

Trade Conflict, Capital Flows and Dynamic Changes in Chinese Stock Market

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Abstract. In Mar, 22nd 2018, the U.S. government announced the list of tariff-imposed commodities, which will impose 25% tariffs on 1,333 items worth US\$50billion of goods exports from China to the U.S. The trade war between China and US has been lasted for 4 years and 5 months, the US government has increased the tariffs 6 times, and specifically, this brings a huge impact on capital flows and dynamic changes in Chinese stock market. This paper demonstrates how increase the tariff bring huge impacts on Chinese stock market by analyzing different models, such as ADF test, VAR model, and ARMA-GARCH model, and by studying the results to better understand how Chinese stock market influenced by the tariff increase, and to provide an accurate prediction for the future trend of the Chinese stock market and make recommendation for Chinese investors and Chinese government. The trade war severe impact Chinese economy, and the stock price is falling which lead to investor to hold their money instead of investing in the market, and investors rushed to the safety of low-yielding government debt. The ARMA-GARCH model analyse and present the data and represents the impacts by analysing the stock returns and the volatility. Lastly, there are some recommendations based on current economic situation.

Keywords: Trade Conflict, Chinese Stock Market, Empirical Research.

1. Introduction

The US is the largest developed country in the world, however, most of their goods are not produced domestically, US must import goods from other countries, and this caused tariff to occur. As early as the 1980s, Trump advocated tariffs to reduce the U.S. trade deficit and boost domestic manufacturing, and said the U.S. was being "ripped off" by its trading partners, making tariffs a central plank of his subsequent presidential campaign [1]. But some economists disagree that trade deficits pose a detriment for US economy, and almost all the economists believe that Trump's tariff will harm US economy than bring benefit to it.

Back to history, since China began economic reforms in the late 1970s, the volume of trade in goods between US and China has grown rapidly [2]. And after China joined the World Trade Organization (WTO) in 2001, the growth of trade accelerated, and the trade relationship between US and China is closely linked. And according to Zhang, US imports more from China than it exports to it, and statistically, in 2017, the US trade deficit in goods with China rose to \$375.6 billion [3].

The US government has from time to time criticized America-China trade relationship, including the huge bilateral trade deficit and China's relatively inflexible exchange rate. And in the aspect of textiles, George W. Bush and Barack Obama must impose tariff on textiles to protect U.S. domestic textiles producers, the reason behind this is China export much more cheaper textiles to US which is detriment to US domestic producers. And because of the dumping prices of the relevant products that export to US, US government establish an anti-dumping investigation organization against China. However, China establishes some policies that further increase its trade profits, such as Belt and Road Initiatives, Made in China 2025, etc., and because of these practical and useful policies implementation, China has become the second largest economy country, second only to that of US.

From Trump perspective, as he supports to impose tariff, he said that US has been an unfair and awkward position because China has some unfair trade policies, which cost US thousands of billions of dollars per year. Trump also said that US experience trade deficit around \$500 billion per year and have an additional \$300 per year because of the intellectual property, and he also think there is no trade war between China and US, what must be done is necessary for US economy.

From China's perspective, Chinese government think the real reason behind the increased tariff is that US government realized that China is now grows very fast, they afraid someday China will replace US, which detriment US economy, and become the number one economy country in the world. And US government want to stifle China's growth. And for the intellectual property problem, Chinese leadership in technological field is based on huge investment from the in the science not a theft from the US intellectual property [4].

And Chinese government response that based on Trump's concerns China will increase imports, lower foreign ownerships limits on manufacture, and increase the protection of intellectual property. Specifically, China has increased personal income tax from ¥3,500RMB to ¥5,000RMB and reduce the top limit of value added tax from 16% to 13%. The income tax reduction will benefit not only medical care, but also mortgage interest and educational expenses. And in May 2019, import declined 8.5% and continue decreased 7.6% in June. And according to Reed, China decreases the tariff on import for other countries from 8.0% to 6.7% but increased the average tariff on US from 8.0% to 20.7% [5].

The US government found that because of the imposed tariff, the sector that is the most susceptible is consumer products. Specifically, the US farmers are most likely to be affected by the trade war. Meanwhile, Trump published some policies that will benefit the farmers, such as add additional trade deals, enhance environmental regulations etc. However, the trade war brings down the agricultural exports from US to China from \$24billions to \$9.1billions in 2018, which mainly includes decreased demand of pork, beef, and wheat. And the trade war also brings negative impacts to US consumers, statistic shows that a 25% tariff increase on Chinese furniture has caused US consumers an extra \$4.6 billion per year. And according to Tankersley, the average US tariff on Chinese products increased from 3.1% in 2017 to 24.3% in August 2019 [6].

The trade war also severely impacts the stock market. Most of the investor are unsure about the negative impacts on the stock market. According to Earl, the Dow Jones Industrial Average fell 724 points after the US government imposed the tariff and start of the trade war [7]. Some firms also affect by the tariff. For example, such as Caterpillar Inc. experienced large loss in the stock market. And on Aug 14, 2019, the Dow decreased by 800 points, the reason behind this the tension between China and US. And based on this, Trump established some policies that want to bring back the economy and try to find the alternative ways to continue do business with China. And after the policies announced, apparently, it brings up the stocks in the market immediately, and the trade tensions between the US and China are minimized.

And for the business sector, more than 3,500 US business companies sued US government, especially sued Trump for the tariff decision. In details, in September 2018, the tariff that imposed on Chinese metals, such as steel, aluminium caused the rise of fertilizer and agricultural equipment expenses in the states of the US. And continuously, 600 companies such as agricultural firms, tech companies appeal to remove the tariff on products, they believe that the additional tariff will not benefit the US economy, and will detriment US local companies' profits, and it is not served long-term interests. And according to Matthew, the president and CEO of the National Retail Federation, announced that the trade war has gone on far too long, and he also said it bring harmful impacts on the US businesses and customers. He also appeals Trump to remove the tariff in case it continues to bring negative impacts on the US economy.

And from economists' perspectives, trade war makes the customers the primary victims, and the tariff is push them into a dark hole, and it is more risks than benefits [8]. And according to Lawrence, the NYU economic professor, import tariff is very likely to equivalent to increase tax, which make people's life more misery, as it increases the burden to live and contribute high cost of living. Specifically, according to Howard, argued that the additional tariff will rip off the benefits that supposed to provide to low and middle-income households. And he also mentioned that, if the US continue to increase the tariff, that will bring the economy into recession. Moreover, the US government should find out their own problem in the industry section and establish specific industry policies to tackle the problem instead of increasing the tariff.

And besides, China and the US, other countries also significantly affect by trade war [9]. For instance, according to Klingler-Vidra, trade war is “very worrying”, and it has negatively impact Singapore’s economy, he urged both US and China government to adjust their approaches [10].

In conclusion, both China and US are affected by the trade war. There is no loser or winner during this battle. The US government behavior is not benefit to establish a long term and healthy relationship with China. They not only detriment to local US manufacture, but also affect Chinese economy, such as big effect Chinese stock market. And since the world’s economy is inter-connected, the tension relationship between China and US will also detriment to other countries’economy. It will be a win-win position if both US and China can figure out a better way to solve the urgent economic problem.

The remaining parts of this paper are arranged as follows: Part 2 is research design, including data sources and identification strategy; Part 3 is estimate results from the model; part 4 is conclusion.

2. Research Design

2.1 Data Resource

This paper uses the investing.com, a search engine that can search and obtain data on specific areas, such as to find out the exchange rate between USD and CNY, the SZI, and the SSEC. Specifically, find out about the historical data which during the period of Jan 2018 to Jan 24th, 2020. It includes the closing prices and the stock returns of USD/CNY, SZI and SSEC, which demonstrates the stock performance before the trade war between China and the United States to the present and shows the stock price is fluctuated due to six times when the United States imposed tariffs. The investing.com provides a data source and data basis for analysing and studying the impact of the additional tariff between China and the United States on stock markets.

2.2 ADF test

The first step this paper need to do is to perform a unit root test (smoothness test) on the model. The unit root test is whether a time series variable is non-stationary and possesses a unit root. Specifically, firstly this paper need to put the data into Stata and running the ADF test. From Table 1, this paper can find that the p-value for the rate of return is 0, which is apparently less than 0.1, which means that this paper can reject the original hypothesis that the model is stable and feasible.

Table 1. ADF test

Variables	t-statistic	p-value
	Price	
SSEC	-1.921	0.6437
SZSE	-1.377	0.8675
Exchange rate	-1.167	0.9170
	Rate of return	
SSEC	-15.704	0.0000***
SZSE	-16.025	0.0000***
Exchange rate	-14.944	0.0000***

2.3 VAR Model

The next model this paper need to run is called VAR model. Theoretically, VAR model is called Vector autoregression model, which is to find the relationship between multiple variables when they change over time. Specifically, there is a likely hood ratio test, this paper usually called LR principle. It said that when the LR statistic is less than the critical value, the lag order of the VAR model is considered moderate. When the LR statistic is greater than the critical value, it is considered that the lag order of the VAR model is not high enough, and more lagged variables should be added as

explanatory variables. Moreover, when the sample size is very small compared with the number of estimated parameters, LR's finite sample distribution will be very different from the LR asymptotic distribution.

And when analysing the stability of VAR model, analysing whether the impact of a pulsating shock on the VAR model will gradually disappear with the passage of time. If it disappears gradually, the VAR model is stable. Otherwise, it's not stable. Like the AR model, the VAR model with unit root is non-stationary, that is, when there is a pulsating shock in the information, the response of endogenous variables in the VAR model will not disappear with time. The condition for a stable VAR model is that all the eigenvalues of the coefficient matrix fall into the unit circle. Moreover, the judgment conditions of stationarity of VAR model are essentially the same as those of AR model.

2.4 ARMA-GARCH Model

The ARMA model, which stands for Autoregressive-moving-average model, provide a description of a stationary stochastic process in terms of two polynomials, one is AR (autoregression) and another one is MA (moving average). The AR model is written as (1), which uses the historical return to predict the future.

$$X_t = \sum_{i=1}^p \varphi_i X_{t-i} + \varepsilon_t \quad (1)$$

And the MA model is written as (2), which uses past volatility to make prediction for the future.

$$X_t = \mu + \varepsilon_t + \sum_{i=1}^q \theta_i \varepsilon_{t-i} \quad (2)$$

And the ARMA model is written as (3), in this research, the AR model uses the historical data before and after the trade war between China and the US, while the MA model uses the presenting errors to make future predictions.

$$X_t = \varepsilon_t + \sum_{i=1}^p \varphi_i X_{t-i} + \sum_{i=1}^q \theta_i \varepsilon_{t-i} \quad (3)$$

The GARCH model stands for generalized autoregressive conditional heteroskedasticity model, and the model is assumed or the error variance, which is written as:

$$\sigma_t^2 = \omega + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_q \varepsilon_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \dots + \beta_p \sigma_{t-p}^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^p \beta_i \sigma_{t-i}^2 \quad (4)$$

Heteroscedasticity describes irregular patterns of variation in error terms or variables in statistical models. In essence, when heteroscedasticity is present, the observations do not fit the linear pattern. Instead, they tend to cluster together.

Consequently, the results drawn from the model will be unstable and unreliable. GARCH is a statistical model that aim to analyze many different types of existing data, such as macroeconomic data. Some financial facilities commonly adopt this model to approximate the return volatility of stocks, bonds, and markets

The common process of GARCH model includes three steps. The first step is to estimate a best-fit autoregressive model. Secondly, is to calculate the autocorrelation of the error term. The third step is to examine its significance.

Another two methods for estimating and forecasting financial volatility are the classical historical volatility method and the exponentially weighted Moving Average volatility method.

3. Estimate Results and Analysis

3.1 VAR Results

From the data analysis, this paper found that the data is stable, which means can conduct VAR model based on this characteristic. After this paper inputs three variables, which are SSEC, SZI, and USDCNY, this paper uses maxlag function when analysis this data. If the maxlag is 1, which means this paper only assess when $t=1$ and $t=2$, if there are relationship or not. When maxlag=12, this means need to assess $t-1$, $t-2$ to $t-12$, and when the time is difference for 12, this paper need to assess what the relationship between the data.

Table 2 shows that the results are not perfect, and this part ignore the first column when analysis results. From the second column, this paper demonstrate that the data can detrievd from a basic standard. When there is a star at the top of the number, which means that according to the principle, this paper need to choose Lag 7. The FPE, AIC, HQIC, and SBIC share the similar principle, which is information criteria. Specifically, for FPE and AIC, this paper choose Lag0, which means that there is no relationship exists, and there is no independent variable between them. And this also means that this model is useless. For economic purpose, this paper has to make the model meanful, so this paper choose the Lag 7 under LR.

Table 2. VAR model identification

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	5625.89				2.2e-14*	-22.9506*	-22.9405*	-22.9249*
1	5632.7	13.627	9	0.136	2.2e-14	-22.9416	-22.9013	-22.8389
2	5638.24	11.074	9	0.271	2.2e-14	-22.9275	-22.8569	-22.7477
3	5646.65	16.814	9	0.052	2.2e-14	-22.9251	-22.8242	-22.6683
4	5651.85	10.407	9	0.319	2.3e-14	-22.9096	-22.7785	-22.5757
5	5657.25	10.796	9	0.290	2.3e-14	-22.8949	-22.7335	-22.484
6	5662.75	11.003	9	0.276	2.3e-14	-22.8806	-22.689	-22.3927
7	5672.34	19.192*	9	0.024	2.3e-14	-22.883	-22.6612	-22.3181
8	5676.13	7.5643	9	0.579	2.4e-14	-22.8617	-22.6096	-22.2197
9	5682.48	12.704	9	0.176	2.4e-14	-22.8509	-22.5685	-22.1319
10	5690.77	16.583	9	0.056	2.4e-14	-22.848	-22.5354	-22.052
11	5697.3	13.065	9	0.160	2.4e-14	-22.838	-22.4951	-21.9649
12	5703.24	11.877	9	0.220	2.5e-14	-22.8255	-22.4523	-21.8753

Figure 1 demonstrates the stability of VAR model. From the diagram this paper can found that the model is stable based on every point is inside the diagram.

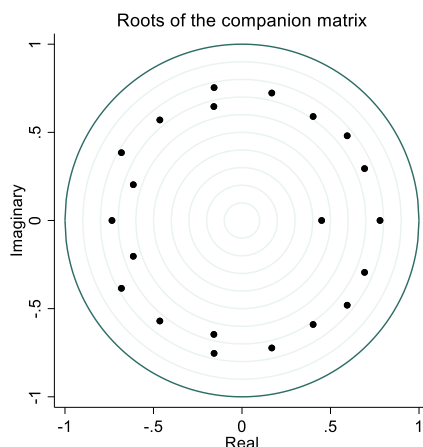


Figure 1. VAR stability

3.2 Impulse Response Results

During the trade conflict between China and the United States, the United States imposed tariffs on China for a short period of time caused the appreciation of the dollar and the depreciation of the yuan, but the economic consequences of exchange rate changes in this period were completely different from those in the period of free trade.

The appreciation of the US dollar will cause capital flows. The international capital market and international floating funds will increase their holdings of US dollar due to the interest factor, and short RMB with the escalation of the trade conflict.

The following changes may occur during the period of free trade: First, the increase of international capital holdings of dollars is likely to cause a large amount of dollars to flow into the stock market or bond market of the United States. This behaviour implies a net inflow of capital into the United States and, similarly, a net outflow of capital from China. The direct economic consequence of this behaviour is to lower the stock price or the yield rate of the Chinese stock market.

Second, the appreciation of the dollar means that the purchasing power of the dollar increases, which will certainly promote China's export. China's economic growth is very dependent on exports. So, a weaker yuan could boost market growth by increasing exports.

But during the trade conflict, the United States restricted imports of Chinese products by adding steep tariffs, and the Chinese government retaliated against the tariff restrictions. These actions would block the second channel of free trade.

Judging from these results, the trade conflict appears to be good for the U.S. market and bad for China. But these actions have a new set of effects.

Restricting imports from China, for example, would clearly drive up the price of goods in the United States and lower the price of Chinese goods in international markets. Moreover, a weaker offshore yuan would not stop companies outside the United States from importing more from China.

To sum up, the net effect of trade conflicts on China's financial markets cannot be directly inferred from theoretical analysis.

According to the estimation results of impulse response function (Figure 2), China's financial market has a net loss in the trade conflict, that is, the negative effect brought by capital outflow is greater than the positive effect of export. A currency shock would quickly feed through to China's financial markets. Specifically, for a one-unit exchange rate shock in period $t=0$, the largest negative effect occurs in period $t=4$ with a magnitude of about 0.1%, and the second highest value occurs in period $t=7$ with a magnitude of slightly less than 0.1%. Although there is a small part of positive effect, but the numerical value is only about 0.05%. It has a similar impact on the return rate of Shenzhen component index, which will not be repeated.

It should be noted that if exchange rate shocks are continuous, China's financial markets all face persistent net effects, and the estimation results in this paper help explain the movements of the entire stock market in 2018.

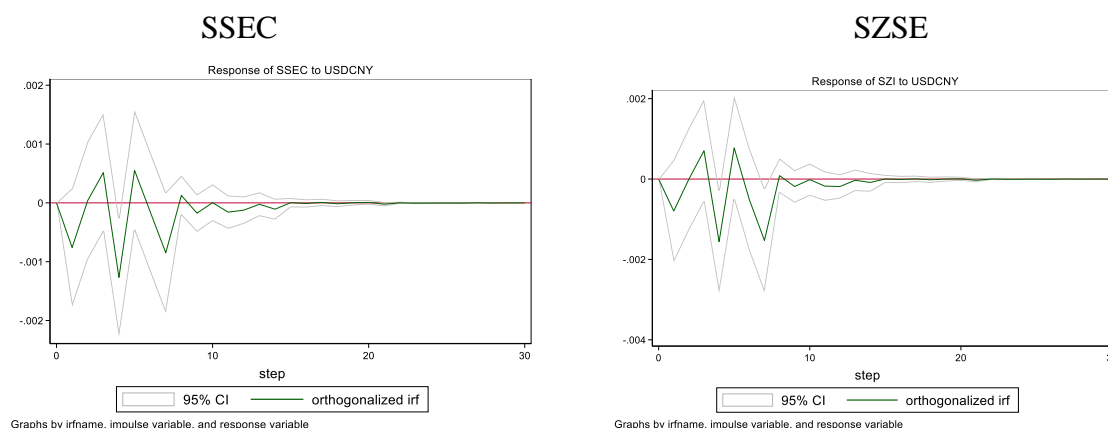


Figure 2. Impulse and response

3.3 ARMA Results

From Figure 3, when it approaches to 0, it means nothing. And the black rectangular represents the confidence interval. When the data inside the rectangular, it means that the data is insignificant, this paper do not need to consider it. The point that beyond the rectangular, this paper should pay attention to. When Lag is 3, 6, and 7, it means that ARMA model uses 3, 6, and 7 to build model according to the PACF model for SSEC. According to the PACF model for SZSE, when Lag is 3, 20,39, it means that this part uses 3, 20, and 39 to build model. When Lag is 3, 6 it means that 3 and 6 will be included in model. According to the ACF model for SZSE, when Lag contains 3 and 39, which means these two terms will be included in model.

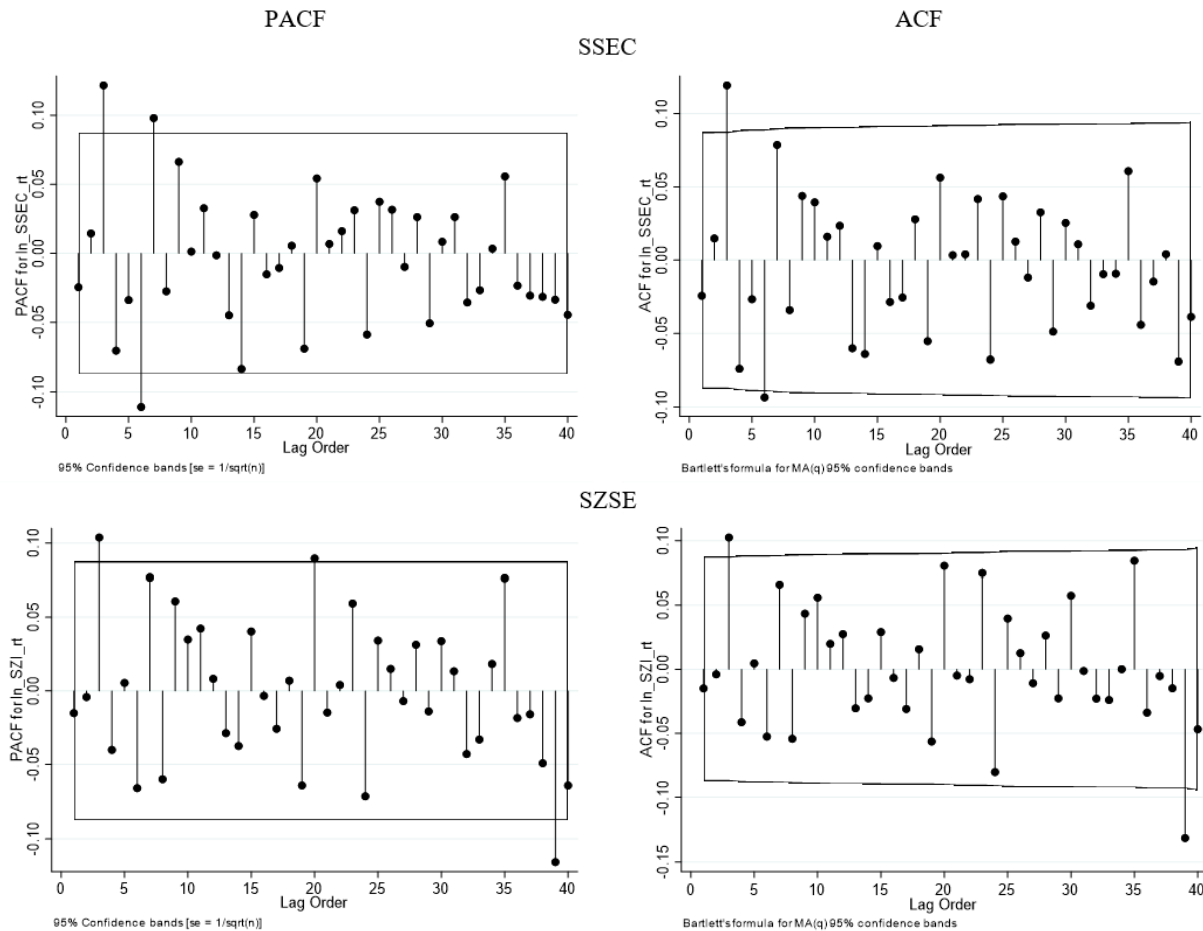


Figure 3. PACF and ACF

3.4 ARMA-GARCH Results

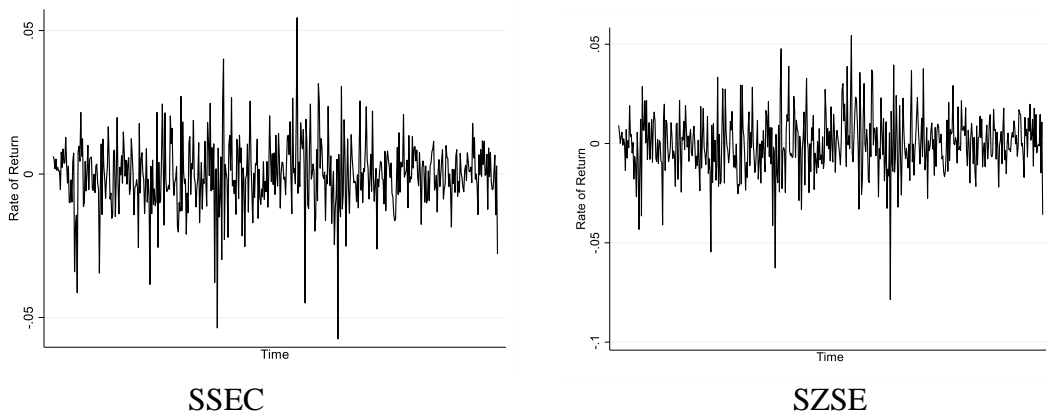


Figure 4. Yield

From the time series diagram (Figure 4), the returns of Shanghai Stock Index and Shenzhen Component Index have obvious conditional heteroscedasticity, and whether they are statistically significant needs to be empirically tested.

Table 3. ARMA-GARCHX estimation results

Variables	SSEC		SZSE	
	(1)	(2)	(3)	(4)
Exchange rate	237.7114*** (0.000)		249.4328*** (0.000)	
Dummy 1		0.2778 (0.336)		0.2474 (0.436)
Dummy 2		-0.3752 (0.387)		-0.4721 (0.388)
Dummy 3		0.6749* (0.053)		0.7989* (0.064)
Dummy 4		-0.8722*** (0.000)		-0.7014*** (0.000)
Dummy 5		-0.5252*** (0.006)		-0.4688** (0.016)
ARCH, L1	0.0854*** (0.004)	-0.0415 (0.155)	0.0943** (0.010)	-0.0298 (0.436)
GARCH, L1	0.8172*** (0.000)	0.0501 (0.940)	0.7881*** (0.000)	0.3083 (0.687)
Constant	-11.3811*** (0.000)	-8.9939*** (0.000)	-10.7355*** (0.000)	-8.8703*** (0.000)

According to the estimation results of ARMA-GARCH in Table 3, the ARCH and GARCH terms in columns (1) and (3) are significant at least at the 5% level, but not in columns (2) and (4). Therefore, this paper mainly focuses on the model of exchange rate return as an external explanatory variable. From the point of coefficient, currency logarithm yield increases 1 unit, the Shanghai index 237.7114 unit, the higher the volatility of the Shenzhen component index 249.4328 unit, the higher the volatility of coefficients in the 1% significant level.

4. Conclusion

The main objective of this paper is to study how the trade war between China and the US impact Chinese stock market. From the data analysis this paper can find that Chinese stock market severely impact by the trade war. The ARMA-GARCH model is used to analyse and present the data and represents the impacts by analysing the stock returns and the volatility. And for the US and China, the supply chains of the two economies are so deep and so long that a trade war between China and the United States would be so devastating that the rest of the world would still shrug it off. But investors in the Chinese market, which has been taking heavy losses, are not taking it in stride.

In addition to the fall in share prices, the yuan has also weakened significantly, shrinking stock market turnover. Fund managers preferred to hold cash rather than invest, and investors rushed to the safety of low-yielding government debt.

And the ARMA-GARCH model has a drawback, it does not include the biggest uncertainty this year, which is geopolitical risk, and it's almost impossible to factor that into the model. However, this cannot underestimate the effects of geopolitical risk when this paer are analysing the impacts on the stock market.

There are some solutions suggested based on the current economic situation. First, all sectors of the stock market will be significantly affected. Decision-making departments should stabilize

investors' sentiment in the short term and reduce investors' overreaction to negative events. Secondly, do a good job to deal with the impact of the sudden trade friction incident to China's stock market, reduce the impact of the negative event by adjusting policies means, give certain liquidity support to financial institutions, and maintain the stability of the financial market. Thirdly, during trade frictions, a small number of industries are less affected, while other industries are greatly impacted. Financial institutions should reasonably allocate their asset portfolios, avoid stocks of long-term disturbance industries, and reduce financial risks.

And nowadays, Biden become the next president of the US, he should be aware with this trade war influence, and establish some practical methods to bring the US economy back on track and restore the relationship with China. If the United States and China cannot reach a new agreement to make up for the failure of the phase one trade deal, the trade war could resume. The essence of China-US economic and trade relations is mutual benefit. There will be no winner in a trade war. And the reason The U.S. also doesn't want a trade war with China because the two of them need to work together based on various international issues, including environmental concerns and some geopolitical conflicts.

Another short-term factor is that the trade war could worsen the current high inflation rate in the US and hurt the dominant position of America manufacturing in the global market. Tariffs imposed in a trade war represent more costs for U.S. importers, manufacturers, and ultimately consumers.

In conclusion, the US and China should bind and win together, this is the only solution for a health and long-term relationship.

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