Proposal: How Monetary Policy drives Stock Returns

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Abstract

This is a term paper proposal submitted to Professor. Ismael Mourifie in ECO475: Applied Econometrics II at the University of Toronto.

1 Motivation

The central policy instrument the Federal Reserve employs to manage price stability is the short-term federal fund rate. While general macroeconomic measurements such as consumption, employment and GDP respond in lag to changes in the policy rate, asset prices react to both the changes in the short-term federal fund rate and also the expectation for future policy rates Neuhierl and Weber (2016). The former can be captured directly in nominal changes in rate, however, it is unclear how to properly model market reactions to expectations for future policy decisions.

Existing research such as Bernanke and Kutner (2005) shed light on the role of unexpected monetary policy actions contributing to excessive stock returns, however, but did not provide a sufficient framework to model the continuous changes in the market expectation for future policy as it focuses on event studies around the Federal Open Market Committee (FOMC meeting). Monetary policy decisions are made on a continuous basis beyond the eight meetings, and how the market expectation for the price path of future interest rates could adjust based on communications of Federal Reserve members outside of meetings and their own assessment of new macroeconomic information.

This motivates our research to analyze how both the expected and unexpected changes in monetary policy drive returns of the stock market. As the role of the financial market grew increasingly dominant in economic activities, it is crucial for the policymakers to be more informed, and better assess the impact of their decisions.

2 Literature Review

Thorbecke and Alami (1994) examined the effect of the federal funds rate on the stock market during 1970s before the change of operating procedures in 1979 through single equation regression in an event study, which provides us clear evidence that tight monetary policy of increasing federal funds rate would cause the decline of stock prices.

Thorbecke (1997) further pointed out that expansionary monetary policy would increase stock returns, estimating a 7-variables vector auto-regression (VAR) and monetary policy exposure would increase the ex-ante return with estimating a multi-factor model.

Lobo (2000) examines the impact of the change of federal funds rate on risk-aversion degrees

and volatility of the stock market through using an asymmetric autoregressive exponential GARCH (ASAR-GARCH), which gave empirical evidence that the monetary policy of federal funds rate change made an important impact on stock returns and convey new information to the stock market.

Bernanke and Kutner (2005) analyzed the impact of monetary policy on equity prices by employing a measurement of federal policy surprises. Using changes in federal fund futures around FOMC meetings, they found that unanticipated cuts in the federal fund rate are associated with an increase in stock market indexes.

Neuhierl and Weber (2016) constructed a slope factor from the residual of regression with 3-month federal fund future price on 1-month federal fund future price. They found that the slope factor captures the market expectation for future policy rates, and concluded the economic significance of this predictor by modelling an investor trading on the slope factor can increase the weekly Sharpe ratio of their portfolio by more than 20% compared to buy-and-hold portfolio.

3 Data

To measure the changes in monetary policy, we will use federal fund rate, federal fund future prices with maturity of 1 months and 3 months from Wharton Research Data Base(WRDS) and Federal Reserve Economic Data (FRED). In particular, we will construct a measure of federal policy surprises based on the changes in federal fund future prices around FOMC meeting days. We will also be using the weekly price and returns of market-level S&P 500 index portfolio from Compustat and Capital IQ.

The time horizon for all of our data will be from January 2006 to January 2023. This time period is selected with the intention of two fold: first, we wish to re-examine if the empirical results drawn from previous studies performed on a relatively distant time period such as 1983-1990 still hold. Second, we intend to test if our hypothesis remains robust to the drastic style changes of Federal Reserves and various black swan events.

4 Empirical Methods

Our examination of the relationship between the linkage between federal fund rate and market index return. Empirical studies about the effect of monetary policy on the stock market started from a single equation regression, where Thorbecke and Alami (1994) provides a good example of regressing stock prices change on the federal funds rate change. Prior to this, Sims (1980) proposed the vector auto-regression (VAR) as an alternative model for empirical macroeconomics with all variables of interest treated as endogenous, and Lee (1992) re-affirmed that the VAR model is useful to evaluate the linkage between stock returns and other variables. This literature established VAR as the standard for modelling the effect of monetary policy on assets for later studies, including the Thorbecke (1997) research which indicated that expansionary monetary policy increases ex-post stock returns. Lobo (2000) is using the asymmetric auto-regressive exponential generalized auto-regressive conditional heteroskedasticity model (ASAR-EGARCH), an extension of E-GARCH that was proved to robustly model asset returns Nelson (1991).

Markov Regime Switching model had also been widely used to model variables whose behaviours change during different business cycles, such as stock returns. Hamilton (1989) and Krolzig and Krolzig (1997) further developed the Markov Switching Vector Auto-Regression (MS-VAR) model, and Marcucci (2005) indicated that Markov Switching Vector GARCH (MS-GARCH) is useful to model stock volatility. In our research, we plan to examine the relationship of interest by estimating and testing different baseline models which are discussed above. As one of the baselines, we intend to extend the following model to estimate the effect of policy stock returns:

$$R_t = d_0 + (d_1 + \beta_1 D_1 + \theta_1 D_2) * R_{t-1}) * R^+_{t-1} + (d_2 + \beta_2 D_1 + \theta_2 D_2) R^-_{t-1} + \epsilon$$

where D_1 denotes n-days window before a change in the Federal fund rate.

D_2 denotes n days window after a change in the federal funds rate.

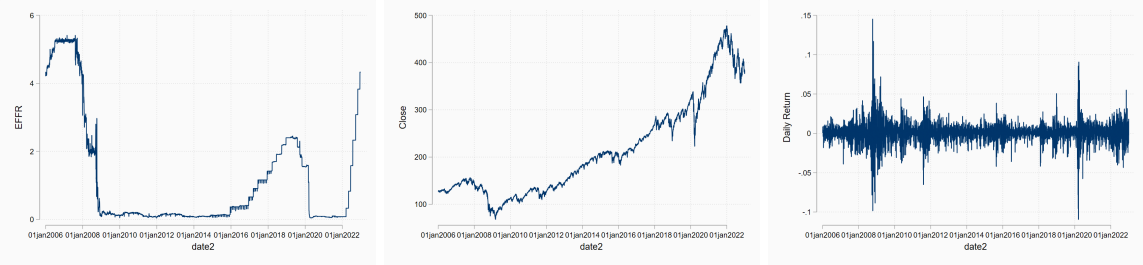
coefficient β refers to estimates before the federal funds rate change and coefficient.

θ refers to estimates after the federal funds rate change.

5 Appendix

Variable	Obs	Mean	Std. dev.	Min	Max
Effective Fund Rate —	4,245	1.194954	1.632439	.04	5.41
Daily Return —	4,278	.0003382	.0126326	-.1094237	.1451977
Close —	4,279	212.6578	99.78543	68.11	477.71

Table 1: Basic Summary Statistics



(a) Effective federal fund rate (b) Closing price (c) Daily return

Figure 1: Effective Federal fund rate, S&P 500 closing price, daily return from 2006 to 2023.

References

Bernanke, B. S. and K. N. Kutner (2005). What explains the stock market's reaction to federal reserve policy? *The Journal of Finance 60*(3), 1221–1257.

Hamilton, J. D. (1989). A new approach to the economic analysis of nonstationary time series and the business cycle. *Econometrica: Journal of the econometric society*, 357–384.

Krolzig, H.-M. and H.-M. Krolzig (1997). The markov-switching vector autoregressive model. *Markov-switching vector autoregressions: Modelling, statistical inference, and application to business cycle analysis*, 6–28.

Lee, B.-S. (1992). Causal relations among stock returns, interest rates, real activity, and inflation. *The journal of finance 47*(4), 1591–1603.

Lobo, B. J. (2000). Asymmetric effects of interest rate changes on stock prices. *Financial Review 35*(3), 125–144.

Marcucci, J. (2005). Forecasting stock market volatility with regime-switching garch models. *Studies in Nonlinear Dynamics & Econometrics 9*(4).

Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica: Journal of the econometric society*, 347–370.

Neuhierl, A. and M. Weber (2016, November). Monetary policy and the stock market: Time-series evidence. Working Paper 22831, National Bureau of Economic Research.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: journal of the Econometric Society*, 1–48.

Thorbecke, W. (1997). On stock market returns and monetary policy. *The Journal of Finance 52*(2), 635–654.

Thorbecke, W. and T. Alami (1994). The effect of changes in the federal funds rate target on stock prices in the 1970s. *Journal of Economics and Business 46*(1), 13–19.