

Research on the Relationship of Stock Price Fluctuation in China and America Financial Industry based on VAR Model

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Abstract

With the opening up and internationalization of China's financial market, the relationship between China's financial market and international financial market is getting closer, especially the relationship between China's financial market and American financial market. In this context, using the daily-frequency time series data from January 1,2019, to August 7,2020, studying the relationship between stock price volatility in China and the US financial sector based on the Vector Autoregression (VAR) model, the result shows that the fluctuation of American financial stock price has a greater, more obvious and more lasting influence on Chinese financial stock price, however, the influence of Chinese Financial Stock Price Fluctuation on American financial stock price is relatively weak and short-lived.

Keywords

VAR Model; The Chinese and American Financial Sectors; The Price of the Stock.

1. Introduction

In the context of economic globalization, China and the United States, as the two largest economies in the world, have close economic exchanges with each other. Although there have been conflicts and frictions in the economic and trade fields between the two countries since 2018, it is undeniable that the economic exchanges between the two countries are still close and affect each other. As an important industry in the modern economic system, the financial industry plays an important role in the economy and society. The financial industry connects the production and operation of various departments, industries, and units, and connects every member of society and family. It is an important lever and means for the country to manage, supervise and regulate the operation of the national economy; the financial industry plays an important role in international economic exchanges. Status is the link for realizing international trade, attracting foreign capital, and strengthening international economic cooperation.

With the continuous opening and internationalization of China's financial market, China's financial market and the international financial market have become increasingly connected, especially the linkage with the US financial market has continued to increase, and the connection between the Chinese and American financial industries has become increasingly close. [1] Mo You et al. (2017) [2] Through empirical research, it is found that there is a long-term equilibrium positive correlation between the Chinese and American stock markets; Liu Jiming (2018) [3] Through empirical research, it is found that the linkage between the Chinese and US stock markets is continuously increasing Trend; Zhou Zhizhong (2020) [4] found through empirical research that China and the US stock markets have a strong linkage.

The exchange rate, as a link connecting domestic and foreign markets, has an important influence on the price fluctuations of international stock markets. Since the stock price is the present value of the company's future cash flow, exchange rate fluctuations will impact the stock price, so there is a causal relationship between exchange rate fluctuations and stock price fluctuations. [5] When the exchange rate increases, that is, the domestic currency appreciates, the stock market and other capital markets will attract a large amount of domestic and foreign capital inflows, and the prices of stocks and other assets will be revalued, prompting the appreciation of stocks and pushing up stock prices.

As the linkage between the Chinese and American stock markets continues to increase, what is the internal relationship between the stock price volatility of the Chinese and American financial industries? This article uses time series data to study the relationship between the stock price volatility of the Chinese and American financial industries based on the VAR model.

2. Data Description

The Shanghai Composite Index and the S&P 500 Index are representative of the Chinese and American stock markets. Therefore, the SSE Financial Real Estate Industry Index and the S&P 500 Financial Sector Index are used to represent the financial sector stock prices in China and the United States, respectively, and the exchange rate of the US dollar against the RMB is used as the adjustment variable. , The three variables are represented as *ss*, *sp500*, *er*, and the daily frequency time series data from January 1, 2019 to August 7, 2020 are selected. The above data comes from the Yingwei Finance website (<https://cn.investing.com/>).

3. Empirical Analysis of VAR Model

3.1. Stationarity Test, Co-integration Test and Model Setting

The following empirical analysis is carried out using Eviews8.0. First, the stationarity test is performed. Before analyzing the time series data, the data must be tested for stationarity. The ADF unit root test is used to test the stationarity of *ss*, *sp500*, and *er*. The results are shown in Table 1. It can be seen that at the 1% significance level, *ss*, *sp500*, *er* is a first-order single integer sequence.

Table 1. Stationarity test results

variable	Inspection form	ADF statistics	1% threshold	Stationarity
<i>ss</i>	(c,t,0)	-3.466	-3.982	Non-stationary
<i>dss</i>	(0,0,0)	-18.633	-2.571	stationary
<i>sp500</i>	(c,t,0)	-2.309	-3.983	Non-stationary
<i>dsp500</i>	(0,0,0)	-6.019	-2.571	stationary
<i>er</i>	(c,t,0)	-1.769	-3.983	Non-stationary
<i>der</i>	(0,0,0)	-20.336	-2.571	stationary

Then perform Co-integration test on *ss*, *sp500*, *er*. The Johansen cointegration test was used to test the cointegration relationship of *ss*, *sp500*, and *er*. The results are shown in Tables 2 and 3. According to the results of the trace test and the maximum eigenvalue test, it can be seen that at the 1% significance level, *ss*, *sp500*, the null hypothesis that there is no cointegration equation among *er*, that is, there is no cointegration relationship among *ss*, *sp500*, and *er*, and the VAR model can be further established.

Table 2. Trace test results of Johansen cointegration test

Null hypothesis	Eigenvalues	Trace statistics	1% threshold	P value
Null	0.049	23.216	35.458	0.236
At most 1	0.010	6.049	19.937	0.690
At most 2	0.008	2.626	6.635	0.105

Table 3. The results of the largest eigenvalue test of Johansen cointegration test

Null hypothesis	Null hypothesis	Eigenvalues	Trace statistics	1% threshold
Null	0.049	18.559	25.861	0.110
At most 1	0.020	7.394	18.520	0.444
At most 2	0.008	3.112	6.635	0.078

When establishing the VAR model, Sims et al. (1980) believed that no difference was used even when the variables had unit roots. They believed that the purpose of VAR analysis was to determine the relationship between variables, not parameter estimation, and the difference would lose the original data. Information in. [6] Therefore, use ss, sp500, er to establish a VAR model, the model is as follows:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t \tag{1}$$

Among them, Y represents the column vector including ss, sp500, er, p represents the lag order of all endogenous variables, A represents the correlation coefficient matrix, and ε represents the disturbance vector.

3.2. Model Lag Period Determination, Stability Test

First, determine the lag period of the model. Determining the lag period is a key step in the establishment of a VAR model. The LR, FPE, AIC, SC, and HQ information criteria are selected to determine the lag period of the model. The results are shown in Table 4. It can be seen that the lag period of the model selected by each information criterion is 2. This establishes the VAR (2) model.

Table 4. Determination of the model lag period

Lag period	LogL	LR	FPE	AIC	SC	HQ
0	4344.204	NA	2353603.	23.18509	23.21650	23.19756
1	2568.471	3513.584	190.3534	13.76251	13.88817	13.81240
2	2526.291	82.78410*	159.4828*	13.58555*	13.80546*	13.67286*
3	2517.858	16.41658	159.9696	13.58858	13.90273	13.71330

Note: * indicates the lag period of the model selected by each information criterion.

Then the stability test of the VAR (2) model is carried out. Only when the VAR model is stable, can the analysis of impulse response and variance decomposition be continued, and the stability test of the VAR (2) model using AR characteristic roots, the 6 characteristic root reciprocals of the model are all in the unit circle Inside, as shown in Figure 1, the VAR (2) model is stable.

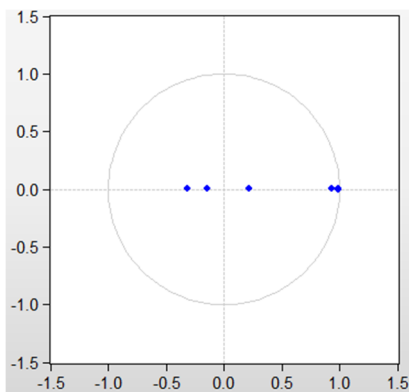


Figure 1. Model stability test

3.3. Granger Causality Test

Perform Granger causality test on ss, sp500, er, the lag period is 2, and the results are shown in Table 5. It can be seen that at a significance level of 10%, sp500 is the one-way Granger cause of ss, er and ss are Granger causality of each other, and Sp500 is er's one-way Granger reason. Based on this, it can be seen that the Granger causality relationship among Chinese financial industry stock prices, U.S. financial industry stock prices, and the US dollar exchange rate is shown in Figure 2. It can be seen that fluctuations in U.S. financial industry stock prices can directly and significantly affect China's financial industry stock prices. The exchange rate indirectly significantly affects the stock prices of China's financial industry.

Table 5. Granger causality test results

Null hypothesis	F value	P value
sp500 is not a Granger reason for ss	2.948	0.054
ss is not the Grange reason of sp500	0.046	0.955
er is not the Granger reason for ss	3.330	0.037
Grange reasons for ss not er	18.204	3.E-08
er is not the Granger reason of sp500	2.273	0.105
Sp500 is not a Grange reason for er	14.462	9.E-07

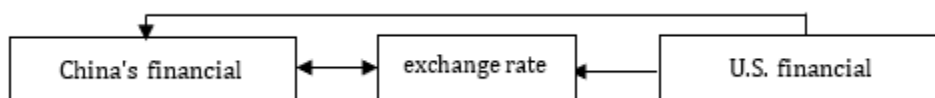


Figure 2. Granger causality path

3.4. Impulse Response Analysis

Analyze the impulse response of the VAR(2) model established above. The lag period is 20. The result is shown in Figure 3. It can be seen that: (1) ss has a gradually weakening positive impact on itself; From the second period, it has a slowly increasing positive impact, and after the eighth period, it remains basically stable; er has a gradually weakening negative impact on ss from the second period. (2) sp500 has a slowly weakening positive impact on itself, basically remaining stable; ss has a slowly weakening positive impact on sp500; er has a gradually weakened negative impact on sp500 from the second period. This shows that: (1) The stock price volatility of China's financial industry is greatly affected by itself in the short term, and it is affected by the gradual increase in the stock price volatility of the US financial industry in the long term; (2) The stock price volatility of the US financial industry is affected by its own in the long run. Price fluctuations have a greater impact, and the long-term impact of the stock price fluctuations in China's financial industry has gradually weakened.

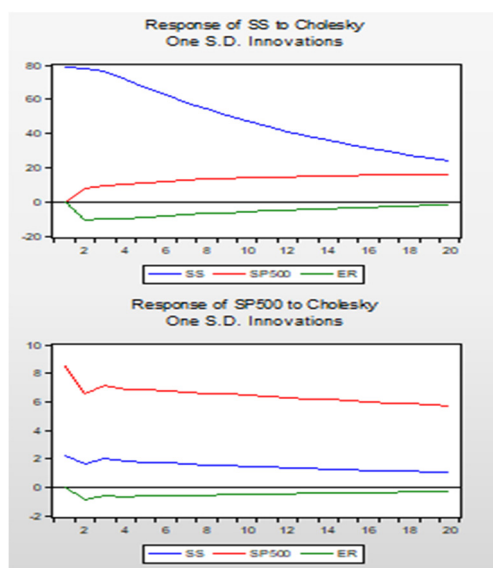


Figure 3. Impulse response analysis results

3.5. Analysis of Variance Decomposition

Table 6. Variance decomposition results

Lag period	ss			sp500		
	Ss(%)	sp500(%)	er(%)	ss(%)	sp500(%)	er(%)
1	100.0000	0.000000	0.000000	6.142656	93.85734	0.000000
2	98.65829	0.479696	0.862015	6.039770	93.29959	0.660638
3	98.04957	0.823956	1.126474	6.378577	92.94638	0.675041
4	97.62149	1.106429	1.272083	6.377604	92.88111	0.741281
5	97.27834	1.376292	1.345363	6.345687	92.89878	0.755534
6	96.97106	1.643256	1.385682	6.267251	92.97045	0.762296
7	96.67767	1.915638	1.406693	6.173915	93.06640	0.759681
8	96.38791	2.195880	1.416207	6.071768	93.17539	0.752839
9	96.09642	2.485304	1.418276	5.966866	93.29011	0.743026
10	95.80049	2.784126	1.415382	5.861918	93.40662	0.731459
11	95.49881	3.092109	1.409081	5.758708	93.52251	0.718780
12	95.19088	3.408702	1.400419	5.658227	93.63632	0.705451
13	94.87671	3.733173	1.390122	5.561058	93.74717	0.691773
14	94.55660	4.064681	1.378715	5.467510	93.85453	0.677957
15	94.23109	4.402320	1.366587	5.377726	93.95812	0.664152
16	93.90082	4.745152	1.354031	5.291737	94.05780	0.650465
17	93.56649	5.092231	1.341274	5.209503	94.15353	0.636972
18	93.22889	5.442621	1.328491	5.130940	94.24533	0.623727
19	92.88877	5.795408	1.315820	5.055934	94.33330	0.610771
20	92.54692	6.149708	1.303369	4.984355	94.41751	0.598130

Based on the above VAR (2) model, the variance decomposition is performed, and the results are shown in Table 6. It can be seen that: (1) The contribution rate of ss to its own volatility slowly decreases, and the contribution rate in the 20th period is 92.55%; the contribution of sp500 to ss volatility the rate of increase slowly, the contribution rate of the 20th period is 6.15%; the contribution rate of er to ss fluctuation is kept within 2%. (2) The contribution rate

of sp500 to its own volatility decreases slowly, with a contribution rate of 94.42% in the 20th period; the contribution rate of ss to sp500 volatility decreases slowly, the contribution rate of the first period is 6.14%, and the contribution rate of the 20th period It is 4.98%; the contribution rate of er to ss fluctuation is kept within 1%. This shows that: (1) the stock price fluctuations of the US financial industry have a slowly increasing long-term contribution to the stock prices of the Chinese financial industry; (2) the stock price fluctuations of the Chinese financial industry have a slow and weakening long-term contribution to the stock prices of the US financial industry; (3) The exchange rate contributes very little to the stock price fluctuations of the Chinese and American financial industries.

4. Conclusion

Based on the VAR model, through empirical research on the relationship between stock price fluctuations in the Chinese and American financial industries, the conclusions are as follows: (1) From the perspective of the path of action, the stock price fluctuations in the American financial industry can directly and significantly affect the stock prices of the Chinese financial industry, and can also be indirectly through the exchange rate. Significantly affect the stock price of China's financial industry, while the fluctuation of the stock price of China's financial industry has no significant impact on the stock price of the US financial industry. (2) From the perspective of the degree of influence, the stock price fluctuations of the US financial industry will have a weaker impact on the stock prices of the Chinese financial industry in the short term, and the stock price fluctuations of the US financial industry will have a slower and stronger impact on the stock prices of the Chinese financial industry in the short term; The stock price fluctuations of the Chinese financial industry have a strong influence on the stock prices of the American financial industry. In the long term, the stock price fluctuations of the Chinese financial industry have a slow weakening influence on the stock prices of the American financial industry. (3) The exchange rate of USD to RMB has a strong influence on the stock price fluctuations of China's financial industry, while its influence on the stock price fluctuations of the US financial industry is relatively weak.

In short, the stock price volatility of the US financial industry has a greater, more pronounced, and longer-lasting impact on the stock price of the Chinese financial industry, while the stock price volatility of the Chinese financial industry has a relatively weak and short-lived impact on the stock price of the US financial industry. This is closely related to the well-established and open financial system of the United States and the importance of the U.S. dollar in the global monetary system. Therefore, it is suggested that China should further open up and improve its financial market on the premise of ensuring the security of the national economy to bring it into line with the global financial market. At the same time, the internationalization of the renminbi should be further promoted to enhance its influence and role in the international monetary system.

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