaround?
- Why didn’t it have more of an impact?

Federal Reserve Balance Sheet



From: Federal Reserve Bank of Cleveland.

High-Employment Budget Surplus

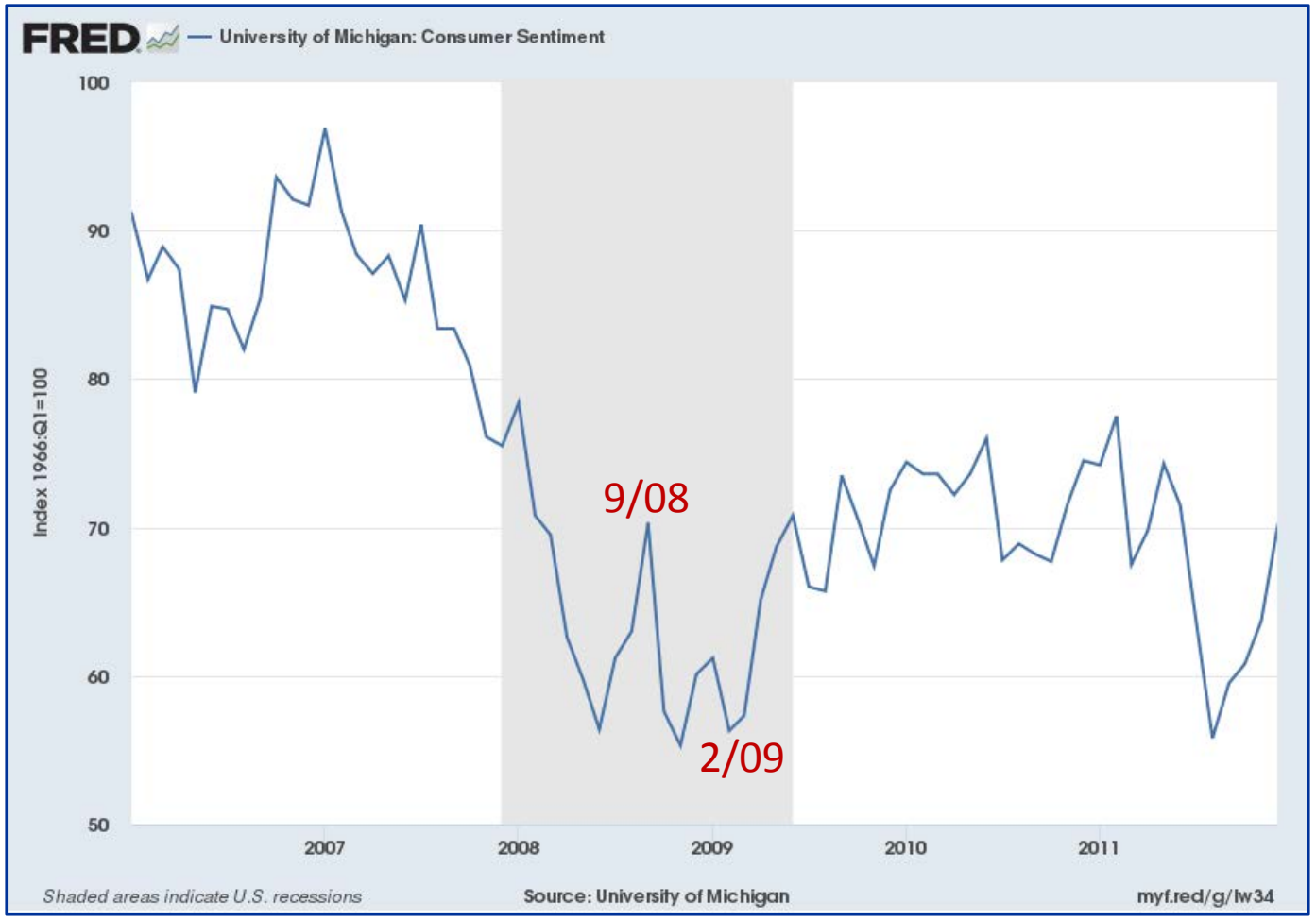


From: IMF, WEO Database.

S&P 500 in 2008–2009

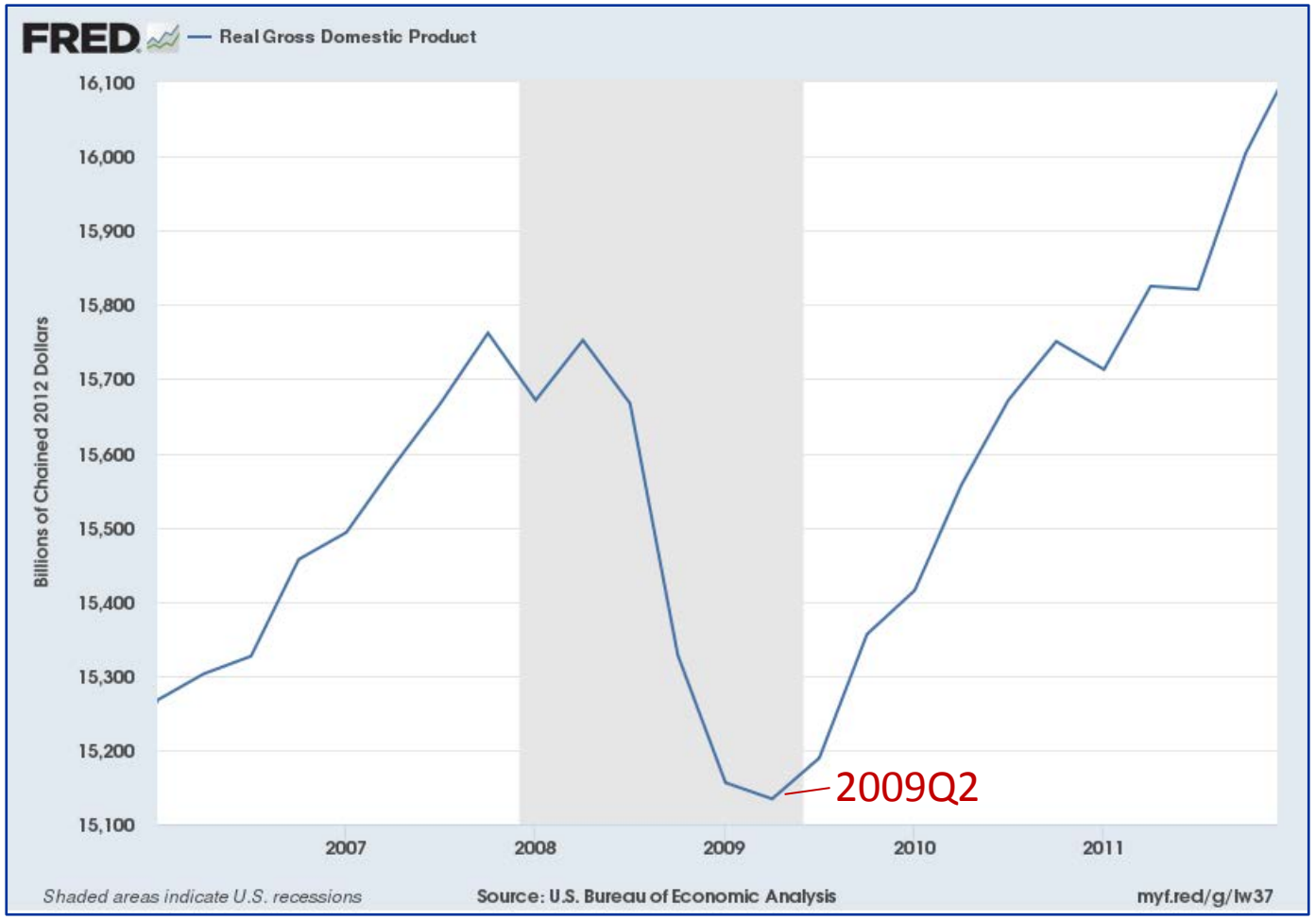
From: FRED.

Consumer Sentiment



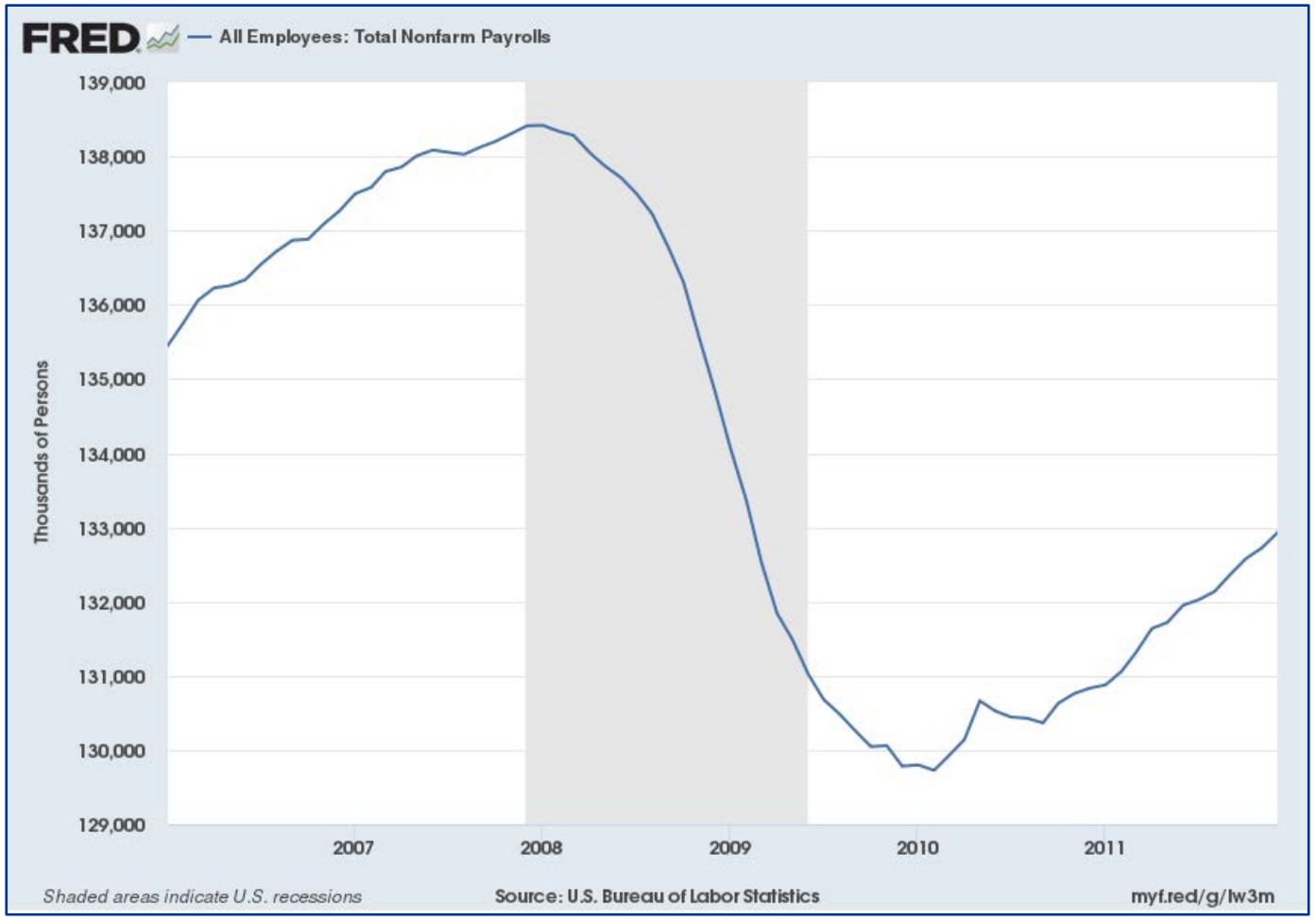
From: FRED.

Real GDP



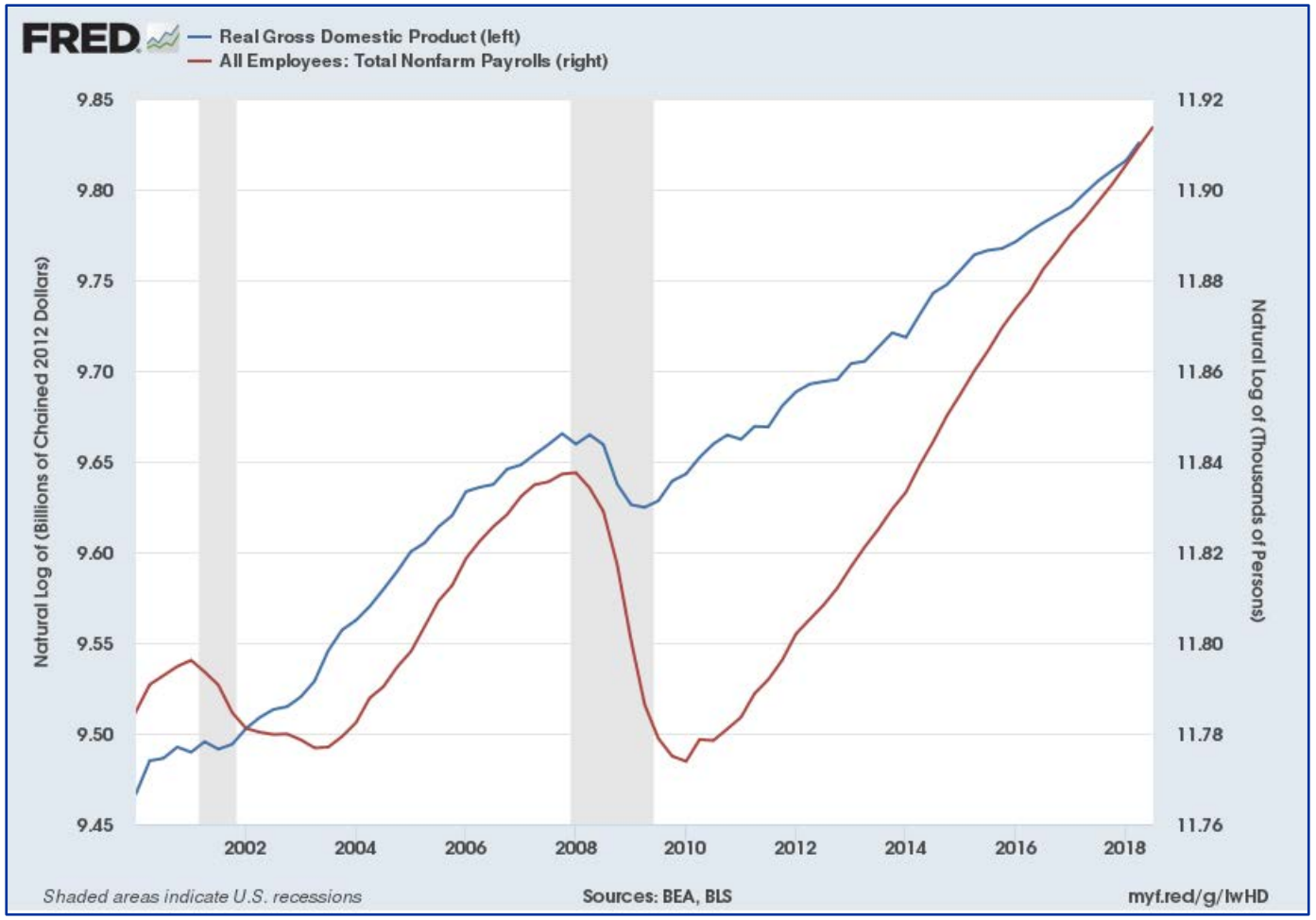
From: FRED.

Payroll Employment



From: FRED.

GDP and Employment since 2000



From: FRED.

What Might Have Gone Wrong?

- Poor communications.
- Lack of policy follow-through.
- Additional shocks.
- Other?

Quantitative Easing

- Used to mean continued conventional OMO (buying short-term government bonds) at the ZLB.
- Has come to mean ***un***conventional OMO (buying unusual assets such as long-term government bonds or MBS).
- Can matter through portfolio balance effects.
- May also be a way of affecting expectations.

Papers for Today

- Swanson: Operation Twist from the early 1960s.
- Krishnamurthy and Vissing-Jorgenson: QE in U.S. in recent episode.
- Swanson and Williams: ZLB more generally.

II. Eric Swanson, "Let's Twist Again: A High-Frequency Event-Study Analysis of Operation Twist and Its Implications for QE2"

What Was Operation Twist?

- An explicit attempt to change the slope of the yield curve.
- What was the motivation?
- It involved:
  - Treasury issuing short-term bonds.
  - The Fed holding the funds rate constant.
  - The Fed purchasing long-term government bonds.

Table 1. Comparing Operation Twist and QE2

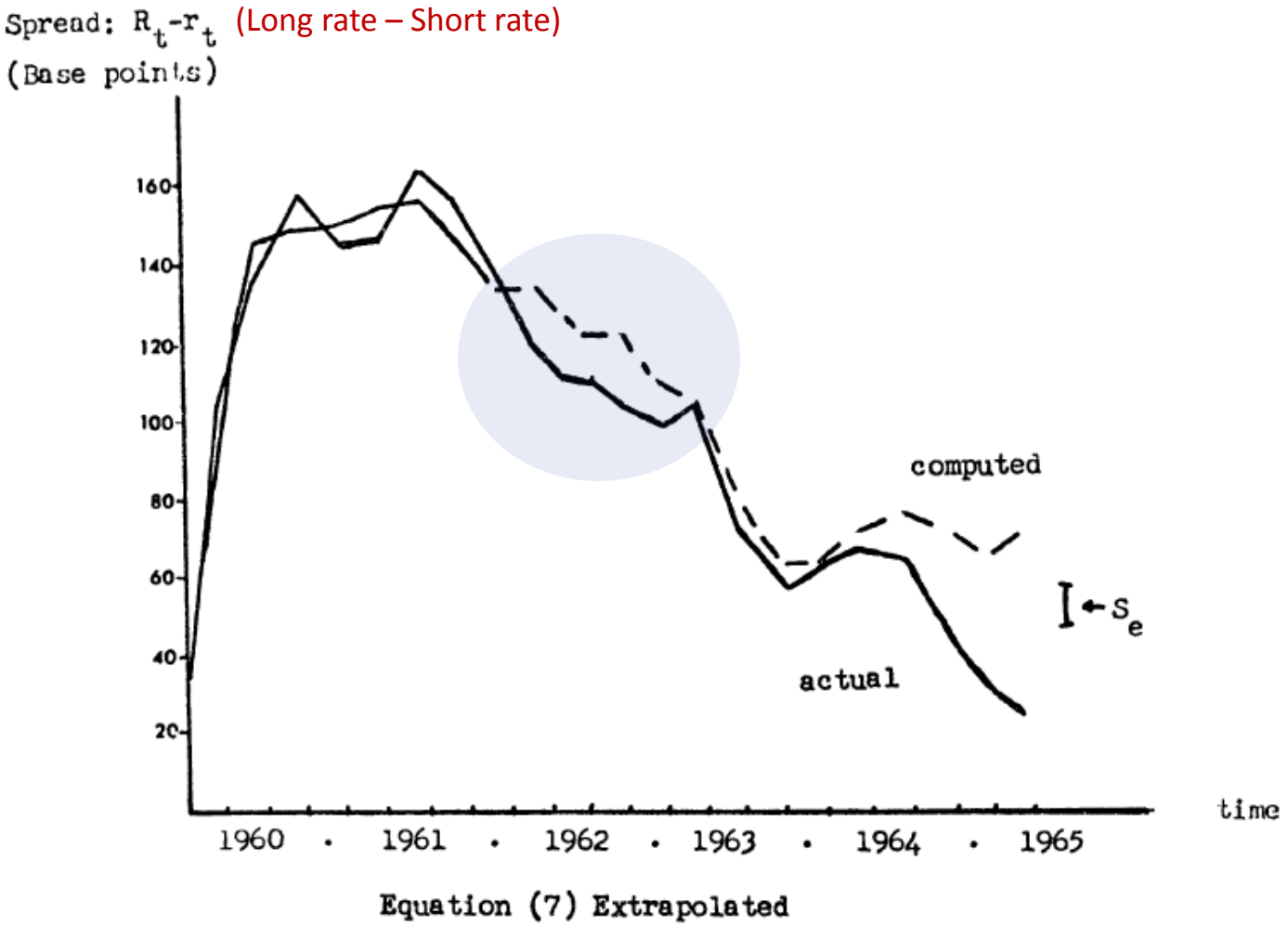
Billions of current dollars except where stated otherwise

	Operation Twist	*QE2*
Size of Federal Reserve program	8.8	600
GDP	528	14,871
Treasury marketable debt outstanding[a]	189.3	8,543
Agency debt outstanding[b]	7.4	6,379
Agency-guaranteed debt outstanding[c]	0.2	1,166
Size of Federal Reserve program		
As percent of GDP	1.7	4.0
As percent of Treasury debt outstanding	4.6	7.0
As percent of Treasury-guaranteed debt outstanding	4.5	3.7
Additional supporting program by Treasury?[d]	Yes	No

Sources: Meulendyke (1998), U.S. Treasury Bureau of the Public Debt, Federal Reserve Flow of Funds, and Bureau of Economic Analysis.

From: Swanson, "Let's Twist Again"

Modigliani and Sutch's Time-Series Analysis



From: Modigliani and Sutch, "Innovations in Interest Rate Policy"

Possible Problems with Previous Studies

- With quarterly data, there are lots of things moving spreads.
- Hard to know if Operation Twist didn't matter or if other factors were counteracting its effects.
- Possible endogeneity of Federal Reserve actions.

Swanson's Methodology

- High-frequency event study.
- How does that deal with problems inherent in time-series studies?

How Does Swanson Identify News?

- Source?
- Strengths?
- Possible Concerns?
- What do you think of the somewhat ad hoc event window?

Table 2. Significant Announcements Regarding Operation Twist

Announcement date	*Time*[a]	*Description*	*Event window*[b]	*Expected effect on long-term Treasury yields*
February 2, 1961 (Thursday)	"early Thursday"	President Kennedy announces goals and methods of Operation Twist, and says Federal Reserve and Treasury will both participate.	1 day (February 1–2)	Decrease
February 2, 1961 (Thursday)	"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.	1 day (February 2–3)	Decrease
February 9, 1961 (Thursday)	Not reported[c]	Federal Reserve statistics are released showing that the Fed made a rare purchase of longer-term Treasury securities.	2 days (February 8–10)	Decrease
February 20, 1961 (Monday)	2:45 p.m., "too late for the investment community . . . to become heavily involved in the market"[c]	Federal Reserve releases rare public statement explicitly endorsing Operation Twist and announces a new policy of buying Treasury securities with maturities longer than 5 years.	2 days (February 17–21)	Decrease
March 15, 1961 (Wednesday)	After the market close	Treasury announces a "surprise" refunding using 5- and 6-year notes, longer maturities than expected; markets interpret this as a decrease in Treasury and Federal Reserve commitment to Operation Twist.	1 day (March 15–16)	Increase
April 6, 1961 (Thursday)	"after the market had closed"	Federal Reserve statistics are released showing a sharp increase in Fed buying of longer-dated Treasuries on the open market, including maturities longer than 10 years for the first time.	1 day (April 6–7)	Decrease

Sources: *New York Times* and *Wall Street Journal*, various issues.

From: Swanson, "Let's Twist Again"

Swanson's Statistical Approach

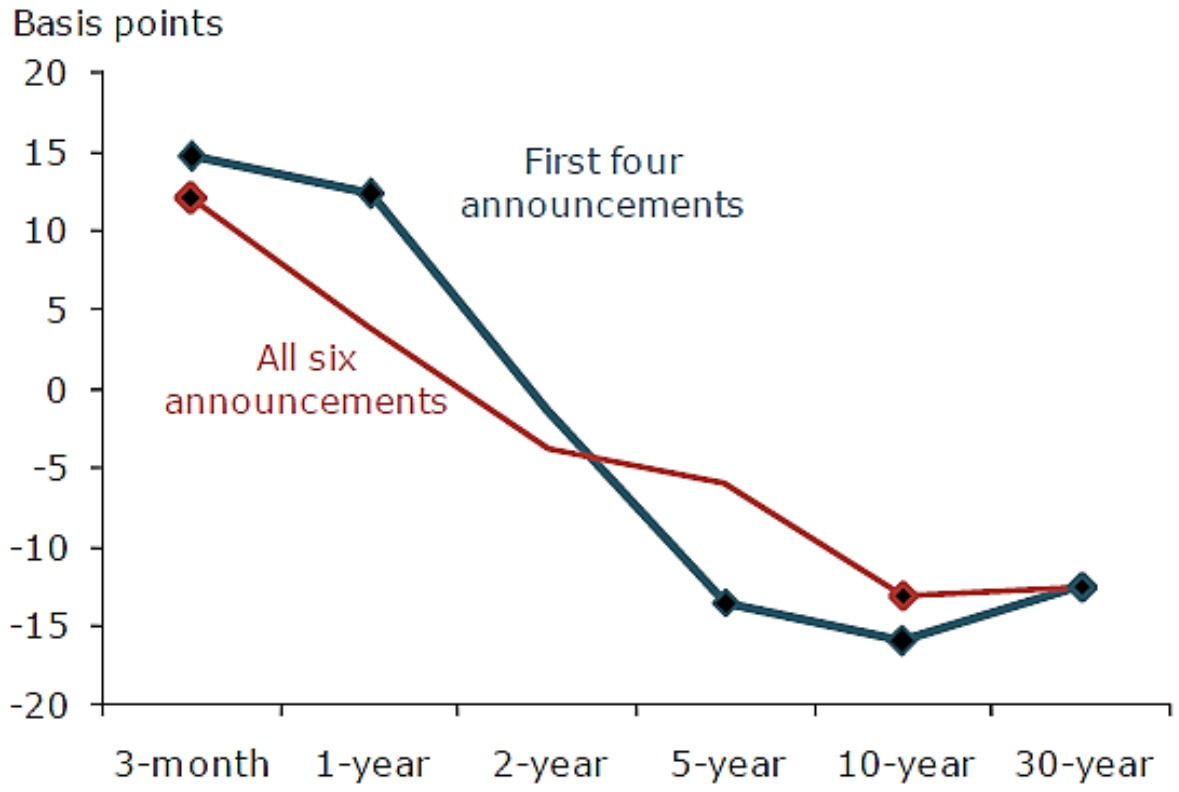
- Data source for yields by maturity and asset class.
- Null hypothesis: no effect of Operation Twist on Treasury yields at any maturity.
- Alternative hypothesis: had an impact in the expected direction (two possible channels).
- Look at how large the change is relative to the unconditional standard deviation of yield for the same asset, maturity and window length in 1962 (and also whether it is in the predicted direction).

Table 3. Treasury Yields and Estimated Impacts on Yields around Operation Twist Announcements

	Maturity					
Date or change in yield	*3-month*	*1-year*	*2-year*	*5-year*	*10-year*	*30-year*
Estimated responses to announcements (basis points)[b]						
1-day change, February 1–2	1	−0.7	−4.3*	−3.5*	−3.7**	−4***
1-day change, February 2–3	−0.2	3	3.7	−2	−3.3*	−1.5
2-day change, February 8–10	2.8	4	2	1	−1	−1
2-day change, February 17–21	11***	6*	−2.7	−9***	−8***	−6***
1-day change, March 15–16	−2.5	−3.5*	−1	8.5***	3.3*	1.5
1-day change, April 6–7	−0.2	−5**	−1.3	−1	−0.3	−1.5
Cumulative, first four announcements[c]	14.7***	12.3**	−1.3	−13.5***	−16***	−12.5***
Cumulative, all six announcements	12*	3.8	−3.7	−6	−13***	−12.5***
Unconditional standard deviation of Treasury yield changes, 1962 (basis points)[d]						
1-day changes	2.14	1.99	2.25	1.93	1.73	1.15
2-day changes	3.18	3.08	3.50	2.95	2.58	1.67
6-day changes	5.41	5.19	5.88	4.99	4.39	2.87
8-day changes	6.20	5.90	6.68	5.68	5.02	3.30

From: Swanson, “Let’s Twist Again”

Figure 1
Cumulative response of yield curve to Operation Twist



Source: Data from Swanson (2011).
Note: Black nodes are statistically significant movements.

From: Alon and Swanson, "Operation Twist and the Effect of Large-Scale Asset Purchases"

Table 4. Agency and Corporate Yields and Estimated Impacts on Yieldsaround Operation Twist Announcements

	Type of debt and maturity										
	Agency debt[a]				*Commercial paper*[b]			*Corporate bonds (Moody's indexes)*[c]		*Memorandum: Treasury debt*	
Date or change in yield	*1-year*	*2-year*	*5-year*	*10-year*	*1-month*	*3-month*	*6-month*	*Aaa*	*Baa*	*1-year*	*10-year*
Estimated responses to announcements (basis points)[e]											
1-day change, February 1–2	−0.3	−0.7	0	0	0	0	0	−1*	1	−0.7	−3.7**
2-day change, February 2–6	−2.3	3.7	−3.3	−4.3**	0	0	0	−1	−2**	4	−2.3
3-day change, February 8–14	8.3*	−2	1	−1.3	0	0	0	0	1	3	−1
3-day change, February 17–23	−1.7	−2.7	−7**	−8.7***	12.5	12.5**	0	−2**	−2*	5.7	−8.7***
2-day change, March 15–17	−2.3	−2	3.3	0	0	0	0	0	0	−4.5	4.3*
2-day change, April 6–10	−2.3	−0.7	0.7	1	0	0	0	0	−1	−3.5	1.3
Cumulative, first four announcements[f]	4	−1.7	−9.3	−14.3***	12.5	12.5	0	−4**	−2	12*	−15.7***
Cumulative, all six announcements	−0.7	−4.3	−5.3	−13.3**	12.5	12.5	0	−4**	−3	4	−10
Unconditional standard deviation of yield changes, 1962 (basis points)[g]											
1-day changes	2.15	2.19	2.01	1.52	4.44	3.63	5.00	0.56	0.62	1.99	1.73
2-day changes	3.04	3.10	2.84	2.15	6.28	5.14	7.07	0.72	0.87	3.08	2.58
3-day changes	3.72	3.80	3.48	2.64	7.69	5.90	8.65	0.90	1.05	4.17	3.31
9-day changes	6.44	6.58	6.03	4.57	13.32	10.45	14.99	1.56	1.83	6.94	5.62
13-day changes	7.74	7.91	7.25	5.49	16.01	12.73	18.01	1.87	2.21	8.20	6.70

Sources: *Wall Street Journal*, various issues; Federal Reserve H15 report, various issues; *Moody's Bond Survey*, various issues; author's calculations.

From: Swanson, "Let's Twist Again"

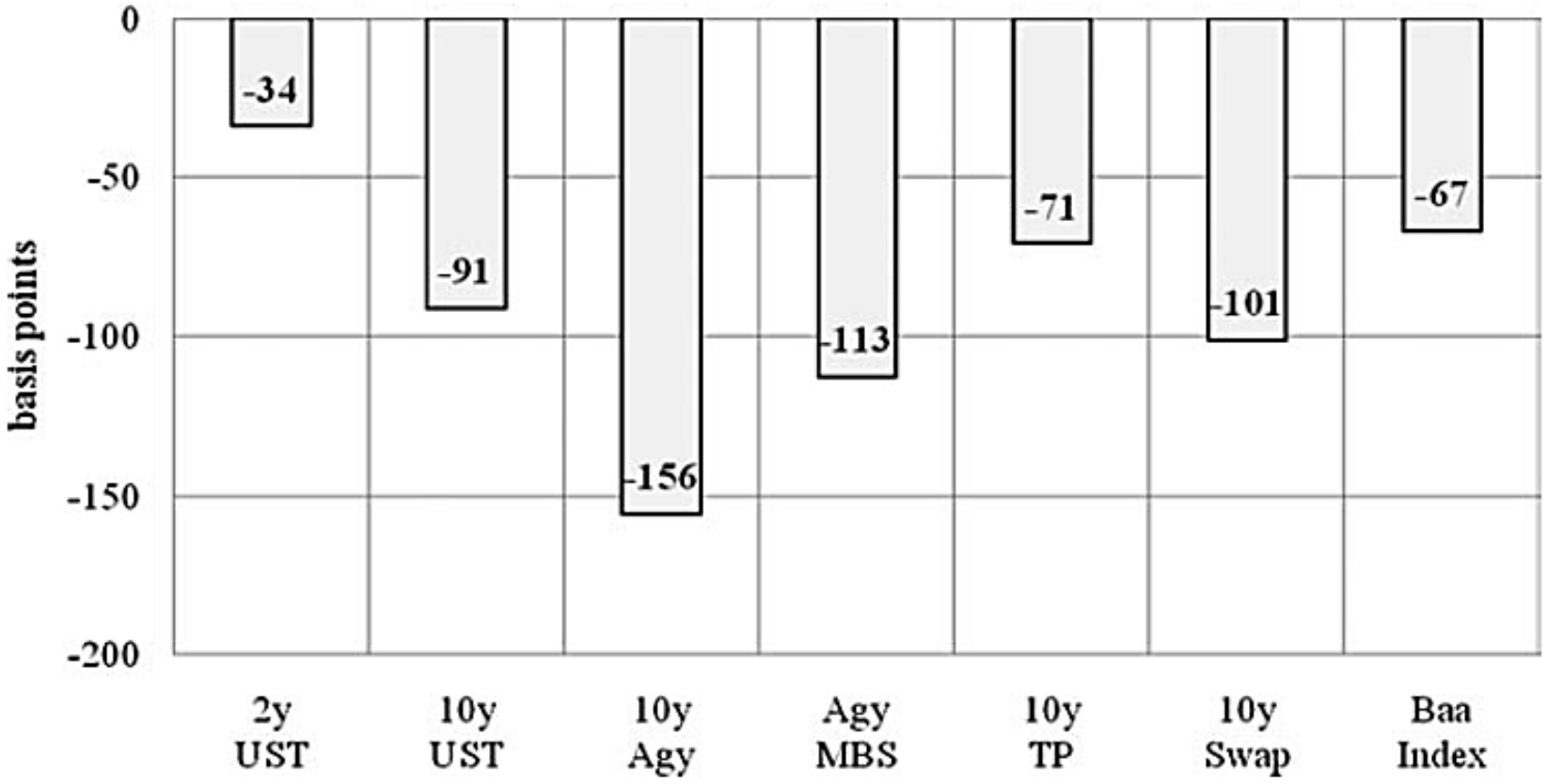
What is Swanson's explanation for the different responses of various interest rates?

Evaluation

- Bottom line on the quality of the evidence.
- Implications for the effects of quantitative easing.

III. Arvind Krishnamurthy and Annette Vissing-Jorgensen, "The Effects of Quantitative Easing on Interest Rates"

Figure 5. Cumulative Interest Changes on Baseline Event Set Days



Source: Bloomberg, Barclays Capital.

From: Gagnon et al.

Table 1. Interest Rate Changes around Baseline and Extended Event Set Announcements

Date	Event	2y UST	10y UST	10y Agy	Agy MBS[b]	10y TP	10y Swap	Baa Index
11/25/2008[a]	Initial LSAP Announcement	−2	−22	−58	−44	−17	−29	−18
12/1/2008[a]	Chairman Speech	−8	−19	−39	−15	−17	−17	−12
12/16/2008[a]	FOMC Statement	−9	−26	−29	−37	−12	−32	−11
1/28/2009[a]	FOMC Statement	10	14	14	11	9	14	2
3/18/2009[a]	FOMC Statement	−22	−47	−52	−31	−40	−39	−29
4/29/2009	FOMC Statement	1	10	−1	6	6	8	−3
6/24/2009	FOMC Statement	10	6	3	2	4	4	5
8/12/2009[a]	FOMC Statement	−2	5	4	2	3	1	2
9/23/2009[a]	FOMC Statement	1	−3	−3	−1	−1	−5	−4
11/4/2009[a]	FOMC Statement	−2	6	8	1	5	5	3
Baseline Event Set		*−34*	*−91*	*−156*	*−113*	*−71*	*−101*	*−67*
Baseline Set + All FOMC		*−1*	*−55*	*−134*	*−114*	*−47*	*−75*	*−72*
Cumulative Change: 11/24/08 to 3/31/2010		*−19*	*50*	*−75*	*−95*	*30*	*28*	*−489*
Std Dev of Daily Changes: 11/24/08 to 3/31/10		*5*	*8*	*9*	*10*	*6*	*9*	*7*

From: Gagnon et al.

General Issues with Event Studies

What Is the Event Telling Us about?

Example: The Fed announces QE.

- The event is telling us about the effects of a change in the probability of QE, not about QE for sure vs. no QE for sure.
- The event may be in part telling us about the effects of the specifics of QE (for example, its composition).
- We can't assume that it is telling about the effects of QE holding expectations of future Fed policy rates constant.
- We can't assume that it is telling us about the effects, holding constant beliefs about the path of the economy for a given monetary policy – the announcement may reveal some of the Fed's information about the economy.

What Is the Right Window to Consider?

Depends on:

- How difficult the news is to interpret.
- How liquid markets are.
- Whether any of the news comes out *before* any official announcement.

Two Additional Issues with Event Studies

- How to treat background “noise”?
- What do financial market participants have expertise about?

Krishnamurthy and Vissing-Jorgensen's Channels

- Duration risk.
- Liquidity.
- Safety premium.
- Signaling.
- Prepayment risk.
- Default risk.
- Inflation.

$$r_{risky,\ illiq\ ,long-term} = E\left[i_{safe,\ liq\ ,short-term}\right] - \pi^{e}$$
$$+ Duration \times P_{DurationRisk}$$
$$+ Illiquidity \times P_{Liquidity}$$
$$+ LackofSafety \times P_{Safety}$$
$$+ DefaultRisk \times P_{DefaultRisk}$$
$$+ PrepaymentRisk \times P_{PrepaymentRisk}.$$

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

Results for QE1

Table 2. Changes in Federal Funds Futures Yields around QE1 and QE2 Event Dates[a]
Basis points

	Federal funds futures, contract maturity			
Date[b]	*3rd month*	*6th month*	*12th month*	*24th month*
QE1[c]	−6	−5	−8	−16
Nov. 25, 2008	−6	−3	−7	−20
Dec. 1, 2008	−13	−15	−10	−11
Dec. 16, 2008	−1	−1	−1	19
Jan. 28, 2009	−2	−4	−8	−11
Mar. 18, 2009	−28*	−27	−33**	−40
Sum[d]				
QE2				
Aug. 10, 2010				
One-day change	0	0	−2	−3
Two-day change	0	0	−3	−8
Sep. 21, 2010				
One-day change	0	−1	−3	−8
Two-day change	0	−1	−3	−8
Sum[d]				
One-day changes	0***	−1	−4***	−11***
Two-day changes	0***	−1	−5***	−16***

Source: Authors' calculations using Bloomberg data.

a. Asterisks denote statistical significance at the ***1 percent, **5 percent, and *10 percent level.

b. See table 1 for descriptions of events on QE1 dates; QE2 dates are those of FOMC statements regarding QE2.

c. All changes in yields for QE1 are 2-day changes, from the day before to the day after the event.

d. Because our significance tests are based on comparing changes on QE announcement days with changes on other days, changes on QE announcement days of zero can be statistically significant. For the 3-month federal funds futures, changes on non-QE days were on average slightly negative. Values may differ from the sum of the values reported for individual dates because of rounding.

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

Table 1. Changes in Treasury, Agency, and Agency MBS Yields around QE1 Event Dates[a]
Basis points

		Treasury yields (constant maturity)					*Agency (Fannie Mae) yields*				*Agency MBS yields[b]*	
Date	*Event*	*30-year*	*10-year*	*5-year*	*3-year*	*1-year*	*30-year*	*10-year*	*5-year*	*3-year*	*30-year*	*15-year*
Nov. 25, 2008	Initial announcement	−24	−36	−23	−15	−2	−57	−76	−57	−42	−72	−88
Dec. 1, 2008	Bernanke speech	−27	−25	−28	−15	−13	−52	−67	−50	−33	−14	12
Dec. 16, 2008	FOMC statement	−32	−33	−15	−4	−5	−37	−39	−26	−25	−26	−16
Jan. 28, 2009	FOMC statement	31	28	28	19	4	33	28	27	14	31	20
Mar. 18, 2009	FOMC statement	−21	−41	−36	−24	−9	−31	−45	−44	−35	−27	−16
Sum of above five dates[c]		−73*	−107**	−74	−39	−25**	−144**	−200***	−150***	−123***	−107*	−88

Sources: FRED, Federal Reserve Bank of St. Louis; Bloomberg.

a. All changes are over 2 days, from the day before to the day after the event. Asterisks denote statistical significance at the ***1 percent, **5 percent, and *10 percent level.

b. Averages across current-coupon Ginnie Mae, Fannie Mae, and Freddie Mac MBSs.

c. May differ from the sum of the values reported for individual dates because of rounding.

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

Table 3. Changes in Corporate Yields, Unadjusted and Adjusted by Credit Default Swap Rates, around QE1 Event Dates[a]
Basis points

	Corporate yields											
	Long-term						*Intermediate-term*					
Date[b]	*Aaa*	*Aa*	*A*	*Baa*	*Ba*	*B*	*Aaa*	*Aa*	*A*	*Baa*	*Ba*	*B*
Nov. 25, 2008	−28	−18	−23	−19	−4	4	−17	−15	−18	−18	1	−47
Dec. 1, 2008	−24	−24	−21	−17	−13	28	−21	−15	−18	−8	−5	6
Dec. 16, 2008	−43	−37	−45	−39	1	−11	−19	−21	−24	−27	−28	−42
Jan. 28, 2009	34	17	17	14	−16	−25	12	8	7	3	−32	−25
Mar. 18, 2009	−16	−21	−21	−20	−28	−39	−43	−50	−39	−26	−18	−22
Sum[c]	−77	−83**	−93**	−81**	−60**	−43	−88**	−93**	−92**	−76**	−82***	−130***
	Credit default swap rates[d]											
	10-year maturity						*5-year maturity*					
Nov. 25, 2008	−1	10	−17	−13	−31	−798	−1	−6	−20	−18	−32	−573
Dec. 1, 2008	1	0	9	11	21	1	1	3	13	7	28	33
Dec. 16, 2008	−2	−8	−18	−17	−23	−308	−2	−15	−20	−21	−40	−172
Jan. 28, 2009	−3	−15	−6	−13	−26	−231	−3	−7	−9	−11	−27	−255
Mar. 18, 2009	−2	−1	0	−7	−18	−18	−2	8	2	−8	−27	−25
Sum[e]	−7***	−14	−32	−40*	−78*	−1,354**	−6***	−17	−33	−51**	−98*	−991**

(continued)

From: Krishnamurthy and Vissing-Jorgensen, “The Effects of Quantitative Easing”

Table 4. Changes in Inflation Swap Rates, TIPS Yields, and Implied Interest Rate Volatility around QE1 Event Dates[a]
Basis points

	Inflation swap rates				*TIPS real yield (constant maturity)*			*Implied interest rate volatility[c]*
Date[b]	*30-year*	*10-year*	*5-year*	*1-year*	*20-year*	*10-year*	*5-year*	
Nov. 25, 2008	1	−6	−28	48	−22	−43	5	1
Dec. 1, 2008	15	27	12	−40	−38	−34	−52[d]	−7
Dec. 16, 2008	4	37	35	−17	−45	−57	−83	−20
Jan. 28, 2009	14	15	−6	5	15	6	13	0
Mar. 18, 2009	2	22	24	45	−45	−59	−43	−11
Sum[e]	35**	96**	38	41	−135***	−187***	−160**	−38***

Sources: FRED, Federal Reserve Bank of St. Louis; Bloomberg.

a. All changes are over 2 days, from the day before to the day after the event. Asterisks denote statistical significance at the ***1 percent, **5 percent, and *10 percent level.

b. See table 1 for descriptions of the events on these dates.

c. Volatility implied from swaptions as measured using the Barclays implied volatility index.

d. The constant-maturity TIPS data from FRED indicate that the 5-year TIPS fell by 244 bp around this event. We think this is a data error. Using data from FRED on the 5-year and 10-year underlying TIPS with remaining maturities near 5 years around QE1 (the 5-year TIPS maturing April 15, 2013, and the 10-year TIPS maturing January 15, 2014), we found yield changes of −58 bp and −46 bp, respectively. The value reported in the table is the average of these changes.

e. May differ from the sum of the values reported for individual dates because of rounding.

From: Krishnamurthy and Vissing-Jorgensen, “The Effects of Quantitative Easing”

Results for QE2

Table 2. Changes in Federal Funds Futures Yields around QE1 and QE2 Event Dates[a]
Basis points

	Federal funds futures, contract maturity			
Date[b]	*3rd month*	*6th month*	*12th month*	*24th month*
QE1[c]	−6	−5	−8	−16
Nov. 25, 2008	−6	−3	−7	−20
Dec. 1, 2008	−13	−15	−10	−11
Dec. 16, 2008	−1	−1	−1	19
Jan. 28, 2009	−2	−4	−8	−11
Mar. 18, 2009	−28*	−27	−33**	−40
Sum[d]				
QE2				
Aug. 10, 2010				
One-day change	0	0	−2	−3
Two-day change	0	0	−3	−8
Sep. 21, 2010				
One-day change	0	−1	−3	−8
Two-day change	0	−1	−3	−8
Sum[d]				
One-day changes	0***	−1	−4***	−11***
Two-day changes	0***	−1	−5***	−16***

Source: Authors' calculations using Bloomberg data.

a. Asterisks denote statistical significance at the ***1 percent, **5 percent, and *10 percent level.

b. See table 1 for descriptions of events on QE1 dates; QE2 dates are those of FOMC statements regarding QE2.

c. All changes in yields for QE1 are 2-day changes, from the day before to the day after the event.

d. Because our significance tests are based on comparing changes on QE announcement days with changes on other days, changes on QE announcement days of zero can be statistically significant. For the 3-month federal funds futures, changes on non-QE days were on average slightly negative. Values may differ from the sum of the values reported for individual dates because of rounding.

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

Table 7. Changes in Inflation Swap Rates, TIPS Yields, and Implied Interest Rate Volatility around QE2 Event Dates[a]
Basis points

	Inflation swaps				*TIPS real yield (constant maturity)*			*Implied interest rate volatility*[b]
Date	*30-year*	*10-year*	*5-year*	*1-year*	*20-year*	*10-year*	*5-year*	
Aug. 10, 2010								
One-day change	5	−1	−3	0	−7	−9	−8	−2
Two-day change	−2	0	−3	−4	−5	−9	−5	−3
Sep. 21, 2010								
One-day change	6	6	6	−1	−13	−16	−14	−1
Two-day change	6	4	7	9	−18	−20	−18	−2
Nov. 3, 2010								
One-day change	6	−3	2	1	8	1	−6	−2
Two-day change	1	−11	4	14	12	−5	−14	−3
Sum of Aug. 10 and Sep. 21[c]								
One-day change	11***	5	3	−1	−20***	−25***	−22***	−3***
Two-day change	4	4	4	5	−23***	−29***	−23***	−5***

Sources: FRED, Federal Reserve Bank of St. Louis; Bloomberg.
a. Dates are those of FOMC statements regarding QE2. Asterisks denote statistical significance at the ***1 percent, **5 percent, and *10 percent level.
b. Volatility implied from swaptions as measured using the Barclays implied volatility index.
c. May differ from the sum of the values reported for individual dates because of rounding.

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

Table 5. Changes in Treasury, Agency, and Agency MBS Yields around QE2 Event Dates[a]
Basis points

	Treasury yields (constant maturity)					*Agency (Fannie Mae) yields*				*Agency MBS yields[b]*	
Date	*30-year*	*10-year*	*5-year*	*3-year*	*1-year*	*30-year*	*10-year*	*5-year*	*3-year*	*30-year*	*15-year*
Aug. 10, 2010											
One-day change	−1	−7	−8	−3	−1	−2	−7	−8	−4	−1	−4
Two-day change	−8	−14	−10	−3	−1	−8	−13	−9	−7	−4	−8
Sep. 21, 2010											
One-day change	−8	−11	−9	−5	0	−8	−11	−9	−6	−8	−8
Two-day change	−13	−16	−10	−5	−1	−14	−16	−10	−6	−4	−5
Nov. 3, 2010											
One-day change	16	4	−4	−2	0	13	5	−5	−3	−4	−4
Two-day change	11	−10	−11	−6	−1	4	−10	−14	−8	−10	−9
Sum of Aug. 10 and Sep. 21[c]											
One-day change	−9*	−18***	−17***	−8***	−1	−9**	−17***	−17***	−10***	−9*	−12***
Two-day change	−21***	−30***	−20***	−8***	−2	−22***	−29***	−20***	−13***	−8	−13**

Sources: FRED, Federal Reserve Bank of St. Louis; Bloomberg.
a. Dates are those of FOMC statements regarding QE2. Asterisks denote statistical significance at the ***1 percent, **5 percent, and *10 percent level.
b. Averages across current-coupon Ginnie Mae, Fannie Mae, and Freddie Mac MBSs.
c. May differ from the sum of the values reported for individual dates because of rounding.

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

FOMC Statement, September 21, 2011

"The Committee intends to purchase, by the end of June 2012, $400 billion of Treasury securities with remaining maturities of 6 years to 30 years and to sell an equal amount of Treasury securities with remaining maturities of 3 years or less. This program should put downward pressure on longer-term interest rates and help make broader financial conditions more accommodative. …

"To help support conditions in mortgage markets, the Committee will now reinvest principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities."

"From September 20 to 21, [2011,] long-term interest rates decline substantially and across the board. The largest decline, 23 bp, is in the 30-year MBS …; the yield on the comparable -duration 10-year Treasury declines by 7 bp, that on the 10-year agency by 2 bp, and long-term corporate rates from the Aaa to the Baa category by between 15 and 17 bp. These moves are plausibly affected by an MBS risk premium channel, with attendant effects for corporate borrowing rates, as in QE1. On the other hand, the market responses differ in three other ways from those following to QE1. First, the federal funds futures contract barely moves …, suggesting a negligible signaling channel. … Second, default risk rises, with 10-year investment-grade CDS rates rising by 9 bp and high-yield CDS rates rising by 1 bp. … The rise in perceived default risk … is puzzling to us. One possible answer …. Finally, unlike in both QE1 and QE2, inflation expectations measured from inflation swaps are down 8 bp at the 30-year horizon and 4 bp at the 10-year horizon. It is possible that since QE3 involved no change in the monetary base, markets perceived the operation to not be inflationary. …"

From: Krishnamurthy and Vissing-Jorgensen, "The Effects of Quantitative Easing"

IV. Eric Swanson and John Williams, "Measuring the Effect of the Zero Lower Bound on Medium- and Longer-Term Interest Rates"

Key Ideas

- There may be a big difference between monetary policy currently being at the zero lower bound and it being at the zero lower bound and expected to remain there for a long time.
    - One specific place where this distinction may be important: interpreting the implications of evidence on cross-section fiscal multipliers.
- How interest rates of different maturities respond to news may provide evidence about this issue.

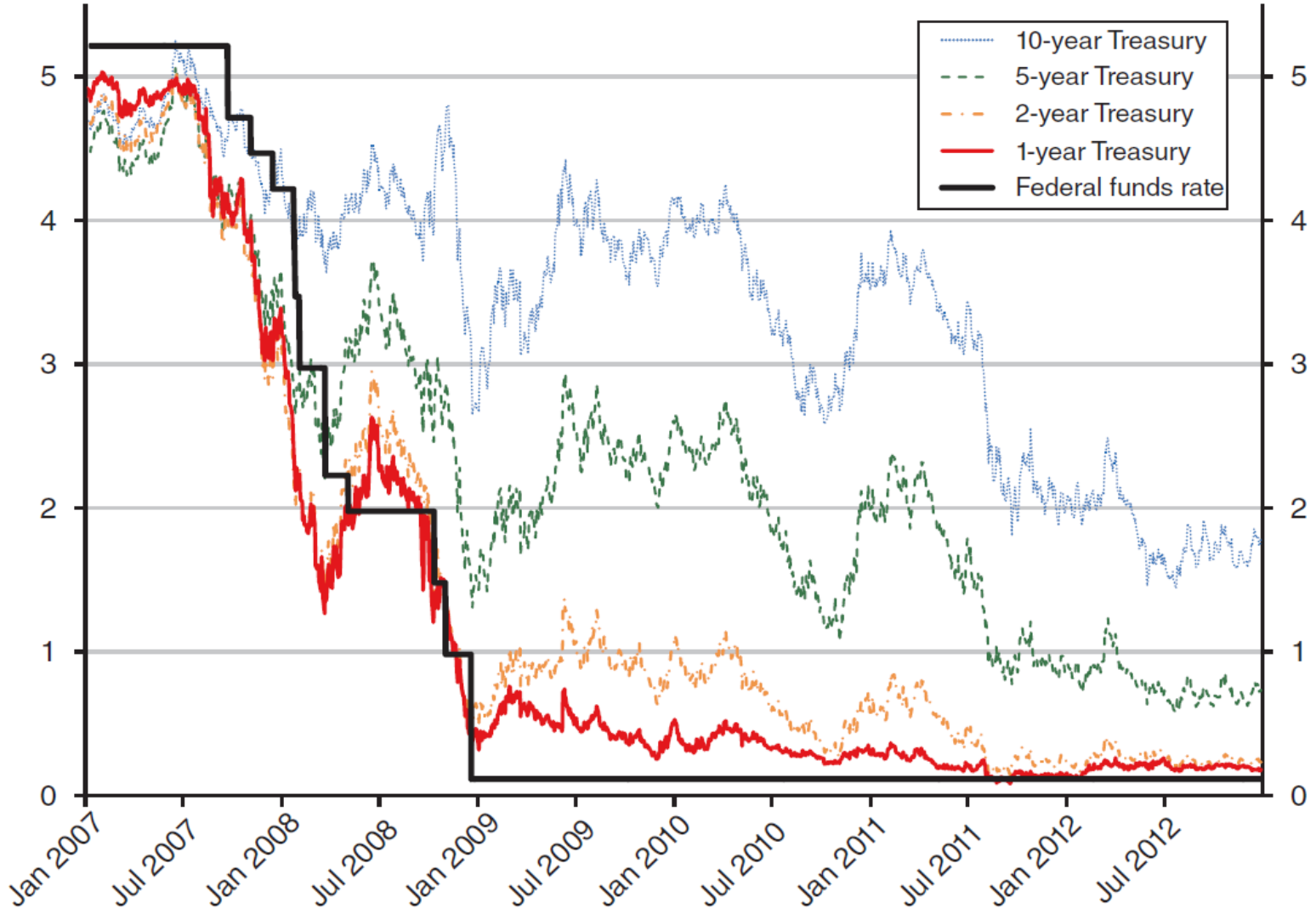


FIGURE 1. FEDERAL FUNDS RATE TARGET AND ZERO-COUPON TREASURY YIELDS

From: Swanson and Williams, "Measuring the Effect of the Zero Lower Bound"

Ideas That Are Illustrated by Their Model

- When the short-term rate, i^{ST}, equals 0 but is not expected to remain 0 forever, *i*'s for all horizons respond less to news than if $i^{ST} > 0$.
- For a given maturity, the damping is greater the longer i^{ST} is expected to remain at 0.
- For a given expected duration of $i^{ST} = 0$, the damping is greater the shorter the maturity.
- The damping of the response to different shocks is similar if the persistence of the shocks is similar.
- The damping is roughly symmetric for positive and negative shocks.

A Tension in S&W's Theoretical Analysis

- The theory is based on the new Keynesian IS curve, which implies that *y* depends only on a very long-term interest rate:

$$y(t) = \int_{\tau=0}^{\infty} [i(t+\tau) - \pi(t+\tau) - \rho] d\tau\,(t).$$

- But S&W look at the behavior of many different interest rates, not just very long-term ones.

- Probably a good decision—related to the "forward guidance puzzle."

Specification

$$\Delta i_t = \gamma_t + \delta_t \beta' X_t + \varepsilon_t.$$

- Estimated separately for each maturity.
- Daily data, 1990–2012.
- X_t is a vector of surprise components of macroeconomic data releases. (So most observations are zero. Days where all the elements of $X = 0$ are excluded.) β is a vector.
- δ_t is a scalar (as is γ_t). In the baseline, the δ_t's are constant within each year but can vary across years. Their mean over 1990–2000 is normalized to 1.
- Estimation by nonlinear least squares.

Steps

- Obtain a time series for $\hat{\delta}_t$.
- Compare $\hat{\delta}_t$ for a time when the funds rate was close to the zero lower bound to the average $\hat{\delta}_t$ for normal times (1990–2000).
    - If it is similar to its value in normal times, as if the zero lower bound is not important to the behavior of interest rates.
    - If it is less, how much lower is a measure of how important the zero lower bound is to the behavior of interest rates.

TABLE 2—COEFFICIENT ESTIMATES β FROM NONLINEAR REGRESSION $\Delta y_t = \gamma^{\tau_i} + \delta^{\tau_i}\beta \mathbf{X}_t + \varepsilon_t$

	Treasury yield maturity					
	3-month		2-year		10-year	
Capacity utilization	0.73	(1.56)	1.49	(2.89)	0.68	(2.02)
Consumer confidence	0.75	(2.90)	1.37	(3.71)	0.84	(2.43)
Core CPI	0.39	(1.88)	1.89	(5.00)	1.17	(3.60)
GDP (advance)	0.92	(3.15)	1.42	(2.40)	0.95	(1.69)
Initial claims	−0.30	(−1.82)	−1.10	(−5.35)	−0.95	(−5.02)
ISM manufacturing	1.23	(3.24)	2.72	(7.09)	1.98	(5.96)
Leading indicators	0.20	(0.62)	0.28	(0.85)	0.28	(1.01)
New home sales	0.83	(2.65)	0.65	(1.99)	0.50	(1.93)
Nonfarm payrolls	3.03	(7.67)	4.79	(9.54)	2.95	(6.79)
Core PPI	0.22	(0.79)	0.52	(1.54)	0.85	(3.14)
Retail sales ex. autos	0.83	(3.76)	1.86	(4.92)	1.62	(4.31)
Unemployment rate	−1.24	(−3.53)	−1.26	(−2.78)	−0.41	(−1.07)
Observations	2,829		2,829		2,829	
R^2	0.08		0.17		0.10	
H_0 : β constant, p-value	0.598		0.265		0.630	
H_0 : δ symmetric, p-value	0.095		0.310		0.319	
H_0 : δ constant, p-value	$<10^{-16}$		$<10^{-16}$		0.015	

Notes: Regression is at daily frequency on days of announcements from January 1990 to December 2012. Coefficients indexed τ_i may take on different values in different calendar years. Δy_t and $\mathbf{X}_t$ are as in Table 1. Heteroskedasticity-consistent t-statistics in parentheses. H_0 : β constant p-value is for the test that β is fixed over time and only the δ^{τ_i} vary. H_0 : δ symmetric tests whether δ^{τ_i} is the same for positive and negative surprises $\beta \mathbf{X}_t$. H_0 : δ constant tests whether $\delta^{\tau_i} = 1$ for all years i. See text for details.

From: Swanson and Williams, "Measuring the Effect of the Zero Lower Bound"

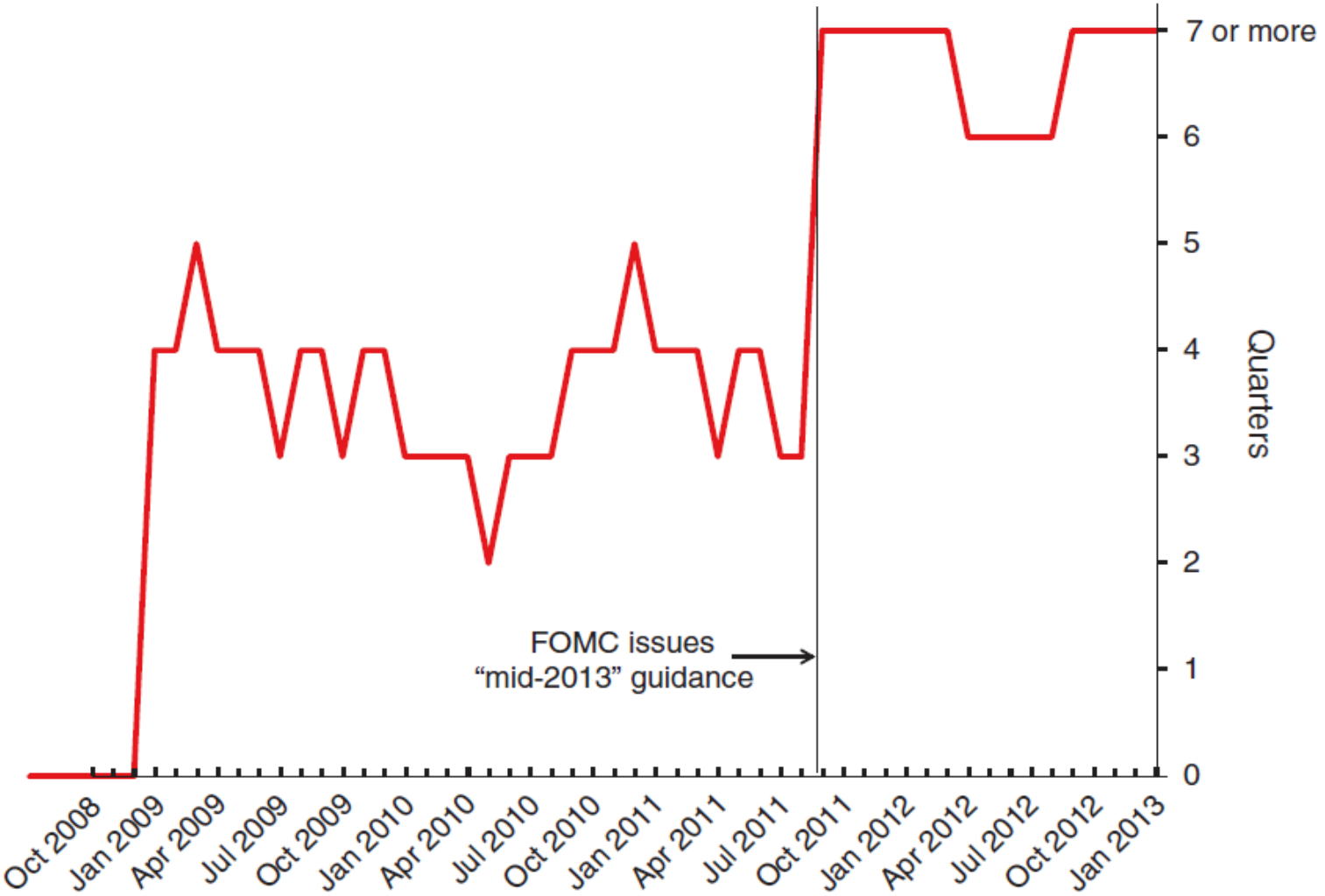


FIGURE 4. EXPECTED NUMBER OF QUARTERS
UNTIL FIRST FEDERAL FUNDS RATE INCREASE TO 25 BP OR HIGHER

From: Swanson and Williams, "Measuring the Effect of the Zero Lower Bound"

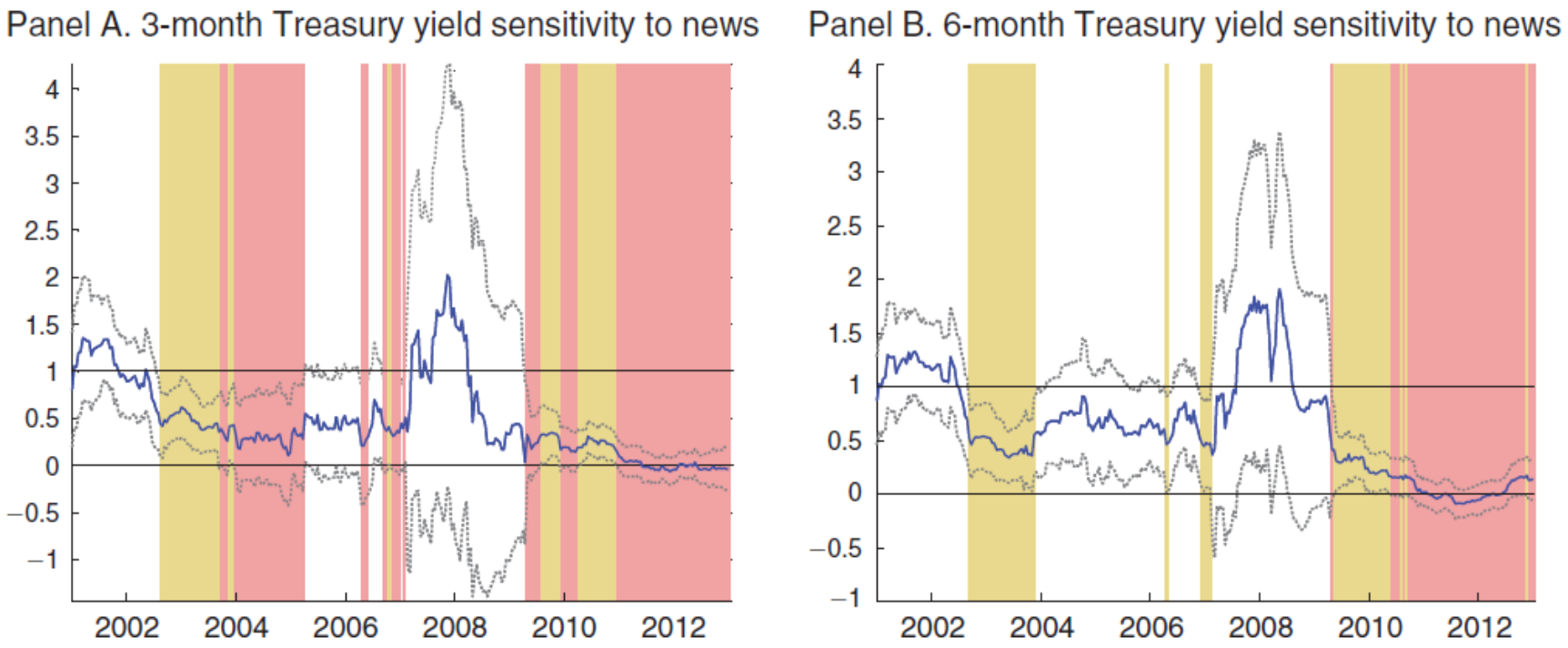
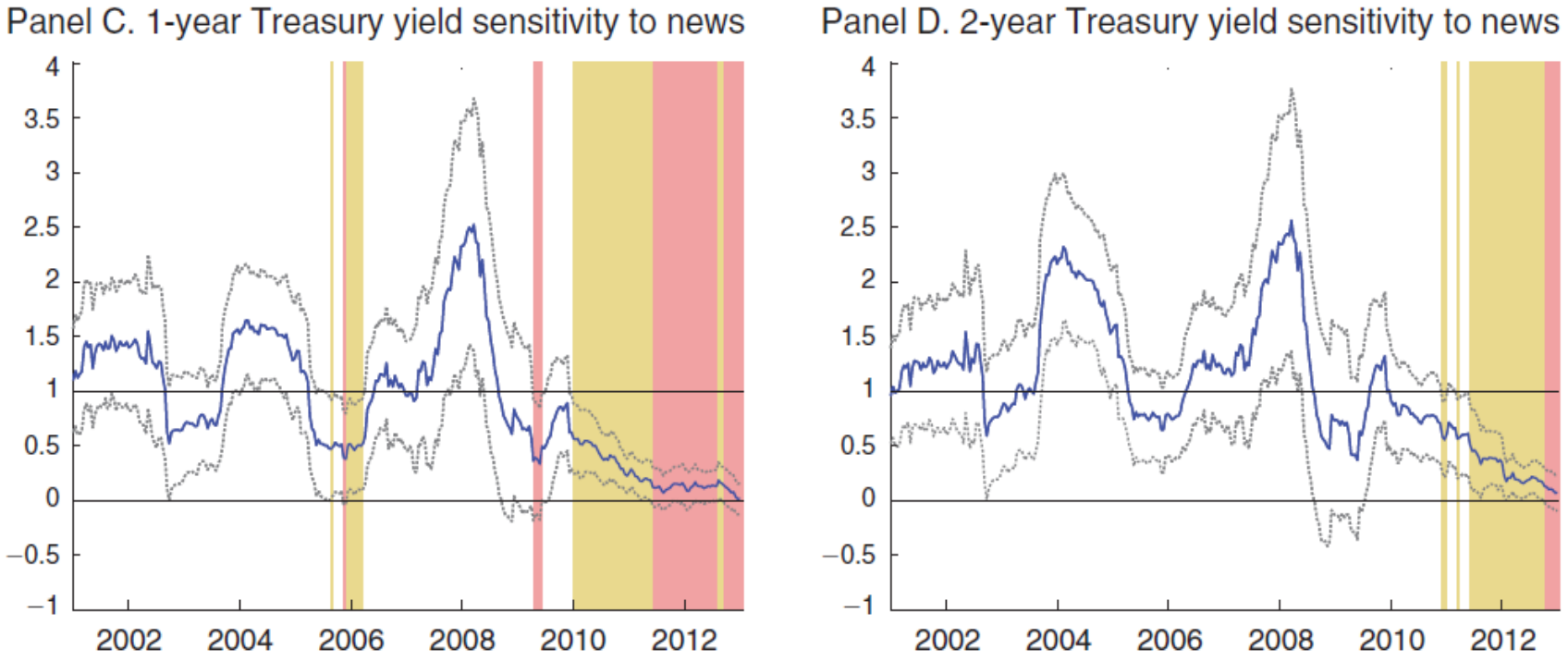


FIGURE 3. TIME-VARYING SENSITIVITY COEFFICIENTS δ^τ FROM REGRESSION (10)

Notes: Dotted gray lines depict heteroskedasticity-consistent ± 2-standard-error bands, adjusted for two-stage sampling uncertainty in (10). $\delta^\tau = 1$ corresponds to normal Treasury sensitivity to news; $\delta^\tau = 0$ to complete insensitivity. Lightly shaded regions (yellow shaded in color) denote δ^τ significantly less than 1; darker shaded regions (red shaded in color) denote δ^τ significantly less than 1 and not significantly different from 0. See text for details.

From: Swanson and Williams, "Measuring the Effect of the Zero Lower Bound"



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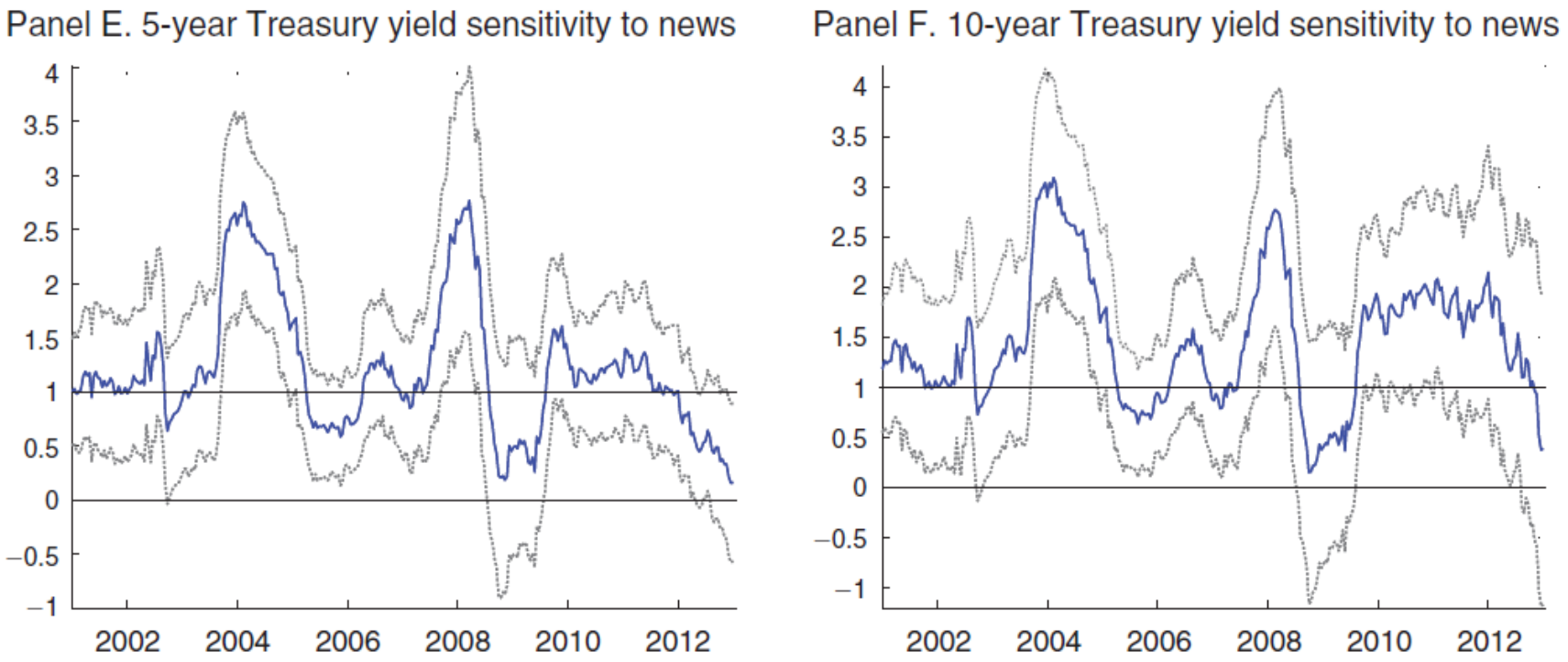

FIGURE 3. TIME-VARYING SENSITIVITY COEFFICIENTS δ^{τ} FROM REGRESSION (10)

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From: Swanson and Williams, "Measuring the Effect of the Zero Lower Bound"

Possible Mechanisms

- We can write a long-term interest rate as the expected average short-term rate plus a term premium.

- So the effects could operate through:
    - Expectations about future short-term rates.
    - The term premium (which could be affected by expectations about QE).

Possible Concerns?

- Other sources of time-variation. For example, Swanson and Williams discuss possible effects via the level of short-term rates and uncertainty about future short-term rates unrelated to the zero lower bound.
- Is the spike in estimated sensitivity c. 2008 important?
- Suppose the NKIS curve isn't the right way to understand the effects of changes in interest rates.
- Failure to reject hypotheses vs. accepting them.
- Other?