Breaking the Zero Lower Bound Period: The Shift Across Two Unconventional Policies

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Abstract

The impact of unconventional monetary policies on asset prices can be broken into two distinct time periods in the US. While the impact of large-scale asset purchases was substantial on stock prices and the exchange rate before September 2011, their impact almost fully disappears afterward. On the contrary, the effects of forward guidance on asset prices grow substantially after this date. This shift could be explained by the severe illiquidity in financial markets before September 2011 and the Fed's explicit communication regarding the initial policy rate hike afterward.

Keywords: Large-scale asset purchases, forward guidance, zero lower bound, structural break

JEL Classification: E52, E58, E44

1. Introduction

The policy rate of the Federal Reserve (Fed) effectively hit the zero lower bound (ZLB) in December 2008. Hence, the communication about the future path of the policy rate, i.e. forward guidance (FG), gained more importance while it had been a monetary policy tool since the Fed had started to issue detailed statements after Federal Open Market Committee (FOMC) meetings. Another unconventional monetary policy (UMP), large-scale asset purchases (LSAPs), was initiated in late 2008 to further stimulate the economy by lowering the long-term interest rates and injecting liquidity into the financial system.

The event-study literature has identified a conventional monetary policy surprise as the change in the current or one-month-ahead Fed funds futures rate following Kuttner (2001). Gürkaynak et al. (2005) extend this methodology by identifying a second significant monetary policy surprise, future path of the policy rate, i.e. FG. However, the variation of the conventional monetary policy surprise is clearly zero at the ZLB, during which LSAP policies were introduced. Rogers et al. (2018) and Swanson (2020) separately identify FG and LSAP surprises, extending the methodology in Gürkaynak et al. (2005) to the ZLB period. These surprises almost fully explain the movement of the term structure around FOMC announcements during the ZLB period. I use the methodology in Rogers et al. (2018) to identify the UMPs in the US.

In this paper, I show that the impact of FG and LSAP policies, i.e. UMPs, of the Fed during the ZLB period can be broken into two time periods. The impact of LSAP surprises was large on stock prices and the exchange rate only before September 2011. On the contrary, the effects of FG surprises on stock prices and the exchange rate grow substantially after this date. I explain this shift by the severe illiquidity in financial markets before the structural break and the Fed's explicit communication about the horizon of the ZLB period afterward.

2. Identification of Monetary Policy Surprises

I identify FG and LSAP surprises following Rogers et al. (2018). I use two intraday windows (120-minute and 30-minute) bracketing each FOMC announcement during the ZLB period, from January 2009 to October 2015, to construct UMP surprises. I characterize the intraday change in the eighth Eurodollar futures rate, i.e. the market expectations of what the short rates in the US will be roughly in two years, as the FG surprise.[1] I assume that term premia do not change over this small interval following the literature (e.g. Piazzesi & Swanson (2008)).[2]

[1]The choice of Eurodollar futures to capture the interest rate expectations is due to the liquidity of these assets. Their high-frequency response to FOMC announcements within a 30-minute or 120-minute window is highly volatile. Although the interest rate expectations in the US are better captured by the overnight index swap (OIS) rates, the OIS futures are less volatile. In order to control for the difference between the interest rate implied by Eurodollar futures, i.e. the London Interbank Offered Rate (LIBOR) rate, and the OIS rate, I check the daily response of the LIBOR-OIS spread to an FG surprise and find no economic significance. The spread moves a basis point in response to an FG surprise that moves the 8-quarter-ahead interest rate expectations by 25 basis points.

[2]I also find that the term premia component of 2-year rates do not significantly move at daily frequency around FOMC announcements during the ZLB period.

As noted by Swanson (2020), this surprise is very highly correlated with the FG factor obtained through rotating the first two principle components of asset price movements as in Gürkaynak et al. (2005). Note that the Fed funds futures rate, i.e. the market expectations of what the Fed funds rate will be at the end of the current month, and its surprises were practically zero during the ZLB period.

Swanson (2020) shows that asset price movements around FOMC announcements at the ZLB can be explained by the two principal components of the changes in interest rate expectations at different horizons and these principal components can be rotated to have the structural interpretation of FG and LSAP surprises. Following Rogers et al. (2018), I identify LSAP surprises by regressing the high-frequency (120-minute or 30-minute) change in the 10-year Treasury yields around FOMC announcements on the FG surprise. I characterize the residuals of this regression as the LSAP surprise. Hence, the intraday response of long rates is explained by the combination of FG and LSAP surprises by construction.

3. Estimation

Given the UMP surprises, their impact on asset prices could be estimated through an event-study approach:

$$\Delta Y_t = \beta_0 + \beta_{FG} FG_t + \beta_{QE} QE_t + \varepsilon_t \tag{1}$$

where ΔY_t is the intraday change in the log stock price index or the log exchange rate. The window of asset price changes (either 120-minute or 30-minute) matches those of UMP surprises.

After running the baseline regressions, I conduct structural break tests with an unknown date as in Andrews (1993). This test proposes the structural break date with the largest Wald statistic which is constructed using the quadratic distance between the estimated coefficients before and after the proposed break. Note that under the null hypothesis, there is no structural break.

4. Results

I present the results using two alternative intraday windows: 120-minute and 30-minute. The UMP surprises are constructed using the same windows as the dependent variable. Swanson (2020) and Gürkaynak et al. (2005) employ the tighter (30-minute) window to avoid capturing non-policy news. However, Rogers et al. (2018) use the wider (120-minute) window to fully incorporate the impact of UMPs and to include the press conferences which often convey important information regarding the announced policy.

Table 1: Testing a Structural Break with an Unknown Break Date

	120-Minute Window			**30-Minute Window**		
Variables	Structural Break Date	sup-Wald Statistic	p-value	Structural Break Date	sup-Wald Statistic	p-value
S&P500	September 2011	16.52	0.02	September 2011	23.40	8×10^{-4}
\$/Euro	September 2011	23.49	7×10^{-4}	September 2011	18.27	8×10^{-3}
\$/Yen	September 2011	12.05	0.10	September 2010	26.33	2×10^{-4}

Notes: The conducted test is a structural break test with an unknown date as in Andrews (1993). The sample spans the ZLB period in the US: January 2009-October 2015.

As presented in Table 1, all tests reject the null hypothesis that there is no structural break in the impact of UMPs on asset prices during the ZLB period. The implied structural break date is September 2011 in all tests except for the 30-minute response of the yen value of the US dollar. However, a structural break test with a known date of September 2011 for this regression also rejects the null hypothesis of no structural break very significantly.

In September 2011, the FOMC announced its maturity extension program where it would sell \$400 billion of short-term Treasuries to buy an equal amount of long-term Treasuries. It is also the first announcement after the FOMC started to explicitly communicate the expected horizon of the ZLB period (i.e. "at least through mid-2013") in August 2011.

I split the ZLB sample into two sub-samples, before and after September 2011. Table 2 reports the responses of stock prices, and the dollar values of the euro and yen to UMPs for these two time periods. The full sample period spans January 2009 to October 2015.

Table 2: Response of Asset Prices to UMP Surprises

	120-Minute Window			30-Minute Window		
	Full Sample	Pre-Break	Post-Break	Full Sample	Pre-Break	Post-Break
S&P500						
FG	−0.65	0.15	−1.09***	−0.46†	0.26	−1.27***
	(0.54)	(0.60)	(0.29)	(0.47)	(0.43)	(0.29)
LSAP	−1.02	−2.13***	1.21*	−0.67***†	−0.97***	0.09
	(0.71)	(0.63)	(0.66)	(0.20)	(0.09)	(0.31)
R^2	0.19	0.54	0.43	0.21	0.51	0.42
N	55	21	34	55	21	34
$/Euro						
FG	1.14***	0.58**	1.45***	1.07***	0.66**	1.48***
	(0.26)	(0.23)	(0.18)	(0.28)	(0.26)	(0.20)
LSAP	0.90**	1.53***	-0.09	1.06***	1.32***	0.40
	(0.36)	(0.31)	(0.46)	(0.20)	(0.08)	(0.29)
R^2	0.54	0.71	0.66	0.62	0.76	0.66
N	55	21	34	55	21	34
$/Yen						
FG	0.96***	0.59***	1.24***	0.92***	0.69**	1.13***
	(0.21)	(0.20)	(0.27)	(0.22)	(0.28)	(0.12)
LSAP	0.97***	1.22***	0.77**	1.15***	1.41***	0.48**
	(0.17)	(0.17)	(0.36)	(0.22)	(0.07)	(0.18)
R^2	0.63	0.77	0.63	0.74	0.85	0.75
N	55	21	34	55	21	34

Notes: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The estimated coefficients are the percentage point changes in asset prices in response to 25 basis point tightening surprises. The regressions are run as in Equation (1).
†Swanson (2020) reports different results for this regression due to differences in surprise definitions and used standard errors.

Table 2 reports the intraday response of the log S&P500 index to UMPs. The reported coefficient estimates are the percentage point changes of stock prices in response to FG and LSAP surprises that increase 2-year and 10-year rates by 25 basis points respectively. The pre-break regressions show that only LSAP surprises were effective in moving stock prices before September 2011. Note that the significance and the size of the LSAP coefficient in the pre-break regression with the tighter window is robust to omitting the influential March 2009 announcement. The signs are as expected: an easing increases stock prices due to higher expected future earnings and a lower discount rate. However, the significance of LSAP surprises on asset prices disappears after the structural break.[3] On the other hand, FG surprises are only effective in

[3]The wider window reports a marginally significant coefficient with an inverse sign which could be due to a Delphic interpretation of an LSAP surprise as discussed in Aksit (2020).

moving stock prices after September 2011.

Table 2 also presents the response of the log exchange rates, the euro and yen values of the US dollar respectively. UMP easings depreciate the US dollar as one would expect. Unlike stock prices, the exchange rates respond significantly to UMPs throughout the ZLB period. Similar to stock prices, the degree of exchange rate responsiveness changes drastically with the structural break. While LSAPs substantially move the exchange rates before September 2011, FG has a larger impact afterward. Note that the pre-break results for both windows are robust to omitting the influential announcement of March 2009 for both exchange rates.

5. Discussion

The substantial impact of LSAPs on asset prices before September 2011 could be explained by the severe market dislocation and illiquidity in the early years of the ZLB period, as discussed by Greenlaw et al. (2018). A policy tool that injects liquidity in troubled financial markets at a large-scale is expected to "correct" asset prices. Once financial markets recover and market participants start pricing expected future asset purchases (indeed, the size of LSAP surprises decreased on average after September 2011), LSAP surprises are expected to have a smaller impact on asset prices, if any.

The impact of FG on asset prices is expected to grow after September 2011 since the Fed started to communicate the timing of the initial policy rate hike explicitly in August 2011. Communicating the expected horizon of the ZLB period explicitly could help resolve the uncertainty associated with the length of the low interest rate environment. Hence, financial decisions would become more responsive to an FG surprise of the same size. Moreover, the limited impact of FG on asset prices before the structural break could partially be due to the drastic decline in global capital flows following the global financial crisis.

6. Conclusion

In this paper, I show that the impact of UMPs on asset prices changes drastically in the US during the ZLB period. While LSAP surprises influence stock prices and the exchange rate substantially before September 2011, their impact subsides afterward. On the other hand, the impact of FG on stock prices gets significant while its impact on the exchange rate doubles after this structural break. The sizeable impact of LSAP surprises on asset prices in the first few years of the ZLB period could be explained by severe market dislocation and illiquidity. The rise in the effectiveness of FG is likely driven by the Fed's explicit guidance on the expected horizon of the ZLB period after the structural break.

In light of these findings, during the current ZLB period induced by the COVID-19 pandemic, the Fed's initial LSAP policies are expected to be effective in correcting asset prices. Moving forward, the Fed should explicitly communicate the expected horizon of the ZLB period to have a larger influence on asset prices.

Acknowledgments

I would like to thank Jonathan Wright and the anonymous reviewer for their insightful comments and suggestions.

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