Money Supply and Stock Price in China

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Abstract. To explore the clear relation between capital market and money market. We construct the Chinese Shanghai Composite currency and money supply model. The model analysis found that they are serial correlations. The two time series data are first-order non-stationary series. With the two non-stationary sequence, we established the error correction model, found that the currency circulation and the stock price are with cointegrated. When the stock prices in short-term deviate from the long-run equilibrium, the money supply will have a smaller adjustment of -0.036 to the level of stock prices, and the force of money supply will slightly make the stock price back to long time equilibrium.

Introduction

The relationship between money supply and stock prices is essentially a reflection of capital market and money market. Many researches are to study a unified multi-dimensional and money supply broadly, within the research on asset prices and macroeconomics. The advantage with a broad view can be avoiding missing key variables, but it is also inadequate, for multiple variables in a complex model is not easily showing the clear relationships among variables. To find the correlation between money supply and stock prices, this article will draw on the experiences of multi-dimensional model analysis, and focus only on the two variables.

On the relationship between money supply and stock prices, there is no a consistent conclusion. In theory, there are two completely different conclusions, the first view is that the amount of currency with a strong correlation between stock prices, money supply will directly affect the stock price level. Liu Zhiyang (2002) using Qian Xiaoaom's (1998) research method concluded that there is a positive correlation between money supply and stock price index in China. The second view argued that there was no correlation between money circulation and the stock price. Qian Xiaoaon (1998) using the data from the year of 1994 to 1997 found that the stock prices have positive relation with money supply M0, a narrow measure of money supply, have no relationship with M1, and have a weak negative correlation with M2, a broad measure of money supply. Sun Huahao (2003) found that all the quantity of money (M0, M1, M2) has no effect on the stock market. Liu Song (2004) concluded that changes in M1 has a significant effect on the stock price changes, the stock market price changes have a significant impact with M0. A third view is that the amount of currency with two-way influence on the stock price relationship. Yang Xinsong, Long Gesheng (2006) concluded that a two-way positive correlation between money supply and stock prices.

The innovation of this paper is to use a longer time-series data on quantitative analysis to improve the reliability and validity of the study, revise and improve some of the conclusions of previous studies.

The paper is organized as follows, the second part is a theoretical overview of the relationship between the money supply and stock prices, the third part is the empirical analysis on Chinese money supply and Chinese stock prices level, the fourth part draw conclusions, and make policy suggestion.

Theoretical Overview on the Money Supply Influence on the Stock Price

According to literature, the impact of money supply on the stock market, mainly through four effect Implementation: portfolio effect, the intrinsic value of the stock growth effect, expected effects, and
the effects of inflation. With the increase in money supply it will lead to marginal benefits of money, securities assets, making marginal revenue share increases, thereby increasing the public investment in stocks. The expected return due to the increase in the money supply caused by the rise, increase demand for stocks, so promote stock prices. This paper using ECM model is to analyze and to determine the correlation between money supply and stock prices in China.

Empirical Analysis of Money Supply to the Stock Price in China

Models Construction

Basic Model. First of all, we have established the basic money supply and stock price impact model

$$\ln(SPI_t) = \alpha + \beta \ln(MSP_t) + u_t, \quad t = 1,2,\ldots,T$$  \hspace{1cm} (1)

SPI is the level of stock prices, MSP is the currency in circulation.

Data Collection and Selection. In the base model, SPI, MSP have many indicators to choose from. SPI index include China Shanghai Composite Index, China Shanghai A-share stock index, the CSI 300 Index, China Shanghai Securities 180 Index, China Shanghai Securities 50 Index, Shenzhen Component Index securities, the Shenzhen Composite Index, China Shanghai Securities 50 China Shanghai Securities plurality of indicators 30, the Shenzhen a-share index constituent securities, the Shenzhen composite index, etc; Also MSP indicators include: M0, M1, M2 and so on. How to choose one or more variables as the empirical key variables in the selected portions of the data, we will conduct a detailed analysis.

What this paper selects of the money supply variable is the amount of narrow measure money to broad measure money supply, monthly data of M0, M1 and M2. Stock prices selected Chinese Shanghai Composite Index (abbreviated as "SHI"), the Securities Shenzhen Component Index (abbreviated as "SZI") . The data are monthly closing price data of SHI, SZI, respectively. In order to reduce heteroskedasticity, we take the variable data as logarithmic analysis. Positive sample data for January 2000 Month to December 2015, a total of 16 years of monthly transactions of time.

Since the stock price data have data daily transactions of the trading day, while money supply has only the monthly data. In order to maintain consistency, we take the trading closing value of stock market on the last day of each month, as monthly data of the stock market transactions.

All the data are from the economic and financial databases "TONGHUASHUN". To use EVIEWS 8.0 software for the processing.

In order to choose the right stock prices and money supply indicators representatives, we first make the correlation analysis among M0, M1, M2. We first take the log data, intuitive judgment and analysis. Related lines are as follows:

Figure 1. Trend of MO, M1, M2 from the year 2000 to 2015 in China.

Figure 2. Trend of China’s Shanghai Composite Index and Shenzhen Composite from the year 2000 to 2015 in China.
At the same time, the relevant indicators correlation analysis as following tables (Table 1).

Table 1. China money supply MO, M1 and M2 correlation analysis.

|       | MO- | M1- | M2- |
|-------|-----|-----|-----|
| MO-   | 1   | 0.982 | 0.977 |
| M1-   | 0.982 | 1   | 0.987 |
| M2-   | 0.977 | 0.987 | 1   |

Table 2. State Chinese Shanghai Composite Index and Shenzhen Composite correlation analysis.

|       | SHI- | SZI- |
|-------|------|------|
| SHI-  | 1    | 0.817 |
| SZI-  | 0.817 | 1    |

From the regression results we found that three money supply indicators are very closely positive correlation. In theory, any one of the indicators as explanatory variables or explanatory variables are significant.

We conducted correlation analysis of China Shanghai Composite Index and Shenzhen Composite Index, the results as follows (Table 2).

From the correlation analysis, we found a high correlation between the two variables. In theory we can choose any one of the indicators. Since the Shanghai Stock Exchange trading volume dominant in the capital market, so we take the Chinese Shanghai Composite Index as a measure of indicators of capital market. The monetary variables, M2, a broad measure of money supply, is often used as indicators of macroeconomic indicators of monetary measure, therefore, we choose M2 money supply as a proxy variable.

We established the models. In the model, if not containing the intercept, when M2 coefficient is 0, it means that the stock price index are also zero. Obviously this does not meet the actual situation of the stock price. Therefore, the model should be concluded the constant term. Form of the model is:

\[ \ln(\text{shi}_t) = c + \beta \ln(\text{m2}_t) + u_t \]

"shi" is the Chinese Shanghai Composite Price Index, "m2" is the broad measure money circulation, "u" is the disturbance.

Model Analysis and Testing

Serial Correlation Test of the Model. After regression of model (3.2), we obtained the results:

\[ \ln(\text{shi}_t) = 4.379 + 0.2545\ln(\text{m2}_t) \]

\[ t=11.16529 \quad 8.419694 \]

\[ R^2=0.2717 \quad D.W=0.065 \]

Since the model containing the intercept, D.W test cannot be used. We use Q and LM tests. LM test results are as follows:

Table 3. Breusch-Godfrey Serial Correlation LM test.

| Breusch-Godfrey Serial Correlation LM Test. |
|-------------------------------------------|
| F-statistic: 1399.806 | Prob. F(2, 188): 0.0000 |

LM statistics showed that at the 5% significance level it reject the null hypothesis which the residual series regression equation is serial correlation. So, the estimation results of the regression equation is no longer valid.

We then using Q test, test results are as follows:

Figure 3. The basic model of residual serial correlation diagram.

Figure 4. Lag of first order residual LM test diagram.
As can be seen, Q statistic P values are less than 5%, indicating that the 5% significance level, reject the null hypothesis, the presence of residual series model is serial correlation. When the test results reject the null hypothesis, residual sequence serial correlation, level of significance, goodness of fit test and F statistics will no longer be trusted.

**Analysis of Chinese Smooth Data Sequence Shanghai Composite Index Securities and Broad Money Circulation Data Sequence Stability Analysis.**

(1) Chinese Shanghai Composite Index data sequence

We build China Shanghai Composite Index data AR (1) model

\[
\ln(\text{shi}_t) = c + \alpha \ln(\text{shi}_{t-1}) + \beta_1 \ln(m2_t) + \epsilon_t
\]

Analysis of residuals, statistical results for LM is in Figure 4 and Q test in Figure 5. As can be seen, model residuals have a first-order serial correlation.

**Unit Root Test on Stock Price Index and Currency Circulation.** In order to obtain intuitive understanding, we first draw charts of two variables.

We judges that SHI has no clear trend. So, with unit root test, we have selected the intercept, no trend item unit root test. Analysis of results are as follows (Table 3):

| Null Hypothesis: SHI has a unit root. | Exogenous: Constant. |
|--------------------------------------|----------------------|
| Lag Length: 2 (Automatic - based on SIC, maxlag=14) | Augmented Dickey-Fuller test statistic: |
| I-Statistic: -2.367175 | Prob.: 0.1525 |

As can be seen, P = 0.1525, the test results showed, SHI sequence would accept the null hypothesis which is a non-stationary sequence. Next, we SHI first-order differential unit root test, ADF test results are in Table4).

Test results show that the first-order difference sequence \(\Delta \text{SHI}\) reject the null hypothesis and accept \(\Delta \text{SHI}\) series is stationary sequence conclusions. Several test methods using other unit root, we get the same conclusion, therefore \(\Delta \text{SHI}\) sequence is a first-order single whole sequence, namely \(\text{SHI} \sim I(1)\).

Next, we determine the sequence of M2 money supply is stable. In the money supply figures, we can observe that, from the years of 2001 to 2015, China's money supply has a clear upward trend. When ADF test, select the constant term and contains time trend. M2 ADF test sequence is in Table 5.

Test results show, M2 sequence with almost the maximum value of P 0.99, that is 99% significance level of acceptance of the null hypothesis that M2 has a unit root. To make a first order difference of M2 sequence, then \(\Delta \text{M2}\) choose a constant term and time trend, ADF test, test results are in Table 6.
Test results show that the first-order difference sequence $\Delta M2$ at the 95% significance level, reject the null hypothesis. $\Delta M2$ sequence have a first difference stationary, first-order single whole sequence, and $M2 \sim I(1)$

Stock Prices and Money Supply ECM Model. Because SHI and M2 are first-order non-stationary sequence, the two variables have the same single integer order, we do the co-integration test.

We first establish SHI and M2 error correction model (ECM). Firstly establish long-term equilibrium equation using the data of Jan 2001 to Dec 2015

$$\ln(shi) = k_0 + k_1 \ln(m2) + u_t \quad t = 1, 2, \ldots, T$$  \quad (4)

So let residual series $\hat{ecm}_t = \hat{u}_t$, as the error correction term, the establishment of the following error correction model is

$$\Delta \ln(SHI) = c + \alpha \Delta \ln(SHI(-1)) + \beta_1 \Delta \ln(M2) - \beta_2 \Delta \ln(M2(-1))$$  \quad (5)

After the estimation, the establishment of equation is

$$\Delta \ln(SHI) = \beta_0 + \alpha \hat{ecm}_{t-1} + \beta_1 \Delta \ln(M2) + \epsilon_t$$  \quad (6)

Computer Data into the model, the estimated equation is as follows:

$$\Delta \ln(SHI) = 0.0057 + 0.143 \Delta \ln(SHI(-1)) + 0.000000379 \Delta \ln(M2) - 0.000000762 \Delta \ln(M2(-1))$$  \quad (7)

The regression equation by the LM test, the test results are (Table 7)

Conclusion

Inspecting on stock prices and money supply in China, the results are: China Shanghai Securities Composite Index is a non-stability sequence with first-order autocorrelations, while the money supply is also the same. After the unit root tests, we found that stock prices and the money supply in China is stable cointegration relationship. When the short-term fluctuations deviate from the long-run
equilibrium, coefficient of adjustment of the money supply will be -0.036, and the stock prices from
a non-equilibrium state will be back to equilibrium very slightly.

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