Economics Letters 160 (2017) 54–58

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

The time varying effect of monetary policy on stock returns

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HIGHLIGHTS

- Stock returns respond strongly to monetary policy surprises during the 2000s.
- Stock returns do not respond to monetary policy surprises during the 1990s.
- Bond markets do not demonstrate such time variation.
- Monetary policy's time varying effect is driven by events in the stock market.

ARTICLE INFO

Article history:
Received 23 May 2017
Received in revised form 18 August 2017
Accepted 20 August 2017
Available online 24 August 2017

JEL classification:
E52
E44
G14
C22

Keywords:
Monetary Policy transmission
Stock prices
Time varying parameter model

ABSTRACT

We find that a surprise increase on the federal funds rate has five times stronger and statistically significant effects on stock returns during 2000–2007, versus statistically insignificant effects during 1989–2000. These differences are not apparent in the bond markets.

1. Introduction

The monetary transmission mechanism is in the center of discussions for central bankers and academic researchers. Previous research finds that a monetary policy surprise strongly impacts the stock market (Thorbecke, 1997; Bernanke and Kuttner, 2005; Basistha and Kurov, 2008; Jansen and Tsai, 2010; Neely and Fawley, 2014). However, given many structural changes in recent decades, both in the conduct of monetary policy and in the operation of financial markets, this relationship might not have been a stable one.

Using daily information on the federal funds futures market and a long sample period we find that a monetary policy surprise strongly and significantly affects stock prices, similarly to what previous research has established.[1] However, our time varying coefficient estimates reveal that the effect comes from the period after the 2000s; monetary policy surprise has a weak and insignificant effect before that time.

Looking at the bond market we do not find evidence that the effect of monetary policy surprise differs between the 1990s and the 2000s. Thus, the lower effectiveness of monetary policy in the 1990s is an issue specific to the stock market. The rational bubble theory (Gali, 2014) provides one explanation consistent with our findings.

2. Data

We use the daily futures federal funds rate contracts, as described by Kuttner (2001) and Bernanke and Kuttner (2005) from 149 FOMC meetings over the period June 1989–December 2007. This measure assumes that the monetary policy surprise is the adjusted for the relevant days' difference between the spot-month futures rate on the announcement date, minus the previous day's one. If the monetary policy announcement did not surprise the

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[1] The Federal funds futures market opens in 1989, and we use information until the Great Recession.

http://dx.doi.org/10.1016/j.econlet.2017.08.022
0165-1765/

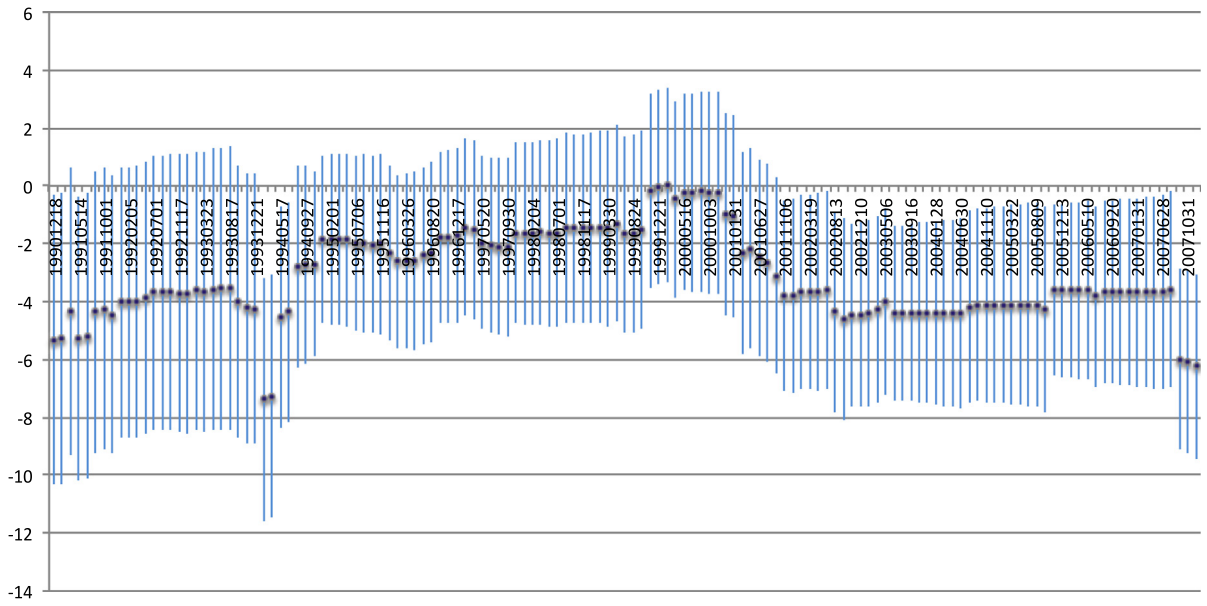

Fig. 1. Time varying effects of monetary policy on stock price returns and 90% significance bands.

markets, then these two contracts should be the same. We specify meeting dates as Barakchian and Crowe (2013).

3. Econometric model

We use the time-varying parameters model (Kim and Nelson, 2006) allowing for GARCH(1,1) heteroskedastic errors. We take into account the time-changing variance as stock returns often exhibit this feature; in addition, if we do not, we could be falsely detecting instability in the coefficients. We consider stock returns, R_t, affected by monetary policy surprise, S_t, and an indicator variable, C_t, taking into account economic conditions, i.e., recessions and expansions:

$$\begin{aligned} R_t &= \beta_{0,t} + \beta_{1,t} S_t + \beta_{2,t} C_t + e_t, \\ e_t \mid I_{t-1} &\sim i.i.d.N(0, \sigma^2_{e_t}), \end{aligned} \tag{1}$$

where

$$\sigma^2_{e_t} = a_0 + a_1 e^2_{t-1} + a_2 \sigma^2_{e_{t-1}}, \tag{2}$$

and I_{t-1} summarizes information up to time $t-1$. Also,

$$\begin{aligned} &\beta_{k,t} = \beta_{k,t-1} + \epsilon_{k,t}, \\ &\epsilon_{k,t} \sim i.i.d.N(0, \sigma^2_{\epsilon,k}), \quad k = 0, 1, 2. \end{aligned} \tag{3}$$

We estimate the system of Eqs. (1)–(3), in the following state-space form:

$$R_t = \begin{bmatrix} \mathbf{X}'_{\mathbf{t}|\mathbf{t-1}} & 1 \end{bmatrix} \begin{bmatrix} \boldsymbol{\beta_t} \\ e_t \end{bmatrix}, \tag{4}$$

$$(R_t = \tilde{\mathbf{X}}'_{\mathbf{t}|\mathbf{t-1}} \tilde{\boldsymbol{\beta}}_{\mathbf{t}})$$

and

$$\begin{aligned} \begin{bmatrix} \boldsymbol{\beta_t} \\ e_t \end{bmatrix} &= \begin{bmatrix} \mathbf{I_3} & \mathbf{0_3} \\ \mathbf{0'_3} & 0 \end{bmatrix} \begin{bmatrix} \boldsymbol{\beta_{t-1}} \\ e_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t \\ e_t \end{bmatrix}, \\ \begin{bmatrix} \boldsymbol{\epsilon_t} \\ e_t \end{bmatrix} &\sim i.i.d.N\left(\begin{bmatrix} \mathbf{0_3} \\ 0 \end{bmatrix}, \begin{bmatrix} \boldsymbol{\Sigma_\epsilon} & \mathbf{0_3} \\ \mathbf{0'_3} & \sigma^2_{e_t} \end{bmatrix} \right), \end{aligned} \tag{5}$$

$$(\tilde{\boldsymbol{\beta}}_{\mathbf{t}} = \mathbf{B} \tilde{\boldsymbol{\beta}}_{\mathbf{t-1}} + \tilde{\boldsymbol{\epsilon}}_{\mathbf{t}}, \quad \tilde{\boldsymbol{\epsilon}}_{\mathbf{t}} \sim i.i.d.N(\mathbf{0_4}, \boldsymbol{\Sigma}_{\tilde{\epsilon}}))$$

where $\boldsymbol{\beta_t} = \begin{bmatrix} \beta_{0,t} & \beta_{1,t} & \beta_{2,t} \end{bmatrix}'$ and $\mathbf{X_t} = [1 \;\; S_t \;\; S_t C_t]'$. $\boldsymbol{\Sigma_{\epsilon,i}}$ is a 3×3 diagonal matrix with $\sigma^2_{\epsilon,k}$ as diagonal elements, for $k = 0, 1, 2$.

The first round of Kalman filter iterations estimate the model's hyperparameters ($\boldsymbol{\Sigma}_{\tilde{\epsilon}}$) maximizing the likelihood function. The second round produces an estimate for $\boldsymbol{\beta_t}$.

4. Empirical results

Fig. 1 shows the time varying effect of monetary policy surprise on stock returns allowing for GARCH errors.[2] We see that for most of the sample period a monetary policy surprise tightening decreases stock price returns. However, the effect varies widely in strength and significance over time.[3] A monetary policy surprise has a weak and insignificant effect on stock price returns during the 1990s. Yet, there is a substantial change taking place during the 2000s, when the effect becomes stronger and statistically significant.[4]

Fixed coefficient estimation (Table 1) of the whole sample implies, similarly to previous literature, a significant decrease of 3.8% in the one-day stock price return in response to a one-percentage point surprise federal funds rate increase. However, the same surprise decreases the one-day stock price return by 1.33% during 1989–2000 and by 7.47% during 2001–2007, i.e., over five times more. In addition, our approach of using low-frequency data to identify monetary policy shocks, allows us to use single-equation estimation and be able to identify changes in significance level. The effect is not statistically significant in the first subsample, but it is during the second subsample. Hence, our results reveal that the strength of the monetary transmission through stock prices varies substantially over time; during the 1990s monetary policy was not able to affect stock prices nearly as much as it was able to do during the 2000s.[5]

[2] We do not find significant variation across recessions and expansions when time variation is taken into account, and thus we present results that do not address this asymmetry.

[3] The estimated time-varying intercept does not exhibit large time variation.

[4] There is also a significant period for a few observations within 1994.

[5] Omitting dates that employment reports released (7/5/91, 7/2/92, 2/4/94), does not change our conclusions.