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Monetary shocks and asymmetric effects in an emerging stock market: The case of China ☆

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ABSTRACT

In this paper, we study the effect of monetary shocks on the Chinese stock market over the period of 2005 to 2011 with the MSVAR–EGARCH model. The evidence suggests that Chinese monetary policies have significantly asymmetric effects on the stock market in different time periods and market cycles. The effects of shocks from interest rate and reserve rate vary across market cycles but effects from money supply and exchange rate do not. Empirical evidence from the non-linear model shows that monetary policy changes increase stock market volatility, even though these monetary policies are often aimed at stabilizing macro-economic activities. The evidence suggests that both the market conditions and the effects on stock markets should be taken into consideration in monetary policy design and implementation.

1. Introduction

Over the past decade, monetary policy has increasingly become a frequently used tool in emerging economies due to the changes of international and domestic economic environment. The flexibility of monetary policy helps emerging economies deal with increasingly internal and external uncertainty. In particular, for those emerging markets experiencing high-speed growth in the past several years, monetary policy has been heavily used to adjust money supply, interest rate, exchange rate and required reserve rate to achieve the desired policy goals. In the meanwhile, due to their inherent characteristics and drawbacks, stock markets in emerging economies are more easily affected by the changes of government monetary policies than in mature markets. This gives rise to an impact of government policies on the volatility of stocks that is as big as, if not bigger than, the impact of the intrinsic value on the volatility of stocks in the emerging markets.

Traditional economic theory suggests a relationship between the stock market performance and information (e.g., Fama et al., 1969; Mitchell and Mulherin, 1994). Shocks from changes of monetary policy have been shown to be one of the most important pieces of information in the stock market and affect the stock market through the "Wealth Effect", "Liquidity Effect" and "Market Channel Effect" (Bernanke and Gertler, 2001; Modigliani, 1986; Ralph and Thomas, 2001). While monetary policy is designed to impact the macroeconomy, those policies, as monetary shocks, also affect the stock market indirectly. Moreover, these impacts on the stock market are significantly different during different time periods and market cycles. In some cases the stock market performance may even be conflicting with the traditional economic and financial theory.

To explore the impacts of monetary shocks, many researchers focus on inflation, employment and output. There is evidence that the impacts of monetary shocks are significantly asymmetric (e.g., Cover, 1998; Karras, 1996; Kim, 2003; Thoma, 1994). With the increasing volatility and risk spread in the global financial market, some studies have started paying attention to the impacts of monetary shocks on stock markets. It is a growing belief that changing monetary policies influence stock markets significantly, especially in emerging markets. Meanwhile, some studies attempt to explore various factors embodied in the monetary shocks that affect the stock market. Francesco and Stefano (2007) argue for the importance of money supply (M3) and the unit labor cost; Bernanke and Kutter (2005) emphasize the role of the federal funds rate which changes the market expectation, hence the stock market. Christos and

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Alexandros (2008) find that monetary shocks influence the stock market by affecting the expected discount factor, hence the pricing of the stock. Nieh and Lee (2001) show that the volatility of exchange rates influences the stock market in the short run but not in the long run. Phylaktis and Ravazzolo (2005) study five Asian emerging markets and find a positive relationship between exchange rate and stock market fluctuations, reinforcing the fact that exchange rate affects the stock market. The existing literature, as shown above, confirms the fact that stock markets are affected by monetary shocks. The propagation mechanism of these effects, however, is not fully understood. In particular, should we expect asymmetric impacts of monetary shocks on stock market as we have observed in the case of inflation, employment, and output? The current paper attempts to answer this question and fill the gap in the literature.

Methodologically, most existing studies focus on time series analysis, especially VAR models, ARCH models and their variants to study the asymmetric effects (e.g., Garcia and Huntley, 2002; Gruen et al., 2007; Holmes and Wang, 2002; Yun et al., 2010). Some scholars have explored the impacts of monetary shocks on the stock market, and analyzed the differences over different periods. However, to the best of our knowledge, there has not been a study that explores the impacts of monetary shocks during different stock market cycles (bull and bear markets). This paper, taking into account four monetary shocks (interest rate, exchange rate, reserve rate, and money supply), provides such an analysis based on the MSVAR–EGARCH model.

Specifically, the current paper answers the following questions. Do monetary shocks from money supply, interest rate, reserve rate and exchange rate have asymmetric effects on stock markets? Are those impacts from different shocks varying over different market cycles? Is the timing of the bull/bear markets given by our endogenous model consistent with the timing of market cycles determined by exogenous criteria?

Our study concentrates on the asymmetric effects of monetary shocks and contributes to the literature in the following ways. First, this paper verifies the relationship between stock market and monetary shocks originating from money supply, exchange rate, interest rate and reserve rate. We find that money supply and exchange rate shocks have stable positive impacts on the stock market, but shocks from interest rate and reserve rate exhibit asymmetric effects on the stock market. Second, this paper studies endogenous market cycles using a Markov switch model. It shows that the impacts from the monetary shocks are various in different market cycles. Third, we compare our estimates of endogenous regimes to the market cycles classified according to the exogenous criteria (Chen, 2007). It turns out that the endogenously estimated regimes are consistent with the exogenous market cycles. This effectively serves as a robustness check of our estimation of an endogenous model. In a word, this paper studies asymmetric effects of each shock on stock market in different endogenous regimes (market cycles). Our study focuses on monetary shocks and the stock market in China mainly because China owns the biggest stock market among all emerging economies after the "Full Circulation Reform for Listed Companies". Studying the case of China helps us understand generally how monetary shocks affect stock market in emerging markets.

The remaining part of this paper is structured as follows. Section 2 introduces theory. Section 3 describes the data and presents the empirical model. Section 4 provides the empirical results and analysis. Section 5 concludes.

2. Theoretical analyses

We start this section with model assumptions. Following Bernanke and Kutter (2005), we define monetary shocks as the information that affects stock markets significantly. Conventional financial theory shows that current stock market return may have lagged effects on future periods (e.g., Fama and French, 1988; Lo and Mackinlay, 1988). Therefore this paper makes assumption 1: the stock market rate of return in period t is affected by previous period rate of return $(t-1)$ and current monetary shocks.

With this assumption, let ΔIND_t denote the market rate of return and $g(\varsigma_t)$ denote monetary shocks at period t, including those from interest rate, exchange rate, reserve rate, and money supply. We have

$$\Delta IND_t = f(\Delta IND_{t-1}) + g(\varsigma_t) \tag{1}$$

where function $f(*)$ represents the regular changes of the rate of return due to non-policy factors, such as inflation, expectation, international factors, and IPO intensity. The benchmark rate of return is given by $f(\Delta IND_{t-1})$. By iterating Eq. (1), we get Eq. (2):

$$\begin{aligned}\Delta IND_t = {} & f\{f[f(\ldots f(\Delta IND_{t-i} + g(\varsigma_{t-i-1}))\ldots) + g(\varsigma_{t-2})] + g(\varsigma_{t-1})\} \\ & + g(\varsigma_t).\end{aligned} \tag{2}$$

It has been shown by some studies that rational expectations could not characterize the reaction of the stock market to monetary shocks perfectly (e.g., Chow and Kwan, 1997). So in this paper we instead adopt the adaptive expectation and assume that the real monetary shocks at period t equals the difference between the realized monetary policy shocks in period t and its expected shocks formed at period $t-1$. Due to the incompleteness of the expectation, the market reacts incompletely at period $t-1$. Hence the correction on the incompleteness becomes the monetary shocks at period t. Then we have

$$g(\varsigma_t) = k_t \times [\Omega_t - E(\Omega_t/\Omega_{t-1})] \tag{3}$$

where Ω_t denotes the realized monetary shocks at period t, k_t is the reaction coefficient and $E(*)$ is the mathematical expectation.

Following the existing literature (e.g., Admati, 2000; Kodres and Pritsker, 2002), to simplify the algebra without losing much insight, we make assumption 2: the expectation on the monetary shocks could be characterized by linear equations. With this assumption, we obtain

$$E(\Omega_t/\Omega_{t-1}) = \theta_{t-1} + \phi_{t-1}\Omega_{t-1} \tag{4}$$

where θ_{t-1} is the intercept and ϕ_{t-1} is the slope. We plug the expression of expectation into Eq. (2):

$$\begin{aligned}\Delta IND_t = {} & f\{f[f(\ldots f(IND_{t-i} + k_{t-i-1}(\Omega_{t-i-1} - \theta_{t-i-2} - \phi_{t-i-2}\Omega_{t-i-2}))\ldots) \\ & + k_{t-2}(\Omega_{t-2} - \theta_{t-3} - \phi_{t-3}\Omega_{t-3})] + k_{t-1}(\Omega_{t-1} - \theta_{t-2} - \phi_{t-2}\Omega_{t-2})\} \\ & + k_t(\Omega_t - \theta_{t-1} - \phi_{t-1}\Omega_{t-1})\end{aligned} \tag{5}$$

Eq. (5) indicates that the rate of return in the stock market ΔIND_t could be accounted for by previous rates of return ΔIND_{t-i} together with a series of realized monetary shocks $\Omega_t \quad \Omega_{t-1} \ldots \Omega_{t-i}$.

In the ideal case, the volatility of the market rate of return, excluding the impact of any policy, should be characterized by a white noise process. According to assumption 1, function $f(*)$ represents the regular changes of the return due to non-policy factors. It is reasonable that the impact of earlier monetary shocks will decline over time (Anzuini et al., 2010), implying that $f(*)$ will converge eventually. From Eq. (2), there is a direct relationship between the contemporaneous realized monetary shocks Ω_t and the rate of return ΔIND_t. However, the relationship between $\Omega_{t-1} \ldots \Omega_{t-i}$ and ΔIND_t is not immediate, mainly because of the uncertain choice of lag periods as well as the unknown functional forms. Therefore we need to set up different models to analyze the relationship among current rates of return ΔIND_t, previous realized monetary shocks Ω_{t-i} and current realized monetary shocks Ω_t. We define *direct* monetary shock as the one resulting from current monetary policy and define *indirect*