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during QE1–QE3

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## **Supply and demand shifts of shorts before Fed announcements during QE1–QE3**

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## **Supply and demand shifts of shorts before Fed announcements during QE1–QE3**

### **Abstract**

Cohen, Diether, and Malloy (Journal of Finance, 2007), find that shifts in the demand curve predict negative stock returns. We use their approach to examine changes in supply and demand at the time of FOMC announcements. We show that shifts in the demand for borrowing Treasuries and agencies predict quantitative easing. A reduction in the quantity demanded at all points along the demand curve predicts expansionary quantitative easing announcements.

## **Supply and demand shifts of shorts before Fed announcements during QE1 – QE3**

### **1. Introduction**

Cohen, Diether, and Malloy (2007) show that shorting demand is an important predictor of future stock returns. We investigate whether shorting demand is a predictor of unconventional Fed policy announcements during Quantitative Easing 1 (QE1), 2008-2010; QE 2, 2010-2011; the Maturity Extension Program (MEP), 2011-2012; and QE 3, 2012-2014.

Short sellers are widely viewed as informed, sophisticated investors. In equity markets, short sales correctly predict negative returns (Aitken, Frino, McCorry, and Swan 1998; Boehmer, Jones, and Zhang 2008; Diether, Lee, and Werner 2009; Cohen, Diether, and Malloy 2007) and shorts have superior ability to process news (Engelberg, Reed, and Ringgenberg 2012). In bond markets, Hendershott, Kozhan, and Roman (2017) find that corporate-bond shorts predict future bond returns; Nashikkar and Pedersen (2007) find that shorts anticipate rating changes. In contrast, Asquith, Au, Covert, and Pathak (2013) find that heavily-shortened corporate bonds do not earn abnormal returns.

We find the demand for short positions for Treasuries and agencies decreases before Fed buy announcements.

### **2. Data and research methodology**

Our sample of Treasuries and agencies comes from Markit Securities Finance. Prime brokers, custodians, asset managers, and hedge funds report these lending data. Our proxies are short

interest, *Borrowed Quantity*, the par value of debt on loan, shorting cost, *Borrowing Fee*, the bps fee. Our data are for 2007-2017. Intervals without an announcement are our control period.

Our sample comprises securities with (1) time-to-maturity  $> 5$  years at least once, (2) mean *Available Quantity* of greater than \$10 million, (3) mean *Borrowed Quantity* greater than \$1 million, and (4) at least 30 daily observations.

We focus on important Fed announcements during QE1, QE2, MEP, and QE3. We classify these announcements as “buy” and “slow” based on the announcement language and the change on the 10-year Treasury yield the day after the announcement. Buy announcements have both expansionary language and decreased yields. Slow announcements have contractionary or decreased policy actions and increased yields. We eliminate announcements that do not fit into either of these categories. Table 1 provides a list and description of the buy and slow announcements.

We employ Cohen, Diether, and Malloy’s (2007) technique that infers shifts in supply and demand curves as follows: increase in *Borrowed Quantity* and *Borrowing Fee* indicates a demand curve shift out (*DOUT*); decrease in *Borrowed Quantity* and *Borrowing Fee* indicates a demand shift in (*DIN*); increase in *Borrowed Quantity* and a decrease in *Borrowing Fee* indicates a supply curve shift out (*SOUT*); and decrease in *Borrowed Quantity* and an increase in *Borrowing Fee* indicates a supply curve shift in (*SIN*). If there is a decline in the demand for borrowing following the LSAP announcements, we expect a *DIN*. Aggarwal, Bai, and Laeven (2016) employ a similar technique to study European government bond lending markets during periods of market stress. We test two hypotheses:

**Hypothesis 1:** Securities experience a *DIN* before buy announcements

Buy announcements reduce the demand for securities to short, reducing the *Borrowing Fee* and *Borrowed Quantity*.

**Hypothesis 2:** Securities experience a *DOUT* before slow announcements

Slow announcements increase the demand for securities to short, increasing the *Borrowing Fee* and *Borrowed Quantity*.

Given that shorts are believed to be informed, we expect that the changes will occur before the announcements. To test these hypotheses, we compare the distribution of shifts before the announcements with the distribution for a control sample using the chi-squared test of equality.

**3. Empirical results**

We test our hypotheses using one week and one-month intervals before the announcements. The results are broadly consistent across time periods but become slightly more pronounced for slow announcements when looking at months, indicating that shorts anticipate Fed moves farther out than one week.

In Table 2, Panels A and B, we assess supply and demand shifts one week before the announcements. For buy announcements, *DIN* is the largest shift category with 44% for agencies and 42% for Treasuries, while the second largest groups are *SOUT* (25%) for agencies and *SIN* (23%) for Treasuries. Using the chi-squared test, we reject the null hypothesis that the shift category distributions for buy announcements equal the control distribution for both agencies and Treasuries (p-value <0.001), supporting Hypothesis 1.

For slow announcements, *DOUT* is the largest shift category for agencies (31%), and *SOUT* is the largest shift category for Treasuries (27%). For agencies, we fail to reject the null hypothesis that the distribution of the slow announcements is the same as that of the control group; however, for Treasuries, we reject the null at the 10% level. Therefore, we reject Hypothesis 2 for *DOUT* before slow announcements for both agencies and Treasuries using a one week window.

Table 2, Panels C and D, report results for the longest shift window in our study—one month. For buy announcements, we find support for Hypothesis 1. The distributions are significantly different than the control, and the largest category is *DIN* for agencies and Treasuries (52% and 37%, respectively). For slow announcements, we do not find support for Hypothesis 2 as the largest category agencies and Treasuries are not *DOUT*.

#### **4. Conclusion**

The unique approach of Cohen, Diether, and Malloy (2007) provides a tool to test whether shorts predicted Fed announcements during QE1–QE3. To summarize our findings, we find that most securities experience a demand shift inward one week and one month before Fed buy announcements for both agencies and Treasuries. Further, the distribution of shifts before buy announcements is statistically different than for our control period.

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**Table 1. QE announcements and classification**

<b>Buy Events</b>	
11/25/2008	FOMC announces intended purchases of \$100 billion in GSE debt and up to \$500 billion in MBS.
12/1/2008	Bernanke speech Chairman Bernanke says that the Fed could purchase long-term Treasuries.
12/16/2008	FOMC statement FOMC first mentions the possible purchase of long-term Treasuries.
3/18/2009	FOMC statement FOMC says it will purchase an additional \$750 billion in agency MBS, increase its purchases of agency debt by up to \$100 billion, and buy up to \$300 billion in long-term Treasuries.
8/10/2010	FOMC statement FOMC states that it will continue to roll over the Federal Reserve holdings of Treasury securities as they mature.
9/21/2010	FOMC statement FOMC states that the Federal Reserve will continue to roll over Treasury securities' holdings as they mature.
9/21/2011	"The Fed kept policy rates unchanged and exceptionally low, but the Fed also decided to engage in a form of Operation Twist."
8/22/2012	"The debate within the Fed about potential additional policy actions has heated up according to the latest FOMC minutes. Many participants said more accommodation is needed unless there is substantial improvement in the economy. But participants also indicated that discussion of the costs and benefits of additional quantitative easing was useful. Some questioned the efficacy of a QE3."
12/12/2012	Maturity Extension Program concludes. FOMC to begin purchasing longer-term Treasuries at an initial pace of \$45 billion per month
6/18/2014	FOMC will "continue purchasing additional agency mortgage-backed securities at a pace of \$40 billion per month and longer-term Treasury securities at a pace of \$45 billion per month."
<b>Slow Events</b>	
1/28/2009	FOMC is ready to expand agency debt and MBS purchases, as well as to purchase long-term Treasuries; however, this event is regarded as disappointing markets
8/27/2010	Bernanke suggests a role for additional QE; however, this event is regarded as disappointing markets
10/15/2010	Bernanke reiterates that Fed stands ready to ease policy further
12/18/2013	"Beginning in January, the Committee will add to its holdings of agency mortgage-backed securities at a pace of \$35 billion per month rather than \$40 billion per month, and will add to its holdings of longer-term Treasury securities at a pace of \$40 billion per month rather than \$45 billion per month."
6/19/2013	"... Bernanke stated that if the members' forecasts were correct, economic conditions would improve to the point that by the end of this year, the Fed could start tapering their purchases of securities."
3/19/2014	Fed will further reduce monthly asset purchases to \$25 billion in MBS and \$30 billion in Treasuries.

**Table 2. Supply and demand shifts: before announcements**

We present statistics for shifts in supply and demand for the buy and slow announcements and during the control period. We show results for both one week and one month before the announcements. Agencies are in Panels A and C. Treasuries are in Panels B and D. For each security, we calculate the change for quantity demanded (*Borrowed Quantity*) and borrowing cost (*Borrowing Fee*). Following Cohen, Diether and Malloy (2007), we define four mutually-exclusive demand-supply shifts for securities: *DIN*, a decrease in *Borrowed Quantity* and a decrease in *Borrowing Fee*; *DOUT*, an increase in *Borrowed Quantity* and an increase in *Borrowing Fee*; *SIN*, a reduction in *Borrowed Quantity* and an increase in *Borrowing Fee* and *SOUT*, an increase in *Borrowed Quantity* and a decrease in *Borrowing Fee*. We drop securities that did not experience a shift. We report the number and percent of bonds in each category. Using a Chi-squared test (SAS— PROC FREQ; TABLES/CHISQ TESTP=)—we test the null hypothesis that the shift category distributions (Columns 3-6) for Buy (Row 3) and slow (Row 5) announcements, in turn, are equal to the those for the control distribution (Row 1) and present the resulting p-values.

		DIN	DOUT	SIN	SOUT	Total	p-value
<b>Panel A: Agencies (One-week before)</b>							
Control	N	3,199	3,370	3,321	3,097	12,987	
	%	25%	26%	25%	24%	100%	
Buy	N	156	48	59	88	351	
	%	44%	14%	17%	25%	100%	<0.0001
Slow	N	31	48	36	40	155	
	%	20%	31%	23%	26%	100%	0.3303
<b>Panel B: Treasuries (One-week before)</b>							
Control	N	10,768	11,389	11,067	10,510	43,734	
	%	25%	26%	25%	24%	100%	
Buy	N	401	140	219	186	946	
	%	42%	15%	23%	20%	100%	<0.0001
Slow	N	154	143	121	158	576	
	%	27%	25%	21%	27%	100%	0.0576

**Table 2 —Continued**

<b>Panel C: Agencies (One-month before)</b>							
Control	N	1,214	1,092	1,272	969	4,547	
	%	27%	24%	28%	21%	100%	
Buy	N	386	57	91	212	746	
	%	52%	8%	12%	28%	100%	<0.0001
Slow	N	41	37	25	38	141	
	%	29%	26%	18%	27%	100%	0.0419
<b>Panel D: Treasuries (One-month before)</b>							
Control	N	3,877	3,186	3,726	3,423	14,212	
	%	27%	23%	26%	24%	100%	
Buy	N	558	235	473	261	1,527	
	%	37%	15%	31%	17%	100%	<0.0001
Slow	N	263	158	125	267	813	
	%	32%	20%	15%	33%	100%	<0.0001