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Are financial markets less responsive to monetary policy shocks at the zero lower bound?

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HIGHLIGHTS

- We study the time-varying effect of monetary policy shocks on financial markets.
- The corporate bond market is highly responsive to monetary policy shocks at the zero lower bound.
- The long-term Treasury bond market is highly sensitive to monetary policy shocks throughout 1990–2012.
- The short-term Treasury bond market is severely constrained by the zero lower bound.
- The stock market is less responsive to monetary policy shocks from 2008 to 2010.

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ABSTRACT

This paper investigates the time-varying effect of monetary policy shocks on financial markets. We show that the corporate bond market is highly responsive to monetary policy shocks throughout 2000–2012, implying a high pass-through of policy-induced movements in Treasury yields to private yields even during the zero lower bound period. While the long-term Treasury bond market is highly sensitive to monetary policy shocks throughout almost the entire sample, the short-term Treasury bond market is severely constrained by the zero lower bound. The stock market is less responsive from 2008 to 2010, but the responsiveness bounces back rapidly in 2011.

1. Introduction

Many studies have documented that monetary policy shocks have an important impact on the stock market, Treasury yields, and corporate yields (see, for example Thorbecke, 1997, Rigobon and Sack, 2004, Bernanke and Kuttner, 2005, Wright, 2012, Kiley, 2013, 2014 and Gilchrist et al., 2015). However, few of the existing studies have further investigated the time-varying effect of monetary policies on these variables. In this paper, we estimate the time-varying effect of monetary policy shocks on a range of economic and financial variables using a similar approach to the one employed by Swanson and Williams (2014).

The consideration of the time-varying effect of monetary policy shocks is important because: (1) The way the Fed makes its move is evolving over time. Conventionally, the fed funds rate serves as a policy instrument. At the zero lower bound (ZLB),[1] the Fed turns to other unconventional instruments (for example, "large-scale asset purchases", "forward guidance", and "operational twist").[2] (2) An outstanding open question is whether or not monetary policies become less powerful over time, especially at the ZLB.

[1] The zero lower bound refers to the period during which the fed funds rate is set at the range between 0 and 25 basis points.

[2] The Fed funds rate is no longer an effective tool at the ZLB. In order to lower long-term interest rates to give more stimulus to the economy, the Fed conducted several rounds of large-scale asset purchases (LSAPs), where it purchased a large amount of Treasury bonds, agency debt and mortgage backed securities (MBS), and other securities with medium to long maturity. The Fed also used other unconventional policy instruments to influence the economy, including: (1) forward guidance, where the Fed promised to keep the Fed funds target rate low for a long period of time in order to affect the expectation of future rates; and (2) operation twist, where the Fed sold a large amount of short-term bonds and used the proceeds to buy long-term bonds in an effort to bring down their term premiums.

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One way to look at this problem is to investigate the time-varying responsiveness of the economic and financial variables to the monetary policy shocks.

Using the methodology developed in Swanson and Williams (2014), we show that the sensitivities of all these measures to monetary policy shocks vary over time. The corporate bond market remains highly responsive to monetary policy shocks throughout the entire sample, implying that the Treasury yield changes induced by monetary policy shocks are largely passed through to private yields during the ZLB period. The long-term Treasury bond market is highly responsive at the ZLB,[3] but the short-term Treasury bond market is severely constrained by the ZLB. The stock market exhibits weaker responses from 2008 to 2010 compared to the "normal" period (which will be clear in the next section), but the sensitivity bounces back quickly in 2011.

Related Literature: The paper most relevant to mine is Swanson and Williams (2014). They develop a new method of measuring the time-varying sensitivity of interest rates to a range of macroeconomic announcements. We find that this methodology is also useful in investigating the power of monetary policy shocks at the ZLB. Kiley (2013) and Gilchrist et al. (2015) also examine the pass-through from Treasury yields movement induced by monetary policies to private yields. My work complements theirs by allowing the pass-through to vary over time.

The remainder of this paper is organized as follows: in Section 2, we describe the data and present the methodology. In Section 3, we report the results. In Section 4, we present our conclusions.

2. Data and methodology

Kuttner (2001) and Gürkaynak et al. (2005) show that economic and financial variables only respond to unanticipated changes in monetary policies. We therefore follow the convention by using Federal Open Market Committee (FOMC) announcements and minutes[4] as events for identifying monetary policy surprises. We first document the daily changes of 1, 2, 5, 7, and 10 year Treasury yields around these event dates. Next, we extract a factor from rolling three year samples of these yield changes.[5] The factor is then normalized to have 1 to 1 relationship with 2 year Treasuries and used to measure the monetary policy surprises. The reason that we do not use short-end Treasuries or the fed funds rate is that these interest rates essentially are constrained at the ZLB, while the longer term interest rates remain very flexible. Therefore, many recent studies use changes in long term interest rates to measure the stance of monetary policy shocks in order to be able to capture the variation of monetary policy shocks at the ZLB (see, for example, Wright, 2012, and Kiley, 2014). The data used in this study are downloadable from the website of the Federal Reserve Bank of St. Louis. The release dates of FOMC minutes (1996–2012) can be acquired from the website of the Federal Reserve Board. We pin down other release dates (1990–1995) by looking up news in the Factiva Database.

We study the impact of monetary policy shocks on three markets (six variables): the corporate bond market (AAA yields and BAA yields), the Treasury bond market (2 year Treasury yields and 10 year Treasury yields), and the stock market (S&P 500 index and VIX index).[6] We next specify the steps to estimate the time-varying sensitivity of a economic variable to monetary policy surprises. Following Swanson and Williams (2014), we first estimate this sensitivity over a benchmark sample, 1990–2000, which is supposed to be free from the ZLB restriction. We next estimate the rest of the sample, 2001–2012, which is then compared to the benchmark case to determine whether or not the power of monetary policy surprises decreases at the crisis or the ZLB.

Our model of measuring the sensitivity of an economic variable h_t to monetary policy shocks M_t takes the form of

$$\Delta h_t = \alpha + \beta M_t + \varepsilon_t \tag{1}$$

where t indexes days and ε_t is an error term.

To measure the time-varying sensitivity β^i (i = 1990–2012), we run regressions year by year from 1990 to 2012.[7] We estimate the time-varying regression of the form

$$\Delta h_t = a^{d_i} + \delta^{d_i} b M_t + \varepsilon_t \tag{2}$$

where a^{d_i} and δ^{d_i} are time-varying parameters, b is the constant part of the sensitivity, i indexes years,[8] and d indexes days within year i. Our focus is δ^{d_i}, which measures the time-varying sensitivity of h_t to monetary policy surprises M_t. Note that in order to separately identify δ^{d_i} and b, we need to normalize δ^{d_i}. Following Swanson and Williams (2014), we normalize the average of δ^{d_i} over 1990–2000[9] to be 1. In the subsequent periods, if δ^{d_i} exceeds 1, variable h is more sensitive to monetary policy shocks compared to that of 1990–2000; if δ^{d_i} is smaller than 1, variable h becomes less sensitive to monetary policy shocks.

In order to determine finer estimates of δ^{d_i}, we follow Swanson and Williams (2014) by estimating daily rolling regressions as follows:

$$\Delta h_t = a^d + \delta^d \tilde{M}_t + \varepsilon_t \tag{3}$$

where $\tilde{M}_t = \hat{b} M_t$ and $\hat{b}$ is estimated from the regression (2). The regression (3) estimates δ^d for each day from Jan 1990 to the end of sample over one-year rolling windows. Because δ^d is estimated at the second stage ($\hat{b}$ is estimated at the first stage), we also take into account this two-stage estimation error following Swanson and Williams (2014) when the standard error is calculated.

3. Estimation results

Table 1 reports the results for the regression (1) over the "normal" sample from 1990–2000 (results are very similar for the entire sample from 1990–2012). These results are robust to whether or not we add lags of M_t. Note again that a one unit increase in monetary policy shock is normalized to increase 2 year

[3] It reacted less in the Great Recession periods (2007–2008), during which the fed funds rate was higher than the ZLB.

[4] We must thank the referee to point out that the sample size is small if only FOMC announcement dates are used. While the results are similar with or without FOMC minute dates, it is meaningful to add them because the sample size becomes larger. As noted in Rosa (2013), FOMC minutes do contain important new information about monetary policies.

[5] The referee pointed out that it is problematic to extract the first principal component using the covariance matrix of the data over the entire sample, because there is a sharp break in the correlation matrix before and after the ZLB (see Kiley, 2014). Therefore, we extract the first principal component from rolling three year samples. It is worth noting that the results are quantitatively and qualitatively similar if we use the entire sample.

[6] At first, we also wanted to look at TIPS and breakeven inflation rates, but the lengths of these samples are too short.

[7] As pointed out by Swanson and Williams (2014), this approach may deliver volatile estimates because of the small sample problem. Swanson and Williams (2014) deal with this small-sample problem by imposing a restriction that the relative magnitude of sensitivity for different macroeconomic announcements are constant over time. As discussed in footnote 3, we overcome the small sample problem by including FOMC minute dates.

[8] $i \in \{1990, 1991, \ldots, 2012\}$.

[9] As noted by Swanson and Williams (2014), this period is supposed to be a "normal" period during which monetary policies are not constrained by the zero lower bound.