

A Study of Shenzhen-Hong Kong Stock Connect Program Impact on the Volatility of Shenzhen Stock Market

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Abstract: *China has successively promulgated relevant laws and implemented relevant policies to guide and regulate the gradual opening up of China's capital market. In order to strengthen the opening up of the stock market and enrich the capital structure of listed companies, the state has implemented a series of measures, including introducing qualified foreign investors, completing the reform of non-tradable shares, and opening Shanghai-Hong Kong and Shenzhen-Hong Kong stock exchanges. Based on the previous research and experience of capital market opening to the outside world, it is particularly important to continue to study the policy effects of Shenzhen-Hong Kong Stock Connect Program. This paper chooses Shenzhen companies data samples, mainly using Double Difference analysis, to compare the volatility characteristics before and after the launch of Shenzhen-Hong Kong Stock Connect Program. Through the analysis of the results of the study, we find out the influencing factors of the volatility of Shenzhen Stock Market and the impact of Shenzhen-Hong Kong Traffic Policy on the volatility of Shenzhen Stock Market.*

Keywords: Shenzhen-Hong Kong Stock Connect Program, Volatility, Influencing Factors, Double Difference

1. Introduction

After the implementation of Shenzhen-Hong Kong Stock Connect Program policy, Shenzhen and Hong Kong have provided fresh samples for capital liberalization research, which will provide theoretical support for global financial integration. A comparative study of the Shenzhen and Hong Kong stock markets and their related markets before and after the implementation of the Shenzhen-Hong Kong Stock Connect Program Policy will help to measure and analyze the risks that China's capital market undertakes in the process of gradual opening up, and make corresponding countermeasures.

If the opening of Shenzhen and Hong Kong lasts for a period of time, it has been proved that it can effectively guide the rational return of securities price fluctuations in the two markets, and promote the prosperity of the securities market and the real economy it supports. Then, it will become a good practice example to break the local protectionism, help guide Shenzhen-Hong Kong Stock Connect Program to carry on better, and provide useful reference for the cooperation between the mainland securities market and other global securities markets, help guide the developing countries to carry out financial reform, and provide a road choice for them to get out of financial restraint.

2. Literature Review

Firstly, the influencing factors of stock market volatility are studied. Hu Daiguang and Gao Hongye (2000) pointed out that from most of the results, the price and return of financial assets are quite volatile, and it is impossible for any model to predict it completely and accurately. He Liping and Wang Juan (2010) pointed out that macroeconomic factors affecting the stock market include economic aggregate,

monetary policy and fiscal policy, exchange rate and so on. Gross domestic product (GDP) or industrial production are often used to measure total economic output. Xu Bingsheng (2007) pointed out that the measurement of monetary policy mainly includes interest rate, deposit reserve rate and money supply. Chen Guojin (2010) Institutional investors take advantage of the behavioral and financial bias of investors in the market to deliberately boost the stock market's ups and downs to make profits. Su Dongwei (2008) removed the fundamental factors from the single asset return rate and measured noise trading by orthogonal return fluctuation with the fundamental. The research found that noise trading enlarged price fluctuation and affected market quality. Secondly, the relevant research on the volatility effect under market transmission. Zou Ping (2010) studied the volatility spillover effect of Shanghai Stock Index and Shenzhen Component Index. Firstly, the GARCH-M model with two variables was established. Then the conditional variance was extracted from the residual term of GARCH-M model. The conditional variance with a lag of 1 to 5 periods was added to the conditional variance equation of GARCH-M model, which was affected by spillover volatility. Finally, the single spillover from Shenzhen Stock Market to Shanghai Stock Market was obtained. The conclusion is drawn. Zhao Hua and Cui Jing (2013) used ternary GARCH to analyze volatility spillovers between different interest rates, and analyzed in detail the ARCH and GARCH effects between bond repurchase rate, Shibor and national interbank dismantling rate. Finally, the impact of Shanghai-Hong Kong Stock Exchange Policy on the volatility of Shanghai Stock Exchange is studied. Yuan Ji (2015) believed that the longer stocks were held, the greater the probability of exchange rate loss. Zhang Pengfei and Song Zhe (2015) believe that Shanghai and Hong Kong Stock Exchange have brought a large amount of incremental capital and mature investors to the A-share market, which will change the style

of speculation in the A-share market and correct the excessive volatility of the stock market.

3. Model Basis and Data Description

3.1 Model Basis

Before the opening of Shenzhen and Hong Kong, Shenzhen stock market was in a basically consistent policy environment. After the opening of Shenzhen-Hong Kong Stock Exchange, Shenzhen Stock Connect Program was divided into Shenzhen Stock Connect Program and Non-Shenzhen Stock Connect Program, which had policy impact on Shenzhen Stock Connect Program. Therefore, the opening of Shenzhen-Hong Kong Stock Connect Program has brought about the impact of policy changes on the stock return and volatility of Shenzhen Stock Connect Program. At the same time, it has also caused the difference between the return and volatility of Shenzhen Stock Connect Program and non-Shenzhen Stock Connect Program. In view of the dual impact on Shenzhen stock after the opening of Shenzhen Stock Connect Program, this paper uses the two different factors of Shenzhen and Hong Kong Stock Exchange on the formation of Shenzhen Stock Connect Program.

$$y_{it} = \alpha + \beta G_i + \lambda T_t + \gamma G_i * T_t + \varepsilon_{it}$$

The above formula is the basic setting of the double difference model. Among them, G is a classified virtual variable (G = 1 for Shenzhen Stock Connect Program Company and G = 0 for non-Shenzhen Stock Connect Program Company), a staged virtual variable (T = 1 after Shenzhen-Hong Kong Transport Policy Implementation and T = 0 before Shenzhen-Hong Kong Transport Policy Implementation), and a G*T interaction item represents the effect of the treatment group after the implementation of the policy, and its coefficient is the processing effect that the double difference model focuses on. Y is the explanatory variable, which represents the return rate and daily variance in the following empirical studies.

3.2 Data Description

The daily return rate and daily variance of 40 stocks in time window are taken as data samples. The time window of the research model is shortened to 200 trading days before and after the opening of Shenzhen and Hong Kong. From Shenzhen Stock Connect Program and non-Shenzhen Stock Connect Program, 10 main board companies and 10 GEM companies were randomly selected. A total of 40 companies were selected as the research object. The time window is also controlled in 200 trading days before and after the opening of Shenzhen and Hong Kong. In the windows database, 10 stocks of Shenzhen, Hong Kong and non-Shenzhen, Hong Kong, and GEM were randomly selected in 200 trading days around December 5, 2016, totaling 40 stocks. Because the operation of dividend distribution and allotment will cause the change of stock price and equity capital, we choose the "pre-revert" to adjust the closing price of the stock, and calculate the logarithmic

return of the selected stock by the adjusted closing price.

20 stocks of Shenzhen Stock Connect Program were randomly selected as treatment group and 20 stocks of non-Shenzhen Stock Connect Program were randomly selected as control group. Randomly selected companies excluded the initial public offering and suspension data within 200 trading days before the opening of Shenzhen and Hong Kong. Finally, 7799 samples of return data and 7760 samples of daily variance data of 40 companies in Shenzhen were collected and sorted out.

Using the collected data of Shenzhen stock market, we calculate the logarithmic return of 40 stocks in 200 trading days, and then use GARCH model and logarithmic return data to estimate the daily variance of 40 stocks in 200 trading days. Taking the return and variance of individual stocks as explanatory variables, this paper explores the direction and extent of the impact of Shenzhen-Hong Kong Communication Policy on the return and volatility of individual stocks in Shenzhen stock market before and after the opening of Shenzhen-Hong Kong Communication Policy.

4. Empirical Analysis

4.1 Yield

Firstly, we calculate the logarithmic return of 40 companies in 200 trading days, excluding the suspension and invalid return data, and get 7799 samples of stock return data.

20 Shenzhen Stock Connect Program Companies of 40 companies are set as treatment group, 20 non-Shenzhen Stock Connect Program Companies are set as control group. Eviews software is used to test whether there is a significant difference in the average return between the treatment group and the control group in the 200 trading days before the opening of Shenzhen Stock Connect Program Company and non-Shenzhen Stock Connect Program Company, which proves that Shenzhen Stock Connect Program Company and non-Shenzhen Stock Connect Program Company have basically the same return rate before the opening of Shenzhen Stock There is no particularity in the selection of Shenzhen Stock Connect Program.

Variable	Mean value of treatment group	Mean of Control group	T value	Saliency
Y	0.001	0.001	-3.01	0.008***

Note: *** means significant at 1% level

Through the above average test, we can see that the returns of Shenzhen Stock Connect Program Company and non-Shenzhen Stock Connect Program Company in the 200 trading days before the opening of Shenzhen and Hong Kong are basically the same, which shows that the Shenzhen Stock Connect Program Company selected in this paper has no particularity.

Based on the above validation, using logarithmic return data of 40 companies before and after the opening of Shenzhen and Hong Kong, using OLS method, taking logarithmic return data sample y as interpreted variable, classifying virtual variable, time virtual variable and interactive virtual variable as explanatory variable, using Eviews to regression, the following results are obtained:

Variable	Coefficient	Standard Deviation	T value	Probability
G	0.00125	0.000998	1.25	0.21
T	-0.00065	0.000998	-0.65	0.52
Q (G*T)	-0.00120	0.001411	-0.85	0.40
C(Constant term)	0.00127	0.000705	-1.80	0.07

According to the results of empirical analysis, we can see that the classified dummy variable G, the time dummy variable T and the interactive dummy variable G*T are larger than the explanatory variable P, which shows that the logarithmic return of 40 stocks in Shenzhen stock market is not significantly affected by the Shenzhen Stock Connect Program policy.

4.2 Volatility

Using GARCH model of logarithmic return of 200 trading days of 40 companies, we can estimate the daily variance of 200 trading days of 40 companies in Shenzhen Stock Connect Program. By eliminating the data information lost by the lagging items of the selected model, we can get the sample data of daily variance of 7680 stocks.

Eviews software was used to test whether the daily variance of 40 companies (20 Shenzhen Stock Connect Program Companies and 20 non-Shenzhen Stock Connect Program Companies) was the same in the 200 trading days before the opening of Shenzhen and Hong Kong. That is to say, it proves whether the volatility of Shenzhen Stock Connect Program Company and non-Shenzhen Stock Connect Program Company is different before the opening of Shenzhen and Hong Kong, and further proves that the selected Shenzhen Stock Connect Program shares have no particularity.

$$v_{it} = 0.000517 - 0.0000662G_t - 0.0000163T_t - 0.0000723G_t * T_t$$

Through the above empirical analysis of the volatility of Shenzhen stock market, we can see that the coefficient of interactive fictitious variable is - 0.000723, which shows that the daily variance of each stock selected by Shenzhen-Hong Kong Stock Connect Program policy has been reduced after the opening of Shenzhen-Hong Kong Stock Connect Program policy, which shows that Shenzhen-Hong Kong Stock Connect Program policy weakens the volatility of Shenzhen stock market and reduces the risk of Shenzhen stock market.

5. Conclusion

Through the research analysis and empirical test of this chapter, the return of Shenzhen stock market is not

We set 20 Shenzhen Stock Connect Program companies in 40 companies as treatment group and 20 non-Shenzhen Stock Connect Program companies as control group. We use Eviews software to test whether the daily variance of the treatment group and the control group is significantly different from the average value of the 200 trading days before Shenzhen Stock Connect Program and non-Shenzhen Stock Connect Program opened, that is to say, Shenzhen Stock Stock Tong companies and non-Shenzhen Stock Stock Tong companies have basically the same daily variance before Shenzhen Stock and Hong Kong opened. It proves that the selected Shenzhen stock has no particularity.

variable	Mean value of treatment group	Mean of control group	T value	Saliency
v	0.00051	0.00046	5.50	0.000***

Note: *** means significant at 1% level

Through the above mean test, it proves that there is no significant difference between the volatility of Shenzhen Stock Company and non-Shenzhen Stock Company before the opening of Shenzhen Stock Company, which can explain that the Shenzhen Stock Company selected in this paper has no particularity.

Based on the above validation, using daily variance data of 40 companies before and after the opening of Shenzhen and Hong Kong, using OLS method, taking logarithmic return data sample y as interpreted variable, classifying virtual variable, time virtual variable and interactive virtual variable as explanatory variable, using Eviews to regression, the following results are obtained:

Variable	Coefficient	Standard Deviation	T value	probability
G	-0.0000662	0.0000118	-5.62	0.000*
T	-0.0000163	0.0000117	-4.38	0.000*
Q (G*T)	-0.0000723	0.0000166	-2.36	0.004*
C(Constant term)	0.000517	0.0000832	62.13	0.000*

Based on the regression results, the following equations can be obtained:

significantly affected by the opening of Shenzhen and Hong Kong in the time window before and after the opening of Shenzhen and Hong Kong. However, after the opening of Shenzhen-Hong Kong Stock Exchange, the risk volatility of Shenzhen Stock Connect Program Company's individual stocks has decreased, by about 0.007 percentage points. After the opening of Shenzhen and Hong Kong stock markets, the risk of Shenzhen Stock Connect Program Company with Hong Kong investors' participation tends to decrease. Although the decline is not significant, we can see that the opening of Shenzhen Stock Connect Program and the further opening of capital market have not increased the volatility of Shenzhen Stock Connect Program, but have inhibited the volatility of Shenzhen Stock Connect Program.

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