Has the Fed Responded to House and Stock Prices? A Time-Varying Analysis

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Abstract

In this paper we use a structural VAR model with time-varying parameters and stochastic volatility to investigate whether the Federal Reserve has responded systematically to asset prices and whether this response has changed over time. To recover the systematic component of monetary policy, we interpret the interest rate equation in the VAR as an extended monetary policy rule responding to inflation, the output gap, house prices and stock prices. We find some time variation in the coefficients for house prices and stock prices but fairly stable coefficients over time for inflation and the output gap. Our results indicate that the systematic component of monetary policy in the US i) attached a positive weight to real house price growth but lowered it prior to the crisis and eventually raised it again and ii) only episodically took real stock price growth into account.

Introduction

The length and the severity of the Great Recession generated considerable interest in the evolution of US monetary policy over the period that preceded the recent economic slump. However, while the financial nature of the Great Recession revived the debate on whether monetary policy should respond directly to asset prices, less attention has been devoted to the measurement of the actual response of the Federal Reserve to asset prices in recent years.

In this paper we take an empirical approach and evaluate to what extent the Fed reacted to asset prices over the Great Moderation period until the beginning of the Great Recession. In particular, we consider whether stock prices and house prices entered the Fed's reaction function with a positive and significant coefficient. Our key contribution is in providing time-varying estimates of the monetary policy response to asset prices by using a VAR model with time-varying parameters and stochastic volatility.

We interpret the interest rate equation in our VAR using five variables (interest rate, Inflation rate, the output gap, house prices and stock prices) as an extended monetary policy rule in the spirit of Arias et al. (2015), Belongia and Ireland (2016a,b), Canova and Gambetti (2009) and Primiceri (2005), among others. This set-up allows us to track the systematic response to stock prices and house prices over our sample period, which goes from 1975:Q2 to 2008:Q4.

The VAR Model

We consider quarterly data from 1975:Q2 to 2008:Q4.

1. Year-over-year percentage changes in the deflator for personal consumption expenditures (excluding food and energy)
2. Output gap measured as the percentage-point difference between actual real GDP and the US Congressional Budget Office estimate of real potential GDP
3. Percentage growth of the real Freddie Mac House price index
4. Percentage growth of the real S&P 500 index
5. Federal funds rate.

Asset prices are deflated by core PCE. All raw series are drawn from the FRED database.

Bayesian time-varying parameter and stochastic volatility VAR à la Primiceri (2005) and Cogley and Sargent (2005).

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21,t} & 1 & 0 & 0 & 0 \\ a_{31,t} & a_{32,t} & 1 & 0 & 0 \\ a_{41,t} & a_{42,t} & a_{43,t} & 1 & 0 \\ a_{51,t} & a_{52,t} & a_{53,t} & a_{54,t} & 1 \end{bmatrix}}_{\boldsymbol{A}_t} \underbrace{\begin{bmatrix} \Pi_t \\ \widetilde{Y}_t \\ \Delta H_t \\ \Delta SP_t \\ R_t \end{bmatrix}}_{\boldsymbol{x}_t}$$

$$= \underbrace{\begin{bmatrix} ab^1_{11,t} & ab^1_{12,t} & ab^1_{13,t} & ab^1_{14,t} & ab^1_{15,t} \\ ab^1_{21,t} & ab^1_{22,t} & ab^1_{23,t} & ab^1_{24,t} & ab^1_{25,t} \\ ab^1_{31,t} & ab^1_{32,t} & ab^1_{33,t} & ab^1_{34,t} & ab^1_{35,t} \\ ab^1_{41,t} & ab^1_{42,t} & ab^1_{43,t} & ab^1_{44,t} & ab^1_{45,t} \\ ab^1_{51,t} & ab^1_{52,t} & ab^1_{53,t} & ab^1_{54,t} & ab^1_{55,t} \end{bmatrix}}_{\boldsymbol{A}_t\boldsymbol{B}_{1,t}} \underbrace{\begin{bmatrix} \Pi_{t-1} \\ \widetilde{Y}_{t-1} \\ \Delta H_{t-1} \\ \Delta SP_{t-1} \\ R_{t-1} \end{bmatrix}}_{\boldsymbol{x}_{t-1}} + \underbrace{\begin{bmatrix} \sigma_{1,t} & 0 & 0 & 0 & 0 \\ 0 & \sigma_{2,t} & 0 & 0 & 0 \\ 0 & 0 & \sigma_{3,t} & 0 & 0 \\ 0 & 0 & 0 & \sigma_{4,t} & 0 \\ 0 & 0 & 0 & 0 & \sigma_{5,t} \end{bmatrix}}_{\boldsymbol{\Sigma}_t} \underbrace{\begin{bmatrix} \varepsilon_{\pi,t} \\ \varepsilon_{Y,t} \\ \varepsilon_{H,t} \\ \varepsilon_{SP,t} \\ \varepsilon_{R,t} \end{bmatrix}}_{\boldsymbol{\varepsilon}_t}$$

Rearranging the fifth row results in the following monetary policy reaction function

$$\begin{aligned} R_t = & -a_{51,t}\Pi_t - a_{52,t}\widetilde{Y}_t - a_{53,t}\Delta H_t - a_{54,t}\Delta S\&P^{500}_t \\ & + ab^1_{51,t}\Pi_{t-1} + ab^1_{52,t}\widetilde{Y}_{t-1} + ab^1_{53,t}\Delta H_{t-1} + ab^1_{54,t}\Delta S\&P^{500}_{t-1} + ab^1_{55,t}R_{t-1} \\ & + \sigma_{5,t}\varepsilon^R_t, \end{aligned}$$

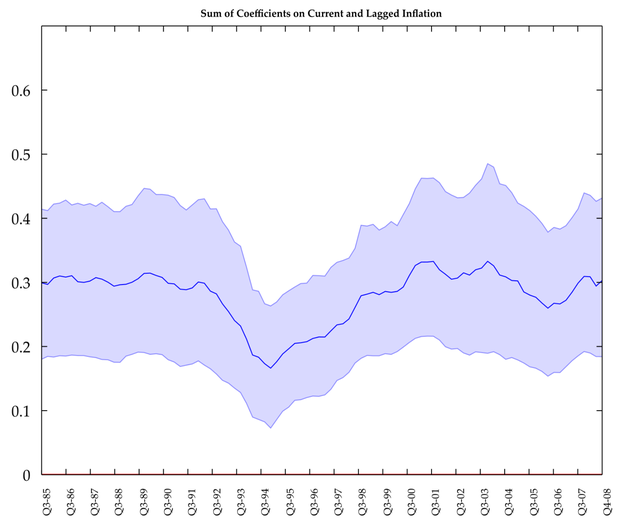
We will focus on the time evolution of the sum of the coefficients on the contemporaneous and lagged . These coefficients are viewed as the correct empirical benchmark for detecting violations of the so-called Taylor principle, derived by the theoretical literature.

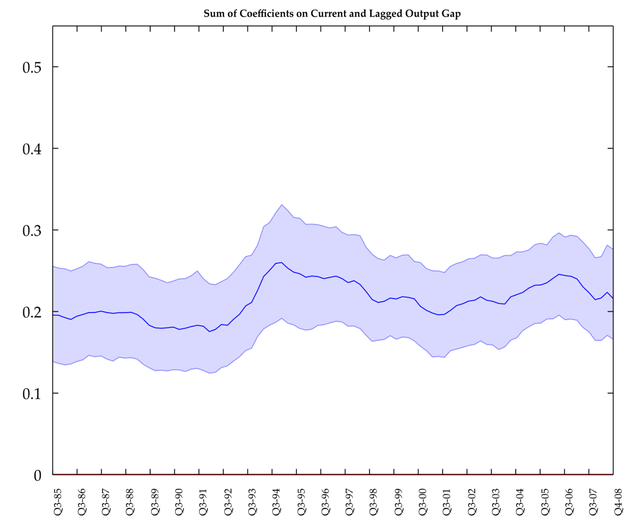
Results

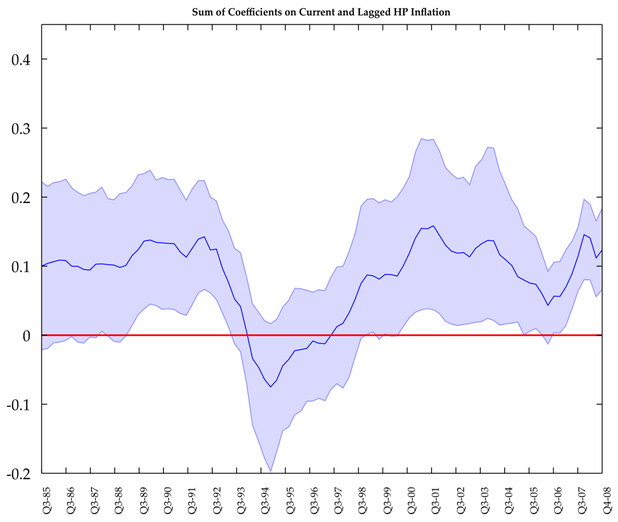
Our main result is that the Fed responded to house prices and stock prices. While the response to stock prices was mild and episodic, the response to house prices was significant, from a statistical and economic point of view. We estimate the coefficient for house price growth to be about one third of the inflation coefficient in the policy rule.

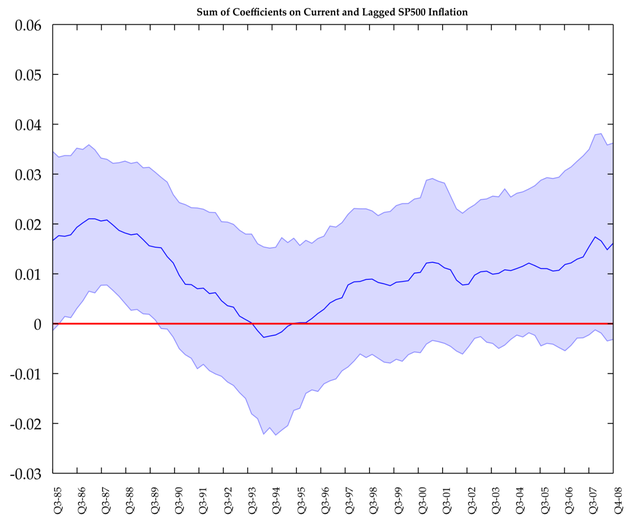
Moreover, we identify non-negligible time variation in the coefficients. The coefficient on stock prices is higher around the end of the 1980s, thus capturing a marked response to the stock market crash of 1987, whereas it is relatively low and stable in the last part of the sample. The coefficient on house price inflation exhibits more pronounced swings. Indeed, we identify a lower response around the mid 1990s and also in the Pre-Great Recession period. Nevertheless, the coefficient is large, even in the pre-Great Recession period. Finally, the coefficient s on inflation and the output gap and the interest rate smoothing term are relatively stable over time, with the partial exception of the mid 1990s.

While we do not find major evidence of time variation in the coefficient for inflation and the output gap, the use of a model with time-varying coefficients and stochastic volatility turns out to be crucial for detecting the Fed's response to house price growth and to stock market returns. In fact, when we shut down time variation in the coefficient or stochastic volatility, the model does not find any response to house price growth. Moreover, the response to stock prices is estimated to be not statistically significant in a model with constant coefficients. Therefore, we conclude that having a model with time-varying coefficients and stochastic volatility is important in order to analyze our research question. Notably, the finding of a significant response to house prices is robust to changing the order of the variables in our VAR.









Conclusions

The main contribution of this paper is to provide evidence on the time-varying response of monetary policy to stock prices and house prices. We find that the response to stock price fluctuations has been small and episodic, in keeping with the previous literature. Our main result is that we find a significant response to house prices, both in economic and statistical terms. While the response to house prices declines somewhat in the pre-Great Recession period, our evidence shows that the Fed considers variables other than inflation and real economic activity in its estimated reaction function. Our analysis has no normative implications for whether such a response to asset prices (and house prices in particular) was optimal, insufficient or excessive. Nevertheless, we believe it is interesting to document that it was substantial.

References and Contact

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