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Impact of the US Monetary Policy Changes on the Chinese Stock Markets

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Abstract. In this paper, I develop a vector autoregression (VAR) model to estimate the effects that the U.S. monetary policy have on Chinses stock market, using money supply, market interest rate, spread interest rate and effective exchange rate as the U.S. monetary policy index. It turns out that, according to any U.S. monetary policy index, the expansionary monetary policy in the U.S. exerts negative influence on Chinese stock market, while U.S. contractionary monetary policy bring positive impact on Chinese stock market. This result, revealing the discordance with the mainstream prediction in financial and economic fields, illustrates that the U.S. monetary policy has meaningful impact on Chinese stock market, which needs more thorough theoretical and experimental analysis.

Keywords: Monetary Policy, Stock Markets, VAR Model.

1. Introduction

It is known that monetary policy changes from a country's central bank will largely affect its financial markets. Economic globalization connects economies in each country tightly and closely, which means factors that affects one country's economy also can exert influence on the other country's economy to some extent. As the largest economy, the United States could have tremendous impacts on other countries with any slight changes in monetary policy. Ever since the financial crisis, the U.S. has been frequently changing policies to boost the economy. In the past few years, the two major changes in the U.S. monetary policy are the required reserve ratio and interest rate. The stock market, as a generally accepted signal of the function and efficiency of economy, will yield reaction to this influence distinctively. China, as one of the fastest growing country, contributes a huge amount to the global economy. So, its stock market is closely linked to the changes in the U.S. monetary policy. Therefore, this paper aims to analyze the impact of the changes in the U.S. monetary policy on the Chinese stock market.

To explore how the U.S. monetary affects the Chinese stock market is essential for both the economy in China and the rest of the world, theoretically and practically. For one thing, the study discusses the impact of an advanced country has on an emerging economy. It will then come to a conclusion on how this system interacts. So, theoretically, the study will serve as an excellent case for analyzing how the economy in an advanced economy influence a growing one. For another thing, the study will provide some suggestions for China, and all other similar economies, to respond to these monetary policy changes. Also, any response that China takes will impacts the global economy significantly as well. Thus, to study the impact of U.S. monetary policy on the Chinese stock market could also offer some insights into the world economy. This paper, developing vector autoregression (VAR) model, analyzes the impulse response of Chinese stock market to the U.S. monetary policy, generating some new findings.

2. Literature Review

Plenty of previous theoretical and empirical research found the interdependencies of one country's monetary policy to another country's economy. The theoretical researches are based on economic models. In terms of the international transmission mechanism, several theoretical frameworks are utilized. For instance, the Mundell-Fleming model, considered as an extension of the IS-LM model, is mainly applied to analyze the international transmission of monetary policy. What differs it from the IS-LM model is that it is suitable for an open economy. According to the model, the expansion of domestic monetary policy will result in a decrease in foreign output. Yet it could also be altered by

the foreign income effects. However, this model has limitations since it is under the assumption that domestic and foreign securities could be substituted perfectly, which seems impossible in the real world.

Another economic model, the New Open Economy Macroeconomics (NOEM) also provides a theoretical framework for analyzing international economies in an open economy. The model has overcome the limitations of the Mundell-Fleming model. The NOEM literature claims that the expansion of domestic monetary will reduce the output of other economies (Corsetti and Pesenti). However, it also points out that if the monetary expansion leads to the reduction of the effective rate of interest, the global demand for domestic regular goods as well as foreign ones. Thus, it is also possible that the foreign output will increase due to the change. Therefore, more empirical researches are needed in further exploring the question.

Literature focusing on empirical findings are of vital significance for policymakers. Based on the theoretical researches, various professionals have studied the impacts of monetary policy on the stock market in actual cases. In 2001, David E. Rapach identified the money supply shocks as well as other shocks on the real stock market in the U.S. The study was based on a VAR model motivated by long-run restrictions. It has pointed out that the aggregate supply shock serves as the major impulse affecting the real stock price (Rapace). These findings are not limited to the U.S., but the global economy.

Similarly, Stefano Neri found in 2002 the effects of policy shocks on the stock market in the G-7 countries. It is also based on VAR models while motivated by short-run restrictions. The study points out in details that contractionary monetary policy shocks have slight temporary, and negative impacts on the stock market. The study also finds out that these influences differ between nations, in terms of persistence, magnitudes as well as timing (Neri). Also, the real stock prices demonstrate positively essential responses to the monetary policy shocks.

There is also literature about how the U.S. monetary policy changes affect the foreign economies. The global economy has gone through several changes since the 1990s, as the world was developing in a rapid manner. As the largest economy in the world, the U.S. has been facing severe challenges especially during the financial crisis around 2008. To deal with the economic recession following the events, the Federal Reserve System had to change the monetary policies. For example, the most significant policy of the U.S. is its quantitative easing policy. These changes also drew the world' attention to it. In 2015, Saroj Bhattarai et al. have analyzed how the U.S. quantitative easing monetary policy was influencing the emerging economies. (Bhattarai et al.) The research has found significant impacts that an expanding quantitative easing policy could have on these countries. It is reflected in the changes in financial variables. To put it specifically, the policy will cause an exchange rate appreciation. Also, it could result in the reduction of long-term bond yields. Other impacts are also showed in the booming stock market as well as increasing capital inflow. Yet the study does not discover a certain link between the quantitative easing policy and the output of the emerging economies.

However, only a few studies have discussed specifically the impacts of U.S. monetary policy changes on the Chinese stock market. Tang et al. in 2013 studied how the U.S. monetary policy affects the monetary policy as well as the stock market in China. It focused especially on changes in the interest rate and required reserve ratio. According to the research, lowering policies could lead to monetary supply. The results demonstrate that stock returns will increase yet with a delay, while things differ under the bear market. The research has found that the lowering monetary policies could result in more volatility than the raising ones (Tang et al.). This research is essential for my research since it is among the few studies which discuss the same topic. However, the results may alter in a changing economic environment.

Apparently, the world economy is far from stable. Instead, it is varying daily. Especially when the U.S. and China are under an intense condition in terms of trade, it is likely that the U.S. would change its monetary policies. Under that circumstance, how the monetary policy of the U.S. will change attracts global attention. Meanwhile, the Chinese government has to figure out ways to respond to the changes. Therefore, it is necessary to reinvestigate how U.S. monetary policy changes are influencing

the Chinese stock market. It will not only offer suggestions for policymakers of China to react to the changes. Meanwhile, the study could provide more insights for other emerging economies.

3. VAR Model and Data

This research is conducted and analyzed by using Vector Autogression Model, proposed by Christopher A. Sims (1980), which is a stochastic process model to evaluate linear interdependencies between multiple time series. A VAR model contains n equations and n linear variables in which each variable is explained by its own lagged value. Currently, most research regarding to monetary policy utilizes VAR model to obtain coherent and reliable data analysis, forecasting, structural interdependencies and policy efficacy.

In this paper, to better represent the tightness or ease of monetary policy, I meticulously choose money supply, market interest rate, interest rate spread, exchange rate as the proxy variables of monetary policy. Firstly, I adopt a broader classification of money supply M2, noted as M2 as the index of money supply. According to the current practical function of U.S. monetary policy, federal funds rate itself, noted as IR, is the obvious variable to measure the tight or ease monetary policy. However, the federal funds rate is not robust enough to illustrate the long-term policy, so I also included the spread between the federal funds rate and ten-year bond rate, called SP, based on the research conducted by Bernanke and Blinder (1992). The long-term rate can integrate the inflationary expectations component that might influence the judge of monetary policy, so SP also serves as an important signal of monetary policy. I also utilize the effective exchange rate generated by Bank of International Settlement as an exchange rate variable of U.S. monetary policy, which noted as ER. According to the purpose of my research, representativeness and data accessibility, I choose Shanghai Stock Exchange Composite Index, recorded as STK, as the variable of Chinese stock market.

The sample period of my research runs from October 2000 to April 2018 with sample unit of quarter, including 71 samples. The beginning with the year 2000 is chosen based on the data availability. All data come from Federal Reserve Economic Data. Among those data, M2 appears with unit of billions of dollars. IR and SP are acquired in the form of percent. ER is obtained with index 2010 equal to 100. STK is calculated using the base period of 100. All data is seasonally adjusted using CENSUS X12.

4. Empirical Analysis

4.1 Model Validation

I use Augmented Dickey-Fuller Test to examine the stationarity of time series M2, IR, SP, ER and STK, as shown in graph 1. In the table, C=1 means the equation contains constant, otherwise no constant; T=1 shows the equation has obvious trend, otherwise no trend; L means the lag order less than 11 based on the SIC criterion. In the column of result, the first line is the t-statistics in ADF test, and the second line is the accordingly 5% critical value. According to table 1, under 5% significance level, we fail to reject the null hypothesis that each series exhibits a unit root, which means that each series is a non-stationary time series. However, under 5% significance level, we can overwhelmingly reject the null hypothesis of a unit root based on any time series after first difference, which means each series is integrated of order one.

4.2 Impulse Responses Analysis

Using the money supply, market interest rate, interest rate spread, exchange rate and Chinese stock market price as endogenous variables, I build a VAR model, selecting lag order of 5 based on AIC criterion. Then I obtain the impulse response graph of Chinese stock market price to the four proxy variables of U.S. monetary policy respectively after utilizing the orthogonalized impulse-response function and cumulative orthogonalized impulse-response function, as shown in graph 1 to graph 8.

Table 1. The Result of ADF Test about Series Stationarity

	Zero order		First Difference	
Series	C, T, L	Results	C, T, L	Results
M2	1, 1, 1	-0.995 -3.481	1, 1, 0	-5.449 -3.481
IR	1, 0, 1	-2.564 -2.915	0, 0, 0	-3.600 -2.915
SP	1, 0, 0	-2.534 -2.914	1, 0, 0	-5.733 -2.915
ER	0, 0, 0	-1.487 -2.914	0, 0, 0	-5.690 -2.915
STK	0, 0, 4	-2.206 -2.917	0, 0, 3	-5.202 -2.917

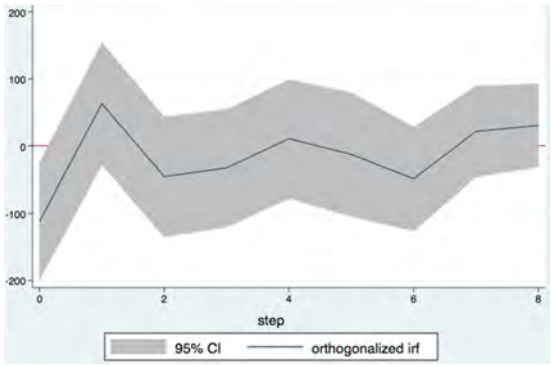

Figure 1. The Orthogonalized Impulse Response of STK to M2

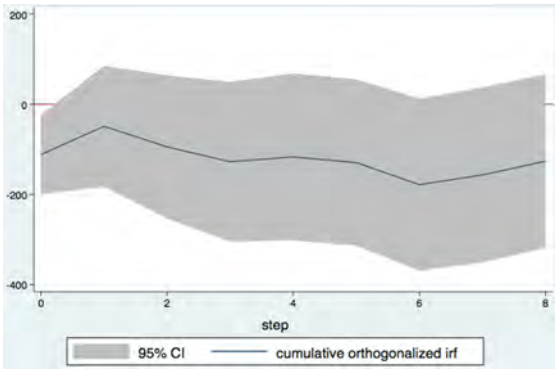

Figure 2. The Cumulative Orthogonalized Impulse Response of STK to M2

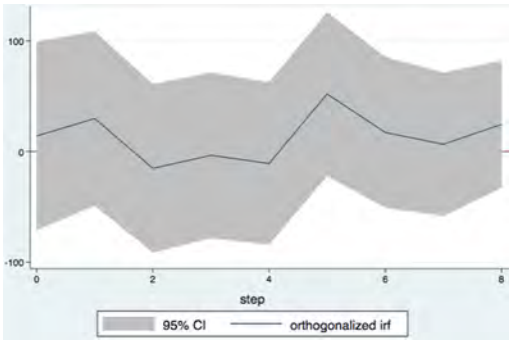

Figure 3. The Orthogonalized Impulse Response of STK to IR

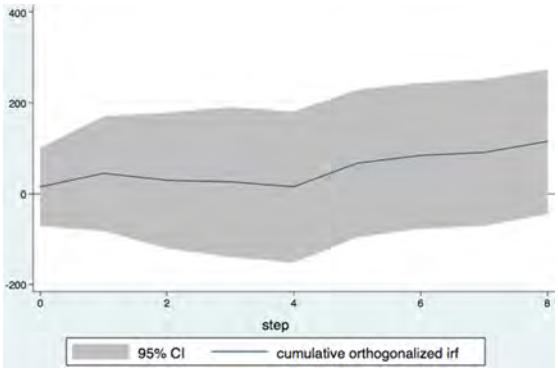

Figure 4. The Cumulative Orthogonalized Impulse Response of STK to IR

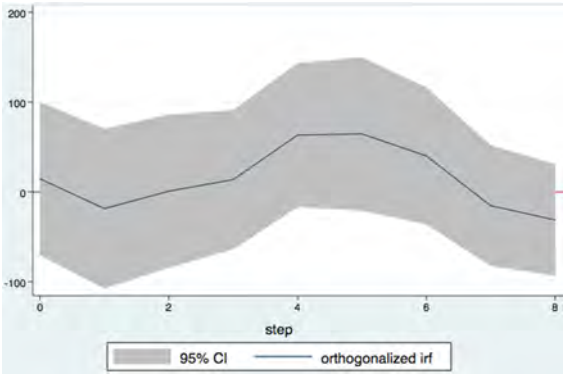

Figure 5. The Orthogonalized Impulse Response of STK to SP

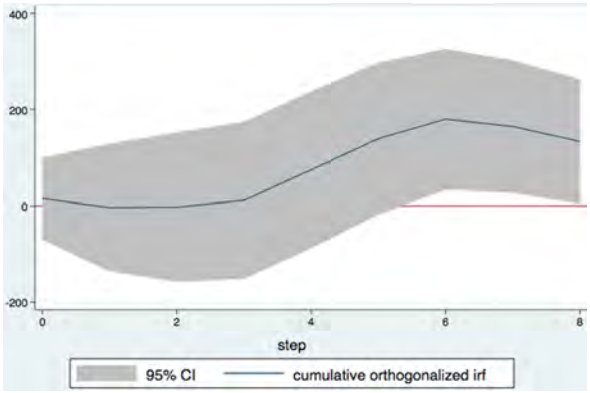

Figure 6. The Cumulative Orthogonalized Impulse Response of STK to SP

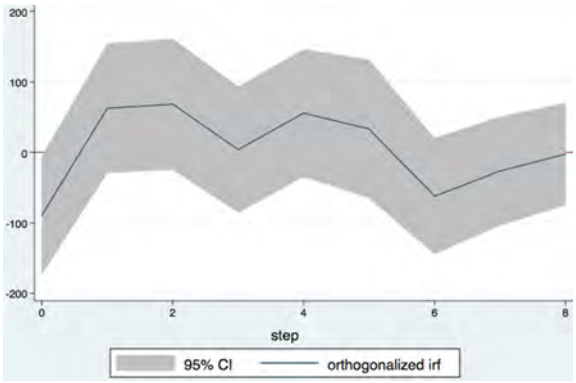

Figure 7. The Orthogonalized Impulse Response of STK to ER

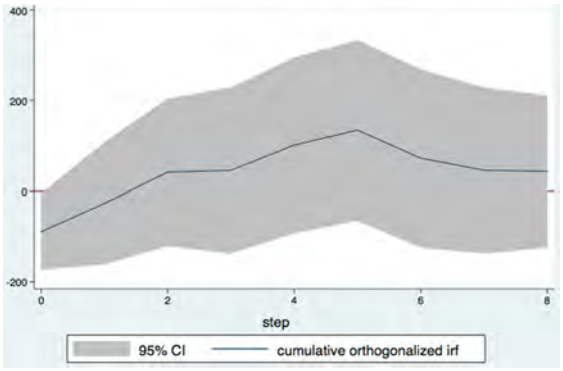

Figure 8. The Cumulative Orthogonalized Impulse Response of STK to ER

It is observable from graph 1 to 8 that, in 2 years, Chinese stock market has more than half negative response to the impulse of money supply in U.S., positive response to the impulse of U.S. market interest rate, almost all positive response to the impulse of U.S. interest rate spread, and firstly negative, then positive response to the impulse of effective exchange rate. In fact, the cumulative impulse response of Chinese stock market to the U.S. money supply is constantly negative, while the cumulative impulse response of Chinese stock market to the market interest rate, spread interest rate and effective exchange rate in the U.S. is are always negative.

4.3 Further Discussion

According to related research by Stock & Watson (1989), after detrending, the increase of money supply, the decrease of market interest rate, narrowing down of spread interest rate and decline of effective exchange rate are conceived as the tendency of ease monetary policy, while the other side change of those variables illustrates a tight monetary policy. Thus, during my sample period, U.S. ease monetary policy exerts negative influence on Chinese stock market, to be more specific, it decreases the nominal return of Chinese stock market. In the other hand, U.S. tight monetary policy affect Chinese stock market positively, according to the four proxy indexes of U.S. monetary policy.

However, this finding is not in accordance with mainstream Economic theories. For instance, IS-LM model indicates that tightness of monetary policy causes the increase of the effective interest rate and global demand for domestic and foreign goods and services, which leads to a positive impulse on foreign stock market. My result contradicts this model, and this paradox requires more comprehensive understanding and exploration on the issue about the influence of one country's monetary policy on the others.

5. Conclusion

In this paper, I utilize a vector autoregression (VAR) model to estimate the effects that the U.S. monetary policy have on Chinses stock market, selecting money supply, market interest rate, spread interest rate and effective exchange rate as the U.S. monetary policy index, sampling from October 2000 to April 2018. The results indicate that, according to any U.S. monetary policy index, the expansionary monetary policy in the U.S. exerts negative influence on Chinese stock market, while U.S. contractionary monetary policy bring positive impact on Chinese stock market. The discordance between my result and the mainstream prediction in financial and economic fields illustrates that the U.S. monetary policy has meaningful impact on Chinese stock market that needs more theoretical and experimental analysis.

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