RIPPLE EFFECT OF TRUMP'S TARIFF ON THE STOCK MARKET SPILLOVER IN SIX ASIAN COUNTRIES

BY

CHANG LING
GOH DICKSON
HO CHUN LOONG
LIAU JIA HUI
PUAH YEN ROU

A final year project submitted in partial fulfilment of the requirement for the degree of

BACHELOR OF ECONOMICS (HONS)
FINANCIAL ECONOMICS

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF ECONOMICS

APRIL 2020

DECLARATION

We hereby declare that:

(1) This undergraduate project undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 22784 words.

Name of Student	Student ID	Signature
1. CHANG LING	1605770	Chang
2. GOH DICKSON	1605895	Dickson
3. HO CHUN LOONG	1402022	Cloong
4. LIAU JIA HUI	1701338	Jhui
5. PUAH YEN ROU	1603394	Yrou

Date: 15 APRIL 2020

ACKNOWLEDGEMENT

Firstly, we would like to take this opportunity to thank Universiti Tunku Abdul Rahman (UTAR) for giving us the chance to conduct this final year project research and also providing us with sufficient and adequate reading materials for our research.

Secondly, we would like to express our sincerest gratitude and thanks to our supervisor, Dr Wong Chin Yoong, for without his expertise and guidance, we could not have accomplished the objectives of our final year project. Completing our final year project under his tutelage has been a wonderful experience as we got the opportunity to learn new knowledge that was not taught in classes or anywhere else.

Thirdly, we would also like to thank our examiner, Ms Lim Shiau Mooi for providing suggestion and guidance on where we could improve on in our final year project. Her suggestion and guidance ensured that our final year project would be on the correct route to success.

Last but not least, the effort of each of the members in this group has definitely made its mark in this final year project, for in the end, we were able to complete it together. We would also like to thank our family members for the support they have shown throughout this research process.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Trade war happened when a nation imposed tariffs or limits the quotas on imports and another foreign country react with similar forms of trade to protect its own benefit. Most countries would impose tariff as their useful tools to control the trade deficit. In 2018, United States started a trade war with China with the reason to reduce the 621 billion US trade deficit. In our study, we are going to examine the trade war happened between United States and China that could possibilities affect the Asia countries' stock market return.

Throughout the past studies, most researchers focus on the impact of both US and China trade war by looking at the economic factors such as GDP, inflation and unemployment rate. Thus, we aim to focus on the trade pattern that could probably affect the stock market return and also spillover effect towards country. The reason that we narrow from economic factors to stock market is because it can be easy capture the spillover effect and stock market are more sensitive on news.

We are using different test such as Panel Least Square, Autoregressive Conditional Heteroscedasticity (ARCH), Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) models to determine the spillover effect of the trade war on six countries which is Taiwan, Malaysia, Singapore, Japan, South Korea and Hong Kong. The period that we investigate starting from 22 Jan 2018 to 1 June 2019 total of eight scenario situation that US impose tariff and China retaliate.

In the overall result, we conclude that Taiwan and Hong Kong are the biggest winner in this trade war. Both of the country gets positive impact more than negative impact in stock market while at the same time, Japan, South Korea, Taiwan and Malaysia react more on unexpected negative news. While as an overview, US and

China move on to negotiation in order to lower down the loss for both and other countries. In trade world, many countries are connected globally and it is important that both countries have to step forward to solve the trade conflict.

CHAPTER 1: RESEARCH OVERVIEW

1.1 Research Background

The trade conflict between United States and China started when US International Trade Commission recommended President Trump to introduce global safeguard tariff in order to protect the local solar and washing machine industries from being negatively affected by import. The tariff worth $8.5 billion in imports of solar panels and $1.8 billion of washing machines was imposed on 22 January 2018. Following with the report revealed by Department of Commerce, stating that import of steel and aluminum has threatened US national security under Section 232 of the Trade Expansion Act of 1962, Trumps announced to impose 10% tariff on aluminum and 25% on steel to all trading partners on 1 March 2018. The tariff implemented to US trading partner which exported $7.7 billion of aluminum products and $10.2 billion of steel products to US on 23 March 2018. China reacted to the tariff by imposing retaliatory tariff which worth $2.4 billion to US on aluminum waste and scrap, pork, fruits and nuts and other US products on 2 April 2018 (Bown & Kolb, 2019).

In addition, according to the report of US Trade Representative that especially investigate the trade policy, laws and practices of China, President Trump declares that China operated unfair trade practices that harmed American intellectual property rights, innovation, technology development. President Trump revised a $50 billion list of 1,333 mostly on intermediate inputs and capital goods which cover $46.2 billion of US imports Chinese products to be charged on 3 April 2018. In response to the tariff imposed by President Trump, China issued a list of 106 products mostly on autos, aircraft and agriculture such as soybean which cover $50 billion of China's imports from US on 4 April 2018. The tariff were implemented by US and China on 6 July 2018. The battle between US and China has stepped up as US introduced import tariff on $200 billion of Chinese goods while China imposed retaliatory tariffs on $60 billion of US goods on 24 September 2018. On the request of President Trump, the tariff rate on Chinese goods that imposed has

raised from 10% to 25% and the retaliatory action taken by China is to increase the tariff of 5% to 10% on $36 billion of the $60 billion list on May 10, 2019 (Bown & Kolb, 2019).

The backdrop of the implementation of tariff is due to the trade imbalance and trade deficit between US and its trading partner especially China and President Trump criticized that there is an unfair trade agreement with China.

China's trade balance to US has been increasing from 1985 with a trade surplus of $0.06 billion to 2016 with a trade surplus of $ 347.02 billion (Lin & Wang, 2019). In 2017, the trade surplus has increased to $363 billion, accout to 44% of total trade deficit in US (Carvalho, Azevedo & Massuquetti). The impact of trade deficit on US domestic empolyment in US has remained one of the main concern of President Trump to take measures and resolves the trade imbalance problem. The high amount of import from China has negatively affected the US domestic employment opportunity in manufacturing sector. Hence, President Trump impose the high tariff on China products as a measure to reduce the trade deficit between US and China and attempt to retain the job in US market (Lin & Wang, 2019).

1.2 Problem Statement

The effect of trade battle between US and China started to reflect on the economics of Asia countries. The trade tension between US and China has generated economic uncertainty and economic disruption as the global relocation of production is difficult to predict. For example, in order to avoid the damage from trade war, Chinese companies have quicken their investment into the developing countries in Asia by relocating and expanding their manufacture process. The relocation brings in the foreign direct investment to Southeast Asia countries and boost the economic in those countries. However, the extent of the trade relocation is unclear as the relocation can be increase or decrease and the process of relocation will take longer period when there is a complex global value chains. These effect will eventually bring in the large spillover effect into financial market as the trade war continue to

intensify. According to confidence channel that organized by IMF, the global GDP to be lowered by 0.5% due to the large and added confidence shock over investment. This scenario is mainly due to the reaction of investor toward uncertainty. Most of the investor is concerned about the further escalation or negotiation between US and China and they tend to hold their investment. Same goes to business, they tend to postpone the big changes in investment plan before getting a clear decision from the trade war (Abiad, et al., 2018).

1.3 Research Objective

1.3.1 General Objective

To study the overall impact of trade war on stock market performance in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia.

1.3.2 Specific Objective

The specific objectives of the research are

i. To study the spillover effect of trade war on the performance of stock market in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia using GARCH family model.
ii. To estimate the stock market reaction of Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia toward the implementation of tariff.
iii. To analyze which county's stock performance will be benefited or hurt the most in the trade war.

1.4 Research Question

Based on the research objective we proposed, research question is set as a guidance to compete the research.

i. How is spillover effect of trade war on the performance of stock market in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia using GARCH family model?
ii. How will the stock market of are Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia react toward the implementation of tariff?
iii. Which county's stock performance will be benefited or hurt the most in the trade war?

1.5 Scope of Study

The countries we are going to study are Japan, South Korea, Hong Kong, Singapore and Taiwan. In 2018, the total export from Asia is $6.91 trillion which having an increase of 8.5% from 2017. According to the calculation from International Monetary Fund's World Economic Outlook Database, China is the largest exporter in Asia with total of $ 2.263 trillion export, account for 36.1% of total export. The second largest exporter country is Japan with total of $ 738.19 billion export, account for 10.7% of total export. The following countries are South Korea with total of $ 605.2 billion export, account for 8.8% of total export; Hong Kong with total of $ 569.1 billion export, account for 8.2% of total export; Singapore with total of $ 411.7 billion export, account for 6% of total export; Taiwan with total of $ 335.8 billion export, account for 4.9% of total export; Malaysia with total of $ 247.3 billion export, account for 3.6% of total export (Workman, 2019). There is 42.2% from the total export of Asia. Hence, we determine the top 5 largest exporter countries (excluded China) and Malaysia as our research countries. As the trade war is on-going, we decide to study the effect of stock market 18 months after Trump is elected and the trade war is stimulated. Therefore, we collect the data set from 26 December, 2016 when Donald Trump elected as the President of United States until 30 June 2019.

1.6 Significance of Study

Trade war is a topical issue that being studied by the researcher and policy maker. US and China are the world two largest economics and the main trading partner to most of the countries. The contribution of this project is mainly focused on the effect of the conflict, when two largest economics which are US and China are involving in trade war, spillover to the stock market in Asia countries which are Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia.

In this project, we study the response of stock market in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia when there is an implementation of tariff and retaliatory tariff by US and China. The major contribution of this project is we can capture the impact of trade war in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia through fluctuation in stock market return. Trade war started on March 2018 and there is about 18 months till now. The period is too short to exactly understand how trade has positively or negatively affected other countries. Hence, we use stock market return as a tool to study the impact of trade war. It is because stock market trades daily and whenever there is an economic changes such as trade war, it affected directly and better instantaneous response toward the changes. Stock market return may help us to understand the instant impact of trade war. Last but not least, we will provide some remedies to be considered by the policy maker to react with the trade war.

1.7 Organization of Study

The rest of the chapters are organized as follows. Chapter 2 will provide the literature review. Chapter 3 will show the model estimation, and explain the appropriateness to use ARCH and GARCH family model. In Chapter 4, we will conduct diagnostic checking and present the result. In Chapter 5, we will review the policy implication and recommend the suitable policy to resolve the problem.

CHAPTER 2: LITERATURE REVIEW

In this chapter, we will review the information that published and doing literature review on unpublished information by using secondary resources. The following review will explain the past trade war and current trade war impact on other countries.

2.1 Past Trade War

The United States has been involved in many cases of trade conflict in the past. Most of the past event shows that it would bring harm to other countries. There are some past history trade that US had practices. The problem of trade deficit haven't been resolve and China unfair trade issue alert president of US Donald Trump wanted to shorten the trade deficit gap.

As one of the cases US-Canada softwood lumber trade, Zhang & Hussain (2004) examine three events such that happened in 1991, 1996 and 2001. The lumber war had hit hard for the product firm in Canada. However, they still have pros and cons as they gain free trade in return. In 1991, the termination of Memorandum had made both Canadian and US companies react negatively. Two of the Americans company stock such as Bowater and Willamette had abnormal returns while four of Canadian firms Canfor, West Fraser Timber, Weldwood, and Slocan also detect negative abnormal return. In 1996, the Softwood Lumber Agreement resulted a significant decline on both U.S. and Canadian firms. As in 2001, the result shows positive event for Canadian stock company while US stock company suffer from negative return. The lumber industry in US has been a complex issue. As statistics show that Canada shares growth gradually from 7% up to 35% in the period of 1952 to 1996. In 1996 the fluctuation remains stable at 33%-34% but in 2006, Canada lumber imports had been decline to 28% due to the crisis of the US housing market (Hoover & Fergusson, 2018).

Besides that, in late year of 2002, the US announced a series of trade barriers on imported steel. It has been damaged on the steel sector in the U.S. and a report from

Consuming Industries Trade Action Coalition (CITAC) foundation shows that the tariff boosted the production costs of steel resulting in a negative impact. Francois & Baughman (2003) journal examine the result and found out that 200,000 Americans lost their jobs and the total wages loss of total 4 billion in that time of period.

2.2 Timeline of US-China Trade War

Battle 1: solar penal and washing machine

October 31, 2017	The US International Trade Commission finds imports of washing machines and solar panels causes losses in US industry.
January 22, 2018	President Trump approves 8.5 billion $ in imports solar panels and 1.8 billion $ of washing machine
April 17, 2018	The Chinese government announces antidumping duties of 178.6% on imports from US.
May 18, 2018	China plans to form a negotiate team to meet US to resolve trade disputes.
August 14, 2018	China announced US tariffs has damage the welfare trade of interest.

Battle 2: Steel and Aluminum

April 20, 2017	President Trump instructs to investigate aluminum and steel imports whether it threatens U.S. national security.
February 16, 2018	The Department of Commerce claims that steel and aluminum products have threaten U.S. national security and will potentially impose on new tariffs.

March 1, 2018	President Trump launch tariffs of 25% on steel and 10% aluminum products, only 6% import covered derive from China.
March 7, 2018	The European Union make announcement on retaliatory response if were hit by tariffs.
March 8, 2018	President Trump issues formal tariffs on steel and aluminum but excluded Canada, Mexico. He allowed other trading partners to have negotiation with U.S. trade to exempt specific products.
March 22, 2018	Trump revised steel and aluminum tariffs for further exempting the European Union, South Korea, Brazil, Argentina, Australia and previous exempted countries.
March 23, 2018	Tariffs on steel and aluminum started to go into effect
March 28, 2018	Korea agrees to reduce steel exports to U.S. in return for permanent exemption.
April 2, 2018	China start to retaliate back of total 2.8 billion item worth compare to U.S. steel and aluminum worth 2.4 billion.
April 30, 2018	President Trump extends steel and aluminum tariffs except Korea and others remain.
June 22, 2018	The European Union activates previous tariff threat of U.S. to recover 3.2 billion of U.S. products in 2017.
July 1, 2018	Canada strikes back total 12.8 billion $ worth of products on U.S.
July 16, 2018	The U.S. files separate disputes at WTO against the retaliation of Canada, China, European Union, Mexico, and Turkey.
August 10, 2018	President Trump announces that tariff rate imposed on Turkey will increase from 25 percent to 50 percent.
August 14, 2018	Turkey announces new tariffs on U.S. imports

November 15, 2018	in the six month find Strong economic growth increase U.S. imports of steel by 2.2% but small and poor countries decline by 12%.
December 20, 2018	Trump's steel tariffs raised the price of steel and eventually creating 8,700 job.
May 17, 2019	U.S. agreed to remove steel tariffs on Canada and Mexico, and at the same time, Canada and Mexico remove their retaliatory tariffs on U.S. goods
June 15, 2019	India retaliatory tariffs against U.S. exports in responds of the U.S. tariffs announces in March 2018.

Battle 3: Unfair Trade Practices of technology and Intellectual property (IP)

March 22, 2018	The Trump administration release report finding China conducting unfair trade practices about technology transfer, intellectual property, and innovation.
April 3, 2018	President Trump releases its 50 billion list of total 1,333 Chinese products under consideration of 25 percent tariffs.
April 4, 2018	China publishes total of 106 products list as ready for retaliation of 25% tariffs imposed by U.S.
June 15, 2018	U.S. Trade Representative release a list of product to impose 25% tariffs starting on July 6, 2018 and April 3, 2018.
June 15, 2018	China react the 50 billion retaliation list of 25 percent, targeted roughly 45 billion of U.S. export.
June 18, 2018	Presidents Trumps continues react to China retaliation announcement by adding 200 billion worth of goods at a rate of 10 percent.

July 6, 2018	U.S. tariffs on 34 billion of Chinese import goes into effect and China tariffs on the first 34 billion of its 50 billion lists of U.S. import.
July 10, 2018	U.S. representative release a list of 200 billion goods import from China to be subjected new 10 percent tariffs.
July 20, 2018	President Trump announces that it ready to impose tariffs on all imported goods from China with total 504 billion in 2017.
August 3, 2018	U.S. trade representative consider adding up to 25 percent tariffs rather than 10 percent.
August 3, 2018	China alerting U.S. it could add duties from 5 percent to 25 percent on U.S. goods.
August 7, 2018	President Trump releases the second phase of its 50 billion list announcing that 16 billion imports may charge 25 percent of tariff rate.
August 8, 2018	China revises the second tariffs by removing crude oil and replacing other goods.
August 23, 2018	U.S. and China impose second phase of 50 Billion Tariffs. China immediately revised tariffs of 16 billion of U.S. export.
September 17, 2018	President Trump finalize 200 billion worth goods product and subject to 10 percent takes into effect.
September 18, 2018	China announced its plan on tariffs 60 billion of U.S. export and President if Trump continues to finalize tariffs on 200 billion goods.
February 24, 2019	President Trump announces that he delay tariffs increase on 200 billion of imports from china.
May 5, 2019	President Trump suddenly decide to impose tariffs from 10 percent to 25 percent .
May 10, 2019	Imports from China previously hit by 10 percent had now dramatically increase to 25 percent.

May 13, 2019	As announcement from President Trump, China had consider to retaliate back to U.S. goods.
June 1, 2019	China's tariffs rate goes into effect covering 36 billion of 60 billion list.
August 1, 2019	U.S. would immediate impose a new 10 percent of tariffs on 300 billion of imports from China final goods.
August 13, 2019	President Trump plans to imposed new tariff on 112 billion worth good then continue 160 billion on 15, December 2019.

2.3 Impact of US-China Trade War

The current trade war between U.S. and China has been continuously affecting the economics of the world. Asia have been one of the issues that will get affected by this tariff of the US and China retaliation. In the journal of Abiad, Bernab, Bertulfo, Camingue, Feliciano, Mariasingham & Mercer-Blackman (2018) study that the trade war impact on Asia developing country. They used several possible channels that include direct or indirect effect impact on the product, services, and international supply chains to capture the impact on economics. The result shows there's a negative impact on China but having a positive relationship with Southeast Asia by using OLS and Tobit estimates for the pooled sample.

Besides, U.S. and China have been triggering the global economy and much more countries will get affected. The president of U.S. Donald Trump intended to reshape America's trade, launching the renegotiation of North American Free Trade Agreement (NAFTA), and seeking of additional national security measure on autos (Ciuriak & Xiao, 2018). The result shows that U.S. overall economy is negative with real GDP reduce by -0.06 % and Canada loss of -0.11%. In the journal of Carvalho, Azevedo & Massuquetti (2018) examine two scenarios, one of the US protectionist measures are considered, while another Chinese retaliation takes into account by using GTAP (Global Trade Analysis Project) Computable General Equilibrium Model. The model developed to determine the impact of cash flows on

different sectors and region of the world, by generating results of global consistency. In the result proven that some of the emerging countries, not directly get involved in a trade war but would benefit by shifting the demand of one sector. It evaluating by the products and goods that impose on tariffs. The countries such as India, Argentina, Brazil, and Mexico will benefit from some sectors.

Furthermore, Rosyadi & Widodo (2018) study on the US tariff increase against China that affects the Global economy. The GTAP model has been used to detect tariff effects. The results of GTAP predicted a negative impact in China and the United States, and other countries showing strong positive especially for Vietnam, Mexico, and Canada on the investment, consumption and expenditure component. On the global level, the result shows that the two countries will be a steep decline in bilateral trade and lead to increasing export on the third party. As stated on Yean, Yi & Ann (2019), it will be potential trade and investment that spill-overs into Malaysia. The tariffs by the US will affect one of the largest solar export to China and raises the possibility of trade and stock diversion towards Malaysia.

To estimate the global and national economic effect, Bollen, & Rojas-Romagosa (2018) construct a paper with different trade conflict scenario and several sectors that will be game-changing in this trade war. They employ a computational general equilibrium (CGE) model of world scan that allows assessing impact tariffs increases between bilateral partners and general equilibrium effects to other countries indirectly. The result shows that the steel and aluminum sectors are a negative effect on trading partners but limited specific sectors may have a strong positive relationship with the tariff. Besides, the test found that it could have positive gains in several countries such as Japan, Canada, Mexico, and Indonesia mainly due to the trade diversion.

As continue, journal of Tsutsumi (2018) evaluating the economic consequences with the trade war of the US and China. The capital deepening and the additional imposed tariffs on goods decline the U.S. and China GDP by 0.1% and 0.2%. In addition, the technological spillover causes the trade war to worsen, the GDP of the U.S. had declined further by 1.6% and China faces the same decline by 2.5%.

2.4 Filling the Gap

After investigating the previous studies, we found out that those study only examine some specific scenarios. For example, Furceri, Hannan, Ostry & Rose (2019) study the macroeconomic aftermath changes on tariffs. The increase in tariffs would be affect the significant variables such as higher employment, inequality, or further adding deadweight losses of tariffs. There are very few journal mention about the relationship between the stock market and impose of tariffs. Therefore, we had divided eight scenarios to examine the stock market fluctuation towards the US tariffs.

2.5 Transmission Mechanism of the Impact of Trade War

In this section, we will discuss about the mechanism of the impact of trade war in more details through six types of channel which are the trade effect, production network effect, price effect, trade uncertainty effect, interest rate affect, and economic interdependence effect.

2.5.1 Channel 1: Trade Effect

Channel 1

Figure 2.1: Trade Effect Channel

When the first tariff imposed by the US, it simply affects the exported goods by China. China goods started to become expensive as the consumer needs to pay more

in order to get the same goods. Thus, the demand for China goods will decrease and led to a straight decline in China gross domestic product (GDP).

2.5.2 Channel 2: The Production Network Effect

Channel 2

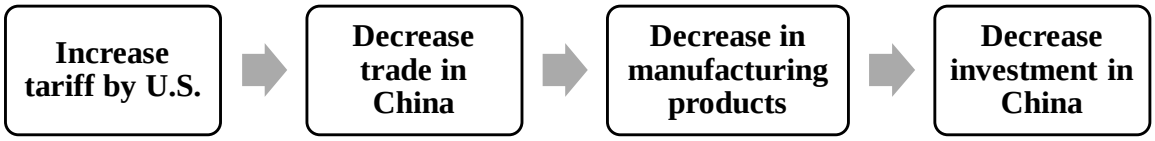

Figure 2.2: The Production Network Effect Channel

The imposed tariff by the U.S. have changed most of the economic factor as manufacturing product and Investment has been one of the most important variables that change in this trade war. During the trade war, the manufacture reduces the production to cover the cost of tariffs. On behalf of that, the manufacturer will consider to lower down the cost and therefore reduce the employee to maintain the cost. As one of the example, the trade conflict by U.S. and japan face a quick jump on automobiles prices and the imported price for U.S increase dramatically and japan suffers from loss. At the same time, 60,000 jobs lost in the automobile industry and reached a peak (Bolt, Mavromatis & Wijnbergen, 2019).In such way, the determinant of production GDP will decrease. Most of the people will lose their job due to exporting country had a sharp decline in sales which significantly affects total output and employment. On the other hand, an investment could be another instrument that gets affected. When china economy slows down, some of the investors tend to save more rather than invest due to the economic uncertainty. The small and medium company in china not willing to expand their company causes the economic conditions to get worse and therefore forces the GDP gets lower.

2.5.3 Channel 3: Price Effect

Channel 3

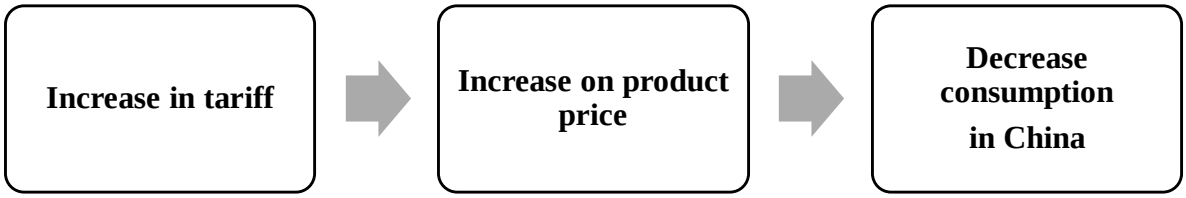

Figure 2.3: Price Effect Channel

The increase of tariff has been chain many variables. One of the channels that relate is pricing effect. When the economy facing high pressure, the manufacturer with transfer the cost to the consumer. As consumer may have to bear the cost, people with give extra money in order to get the same value of goods. Thus, people will consume less as a result of the consumption decrease.

2.5.4 Trade Uncertainty Effect

Channel 4

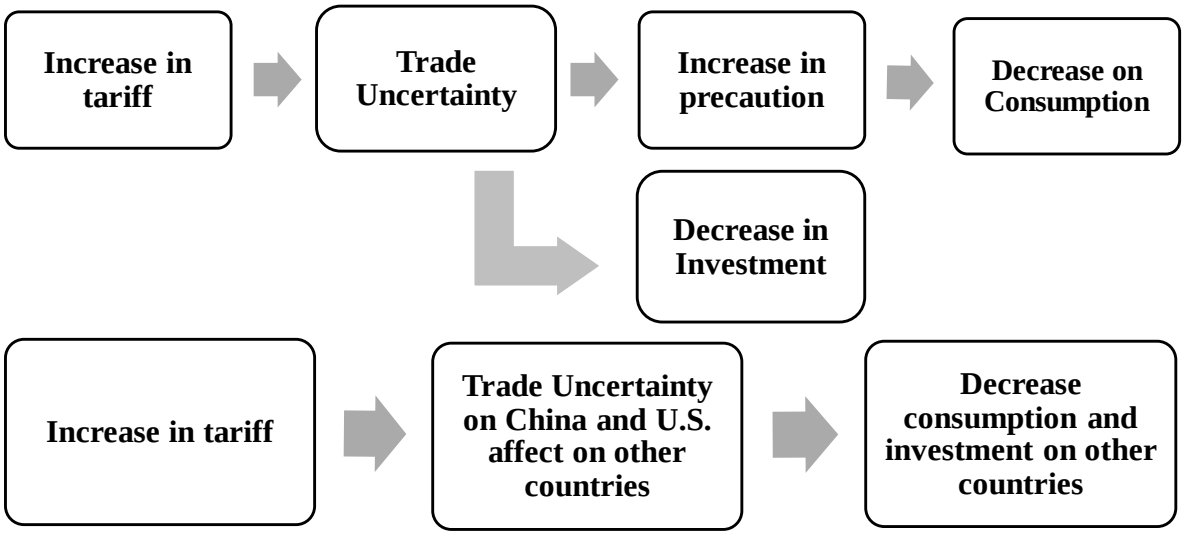

Figure 2.4: Trade Uncertainty Effect Channel

In figure 2.4 explains that when it is a trade war happened, the economy market will appear uncertainty. As tariffs imposed, there are some particular item will be charged but some remain the original price. People will start to slow down the spending because of economy uncertainty could be led to losses job and at the same time falling export of China will further lower down the GDP. Besides, the economy uncertainty will also weaken the stock market. The investor will only choose to invest when it is in a stable situation. Hence, people will save more money rather than invest causing the GDP further decrease.

On the other hand, since the China and US not only trade between them but it is connect globally. So, some other countries probability get affected as they produce or provide raw materials and send to the US or China for further produce finished goods. As some of the foreign companies may suffer from high cost as the tariffs directly affect the whole product chain (Kingsley, Alamu & Adesola, 2015). As a result, it will decrease the consumption and investment on the other countries due to uncertainty on the market, people would prefer to save more and spend less. In other words, investors may also consider not in invest in a violate market.

2.5.5 Channel 5: Interest Rate Effect

Channel 5

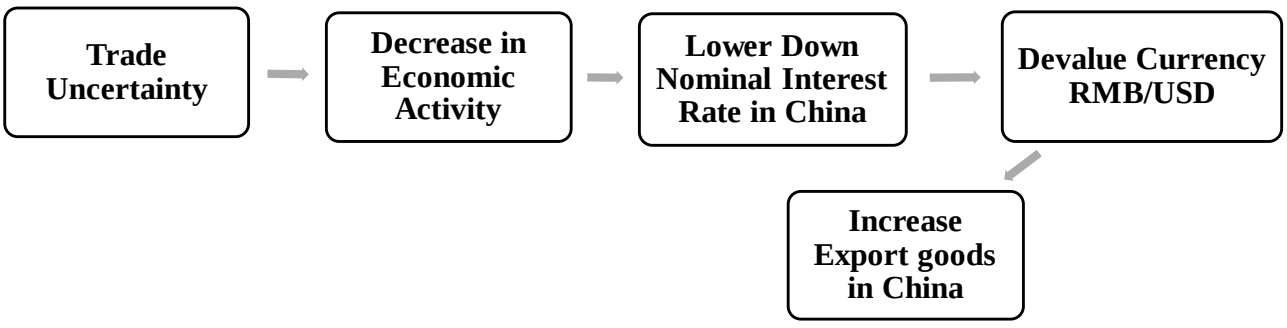

Figure 2.5: Interest Rate Effect Channel

The changes in market will causes real interest rate to start decreasing. The firms may gradually change the prices in response to the tariff implementation. Low economy activity will force the government to use the current account balances. The policy implements an exchange rate and the withdrawal of Foreign Direct Investment (FDI) trigger the reserve assets (Li & Chong, 2019). In other words, RMB will faced pressure as it depreciated by the government using reserve asset to purchase RMB. When the interest rate goes down and devalue RMB as people hold more U.S. dollar, it make the goods of China became cheaper and the U.S. would purchase more on China goods. As a result, the depreciation may turn off the negative impact of tariffs.

2.5.6 Channel 6: Economics Interdependence

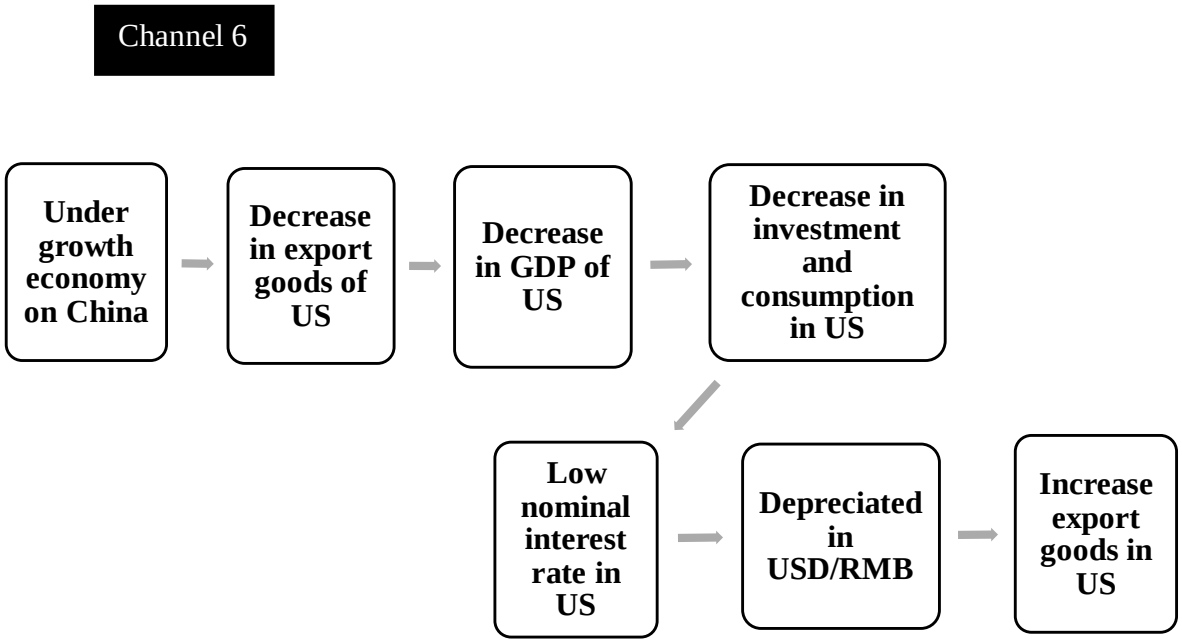

Figure 2.6: Economic Interdependence Channel

The U.S. which having a strong market power is significantly dominant the market supply and changes the trade policy (Broda, Lima & Weinstein, 2007). Due to high pressure on both largest economy, the domestic economy may also be affected.

When economy of China slow down, people will tend to spend less and would not purchase export goods at higher prices thus, reduce in US export.

U.S. will suffer same situation with China that lack of fund in current account hence lower down the GDP. When economic facing downturn, the consumption and investment will decline and effect economy on U.S. (refer to channel 3 & 4). The domestic economy will face downturn as it affect by both countries. U.S. dollar will depreciate and offset the current negative impact on tariff (refer to channel 5).

2.6 Introduction of Stock Market Spillovers

In this section, we will be talking about the stock market spillovers. Generally, spillovers have many theories to it, therefore, in this case, we are going to be specific and focus only on stock market spillovers.

Spillovers, an occurrence whereby an overflow into an area, in terms of growth and development is acknowledged by the economists as a strategic role. In finance, cross-border spillover plays an important role, especially in analyzing the stock market where the effects of it is more noticeable than in the normal periods. According to Shinagawa (2014), the co-movement between countries' financial markets is known as financial market spillovers. A neighboring country's growth in the financial sector may be affected by the spillover effects of the financial development in one country (Yildirim & Ocal, 2016).

At the same time, stock market spillovers has the potential to become a two-way street to create financial instability in both directions. The interdependencies in terms of financial linkages and trade among countries has contribute to the spillover effects when the 2007 global financial crisis happened. A shock was created due to the crisis and then it had a rippling effect across the stock markets due to these inter-market linkages (Angkinand, Barth, & Kim, 2009). There is also evidence suggesting that volatility of the financial market of a large middle-income country,

can be transmitted back to a greater extent to asset prices in other countries' economy, for example, on 6 January 2016, there was a suspension of trading due to the Chinese stock market suffering a drop, which affected the major stock markets around the world (Agenor & Pereira da Silva, 2018).

According to Hung (2018), stock market volatility spillover can be categorized into three integral parts. The first is volatility spillover among the stock markets being bidirectional, which means that it can moves in two directions. Then the second is the flow of the volatility from a stock market to another stock market is unidirectional, meaning that it moves in a single direction only. Third is that the volatility spillover among the stock markets is non-constant. Hamao, Masulis, & Ng (1990), proved that there is a connectivity among the stock markets of the developed countries because there was a price volatility transmission from New York to London and Tokyo. But then again, in these three developed stock markets, negative impact seems to have the bigger impact because of the increase of volatility in the market to trade more as compared to positive impacts (Koutmos & Booth, 1995).

2.7 The Impact of Past Events on the Stock Market Spillovers

2.7.1 Asia

The impact of the global financial crisis that happened during 2007/2008 was severe, and many performance of the stock market were affected by it. Because of that, many researchers decided to conduct a study on impact of the crisis on stock market spillovers and behavior. At the same time, there was acknowledgement on the growing impact of the China stock market on the countries in Southeast Asia like Malaysia, Singapore, Thailand and Vietnam. In order to examine the volatility spillovers and return between China and the other Southeast Asia stock markets, Hung (2019), used a bivariate GARCH-BEKK model to conduct the test for pre-crisis and post-global financial crisis periods. The results showed that volatility

spillover regarding the China stock market has a significant impact on the Southeast Asia stock markets. The stock return linkage between China and the four countries' stock markets seems to be significant during and after the global financial crisis period. The results also suggested that there is a significant unidirectional volatility stock market spillover from the China stock market to the other Southeast Asia countries during the sub-prime crisis as supported by previous studies (Zhou, Zhang, & Zhang, 2012).

Moving on, Gulzar, Kayani, Feng, Ayub, & Rafique (2019), applied the Johansen and Juselius cointegration test, the GARCH-BEKK model and the vector error correction model (V.E.C.M) to examine the spillover effect and the financial cointegration of the financial crisis towards the stock markets of emerging Asia countries like Malaysia, China, India and Korea. The authors collected daily data from the US stock returns, due to the crisis being originated from the US financial market and from the Asia region, particularly Malaysia, China, India and Korea from 1 July 2005 to 30 June 2015 to analysis the pre-crisis, during the crisis and post-crisis period.

The results from the study showed that the returns of these Asia stock markets are affected by the volatility of the US stock market which support the previous studies (Bae & Zhang, 2015). A shock in the US stock market has a short term impact on the returns of the Asia stock markets as revealed by the results of the V.E.C.M and the impulse response function. It turns out that past volatility and shocks have more impact of the specific stock markets during the whole period. The only stocks that had cross-market news and volatility spillover effects during the crisis period was the stock market of Korea and India. But then for the stock market of China and Malaysia, after the crisis period, they were negatively impacted by the news effects even though there were some positive effect on the India stock market. Overall, in the pre-crisis, during the crisis and post-crisis periods, the results showed there is significant volatility spillover effects of the financial crisis from the stock market of the US towards the stock markets of the few Asia countries as supported by previous studies (Dungey & Gajure, 2014).

2.7.2 Europe

European countries was also the victims of the global financial crisis. The financial markets was affected significantly and it was considered as the worst crisis to have happened since the Great Depression in 1929. Therefore, in order to study the impact of the financial crisis on the volatility transmission of European markets, Slimane, Mehanaoui, & Kazi (2013), chose three stock market from Europe which was the UK, Germany and France. The period chosen for the study was pre-crisis and during the crisis. They applied the Flexible Fourier Form (FFF) procedure in order to capture their high frequency five minute intraday data. Then, using a bivariate vector autoregressive framework (VAR) to capture the stock market returns, and following up with an EGARCH model to capture the impact of the shock on stock market volatility. The results showed that for the stock market return spillover between the European markets, the significance of the transmission is particularly the same between the periods of pre-crisis and during the crisis. The German stock market seems to influences the UK and French stock market more during the crisis period. This may be due to the fact that during the period of study, Germany was touted to be the hub of the financial and economic activity in Europe. Therefore, it seems that during the crisis period, the cross-market interactions and dependency are more significant (Aloui, A ïsa, & Nguyen, 2011). But then, the increase of volatility in the crisis period is merely due to the interdependence of the stock markets and it does not support the fact that a pattern of contagion exist.

Next, another crisis that had a significant impact on the stock market was the euro crisis. The time period of the euro crisis was from 2010 to 2012. Therefore, Ftiti, Mazek, & Benzarti (2017), decided to study about the impact of the sovereign rating announcements on the spillover effects and the stock market volatility that is based on the dataset provided by Moody's, Standard & Poor's and Fitch. The data of the European countries that was chosen for the paper was Italy, Greece, Portugal and Spain, this is due to the fact these European countries was known for being frail over the past years. The study was differentiated into two periods, which was the pre-euro crisis that was from 2008 to 2010 and during the crisis period which was 2010 to 2012. GARCH and EGARCH was used in this study to measure the stock

market return volatilities. Their findings showed that stock market volatility reacts individually to the credit rating changes in those periods and is sensitive to both the good and bad news. There was an asymmetric reaction of the stock market in favour of a rating downgrade during the euro crisis period, whereas during the pre-euro crisis period, the stock market volatility reacts to both the upgrades and downgrades. The authors also identified that the downgrade affects the stock market risk more aggressively during the euro crisis period. The reason why upgrade has no impact in the crisis period was due to the uncertainty during the euro crisis period. Moreover, the results from their study also showed that in both the pre-euro crisis and during the crisis period, it had similarity concerning the spillover effect that occurred only in foreign downgrades similarly to the results of previous studies (Alsakka, Gwilym, & Vu, 2014).

2.8 Mechanism of Stock Market Spillovers

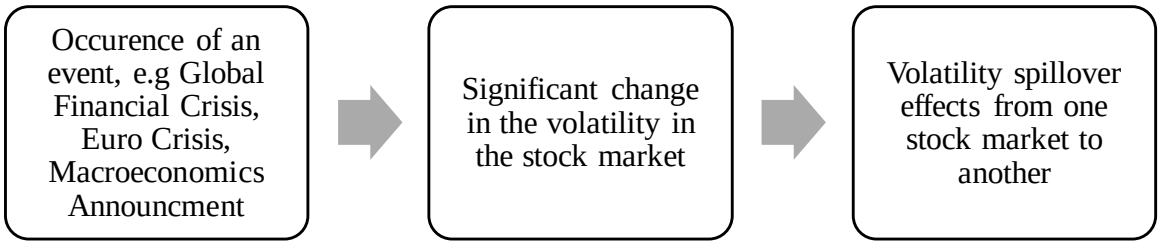

Figure 2.7: Stock Market Spillover Mechanism

The mechanism of the stock market spillovers usually starts with the occurrence of an event, for example, the global financial crisis. When a crisis like that happens, the volatility of the stock market is significantly affected (Tsouma, 2007). According to Rastogi (2014), the results of his test on the changes in volatility in the stock markets showed that Asia countries like China, Korea, India, Malaysia and Indonesia had a significant fall in responsiveness to the news due to uncertainty that was caused by the global financial crisis. Another research on the effect of the global financial crisis on the stock market of the Asia countries by Dungey & Gajure (2014), also stated that there were significant volatility spillover effects detected

from the stock market of the US towards the stock markets of the few Asia countries due to the global financial crisis

In Europe, Hanousek & Kocenda (2010) studied the impact of the macroeconomics announcement and spillovers on the EU stock markets. The strongest spillover effects was produced by the Budapest stock market due to the large trading volume by the investors, whereas the smallest effect was from the Polish stock market. For the euro crisis that happened, Ftiti, Mazek, and Benzarti (2017), did a research on the spillover effecs of the stock market volatility due to the euro crisis and the results showed that there is impact on the stock market volatility due to the sovereign rating announcement.

2.9 Conclusion

First of all, in the first part of the literature review, we briefly talked about the past trade wars that has happened and how it affected the economy of a country from the perspective of the stock market, GDP, consumption and trade. After that, in the second part, we discussed more about the stock market spillover, and found out that usually when an event like the global financial crisis happened, there were significant volatility spillover effects from a stock market towards other stock market.

CHAPTER 3: METHODOLOGY

In this chapter, we had quantified the impact of trade war through the perspective stock market in following section. First, we had listed down the estimated models which are Panel Least Square, ARCH and GARCH family models. We also outline the dummies we create to capture different episode of trade war to test whether there is impact of US-China trade war to the countries' stock market return. We attempt to use Panel Least Square, ARCH and GARCH family to conduct the research on stock market return spillover and volatility spillover to fulfil the research objectives in Chapter 1.

3.1 Estimated Model

Based on the Panel Least Square Regression model below, it is widely used to estimate the panel data. We apply this model to test whether the residual is suffering from the ARCH effect. Since we use daily data and normally for stock market return it involve ARCH effect. After tested, if model is suffering from the ARCH effect, we use ARCH and GARCH family model to solve the limitations. For example, ARCH (1) model and GARCH (1,1) model. The ARCH (1) model and GARCH (1,1) model are suitable to estimate spillover and volatility stock market returns for bonds, stocks and market indices.

Panel Least Square Regression Model

(1) $$Y_{i,t} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{1,it} D_j + \beta_4 X_{2,it} D_j + \beta_5 D_j + u_{it}$$

(2) $$Y_{i,t} = \beta_0 + \beta_1 US\ return_{it} + \beta_2 China\ return_{it} + \beta_3 US\ return_{it} D_j + \beta_4 China\ return_{it} D_j + \beta_5 D_j + u_{it}$$

$Y_{i,t}$ represents the stock market return of the six Asia countries which are Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia while b_0 is intercept. Holding other constant, when US or China stock market return increase by 1%, the

stock market return of six Asia country will increase in b_1% and b_2% respectively. When there is no trade war, the D_j will equal to zero, the stock market return of six Asia countries

(3) $$\frac{dy}{dDj} = \beta_3 X_1 + \beta_4 X_2 + \beta_5$$

When there is an implementation of tariff, the $b_3$will have indirect spillover effect by stock market return of US while b_4 will have indirect spillover effect by stock market return of China. b_5 represent the direct effect from the tariffs. It means when b_3 orb_4 increase by 1%, the $Y_{i,t}$ will increase by b_3% andb_4% respectively.

The most important variables are b_3%, b_4 and b_5. b_3 and b_4 showed indirect spillover effect while b5 showed direct spillover effect when there is an implementation of tariff.

ARCH (1) Model

(4) $$Y_t = \beta_0 + \beta_1 X_{1,t} + \beta_2 X_{2,t} + \beta_3 X_{1,t} D_j + \beta_4 X_{2,t} D_j + \beta_5 D_j + \beta_6 Y_{t-1} + u_t, u_t \sim N(0, h_t)$$

(5) $$Y_t = \beta_0 + \beta_1 US\ return_t + \beta_2 China\ return_t + \beta_3 US\ return_t D_j + \beta_4 China\ return_t D_j + \beta_5 D_j + + \beta_6 Y_{t-1} + u_t, u_t \sim N(0, h_t)$$

where $h_t = s_0 + s_1 u_{t-1}^2$, $j = 1,2,3,4,5,6,7\ and\ 8$

The different between ARCH (1) model and Panel Least Square Regression Model is ARCH (1) model has added a lag of the dependent variable. It is because it assumed that the next period stock market return will be depends on the past value.

GARCH (1,1) Model

(6) $$Y_t = \beta_0 + \beta_1 X_{1,t} + \beta_2 X_{2,t} + \beta_3 X_{1,t} D_j + \beta_4 X_{2,t} D_j + \beta_5 D_j + \beta_6 Y_{t-1} + u_t, u_t \sim N(0, h_t)$$

(7) $$Y_t = \beta_0 + \beta_1 US\ return_t + \beta_2 China\ return_t + \beta_3 US\ return_t D_j + \beta_4 China\ return_t D_j + \beta D_j + +\beta_6 Y_{t-1} + u_t, u_t \sim N(0, h_t)$$

where $h_t = s_0 + s_1 u_{t-1}^2 + \gamma_1 s_{t-1}^2$, $j = 1,2,3,4,5,6,7\ and\ 8$

GARCH (1,1) is used to replace the ARCH (1) model due to its limitations.

where

Y_t = Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia Stock Indices

$X_{1,t}$ = United State Stock Index

$X_{2,t}$ = China Stock Index

u_t = Residual

u_{t-1}^2 = ARCH (1)

s_{t-1}^2 = GARCH (1)

D_1 =1 if there is an implementation of tariff on solar panel and washing machine by US

0 if there is not implementation of tariff on solar panel and washing machine by US

D_2 =1 if there is an implementation of tariff on steel and aluminum tariffs by US

0 if there is not implementation of tariff on steel and aluminum tariffs by US

D_3 =1 if there is an implementation of tariff on China retaliates

0 if there is not implementation of tariff on China retaliates

D_4 =1 if there is an implementation of tariff on first phase of June 15 tariff lists

0 if there is not implementation of tariff on first phase of June 15 tariff lists

D_5 =1 if there is an implementation of tariff on second phase of $50 billion tariffs

0 if there is not implementation of tariff on second phase of $50 billion tariffs

D_6 =1 if there is an implementation of tariff on third phase

0 if there is not implementation of tariff on third phase

D_7 =1 if there is an implementation on raises tariff by US on previous list

0 if there is not implementation on raises tariff by US on previous list

D_8 =1 if there is an implementation of retaliatory tariff raises by China

0 if there is not implementation of retaliatory tariff raises by China

3.2 Modelling trade war

The dependent variable in our study is stock return (Index) of the Top 5 Asia export countries (excluded China) such as Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia (our country). While the independent variables are stock market return (Index) of United State and China.

We also included 8 dummies for different types of events during US-China Trade War. Lag (1) of the dependent variable added to estimate the ARCH (1) and GARCH (1, 1) model. It indicates the current value of based on both the current values of explanatory variables and the lagged (past period) values, denoted. The dummies we create to capture the different episode of trade war to test whether there is impact of US-China trade war to the countries' stock market return. The details of dummies have listed below.

Not only that, we multiple each dummy to our return of United State stock index ($X_{1,it}D_j$) and China stock index ($X_{1,it}D_j$). This means that when the dummy equal to 1, it will have impact on United State and China stock index. For example, if we differentiate the model by using this formula, $\frac{dY_{i,t}}{dX_{1,it}} = \beta_1 X_1 + \beta_{3it} D_j$, we can know whether there is significance relationship from the dummy to the return of United State stock index. This study is finding the relationship between the return of United State and China to the return of Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia when implementation of the tariff during the US-China Trade War. Table 1 below shows the expected sign of dependent variable and independent variables.

We had included 8 dummies into our models to capture the different episode of trade war that used to study whether the US-China trade war have impact on the countries' stock market return. Based on the equations above which are Panel Least Square Regression, ARCH (1) and GARCH (1,1) model, the D_j inside the equations are used to capture whether there has implementation of tariffs. When D_j equal to 1 means there is an implementation of tariff while when D_j equal to zero means there is no implementation of tariff.

The first dummy is President Trump imposes safeguard tariffs on solar panels and washing machines imports on 22nd January 2018. It has hurt the US industries. $8.5 billion in imports of solar panels and $1.8 billion of washing machines had been improved by Trump.

The second dummy is on 23rd March 2018 which Trump had implemented tariff on steel and aluminum. 25% steel tariff applied to countries that exported $10.2 billion of steel products to the US in 2017 and 10% aluminum tariff applied to countries that exported $7.7 billion.

While for the third dummy is China retaliates tariffs on aluminum waste and scrap, pork, fruits and nuts, and other US products on 2nd April 2018. These products have worth $2.4 billion in export value. This compares to the US steel and aluminum tariffs covering Chinese exports worth $2.8 billion in 2017.

The following dummy is United State and China impose first phase tariff of June 15 $50 billion tariff lists on 6th July 2018. US imposed 25% tariff on Chinese imports that worth $34 billion (818 Chinese products). At the same time, China takes retaliatory measures by imposing 25% tariff on the first $34 billion (545 US products) of its $50 billion list of US imports for example, automobiles, agriculture products and aquatic products. These implementations go into effects as this news were revised and announced on June 15, 2018.

While for the fifth dummy is United State and China impose the second phase tariff of $50 billion list on 23th August 2018, US implemented a 25% tariff on $16 billion of 279 goods from China. For example, the goods from China are electric scooters, chemicals, motorbike, plastics and semiconductors. In parallel with US tariff, China impose 25% tariff on 333 goods originating from US which worth $16 billion. The goods targeted on copper scrap, buses, coal, fuel and medical equipment.

On 24th September 2018, the sixth dummy is the third phase of tariffs goes into effect. Trump implemented tariff on $200 billion worth of Chinese imports that announced on 17th September 2018. Along with retaliatory tariff by China on $60 billion worth of US imports that announced on 18th September 2018. During 2018, US has tariffs on 12% of its total imports, while the retaliation of merged trading partner includes 8% of US total exports.

Follow by the seventh dummy which is United State raises tariff rate on the $200 billion Chinese goods on 10th May 2019 from 10% to 25%.

The last dummy number eighth dummy is China raises retaliatory tariffs on 1st June 2019. The products that getting imposed by China tariff worth $60 billion. Since China has also reduced tariffs on US rivals since the beginning of the trade war, there is now a 14 percentage point distinction in China's average US goods tariff versus the remainder of the world's products (Bown & Kolb, 2019).

Dummies work in a way that when there is an implementation of tariff, the dummy will equal to 1, otherwise 0 and holding others variables constant.

Table 3.2: Expected Sign of Independent Variables with Dependent Variables

Independent Variables (return)	Expected Sign with Dependent Variables (return)					
	Japan	**South Korea**	**Hong Kong**	**Singapore**	**Taiwan**	**Malaysia**
United State	positive	positive	positive	positive	positive	positive
China	positive	positive	positive	positive	positive	positive

The table 1 above shows the expected sign of independent variables, the return of United State and China and dependent variables, countries' return such as Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia. According to Tao (2014), United State and China are the largest import and export market and the countries we had selected as dependent variables are the top Asia export countries. Therefore, we expect that stock market return of independent variables and dependent variables will have a positive relationship. These indicate the changes of United State and China stock market return will move in the same direction as the dependent variables (countries' return). For example, when United State return decrease, the return of Japan will decrease as well.

3.3 Data Collection Method

In this study, we used a daily data of closing stock market indices which from 1st December 2016 to 30th June 2019. There are total 694 days from this period excluded the Saturday and Sunday. We want to study the US-China Trade War spillover effects to the Top 5 Asia export countries which are United State, China, Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia (our country) as our sample countries. From these selected countries, we would like to examine return of United State and China stock indices impact on the Top 5 Asia countries and Malaysia. The formula for the daily return is as follow:

(8)

$$R_{i,t} = \left(\frac{P_{i,t}}{P_{i,t-1}}\right)$$

In order to investigate the trade war spillover effects the Asia countries, we obtained stock indices of Asia countries as our dependent variable and United State and China stock indices as independent variables. All these countries unit measurement are in indices. We consider S&P 500 Index to represent United State stock market, Shanghai Composite Index to represent China stock market, Nikkei 225 Index to represent Japan stock market, Korea Composite Stock Price Index to represent South Korea stock market, Hang Seng Index to represent Hong Kong stock market, Straits Times Index to represent Singapore stock market, Taiwan Capitalization Weighted Stock Index to represent Taiwan stock market and Kuala Lumpur Composite Index to represent Malaysia stock market. Lastly, we obtained all these data from Bloomberg.

3.4 Methodology

This section we had discussed about the methods that we are going to use to estimate our model. The methods that we are going to use are Panel Least Square, Autoregressive Conditional Heteroscedasticity (ARCH), Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential GARCH method in GARCH family.

Panel Least Square Method is an ordinary least square method that use for panel data. The models must fulfil the Classical Linear Regression Model (CLRM) assumptions in order to obtain unbiased, efficient and consistent estimated parameter values (Samad, Ashhari & Othman, 2009). This model we used to estimate the impact of implementation of tariff towards the six Asia countries. As this method, we can't evaluate the impact of the individual country, so we proceed to ARCH model.

ARCH model is a time series statistical model. It helps us to capture direct and indirect spillovers effect of implementation of tariff to the individual country. From this, we can estimate which country has the impact from tariffs. However, there is some limitations of ARCH model, so we chose another alternative method to

estimate our model. GARCH model can helps to solve the limitations of ARCH model. Last but not least, we used EGARCH model to estimate our model because it helps to capture asymmetric effects as GACRH model can only capture symmetric effect.

3.4.1 Panel Least Square Method

Panel least square method is an ordinary least square method that use for panel data which is the combination of cross sectional and time series data. Panel data include findings of various phenomena for the same companies of individuals collected over multiple time periods. This model is known as time-invariant because the characteristics for observation are constant over time (homogeneity). This model is the simplest and easy to interpret. Based on Gauss-Markov theorem, there are strictly uncorrected between all the regressor and error term. It must assume the error term is distributed identically and independently with zero mean and constant variance for OLS to be optimal. Besides, make sure the estimated model fulfils all Classical Linear Regression Model (CLRM) assumptions in order to obtain unbiased, efficient and consistent estimated parameter values (Samad, Ashhari & Othman, 2009). However, there are some problems for Panel Least Sqaure which are the model does not distinguish between the various observations in terms of effect and characteristics across periods. Besides that, when heterogeneity exists, estimated parameter will be biased, inefficient and inconsistent (Kaizoji & Miyano, 2018).

(9) $$Y_{it} = \beta_0 + \sum \beta_k X_{k,it} + \varepsilon_{it}$$

Where Y_{it} and X_{it} indicate regressand and regressor for countries i for countries, t for period; ε_{it} is a stochastic error; β_0 and β_k indicate constant intercept and slope coefficient for specific k regressor respectively.

3.4.2 Autoregressive Conditional Heteroscedasticity (ARCH)

ARCH model is a time series statistical model used to interpret variance of error term as function of actual size of previous time periods' error term. If the variance of error term is not uniform known as heteroscedasticity. Heteroscedasticity happens when standard error of variable is non-constant over a specific time. ARCH models are specifically designed to model and forecast conditional variances. In this study, ARCH model of its variance specification can capture commonly observed features of the time series of financial variables such as bonds, stock and market indices. For example, periods in securities market are low volatility often followed by high volatility periods. These indicate that variance of error term interpret the securities markets strongly depending on variance of previous periods (Will, 2019).

According to Engle (1982), Autoregressive Conditional Heteroscedasticity (ARCH) method for modelling volatility has been introduced. Under the ARCH model, the autocorrelation in volatility is modelled by allowing the conditional variance of the error term, s_t^2 to depend on the immediately previous valued of the squared error. This model also known as ARCH (1) model.

(10) $$h_t^2 = s_0 + s_1 u_{t-1}^2$$

The full model would be

(11) $$Y_t = \beta_1 + \beta_2 X_{2t} + \cdots + \beta_k X_{kt} + u_t, u_t \sim N(0, h_t^2)$$
$$\text{where } h_t^2 = s_0 + s_1 u_{t-1}^2$$

3.4.3 Testing for ARCH effect

In order to prove that whether the daily data of the stock market return involve the ARCH effect, we should apply the ARCH test to test for it. First step is to set up the null and alternative hypotheses.

H_0=There is no ARCH effect during the trade war

H_A=There is an ARCH effect during the trade war

Next, set the value of test statistic as TR^2, the number of observations multiplied by the coefficient of multiple correlation from the second regression. Then, create a critical value distributed as a c_q^2. Make a decision rule, reject H_0 if value of test statistic greater than critical value, otherwise do not reject H_0. Lastly, make a conclusion whether have sufficient evidence to reject H_0 or insufficient evidence to reject H_0 at 5% significant level.

3.4.4 Limitations of ARCH Model

In this ARCH model, we are hard to decide the (q). If the required value of (q) might be very large, the number of variables (k) will increase. Increase in (k) will reduce the degree of freedom (n-k-1). Low degree of freedom indicates that we have limited information for estimator to estimate spillover effect of trade war effect. Therefore, the estimation become low accurate. The second limitation for ARCH model is non-negativity constrains might be violated. When we estimate an ARCH model, we must unsure the variance equation must be positive since we squared error and variance cannot be negative. Require s_i>0, where i=1,2,…q.

3.4.5 Generalized Autoregressive Conditional Heteroscedasticity (GARCH)

For ARCH model, it is more likely to breach non-negativity constraints but GARCH (1,1) can help to solve this problem. According to Will (2018), GARCH process is an econometric which generalized by Bollerslev (1986) and Taylor (1986). This GARCH process is often preferred by estimate volatility in financial markets due to it can provide more real world context to predict the price and rates of financial instruments. So we had chosen this to study the spillover effects of trade war. One of advantages using GARCH model is to analyze a different types of financial data

such as macroeconomic data. Also, financial institutions use this GARCH model to estimate volatility returns for bonds, stocks and market indices. The result can use to judge which assets will have the higher potential returns in order to predict current investment returns to help their assets, risk management, hedging and portfolio optimization decisions.

3.4.6 GARCH (1, 1) Model

The variance equation as equation (11)

(12) $$s_t^2 = s_0 + s_1 u_{t-1}^2 + b_1 s_{t-1}^2$$

This model specification usually performs well and is easy to estimate because it only has only three unknown parameters. GARCH (1, 1) Model is a parsimonious alternative to an infinite ARCH(q) process. Successive substitution into the right hand side of equation (11) gives.

(13)
$$\begin{aligned} s_t^2 &= s_0 + s_1 u_{t-1}^2 + \beta s_{t-1}^2 + v_t \\ &= s_0 + s_1 u_{t-1}^2 + \beta\,(s_0 + s_1 u_{t-2}^2 + \beta s_{t-2}^2) + v_t \\ &= s_0 + s_1 u_{t-1}^2 + s_0\beta + s_1\beta u_{t-2}^2 + \beta^2 s_{t-2}^2 + v_t \\ &= s_0 + s_1 u_{t-1}^2 + s_0\beta + s_1\beta u_{t-2}^2 + \beta^2\,(s_0 + s_1 u_{t-3}^2 + \beta s_{t-3}^2) + v_t \\ &= s_0 + s_1 u_{t-1}^2 + s_0\beta + s_1\beta u_{t-2}^2 + s_0\beta^2 + s_1\beta^2 u_{t-3}^2 + \beta^3 s_{t-3}^2 + v_t \\ &= \cdots \\ &= \frac{s_0}{1-\beta} + s_1\,(u_{t-1}^2 + \beta u_{t-2}^2 + \beta^2 u_{t-3}^2 + \cdots) + v_t \\ &= \frac{s_0}{1-\beta} + s_1 \sum_{j=1}^{\infty} \beta u_{t-j}^2 + v_t \end{aligned}$$

The GARCH (1, 1) specification in equation (8) is equivalent to an infinite order ARCH model with coefficients that decline geometrically. Due to this reason, essential to estimate GARCH (1,1) models as alternatives to high order ARCH(p)

models because with this GARCH (1,1) model have less parameters to estimate. Therefore, there is lose fewer degrees of freedom. It indicates we have more information for estimator to estimate spillover effect of trade war effect. The result will be more accurate. In order to further extend the GARCH (1, 1) model to GARCH (p, q) as in equation (13).

(14) $$h_t = s_0 + \sum_{i=1}^{q} s_i u_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j}$$

Based on the equation above, set the conditional variance, h_t varies over time. If a big movement in the stock market return occurred in last period, the period before or up to (q) period ago, the effect of this big movement will be shown in an increased volatility. However, in general GARCH (1, 1) model will be sufficient to capture the volatility clustering in the data.

3.4.7 Limitations of GARCH (p, q) Model

There are some limitations of GARCH model which are non-negativity constraints may still be violated and it cannot account for leverage effects. Since GARCH assume symmetric model, therefore, positive and negative of spillover effect will show the equal result.

3.4.8 GARCH family

GARCH family will be use when GARCH (1, 1) meets its limitations. There are two types of GARCH models which are symmetric and asymmetric GARCH models. Integrated GARCH (IGARCH) and GARCH-in Mean (GARCH-M) are symmetric while Threshold GARCH (TGARCH) and Exponential GARCH (EGARCH) are asymmetric. We will only use EGARCH to test volatility, spillover and leverage effect in those countries' stock return for the US-China trade war events.

Symmetric GARCH did not capture the asymmetry in financial returns data. Asymmetric GARCH allow for asymmetric shocks to volatility (leverage effect). It impacts more on unexpected negative news (decrease in stock price) than unexpected positive news (increase in stock price) (Dutta, 2014).

EGARCH is proposed by Nelson (1991) to solve the limitations of TGARCH which is EGARCH can capture the size and sign of the impact. It is use to capture the effect of external unexpected shocks on predicted volatility (Gabriel, 2012). As they found that EGARCH has lower estimate error and more accurate if compared with other GARCH model. This model not only take into consideration asymmetry, leverage effects, and coefficient restrictions but it also can capture size effects as well as sign effects of shocks (Ali, 2013).

(15)

$$\log(\sigma_t^2) = \omega + \sum_{i=1}^{q} (\alpha_i \eta_{t-i} + \gamma(|\eta_{t-i}| - \mathrm{E}|\eta_{t-i}|)) + \sum_{j=1}^{q} \beta_j \log(\sigma_{t-j}^2)$$

E is the expectation operator. α_i capture the asymmetry. Positive value indicates no leverage effect while negative value indicates that the process reacts more to negative news.

3.5 Conclusion

In the nutshell, our test is mainly used to solve the research problem in Chapter 1. First, we build our model, then we collect data from Bloomberg and all the data are in index unit. After that, we will calculate the return and proceed to our test by using Panel Least Square, ARCH and GARCH family model as estimator.

CHAPTER 4: DATA ANALYSIS

4.1 Model Estimation

In the following chapter we will used panel data to estimate the model according to the model we mentioned in Chapter 3 which are Panel Least Square, Autoregressive Conditional Heteroscedasticity (ARCH), Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) models to determine our results. First of all, we used Panel Least Square method to analyse our results. The dummies represent the scenarios that happened when the United States and China Trade War. There are total of eight dummies that happened at the very beginning of the trade war when US implemented tariff on solar panel and the washing machine on 22nd January 2018 until the China retaliatory tariffs worth 60 billion on 1st June 2019. Our dependent variables will be the stock market return of the six Asia countries. The majority of scenarios shows spillover effect is insignificantly affected.

After using Panel Least Square method, we investigate the impact on stock market return of the 6 six Asia countries by using ARCH and GARCH model as the Panel Least Square method cannot capture the spillover effect of the individual country. Furthermore, the sample size that we choose is big and Panel Least Square method is only suitable for a small sample size. To have an accurate estimation, we used ARCH and GARCH to analyze the spillover effect of six Asia countries separately. At the end, we further investigate the result by using the EGARCH. The reason that we choose another method to run our data because ARCH and GARCH models only capture symmetric assumption. By using EGARCH we can overcome the weakness of ARCH and GARCH models to capture the asymmetric assumption. It not only takes into consideration asymmetry but it also can test for leverage effects, coefficient restrictions, size effects as well as sign effects of shocks. The leverage effect could show the countries react more on unexpected negatives news than unexpected positive news. Some of the countries will react more on bad news than good news and it might cause the stock market return to fluctuate while some other

countries will react more on good news than bad news. We need to perform EGARCH in order to get the consistent results as there are many possibilities that stock market return would get influence by other factors and EGARCH are more suitable to capture trade war effect.

4.2 Capturing Overall Spillover Effect of Trade War on the Asia Countries

On 22nd January 2018, Donald Trump decided to impose safeguard tariffs on solar panel and washing machine which triggered the trade war with China. Trump felt that the China exports was hurting the US industries, because Trump, who is always trying to "make America great again" as he campaigned these slogans to a great degree that led to his stunning presidential victory. Therefore, with a president like Donald Trump, it was not a surprised that he imposed safeguard tariffs that is worth $8.5 billion on imports of solar panels and $1.8 billion on imports of washing machines.

Subsequently, on 23rd March 2018, Donald Trump decided to implement the tariffs on steel and aluminium on trading partners that exported $10.2 billion worth of steel products to the United States. The decision made by Trump was based on the investigation of the commerce department that concluded that the American industrial base was threatened by cheap metals especially from that was flooding into the United States especially from China. This was seen as a threat to national security by Trump.

A trade war happens when countries retaliate against each other. On 2nd April 2018, China decided to retaliate against the tariffs implemented by the United States on China's steel and aluminium worth $2.8 billion by imposing a retaliatory tariffs on United States goods such as scrap, aluminium waste, pork, fruits, nuts and many more that was worth $2.4 billion.

Table 4.1: The battle of machines and commodities between United States and China from 22nd January 2018 – 2nd April 2018

	Solar Panel and Washing Machine War on 22nd January 2018	Steel and Aluminium War on 23rd March 2018	Retaliatory tariff by China worth $2.4 billion on 2nd April 2018
	Stock Return of Asia Countries		
Stock Return of China	0.2391 (0.0297)***	0.3159 (0.0238)***	0.3506 (0.0226)***
Stock Return of US	0.1609 (0.0369)***	0.0930 (0.0251)***	0.1019 (0.0238)***
Dum * Stock Return of China	0.0860 (0.0320)	-0.0056 (0.0270)	-0.0508 (0.0260)*
Dum * Stock Return of US	-0.0567 (0.0401)	0.0320 (0.0306)	0.0207 (0.0298)
Dummy	-0.0141 (0.0152)	-0.0181 (0.0162)	-0.0164 (0.0164)

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses, where Asia Countries are stock return on Hong Kong, Japan, Malaysia, Singapore, South Korea and Taiwan

Table 4.1 above showed the spillover effect after Trump implement the solar panel and washing machine impact stock return on Asia countries. The result showed insufficient evidence to conclude there have direct and indirect spillover effect impact the stock return on Asia countries.

Besides, Trump implemented tariff on steel and aluminium. However, the result showed there are no direct and indirect spillover effect on Asia countries stock market return. This indicate Trump implemented tariffs on steel and aluminium do not impact the six Asia countries stock market return.

Based on the table 4.1 above, the result showed that when China imposed retaliate tariffs worth $2.4 billion will have the indirect negative spillover effect through China impact the stock return on Asia countries. Insufficient evidence to conclude that there have the direct and indirect spillover effect through US impact the stock return on Asia countries.

The trade war escalated to a point where Donald Trump accused China for its unfair trade practices and copyright theft of intellectual property and technology. The first phase of tariffs imposed by Trump on Chinese goods that is worth $34 billion goes into effect on 6th July 2018. In response, China retaliated with a tariffs on United States goods that is worth $34 billion.

On 23rd August 2018, a second phase of tariffs was implemented by both sides because Donald Trump insists that the tariffs on China were inevitable because the economic behavior was harming the United States. However, China disagree and insist that the tariffs not only violates the World Trade Organization rules, it also harms the economy of both countries. Trump still went on to impose the remaining tariffs of $16 billion on Chinese goods, and China responded back with its own tariffs of $16 billion worth on the product of United States. This totaled to $50 billion of tariffs by both United States and China.

Another tariff was implemented on $200 billion of Chinese products by Donald Trump on 24th September 2018. It was part of a strategy to force China into altering its trade practices that was harming the United State industries as claimed by Donald Trump. In retaliation, Xi Jin Ping, China's president, retaliated by imposing tariffs on United States good that was worth about $60 billion.

Table 4.2: Unending retaliatory tariffs between United States and China from 6th July 2018 – 24th September 2018

	First Tariff on 6th July 2018	Second Tariff on 23rd August 2018	Third Tariff on 24th September 2018
	Stock Return of Asia Countries		
Stock Return of China	0.3648 (0.0187)***	0.3353 (0.0169)***	0.3384 (0.0163)***
Stock Return of US	0.0924 (0.0211)***	0.0967 (0.0207)***	0.0981 (0.0205)***
Dum * Stock Return of China	-0.0837 (0.0234)***	-0.0416 (0.0226)*	-0.0498 (0.0224)**
Dum * Stock Return of US	0.0485 (0.0289)*	0.0374 (0.0288)	0.0353 (0.0288)
Dummy	-0.0159 (0.0184)	-0.0241 (0.0198)	-0.0308 (0.0208)

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses, where Asia Countries are stock return on Hong Kong, Japan, Malaysia, Singapore, South Korea and Taiwan

According to table 4.2 above, when US and China imposed the first phase the tariff lists, result showed that strongly significant negative spillover effect through China to impact stock return on Asia countries by reducing 0.0837. Positive spillover effect through US by increasing 0.0485 stock return on Asia countries.

From the table 4.2 showed that US and China implemented second phase of worth $50billion tariffs, the result showed weakly significant negative spillover effect through US by decreasing 0.0416 stock return on Asia countries. However, insufficient evidence to conclude that US and China implemented second phase tariff will have direct and indirect spillover effect through US impact the stock return on Asia countries.

According to Table 4.2.6, when US and China implemented third phase of tariffs, the result showed significant negative spillover by China reducing 0.0498 stock return on Asia countries. However, we do not have enough evidence to conclude that US and China implemented third phase tariff will have direct and indirect spillover effect through US impact the stock return on Asia countries.
On 10th May 2019, there was an anticipation that a deal could be improvised between both of the countries, however it was not materialized. The tariffs by Trump on Chinese goods was raised from 10% to 25%.

In response to Trump's decision to raise the tariffs on $200 billion worth of Chinese products from 10% to 25%, China announced to increase the tariffs to 25% on 2,493 U.S products, with the tariffs ranging from 5% to 25%. On 1st June 2019, China's tariff goes into effect which covered about $36 billion of the $60 billion worth of United States goods from previous tariffs.

Table 4.3: Increment of preceding retaliatory tariff between United States and China from 10th May 2019 – 1st June 2019

	United States raised tariff on 10th May 2019	China raised tariff on 1st June 2019
	Stock Return of Asia Countries	
Stock Return of China	0.3206	0.3123
	(0.0115)***	(0.0113)***
Stock Return of US	0.1128	0.1108
	(0.0148)***	(0.0146)***
Dum * Stock Return of China	-0.1273	0.0116
	(0.0468)***	(0.0686)
Dum * Stock Return of US	0.0492	0.0703
	(0.0645)	(0.1033)
Dummy	-0.0050	0.0889
	(0.0494)	(0.0747)

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses, where Asia Countries are stock return on Hong Kong, Japan, Malaysia, Singapore, South Korea and Taiwan

According to table 4.3, US increased tariff rate on previous list. The result showed strongly significant negative spillover effect by China decreasing 0.1273 stock return on Asia countries. However, we do not have enough evidence to conclude that US and China implemented third phase tariff will have direct and indirect spillover effect through US impact the stock return on Asia countries.

Based on table above 4.3, when China raised retaliate tariffs, the result showed do not have direct and indirect spillover effect through US and China. We can conclude that, when China raised retaliate tariffs, the stock return on six Asia countries do not impact by this tariffs.

4.2.1 Summary of Overall Spillover Effect on the Asia Countries

Overall from these investigating spillover effect of trade war, when US or China implemented the tariffs, there will have negative spillover effect through China impact six Asia countries. However, all of the table above could not showed there have direct spillover effect impact to stock return on six Asia countries.

Probably this could due to we used panel data, we could not accessed estimation of ARCH method. Since we cannot use the ARCH methodology, we could not capture the spillover effect from each tariff war. Also, since our sample size is big, estimation of Panel Least Square method is more suitable to use in small sample size for estimation.

Besides, by using Panel Least Square method, the findings showed the result cannot easily be define. For example, when China decided to retaliate against the tariffs, the result showed negative spillover effect through China impact stock return on Asia countries. However, we could not define which countries are more impacted from this tariff. Therefore, we suggest to separate our Asia countries into individual in order to clearly define each of the variables impact by each scenario.

4.3 Analyzing the Spillover Effect for each Asia Country

After using Panel Least Square method, we proceed to ARCH and GARCH models. Due to the limitation of panel least square for estimation, we separate six Asia countries and run the estimation individually. We use ARCH and GARCH model to capture the spillover effect from trade war and to define the country which suffer or gain the most from trade war. ARCH and GARCH model are suitable to capture the volatility of stock return on stock market.

These section showed the result of ARCH and GARCH. This section discussed about the results of the impact on stock market return of six Asia countries by using ARCH and GARCH models. There are total eight tables from table 4.4 until table 4.11 represent the total eight scenarios. Each table represents each scenario with six Asia countries.

4.3.1 United State implement tariffs on solar panel and washing machine on 22nd January 2018

Based on our results on table 4.4, the day when the tariffs were implemented, the stock market index of Singapore and Japan experienced an indirect negative impact from the stock market index of China as their index dropped, whereas KOSPI, which is the stock market index of South Korea suffered a direct negative impact from this trade war. This can be due to South Korea being one of the largest manufacturer and exporter of washing machines and also President Donald Trump ignoring the recommendation from the US International Trade Commission (ITC) to exclude South Korea from the tariffs because Trump wanted to protect United States based washing machine manufacturers like Whirpool from its competitors mainly Samsung and LG from South Korea. Then, STI, which is the stock market of Singapore, also experienced a setback in the stock market when the tariffs were imposed. This may be due to its dependence on the trade with China since China is one of Singapore's biggest trading partner. Therefore, when the tariffs were imposed, China's trade flow was affected negatively which result in Singapore being affected as well.

Table 4.4: United State implement tariffs on solar panel and washing machine on 22nd January 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.549	0.115	0.0258	0.155	0.157	0.211
	(0.0775)***	(0.0892)	(0.0356)	(0.0580)***	(0.0690)**	(0.0595)***
Stock Return of US	0.220	0.375	0.00994	0.145	0.0897	-0.0517
	(0.108)**	(0.124)***	(0.0528)	(0.0775)*	(0.0950)	(0.0676)
Dum 1* Stock Return of China	0.0172	0.177	0.0810	0.117	0.145	0.119
	(0.0780)	(0.0929)*	(0.0403)**	(0.0604)*	(0.0712)**	(0.0622)*
Dum 1* Stock Return of US	-0.0964	-0.175	-0.00662	-0.0525	0.0526	0.0843
	(0.114)	(0.127)	(0.0567)	(0.0817)	(0.0989)	(0.730)
Dum 1	-0.0992	-0.0538	-0.0329	-0.0668	-0.0977	-0.00928
	(0.0579)*	(0.0690)	(0.0370)	(0.0451)	(0.0534)*	(0.0469)
Lag of Dependent Variables	-0.00634	0.0185	0.0573	-0.0201	-0.0558	-0.0217
	(0.0322)	(0.0420)	(0.0358)	(0.0332)	(0.0403)	(0.0408)
Constant	0.0785	0.0752	0.0116	0.0565	0.0698	0.0712
	(0.0444)*	(0.0519)	(0.0219)	(0.0326)*	(0.0417)*	(0.0349)**
			GARCH			
Stock Return of China	0.552	0.116	0.0236	0.157	0.173	0.231
	(0.0865)***	(0.124)	(0.0691)	(0.0706)**	(0.0693)**	(0.0845)***
Stock Return of US	0.203	0.387	0.00271	0.144	0.0843	-0.0351
	(0.120)*	(0.163)**	(0.0911)	(0.100)	(0.105)	(0.0973)
Dum 1* Stock Return of China	0.0357	0.213	0.0982	0.128	0.128	0.0977
	(0.0888)	(0.127)*	(0.0708)	(0.0729)*	(0.0715)*	(0.0864)
Dum 1* Stock Return of US	-0.0786	-0.224	0.00722	-0.0568	0.0675	0.120
	(0.125)	(0.165)	(0.0927)	(0.103)	(0.108)	(0.100)
Dum 1	-0.0818	-0.0793	-0.0484	-0.0638	-0.104	-0.0650
	(0.0628)	(0.0808)	(0.0475)	(0.0509)	(0.0557)*	(0.0592)
Lag of Dependent Variables	-0.0125	-0.0165	0.0482	-0.0278	-0.0658	-0.0698
	(0.0279)	(0.0334)	(0.0270)*	(0.0297)	(0.0354)*	(0.0257)***
Constant	0.0720	0.0606	0.0307	0.0566	0.0669	0.0671
	(0.0518)	(0.0684)	(0.0403)	(0.0422)	(0.0449)	(0.0497)

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 1= United State implement tariffs on solar panel and washing machine on 22nd January 2018

At the same time, the stock market of Japan was affected negatively because if the relationship between the United States and China was considered the most important in the world, then coming in at second would be the relationship between Japan and China, this shows the significance of their relationship. Since 2017, one-third of Japan's economic growth was contributed by the net exports to China. Therefore, when the tariffs hit China, the stock market of China fell, which indirectly affecting Japan.

Even though the tariffs were imposed, that doesn't mean that everyone would be affected. The stock market of Taiwan, Malaysia and Hong Kong was not affected when President Donald Trump imposed the tariffs. This can be due to these countries was not major importers or exporters for these washing machine and solar panels, even though U.S and China are major trading partners for all of these countries.

4.3.2 United State implement tariffs on steel and aluminium on 23rd March 2018

According to table 4.5, When President Donald Trump proceeded to implement the tariffs on steels and aluminum on all countries, many countries were affected by that decision. The result that we ran showed that the two stock markets that were affected negatively was the stock market of South Korea and Hong Kong.

South Korea, who ranks in third place when it comes to exporting steel to the United States. This explains why South Korea was affected negatively when the tariffs were imposed in this trade war even though South Korea was exempted from the tariffs after accepting the quota to import only 70 percent of total shipments from 2015 to 2017. Whereas Hong Kong was affected negatively because Hong Kong companies that operates between the borders in the transshipment. Therefore, their business is affected as their export to the U.S has to pass through mainland China first, and due to this tariff imposed, exports to the U.S would be lesser which in turn will caused Hong Kong companies to export lesser to mainland China.

On the other hand, the stock market of Taiwan also had an indirect positive impact from the U.S because the tariffs imposed will caused U.S to look for alternatives as U.S will trade lesser with China. This is where Taiwan comes into the picture, because one of Taiwan's main export trading partner is to U.S, therefore, in this scenario, U.S would trade more with Taiwan.

4.3.3 The implementation of retaliatory tariff by China on 2nd April 2018

From table 4.6, Taiwan and Hong Kong have indirect impact that through US or/ and China whereas South Korea have a direct impact from the trade war. This can be explained by Taiwan has a very limited land area, small agriculture sector and high urbanization, so US is the primary supplier for Taiwan especially for beef, nuts, fruits and so on. Taiwan is an important trading partner for sales of US food and agriculture products. Throughout the statistic by HIS Markit, Taiwan ranked 16th in 2018 largest agriculture importer in the world even though they face high tariff on US products. US holds about 36% the largest market shares of Taiwan's agriculture imports.

Hong Kong is the one country that has been affected by China more significantly. Hong Kong is also having a limited and slowed productivity on agriculture sector. It is because the land in Hong Kong is very scarce and less than 7% land is used for agriculture. Most of their lands were used to build companies, house or condominium. As the available land cannot provide enough food for almost 7 million people in Hong Kong, so they have to import large amount of food and agriculture products. China is the largest importer for them, followed by US. The products that China import the most to US are pork, beef, vegetables, eggs while US import fresh fruits.

Table 4.5: United State implement tariffs on steel and aluminium on 23rd March 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.647	0.221	0.0619	0.207	0.229	0.262
	(0.0493)***	(0.0571)***	(0.0250)**	(0.0363)***	(0.0483)***	(0.0510)***
Stock Return of US	0.122	0.200	-0.0164	0.103	0.128	-0.0793
	(0.0476)**	(0.0462)***	(0.0263)	(0.0348)***	(0.0490)***	(0.0348)**
Dum 2* Stock Return of China	-0.112	0.0475	0.0321	0.0585	0.0648	0.0476
	(0.0565)**	(0.0640)	(0.0334)	(0.0407)	(0.0513)	(0.0540)
Dum 2* Stock Return of US	0.0397	0.0625	0.0430	0.00334	0.0126	0.166
	(0.0705)	(0.0650)	(0.0342)	(0.0494)	(0.0593)	(0.0502)***
Dum 2	-0.100	-0.0534	-0.0443	-0.0687	-0.0978	-0.0247
	(0.0563)*	(0.0653)	(0.0379)	(0.0451)	(0.0519)*	(0.0463)
Lag of Dependent Variables	-0.00770	0.0258	0.0592	-0.0172	-0.0523	-0.0212
	(0.0325)	(0.0424)	(0.0362)	(0.0332)	(0.0400)	(0.0407)
Constant	0.0771	0.0764	0.0130	0.0547	0.0611	0.0732
	(0.040)*	(0.0438)*	(0.020)	(0.0293)*	(0.0372)	(0.0332)**
			GARCH			
Stock Return of China	0.663	0.262	0.0840	0.230	0.263	0.319
	(0.0386)***	(0.0485)***	(0.0326)**	(0.0407)***	(0.0440)***	(0.0418)***
Stock Return of US	0.123	0.178	-0.0222	0.101	0.134	-0.0238
	(0.0486)**	(0.0507)***	(0.0386)	(0.387)***	(0.0453)***	(0.0428)
Dum 2* Stock Return of China	-0.104	0.0465	0.0295	0.0492	0.0270	-0.00747
	(0.0452)**	(0.0570)	(0.0361)	(0.0452)	(0.0478)	(0.0434)
Dum 2* Stock Return of US	0.0265	0.0270	0.0481	-0.00512	0.172	0.139
	(0.0667)	(0.0642)	(0.0431)	(0.0472)	(0.0544)	(0.0541)**
Dum 2	-0.0914	-0.0466	-0.0665	-0.0629	-0.103	-0.0607
	(0.0586)	(0.0723)	(0.0433)	(0.0470)	(0.0522)**	(0.0556)
Lag of Dependent Variables	-0.0133	-0.0125	0.0454	-0.0263	-0.0627	-0.0732
	(0.0282)	(0.0345)	(0.0273)*	(0.0296)	(0.0351)*	(0.0277)***
Constant	0.0760	0.0440	0.0354	0.0520	0.0558	0.0574
	(0.0437)*	(0.0536)	(0.0351)	(0.0353)	(0.0384)	(0.0428)

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 2= United State implement tariffs on steel and aluminium on 23rd March 2018

Table 4.6: The implementation of retaliatory tariff by China on 2nd April 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.654	0.297	0.0652	0.232	0.285	0.0304
	(0.0475)***	(0.0436)***	(0.0242)***	(0.0338)***	(0.0407)***	(0.0426)***
Stock Return of US	0.129	0.229	-0.0152	0.109	0.161	-0.0670
	(0.0470)***	(0.0388)***	(0.0260)	(0.0333)***	(0.0447)***	(0.0321)**
Dum 3* Stock Return of China	-0.123	-0.0480	0.0276	0.0264	-0.00561	-0.00560
	(0.0550)**	(0.0521)	(0.0327)	(0.0385)	(0.0449)	(0.0463)
Dum 3* Stock Return of US	0.0294	0.0237	0.0430	-0.00321	-0.0350	0.173
	(0.0709)	(0.060)	(0.0343)	(0.0492)	(0.0576)	(0.0500)***
Dum 3	-0.0920	-0.0450	-0.0432	-0.0639	-0.0866	-0.0218
	(0.0561)	(0.0641)	(0.0380)	(0.0452)	(0.0524)*	(0.0466)
Lag of Dependent Variables	-0.00755	0.0249	0.0589	-0.0168	-0.0518	-0.0280
	(0.0322)	(0.0423)	(0.0362)	(0.0331)	(0.0397)	(0.0403)
Constant	0.0730	0.0688	0.0125	0.0520	0.0534	0.0689
	(0.0397)*	(0.0417)*	(0.0204)	(0.0291)*	(0.0370)	(0.0330)**
			GARCH			
Stock Return of China	0.669	0.358	0.0943	0.274	0.314	0.340
	(0.0378)***	(0.0414)***	(0.0320)***	(00383)***	(0.0390)***	(0.0400)***
Stock Return of US	0.130	0.194	-0.0210	0.107	0.162	-0.0258
	(0.0473)***	(0.0442)***	(0.0378)	(0.0367)***	(0.0423)***	(0.0410)
Dum 3* Stock Return of China	-0.113	-0.0762	0.0175	-0.00699	-0.0372	-0.0348
	(0.0447)**	(0.0528)	(0.0357)	(0.0433)	(0.0436)	(0.0422)
Dum 3* Stock Return of US	0.0167	0.00654	0.0499	-0.121	-0.0231	0.151
	(0.0663)	(0.0622)	(0.0425)	(0.0460)	(0.0526)	(0.0529)***
Dum 3	-0.0815	-0.0470	-0.0642	-0.0552	-0.0935	-0.0579
	(0.0585)	(0.0727)	(0.0432)	(0.0469)	(0.0525)*	(0.0555)
Lag of Dependent Variables	-0.0131	-0.0139	0.0447	-0.0260	-0.0626	-0.0768
	(0.0280)	(0.0343)	(0.0272)	(0.0297)	(0.0353)*	(0.0276)***
Constant	0.0707	0.0431	0.0335	0.0472	0.0491	0.0555
	(0.0431)	(0.0518)	(0.0350)	(0.0347)	(0.0381)	(0.0424)

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 3= Implementation of tariff on China retaliates on 2nd April 2018

South Korea has an export oriented economy that is sensitive to the external demand shock which explains why South Korea was directly impacted by the trade war. U.S. and China are South Korea's two largest trading partners, and South Korea's exports account for more than 50% of its total GDP. Intermediate goods take up most of Korea's exports to China and the goods are used for China's processing exports. When China retaliated with the tariffs on United States, this also means that there would be lesser exports to the United States, which directly impacted the stock market of Korea negatively.

So definitely these countries will be affected by the trade war as they have strong trading relations between each other. Taiwan will have the positive impact during this scenario because as China implemented tariff to US, China will import less food and agriculture products from US. From this, China will find substitutes products from other countries like Hong Kong, Malaysia and Taiwan to fulfil their demand, so these three countries can indirectly benefit from this scenario.

4.3.4 Implementation of tariff in first phase on 6th July 2018

Based on our result in Table 4.7, Hong Kong and Malaysia unlikely had the indirect impact on China and Japan indirectly affected by US and China. Hong Kong serves as a good investment places and also business development but it's still being pressure by the indirect effect of trade. Most importantly, any slow down production or economy reduces in China economy will simply reduce the demand for Hong Kong's banking and finance and also logistics services. The demand for raw materials and semi-manufactured goods will decrease affecting Hong Kong re-exports to china from other countries.

After the announcement release, the Malaysian electrical and electronics (E&E) sector, as well as natural gas were the biggest beneficiaries. The reason that Malaysia gain indirectly is because of tariffs on China forces US make import substitution in most electronics products.

Table 4.7: Implementation of tariff in first phase on 6th July 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.663	0.334	0.105	0.248	0.310	0.329
	(0.0404)***	(0.0388)***	(0.0224)***	(0.0315)***	(0.0347)***	(0.0355)***
Stock Return of US	0.125	0.193	-0.0164	0.0768	0.139	-0.372
	(0.0421)***	(0.0390)***	(0.0255)	(0.0308)**	(0.0397)***	(0.0305)
Dum 4* Stock Return of China	-0.158	-0.138	-0.0413	0.00240	-0.0458	-0.0565
	(0.0494)***	(0.513)***	(0.0347)	(0.0373)	(0.0403)	(0.0420)
Dum 4* Stock Return of US	0.0526	0.163	0.0605	0.0591	0.00422	0.167
	(0.0706)	(0.0630)***	(0.0372)	(0.0488)	(0.0554)	(0.0520)***
Dum 4	-0.0887	-0.0702	-0.0195	-0.0494	-0.0581	-0.00893
	(0.0574)	(0.0649)	(0.0393)	(0.0464)	(0.0533)	(0.0487)
Lag of Dependent Variables	-0.00707	0.0305	0.0602	-0.0177	-0.0494	-0.0290
	(0.0316)	(0.0417)	(0.0360)*	(0.0331)	(0.0396)	(0.0398)
Constant	0.0666	0.0726	0.00560	0.0439	0.0358	0.0634
	(0.0363)*	(0.0383)*	(0.0197)	(0.0272)	(0.0339)	(0.0298)**
			GARCH			
Stock Return of China	0.675	0.365	0.177	0.2779	0.326	0.346
	(0.0350)***	(0.0398)***	(0.0231)***	(0.0330)***	(0.0341)***	(0.0352)***
Stock Return of US	0.118	0.175	-0.00986	0.0654	0143	0.00494
	(0.0432)***	(0.0434)***	(0.0316)	(0.0330)**	(0.0382)***	(0.004)
Dum 4* Stock Return of China	-0.142	-0.100	-0.108	-0.0175	-0.0616	-0.0507
	(0.0435)***	(0.0525)*	(0.0323)***	(0.0393)	(0.0399)	(0.0396)
Dum 4* Stock Return of US	0.0505	0.0495	0.0502	0.0641	0.0115	0.126
	(0.0674)	(0.0623)	(0.0389)	(0.0446)	(0.0204)	(0.0542)**
Dum 4	-0.0843	-0.0698	-0.0196	-0.0432	-0.0699	-0.0602
	(0.0587)	(0.0726)	(0.0396)	(0.0478)	(0.0526)	(0.0547)
Lag of Dependent Variables	-0.0137	-0.0164	0.0523	-0.0271	-0.0603	-0.0752
	(0.0277)	(0.0342)	(0.0269)*	(0.0302)	(0.0353)*	(0.0269)***
Constant	0.0667	0.0495	0.0120	0.0388	0.0327	0.0512
	(0.0385)*	(0.0493)	(0.0272)	(0.0304)	(0.0349)	(0.0377)

ote: ***, **. * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.
Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 4= Implementation of tariff on first phase on 6th July 2018

Malaysia as one of the best Asia countries to perform trading with other limit trade diversion rivals such as Vietnam, Taiwan, and India that having cheap labor cost. However, China export and import to Malaysia are more than United States which consist of 18.4% (China) over 12.7% (US) export and 18.4% (China) over 7.8% (US) import. This prove that Malaysia will get an indirect negative impact on those products because of electronics product are the main trade item for China.

Taiwan as also a biggest winner in this trade war. The tariff imposed makes many Taiwan companies operating in mainland China shift their production line back to Taiwan before the trade war turn into effect. As a result, the trade diversion appears as US will import more product of Taiwan rather than China. The most gained business was the machinery and communication equipment.

Japan as the middle of trade between US and China had an indirect impact on both countries. For Japan, China is their larger export market compares to US by purchasing 22.1% of its export but japan takes total of 34.6billion added value from China export to US. If the US imposed tariff on Chinese products, then definitely the Japan product will gets affected indirectly.

4.3.5 Implementation of tariff on second phase on 23rd August 2018

Based on the result in Table 4.8, it shows that there is an indirect impact of stock market index of Hong Kong and Malaysia get affected by China market stock index. Hong Kong as one of the middle trade ports and financial centers towards US and China will be affected by the imposed tariff direct and indirect which including re-export business, international business and stock market.

Table 4.8: Implementation of tariff on second phase on 23rd August 2018

	Hong Kong	Japan	Malaysia	Singapore	Malaysia	Taiwan
			ARCH			
Stock Return of China	0.629	0.296	0.101	0.243	0.276	0.314
	(0.0384)***	(0.0363)***	(0.0218)***	(0.0297)***	(0.0325)***	(0.0318)***
Stock Return of US	0.122	0.211	-0.0153	-0.0742	0.135	-0.0362
	(0.0415)***	(0.0375)***	(0.0252)	(0.0301)**	(0.0393)***	(0.0294)
Dum 5* Stock Return of China	-0.121	-0.0775	-0.0370	0.0111	0.0108	-0.0337
	(0.0485)**	(0.0495)	(0.0348)	(0.0358)	(0.0381)	(0.0396)
Dum 5* Stock Return of US	0.0530	0.107	0.0586	0.0655	0.00710	0.167
	(0.0717)	(0.0630)*	(0.0370)	(0.0488)	(0.0555)	(0.0516)***
Dum 5	-0.0764	-0.0854	-0.0436	-0.0339	-0.0606	-0.0197
	(0.0591)	(0.0673)	(0.0406)	(0.0494)	(0.0544)	(0.0504)
Lag of Dependent Variables	-0.00816	0.0306	0.0593	-0.0183	-0.0496	-0.0307
	(0.0318)	(0.0424)	(0.0360)*	(0.0331)	(0.0398)	(0.0401)
Constant	0.0588	0.0745	0.0103	0.0377	0.0334	0.0670
	(0.0352)*	(0.0372)**	(0.0195)	(0.0267)	(0.0328)	(0.0286)**
			GARCH			
Stock Return of China	0.641	0.321	0.159	0.267	0.291	0.314
	(0.0335)***	(0.0380)***	(0.0216)***	(0.0306)***	(0.0318)***	(0.0323)***
Stock Return of US	0.117	0.199	-0.0103	0.0642	0.138	0.0107
	(0.0432)***	(0.0434)***	(0.0307)	(0.0324)**	(0.0378)***	(0.0399)
Dum 5* Stock Return of China	-0.101	-0.0330	-0.0884	-0.00109	-0.00743	0.000465
	(0.0426)**	(0.0514)	(0.0321)***	(0.0378)	(0.0377)	(0.0378)
Dum 5* Stock Return of US	0.0488	-0.00242	0.0486	0.0671	0.0155	0.113
	(0.0683)	(0.0627)	(0.0388)	(0.0442)	(0.0505)	(0.0541)**
Dum 5	-0.0732	-0.0869	-0.0580	-0.0272	-0.0749	-0.0683
	(0.0600)	(0.0736)	(0.0406)	(0.0494)	(0.0535)	(0.0551)
Lag of Dependent Variables	-0.0142	-0.0137	0.0513	-0.0276	-0.0604	0.0747
	(0.0278)	(0.0344)	(0.0267)*	(0.0302)	(0.0352)*	(0.0270)***
Constant	0.0586	0.0497	0.0235	0.0317	0.0303	0.0504
	(0.0374)	(0.0475)	(0.0256)	(0.0288)	(0.0339)	(0.0359)

Note: ***, **. * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 5= Implementation of tariff on second phase on 23rd August 2018

Tariffs will strike the price of imported goods. Hong Kong companies that located in China mainland will see an increment of price on raw materials, cost of production and US Products such as agricultural products, food textiles, metal materials, and robotic items. Thus, the tariff will ultimately decrease the competitiveness in the market and adversely impact the re-export trade in Hong Kong.

After the announcement release, Malaysia faced exposure on china economy. Unlikely, Malaysia are small and open economy that highly depend on trade, most of the trading deeply related to global supply chains. Over 82% of small and medium sized enterprise involved in global value chains. China had the largest trading partner and also the main source of tourists. This indicate that China supply chain will knock-on effects on Malaysia exports.

Moving on, Taiwan also one of the winners in this trade war circle. One of the biggest original design manufacturer of notebook computer quanta company moved production of its computer servers out of China and back to Taiwan for further production in 2018. The US trade war tariffs made exporting to America become prohibitively expensive. United Nation recent report claim that Taiwan as third-largest export to US as causes electrical machinery increases at US$287 million in the trade war. China will suffer as Taiwanese companies will move away from a red supply chain in china to a non-red supply chain in Taiwan. As mention earlier, Japan are the hub between US and China trade activities for semi-product and finished goods. Most recent year, Japan had suffered from economy recession due to the weak demand from US and China. The export items to US such as aircraft engines, car parts and plastics has been reduced by 11.4% in this period. It proven that the trade war between US and China is indirectly affects the US and Japan trade.

Table 4.9: Implementation of tariff on third phase o 24th September 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.650	0.297	0.103	0.255	0.267	0.311
	(0.0362)***	(0.0360)***	(0.0213)***	(0.0291)***	(0.0320)***	(0.0310)***
Stock Return of US	0.132	0.219	-0.0168	0.0706	0.136	-0.0379
	(0.0409)***	(0.0374)***	(0.0250)	(0.0299)**	(0.0392)***	(0.0291)
Dum 6* Stock Return of China	-0.166	-0.0832	-0.0428	-0.00970	0.0283	-0.0286
	(0.0476)***	(0.0495)*	(0.0353)	(0.0354)	(0.0377)	(0.0392)
Dum 6* Stock Return of US	0.0383	0.0858	0.0641	0.0758	0.000522	0.171
	(0.0713)	(0.0633)	(0.0372)*	(0.0488)	(0.0555)	(0.0516)***
Dum 6	-0.0646	-0.127	-0.0475	-0.0300	-0.0784	-0.0185
	(0.0607)	(0.0680)*	(0.0420)	(0.0508)	(0.0553)	(0.0523)
Lag of Dependent Variables	-0.00680	0.0294	0.596	-0.0178	-0.0504	-0.0303
	(0.0314)	(0.0425)	(0.0359)*	(0.0330)	(0.0399)	(0.0401)
Constant	0.0530	0.0821	0.0104	0.0361	0.0358	0.0664
	(0.0341)	(0.0366)**	(0.0193)	(0.0261)	(0.0322)	(0.0276)**
			GARCH			
Stock Return of China	0.662	0.320	0.157	0.277	0.282	0.311
	(0.0322)***	(0.0376)***	(0.0211)***	(0.0299)***	(0.0313)***	(0.0312)***
Stock Return of US	0.126	0.205	-0.0133	0.0604	0.140	0.00818
	(0.0423)***	(0.0433)***	(0.0304)	(0.0322)*	(0.0377)***	(0.0386)
Dum 6* Stock Return of China	-0.148	-0.0330	-0.0906	-0.0200	0.00848	0.00687
	(0.0425)***	(0.0513)	(0.0321)***	(0.0374)	(0.0372)	(0.0372)
Dum 6* Stock Return of US	0.0366	-0.0168	0.0544	0.0774	0.00973	0.118
	(0.0678)	(0.0628)	(0.0385)	(0.0439)*	(0.0506)	(0.0536)**
Dum 6	-0.0573	-0.126	-0.0630	-0.0218	-0.0910	-0.0710
	(0.0609)	(0.0736)*	(0.0411)	(0.0508)	(0.0539)*	(0.0559)
Lag of Dependent Variables	-0.0137	-0.0150	0.0518	-0.0275	-0.0613	0.0750
	(0.0276)	(0.0343)	(0.0267)*	(0.0301)	(0.0352)*	(0.0270)***
Constant	0.0515	0.0580	0.0230	0.0299	0.0323	0.0495
	(0.0362)	(0.0467)	(0.0250)	(0.0280)	(0.0334)	(0.0347)

Note: ***, **. * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 6= Implementation of tariff on third phase on 24th September 201

4.3.6 Implementation of tariff on third phase on 24th September 2018

Based on the results in Table 4.9, Malaysia and Japan have negative spillover effect from China while Singapore and Taiwan showed positive spillover effect from US. From the product composition of Trump's tariff on $200 billion imports, there are 50% on intermediate inputs such as computer and auto parts, 25% on capital goods such as electric scooters, chemicals and semiconductors.

There are 50% of products exported from Malaysia to China were used as the intermediate products for China's final products. The final products will then exported to US. Hence, when there is a trade tension between China and US, the export of China to US decreased may eventually bring the negative spillover effect to Malaysia. Japan is the manufacturer and supplier of electronic parts and fabrication devices. The companies such as Apple, Dell, Hewlett-Packard and Gap having their production in China. When trade war intensified, the reduction of consumer spending and capital investment in China will negatively affected the Japanese companies in China.

Besides, Taiwan and Singapore showed positive spillover effect from US. China is the world largest manufacturing country with low labour cost, tax breaks and complete supply chain. Firms were attracted to the ideal production base and set their plants in China to enjoy the advantages. For years, Taiwan has concentrated their tech hardware production in China. When trade war intensified, many information technology and communications (ICT) devices manufactured by Taiwanese firms in China were affected (Fulco, 2019).

Hence, Taiwanese manufacturers shifted back to Taiwan as Taiwan can offers low labor cost and strong supply chain fundamental. When trade war intensified, the cost to export ICT products from China to US will increased. Most of the firm stock return to Taiwan are ICT firms especially the makers of high-end network communication equipment, servers, peripheral PC products, machine tools, auto parts, and bicycles.

The ICT firms will increase their investment through the expansion of their factories and plants in Taiwan.

Since there is higher cost to import computer and auto parts from China, US market is strongly demand for import substitution. Hence, with the capital inflow from returning investment, Taiwan is able to serve as the alternative suppliers and support part of the export to US as there is a strong demand for electronics used in PCs in market. While Singapore top export product is integrated circuit including computer and office machine parts, which consist of 36% of total export. Singapore gained when the US market demand for substitution will shifted to Singapore. The countries get short term benefits through product substitution and supply chain reorientation when trade war intensified.

4.3.7 Implementation of a raised tariff by US on previous list on 10th May 2019 and subsequently China raises the retaliatory tariffs worth $60 billion on 1st June 2019

With the results that we have computed (Table 4.10 & Table 4.11), we decided to put the explanations for the last two scenarios together. The reason for that is because when Trump decided to raise the tariffs on China from 10% to 25% or when China raises the retaliatory tariffs worth $60 billion, we thought countries who at first was affected by the tariffs would be affected again. However, in our results, that was not the case. All the six Asia countries did not show a significant result from this tariff. This does not mean that these countries were not affected. The purpose of ARCH and GARCH test is to capture the spillover effect of the trade war, and our results show that there is none in this case. This just tells us that we have to use other methods to capture the spillover effects.

Table 4.10: Implementation of a raised tariff by US on previous list on 10th May 2019

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.573	0.276	0.0875	0.260	0.288	0.306
	(0.0200)***	(0.0235)***	(0.0170)***	(0.0164)***	(0.0182)***	(0.0192)***
Stock Return of US	0.146	0.238	0.0151	0.0897	0.138	0.0113
	(0.0349)***	(0.0312)***	(0.0181)	(0.0241)***	(0.0270)***	(0.0226)
Dum 7* Stock Return of China	-0.115	-0.221	-0.0332	-0.115	-0.112	0.0115
	(0.0137)	(0.160)	(0.0666)	(0.137)	(0.278)	(0.113)
Dum 7* Stock Return of US	-0.00451	0.0665	-0.0870	0.250	0.0250	0.064
	(0.177)	(0.199)	(0.0763)	(0.247)	(0.261)	(0.0127)
Dum 7	-0.0777	-0.0667	0.0942	-0.0190	0.00959	-0.0518
	(0.127)	(0.139)	(0.0818)	(0.158)	(0.176)	(0.0120)
Lag of Dependent Variables	-0.00436	0.0264	0.0638	-0.0170	-0.0481	-0.0290
	(0.0323)	(0.0420)	(0.0363)*	(0.0328)	(0.0399)	(0.0402)
Constant	0.0371	0.0537	-0.00440	0.0286	0.0164	0.0654
	(0.0295)	(0.0321)*	(0.0178)	(0.0227)	(0.0264)	(0.0238)***
			GARCH			
Stock Return of China	0.593	0.315	0.113	0.275	0.294	0.320
	(0.0201)***	(0.0252)***	(0.0152)***	(0.0180)***	(0.0180)***	(0.0194)***
Stock Return of US	0.140	0.197	0.0179	0.0873	0.147	0.0707
	(0.0351)***	(0.0304)***	(0.0175)	(0.0228)***	(0.0252)***	(0.0243)***
Dum 7* Stock Return of China	-0.144	-0.236	-0.0583	-0.135	-0.132	-0.0392
	(0.153)	(0.187)	(0.0818)	(0.168)	(0.229)	(0.123)
Dum 7* Stock Return of US	0.0152	0.0774	-0.0917	0.255	0.0286	0.0302
	(0.185)	(0.272)	(0.0955)	(0.308)	(0.213)	(0.149)
Dum 7	-0.0776	-0.0708	0.0873	-0.0187	-0.00333	0.0746
	(0.137)	(0.192)	(0.102)	(0.200)	(0.154)	(0.140)
Lag of Dependent Variables	-0.0107	-0.0112	0.0526	-0.0247	-0.0589	-0.0716
	(0.0281)	(0.0332)	(0.0269)*	(0.0296)	(0.0355)*	(0.0260)***
Constant	0.0345	0.0257	-0.00190	0.0230	0.00667	0.0300
	(0.0303)	(0.0361)	(0.0208)	(0.0236)	(0.0267)	(0.0285)

Note: ***, **. * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 7= Implementation on raises tariff by US on previous list on 10th May 2019

Table 4.11: China raises the retaliatory tariffs worth $60 billion on 1st June 2019

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			ARCH			
Stock Return of China	0.561	0.262	0.0825	0.251	0.281	0.302
	(0.0198)***	(0.0234)***	(0.0164)***	(0.0161)***	(0.0182)***	(0.0189)***
Stock Return of US	0.137	0.236	0.00643	0.0967	0.138	0.0147
	(0.0340)***	(0.0308)***	(0.0178)	(0.0240)***	(0.0269)***	(0.0220)
Dum 8* Stock Return of China	0.104	0.0162	0.0368	0.0132	-0.0264	0.143
	(0.156)	(0.0297)	(0.164)	(0.247)	(0.0459)	(0.0184)
Dum 8* Stock Return of US	0.255	0.118	-0.00281	0.243	-0.0857	-0.00741
	(0.288)	(0.430)	(0.242)	(0.483)	(0.0921)	(0.366)
Dum 8	0.0612	-0.0154	0.0450	0.159	0.156	0.0502
	(0.221)	(0.307)	(0.242)	(0.236)	(0.254)	(0.0259)
Lag of Dependent Variables	-0.00796	0.0234	0.0602	-0.0227	-0.0489	-0.0336
	(0.0320)	(0.0421)	(0.0361)*	(0.0330)	(0.0396)	(0.0405)
Constant	0.0287	(0.0480)	-0.00104	0.0180	0.0124	0.0620
	(0.0290)	(0.0318)	(0.0175)	(0.0224)	(0.0262)	(0.0234)***
			GARCH			
Stock Return of China	0.581	0.300	0.108	0.269	0.286	0.314
	(0.0200)***	(0.0250)***	(0.0150)***	(0.0179)***	(0.0180)***	(0.0191)***
Stock Return of US	0.132	0.195	0.0121	0.0916	0.147	0.0730
	(0.0345)***	(0.0304)***	(0.0174)	(0.0226)***	(0.0250)***	(0.0240)***
Dum 8* Stock Return of China	0.0698	-0.0142	0.0147	-0.00660	-0.0319	0.101
	(0.168)	(0.381)	(0.185)	(0.360)	(0.480)	(0.218)
Dum 8* Stock Return of US	0.258	0.131	-0.0207	0.247	-0.1	-0.0569
	(0.314)	(0.524)	(0.270)	(0.672)	(0.948)	(0.0423)
Dum 8	0.0550	-0.00482	0.0438	0.161	0.174	0.0361
	(0.232)	(0.368)	(0.280)	(0.342)	(0.246)	(0.292)
Lag of Dependent Variables	-0.0130	-0.0127	0.0505	-0.0293	-0.059	-0.0733
	(0.0278)	(0.0332)	(0.0268)*	(0.0297)	(0.0348)*	(0.0260)
Constant	0.0256	0.0196	0.00108	0.0149	0.00175	0.0249
	(0.0299)	(0.0359)	(0.0205)	(0.0234)	(0.0265)	(0.0281)

Note: ***, **. * indicates rejection of null hypothesis at 1%, 5%, 10% significant level. Standard error in parentheses.

Where Dum= Dummy, Dependent Variables= Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 8= China raises the retaliatory tariffs worth $60 billion on 1st June 2019

4.4 Investigation of the Leverage and Spillover Effect from the Trade War

To study the overall impact of trade war on stock market performance in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia we also used Exponential GARCH model to run our data. It is because ARCH and GARCH model did not capture the asymmetric assumption as it can use to overcome the weakness of symmetric assumption. It not only takes into consideration asymmetry, leverage effects, and coefficient restrictions but it also can capture size effects as well as sign effects of shocks. Leverage effect means it impacts more on unexpected negative news than the unexpected positive news. When the results are smaller than zero and significance it means negative news generate larger volatility than positive news. While positive value means positive news or error generate less variance than negative news. This section had showed the result of EGARCH.

Table 4.12: The feud of tariffs on solar panel and washing machine by US on 22nd January 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			Mean Equation			
C	0.0534 (0.0454)	0.0407 (0.0395)	-0.0057 (0.0211)	0.0570 (0.0422)	0.0353 (0.0359)	0.0021 (0.0296)
Stock Return of China	0.5472 (0.0774)***	0.0802 (0.0601)	0.0193 (0.0364)	0.1584 (0.0689)***	0.1488 (0.0641)***	0.2078 (0.0558)***
Stock Return of US	0.2068 (0.1065)*	0.3105 (0.1204)***	0.0105 (0.0547)***	0.1436 (0.0985)	0.0943 (0.0946)	-0.0243 (0.0676)
Dum 1* Stock Return of China	0.0224 (0.0807)	0.1911 (0.0639)***	0.08560 (0.0410)*	0.1279 (0.0713)*	0.1388 (0.0660)*	0.0900 (0.0594)
Dum 1* Stock Return of US	-0.0961 (0.1127)	-0.1550 (0.1282)	-0.0072 (0.0577)	-0.0566 (0.1010)	0.0482 (0.0983)	0.0491 (0.0744)
Dum 1	-0.0489 (0.0584)	-0.0500 (0.0429)	0.0042 (0.0344)	-0.0642 (0.0509)	-0.0454 (0.0478)	0.0568 (0.0367)
Lag of Dependent	-0.0143 (0.0324)	0.0102 (0.0380)	0.0826 (0.0378)**	-0.0278 (0.0311)	-0.0615 (0.0402)	-0.0299 (0.0373)

Variables in Dum 1						
			Variance Equation			
C	-0.1133 (0.0421)***	-0.0931 (0.0229)***	-0.1199 (0.0221)***	-0.9997 (4.3605)	-0.0641 (0.0318)**	-0.1727 (0.0280)***
α	0.0891 (0.0376)**	0.0675 (0.0300)**	0.1304 (0.0242)***	0.0100 (0.0596)	0.0345 (0.0251)	0.1192 (0.0380)***
γ	-0.0452 (0.0289)	-0.2179 (0.0292)***	-0.0470 (0.0171)***	0.0100 (0.0377)	-0.0500 (0.0160)***	-0.1789 (0.0312)***
β	0.9239 (0.0306)***	0.8897 (0.0158)***	0.9852 (0.0080)***	0.0100 (4.3656)	0.9553 (0.0223)***	0.9116 (0.0195)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 1= United State implement tariffs on solar panel and washing machine, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

Table 4.12 above showed the EGARCH result for the implementation of tariff on solar panel and washing machines by US on 22nd January 2018. The leverage effect we can see from γ, Hong Kong and Singapore showed insignificant results. It means we do not have enough evidence to conclude that both of them have leverage effect in this solar panel and washing machine scenario. The arch term, α in the equation means the impact of magnitude of a shock, effect of size and spillover effect. All of the countries showed spillover effect except Singapore and South Korea. Malaysia has the biggest size of effect as the coefficient 0.1304 is larger than the coefficients of other countries. For beta term, β in the equation show volatility persistence if the results are significance. All countries except Singapore showed volatility persistence.

Table 4.13: The war of tariffs on steel and aluminum tariffs by US on 23rd March 2018 Malaysia

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			Mean Equation			
C	0.0716 (0.0405)*	0.0651 (0.0340)*	-0.0031 (0.0195)	0.0531 (0.033)	0.0340 (0.0325)	0.0138 (0.0277)
Stock Return of China	0.6299 (0.0506)***	0.1299 (0.0500)***	0.0555 (0.0256)**	0.1955 (0.0435)***	0.2113 (0.0479)***	0.2427 (0.0469)***
Stock Return of US	0.0907 (0.0444)**	0.1619 (0.0560)***	-0.0142 (0.0240)	0.1049 (0.0397)***	0.132677 (0.0492)***	-0.0508 (0.0346)

Dum 2* Stock Return of China	-0.0923 (0.0599)	0.1284 (0.05391**	0.0382 (0.0340)	0.0897 (0.0484)*	0.0672 (0.0507)	0.0408 (0.0527)
Dum 2* Stock Return of US	0.0659 (0.0665)	0.0285 (0.0601)	0.0401 (0.0348)	-0.0039 (0.0492)	0.0031 (0.0570)	0.1244 (0.0511)**
Dum 2	-0.0869 (0.0562)	-0.0893 (0.0372)**	-0.0052 (0.0352)	-0.0768 (0.0444)*	-0.0545 (0.0441)	0.0218 (0.0343)
Lag of Dependent Variables in Dum 2	-0.0156 (0.0330)	0.0131 (0.0385)	0.0843 (0.0375)**	-0.0067 (0.0367)	-0.0589 (0.0399)	-0.0244 (0.0375)
Variance Equation						
C	-0.1182 (0.0416)***	-0.0996 (0.0246)***	-0.1199 (0.0214)***	-0.9506 (0.3058)***	-0.0611 (0.031)**	-0.1702 (0.0274)***
α	0.0981 (0.0372)***	0.0744 (0.0321)**	0.1310 (0.0236)***	0.2945 (0.0857)***	0.0306 (0.0248)	0.1249 (0.0377)***
γ	-0.0428 (0.0294)	-0.2286 (0.03076)***	-0.0470 (0.0174)***	-0.0083 (0.0543)	-0.052853 (0.016098)***	-0.1696 (0.0302)***
β	0.9282 (0.0339)***	0.8877 (0.0160)***	0.9853 (0.0081)***	0.2905 (0.2773)	0.9554 (0.0218)***	0.9171 (0.0195)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 2= United State implement tariffs on steel and aluminium, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

Result above showed the second scenario which Trump had implemented tariff on steel for 25% and aluminium for 10% on 23rd March 2018. For leverage effect Hong Kong and Singapore showed insignificant result while others have the impact more on negative news that positive news in this tariff. While for spillover effect, South Korea stock market return did not show significant result while Singapore has the increase 0.2945 which is the largest impact compared with other countries. From this tariff, South Korea will likely get hurt as South Korea is the third largest exported of steel to US. However, in 2017 steel exported to the US accounted for just 0.6% of the total export value of South Korea. So in this tariff South Korea has not much impact on it. In the implementation of steel and aluminium tariff, Singapore still showed insignificant result in volatility persistence.

Table 4.14: The Chinese's Revenge on US products on 2nd April 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
Mean Equation						
C	0.0667 (0.0401)*	0.0555 (0.0343)	-0.0021 (0.0196)	0.0484 (0.0326)	0.0262 (0.0321)	0.0068 (0.0271)
Stock Return of China	0.6360 (0.088)***	0.2275 (0.0396)***	0.0573 (0.0243)**	0.2408 (0.0390)***	0.2744 (0.0388)***	0.2849 (0.0403)***
Stock Return of US	0.0984 (0.0436)**	0.2117 (0.0539)***	-0.007 (0.0238)	0.1134 (0.0379)***	0.1693 (0.0455)***	-0.0375 (0.0324)
Dum 3* Stock Return of China	-0.1022 (0.0583)*	0.0122 (0.0460)	0.0377 (0.0339)	0.0332 (0.0443)	-0.0133 (0.0434)	-0.0126 (0.0465)
Dum 3* Stock Return of US	0.0554 (0.0670)	-0.0412 (0.0618)	0.0294 (0.0338)	-0.0172 (0.0481)	-0.0480 (0.0569)	0.1158 (0.0515)**
Dum 3	-0.0796 (0.0560)	-0.0768 (0.0409)*	-0.0098 (0.0358)	-0.0671 (0.0446)	-0.0421 (0.0448)	0.0320 (0.0337)
Lag of Dependent Variables in Dum 3	-0.0157 (0.0327)	0.0100 (0.0396)	0.083 (0.0374)**	-0.0071 (0.0364)	-0.0574 (0.0398)	-0.0298 (0.0374)
Variance Equation						
C	-0.1160 (0.0409)***	-0.0977 (0.0242)***	-0.1179 (0.0212)***	-1.0046 (0.3159)***	-0.0532 (0.0305)*	-0.1587 (0.0266)***
α	0.0960 (0.0367)***	0.0781 (0.0320)**	0.1297 (0.0235)***	0.2807 (0.0846)***	0.0226 (0.0243)	0.1121 (0.037)***
γ	-0.0438 (0.0291)***	-0.207 (0.0289)***	-0.0458 (0.0175)***	-0.0054 (0.0544)	-0.0523 (0.0155)***	-0.1720 (0.0302)***
β	0.9292 (0.0331)***	0.8979 (0.0153)***	0.9861 (0.0080)***	0.2232 (0.2937)	0.9575 (0.0225)***	0.9189 (0.0194)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 3= Implementation of tariff on China retaliates, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

Table 4.14 above showed the results of China retaliates tariffs on aluminium waste and scrap, pork, and nuts and others US products on 2nd April 2018. Singapore is the only countries showed insignificant result in leverage effect. While for spillover effect, every country has the impact by this tariff except South Korea. Singapore is showing

the insignificant result in volatility persistence but largest spillover effect 0.2807 in this tariff.

Table 4.15: First phase tariffs between US and China on 6th July 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
Mean Equation						
C	0.0612 (0.0371)*	0.0327 (0.035)	-0.0048 (0.0186)	0.0389 (0.0292)	0.0156 (0.0302)	0.0098 (0.0258)
Stock Return of China	0.6495 (0.0409)***	0.2798 (0.0364)***	0.1009 (0.0206)***	0.2656 (0.0327)***	0.2963 (0.0336)***	0.0258 (0.0351)***
Stock Return of US	0.1030 (0.0404)**	0.1796 (0.0515)***	-0.0044 (0.0228)***	0.0693 (0.0328)**	0.1458 (0.0395)***	-0.0114 (0.0311)***
Dum 4* Stock Return of China	-0.1419 (0.0518)***	-0.0650 (0.0455)	-0.0367 (0.0346)	0.0027 (0.0392)	-0.0501 (0.0398)	-0.0647 (0.0429)
Dum 4* Stock Return of US	0.0670 (0.0675)	0.0341 (0.0647)	0.0403 (0.0370)	0.0531 (0.0433)	-0.0084 (0.0528)	0.0890 (0.0551)
Dum 4	-0.0722 (0.0587)	-0.0450 (0.0525)	-0.0134 (0.0355)	-0.0497 (0.0466)	-0.0188 (0.0470)	0.0323 (0.0356)
Lag of Dependent Variables in Dum 4	-0.0144 (0.0324)	0.0032 (0.0398)	0.0839 (0.0376)**	-0.0055 (0.0355)***	-0.0561 (0.0396)	-0.0316 (0.0373)
Variance Equation						
C	-0.1172 (0.0408)***	-0.1112 (0.0245)***	-0.1177 (0.0209)***	-1.2771 (0.3271)***	-0.0456 (0.0279)	-0.1568 (0.0261)***
α	0.0971 (0.0360)***	0.1017 (0.0324)***	0.1287 (0.0236)***	0.2636 (0.0836)***	0.0166 (0.0229)	0.1141 (0.0366)***
γ	-0.0397 (0.0288)	-0.1815 (0.0266)***	-0.0493 (0.0173)***	0.0032 (0.0528)	-0.0504 (0.0148)***	-0.1695 (0.0290)***
β	0.9289 (0.0331)***	0.9047 (0.0153)***	0.9855 (0.0077)***	-0.0609 (0.320)	0.9610 (0.0203)***	0.9224 (0.0190)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 4= Implementation of tariff on first phase, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

The following battle is US and China impose the first phase tariff on $50 billion tariff list on 6th July 2018. US imposed 25% tariff on Chinese imports that worth $34 billion (818 Chinese products). At the same time, China takes retaliatory measures by

imposing 25% tariff on the first $34 billion (545 US products) for example agriculture and aquatic products. Hong Kong and Singapore showed insignificant result in leverage effect while others have the impact more on negative news that positive news in this tariff. In addition, South Korea did not show spillover effect but Singapore has the largest effect 0.2636 increase in stock market return. On the pther hand, Singapore did not show significant results in volatility persistence.

Table 4.16: Second phase tariffs between US and China on 23rd August 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
Mean Equation						
C	0.0513 (0.0358)	0.0258 (0.0344)	-0.0009 (0.0186)	0.0322 (0.0277)	0.0130 (0.030)	0.0185 (0.0258)
Stock Return of China	0.6223 (0.0393)***	0.2537 (0.0346)***	0.0975 (0.0201)***	0.2526 (0.0307)***	0.2681 (0.0322)***	0.2915 (0.0296)***
Stock Return of US	0.1013 (0.0400)**	0.195 (0.0503)***	-0.0027 (0.0227)	0.0626 (0.0315)**	0.1396 (0.0393)***	-0.0117 (0.0308)
Dum 5* Stock Return of China	-0.1103 (0.0516)**	-0.0239 (0.0441)	-0.0326 (0.0351)	0.0254 (0.0382)	-0.0070 (0.0386)	-0.0304 (0.0395)
Dum 5* Stock Return of US	0.0675 (0.0684)	-0.0146 (0.0616)	0.0338 (0.0373)*	0.0636 (0.0422)	-0.0020 (0.0529)	0.0939 (0.0542)*
Dum 5	-0.0511 (0.0603)	-0.0315 (0.0541)	-0.0361 (0.0382)	-0.0327 (0.0473)	-0.0122 (0.0495)	0.0176 (0.0374)
Lag of Dependent Variables in Dum 5	-0.0160 (0.0327)***	0.0133 (0.0397)	0.0857 (0.0374)**	-0.0053 (0.0354)	-0.0560 (0.0397)	-0.0320 (0.0374)
Variance Equation						
C	-0.1154 (0.0397)***	-0.1049 (0.0239)***	-0.1145 (0.0207)***	-1.3574 (0.3053)***	-0.0498 (0.0285)*	-0.1718 (0.0264)***
α	0.0943 (0.0356)***	0.0915 (0.0316)***	0.1269 (0.0234)***	0.2691 (0.0838)***	0.020 (0.0234)	0.1302 (0.0372)***
γ	-0.0449 (0.0293)	-0.1878 (0.0266)***	-0.0486 (0.0176)***	0.0028 (0.0520)	-0.0508 (0.0152)***	-0.1654 (0.0300)***
β	0.9281 (0.0321)***	0.9009 (0.0154)***	0.9866 (0.0076)***	-0.1358 (0.3016)	0.9591 (0.0208)***	0.9194 (0.0197)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong,

Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 5= Implementation of tariff on second phase, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

Table 4.16 above is about US and China imposed the second phase tariff of $50 billion list on 23rd August 2018. US implemented a 25% tariff on $16 billion of 279 goods from China. While China impose 25% on 333 goods from US that worth $16 billion. Hong Kong and Singapore did not have enough evidence to conclude that they have more impact towards negative news than positive news. South Korea did not show spillover effect and Singapore did not show significant results in volatility persistence but largest increase in spillover effect.

Table 4.17: Third phase tariffs between US and China on 17th September 2018

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
			Mean Equation			
C	0.0468 (0.0350)	0.0301 (0.0340)	-0.0014 (0.0183)	0.0326 (0.0271)	0.0167 (0.0297)	0.0187 (0.0256)
Stock Return of China	0.6395 (0.0372)***	0.2614 (0.0343)***	0.1008 (0.0195)***	0.2685 (0.0298)***	0.2627 (0.0322)***	0.2889 (0.0290)***
Stock Return of US	0.1098 (0.0394)***	0.2001 (0.0504)***	-0.0038 (0.0224)	0.0601 (0.0315)*	0.1411 (0.0396)***	-0.0118 (0.0304)
Dum 6* Stock Return of China	-0.1543 (0.0508)***	-0.0456 (0.0438)	-0.0419 (0.0360)	-0.0012 (0.0374)	0.0040 (0.0389)	-0.02640 (0.0396)
Dum 6* Stock Return of US	0.0553 (0.0685)	-0.0217 (0.0613)	0.0385 (0.0379)	0.0718 (0.0421)*	-0.0056 (0.0531)	0.0954 (0.0543)*
Dum 6	-0.0437 (0.0612)	-0.0638 (0.0567)	-0.0387 (0.0392)	-0.0356 (0.0491)	-0.0284 (0.04930)	0.0186 (0.0380)
Lag of Dependent Variables in Dum 6	-0.0148 (0.0324)	0.0105 (0.0398)	0.0876 (0.0375)**	-0.0057 (0.0354)	-0.0565 (0.0398)	-0.0320 (0.03750)
			Variance Equation			
C	0.0324 (0.0382)***	-0.1064 (0.0241)***	-0.1146 (0.0207)***	-1.3409 (0.3179)***	-0.04970 (0.0281)*	-0.1729 (0.0267)***
α	0.0911 (0.0339)***	0.0944 (0.0318)***	0.1264 (0.0232)***	0.2624 (0.0830)***	0.0221 (0.0234)	0.1311 (0.0373)***
γ	-0.0429 (0.0284)	-0.1886	-0.0509 (0.0174)***	0.0032 (0.0522)	-0.0486 (0.0147)***	-0.1661 (0.0300)***

		(0.0271)***				
β	0.9327 (0.0309)***	0.9021 (0.0153)***	0.9863 (0.0077)***	-0.1247 (0.3135)	0.9611 (0.0200)***	0.9188 (0.0198)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 6= Implementation of tariff on third phase, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

This result is based on the third phase of tariffs goes into effect. US implemented tariff on $200 billion Chinese imports on 17th September 2018 and China retaliatory tariff on $60 billion of US imports on 18th September 2018. Singapore and Hong Kong showed insignificant result in leverage effect. South Korea still did not have spillover effect and Singapore also did not show significant results in volatility persistence but largest increase in spillover effect.

Table 4.18: The rise of tariffs by US on 10th May 2019

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
Mean Equation						
C	0.0369 (0.0304)	0.0300 (0.0330)	-0.0124 (0.0171)	0.0211 (0.0236)	0.0141 (0.0263)	0.0251 (0.0247)
Stock Return of China	0.5802 (0.0216)***	0.2497 (0.0229)***	0.0832 (0.0162)***	0.2752 (0.0182)***	0.2708 (0.0203)***	0.2819 (0.0190)***
Stock Return of US	0.1241 (0.0334)***	0.1848 (0.0330)***	0.0134 (0.0174)	0.0880 (0.0228)***	0.1397 (0.0252)***	0.0122 (0.0259)
Dum 7* Stock Return of China	-0.1250 (0.1580)	-0.14960 (0.1902)	-0.0286 (0.0750)	-0.1436 (0.1483)	-0.0946 (0.2767)	-0.0256 (0.1141)
Dum 7* Stock Return of US	0.0750 (0.1884)	0.1135 (0.2434)	-0.0830 (0.0889)	0.2518 (0.2971)	0.0264 (0.2682)	0.0800 (0.1182)
Dum 7	-0.0659 (0.1162)	-0.1887 (0.1160)	0.0681 (0.0774)	-0.0292 (0.1790)	-0.0866 (0.1452)	-0.0272 (0.0611)
Lag of Dependent Variables in Dum 7	-0.0122 (0.0328)	0.0112 (0.03840)	0.0880 (0.0379)**	-0.0061 0.0359)	-0.0546 (0.0398)	-0.0322 (0.0372)
Variance Equation						
C	-0.1125 (0.0411)***	-0.0998 (0.0238)***	-0.1227 (0.0213)***	-1.0143 (0.3078)***	-0.0433 (0.0261)*	-0.1654 (0.0260)***

α	0.0823 (0.0366)***	0.0820 (0.03170)***	0.1327 (0.0238)***	0.2729 (0.0839)***	0.0145 (0.0222)	0.1189 (0.0372)***
γ	-0.0601 (0.0285)**	-0.1923 (0.0259)***	-0.0501 (0.0169)***	-0.0098 (0.0529)	-0.0518 (0.0143)***	-0.16990 (0.0293)***
β	0.9170 (0.0302)***	0.9002 (0.0151)***	0.9841 (0.0079)***	0.2099 (0.2858)	0.9623 (0.0177)***	0.9172 (0.0188)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 7= Implementation on raises tariff by US on previous list, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

For the seventh scenario is about US raises tariff rate on $200 billion Chinese goods on 10th May 2019. Singapore showed insignificant result in leverage effect and volatility persistence. While South Korea showed insignificant result in spillover effect while Singapore show largest impact which is 0.2729 in spillover effect.

Table 4.19: The rise of tariffs by China on 1st June 2019

	Hong Kong	Japan	Malaysia	Singapore	South Korea	Taiwan
Mean Equation						
C	0.0294 (0.0298)	0.0237 (0.0329)	-0.0090 (0.0169)	0.0131 (0.0226)	0.0088 (0.0261)	0.0186 0(0.0241)
Stock Return of China	0.5655 (0.0211)***	0.2416 (0.0228)***	0.0801 (0.0159)***	0.2535 (0.0156)***	0.2645 (0.0202)***	0.2779 (0.0186)***
Stock Return of US	0.1187 (0.0328)***	0.1857 (0.0327)***	0.0066 (0.0172)	0.0953 (0.0252)***	0.1402 (0.0251)***	0.0286 (0.0242)
Dum 8* Stock Return of China	0.0706 (0.1911)	-0.0078 (0.4047)	0.0283 (0.1555)	-0.0058 (0.2712)	-0.0188 (0.5881)	0.0344 (0.1605)
Dum 8* Stock Return of US	0.3055 (0.3249)	0.0842 (0.5248)	-0.0209 (0.2326)	0.2271 (0.5218)	-0.0703 (1.0391)	-0.0382 (0.2699)
Dum 8	0.0308 (0.2406)	-0.1397 (0.3016)	0.0422 (0.2224)	0.1509 (0.2547)	0.0542 (0.2613)	0.0649 (0.1392)
Lag of Dependent Variables in Dum 8	-0.0164 (0.0326)	0.0111 (0.0384)	0.0840 (0.0376)**	-0.0251 (0.0335)	-0.0549 (0.0394)	-0.0303 (0.0379)
Variance Equation						
C	-0.1202 (0.0427)***	-0.1026 (0.0236)***	-0.1208 (0.0209)***	-0.0716 (0.0254)***	-0.0504 (0.0285)*	-0.1689 (0.0265)***

α	0.0879 (0.0381)**	0.0864 (0.0313)***	0.1311 (0.0236)***	0.0668 (0.024)***	0.0199 (0.0231)	0.1226 (0.0381)***
γ	-0.0623 (0.0290)**	-0.1899 (0.0255)***	-0.0501 (0.0165)***	-0.027 (0.0184)	-0.0507 (0.0146)***	-0.1709 (0.029)***
β	0.9117 (0.0313)***	0.8993 (0.0151)***	0.9846 (0.0077)***	0.9814 (0.0117)***	0.9582 (0.0202)***	0.9154 (0.0190)***

Note: ***, **, * indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses. Where Dum= Dummy, Dependent Variables=Stock Return on Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, Dum 8= China raises the retaliatory tariffs worth $60 billion, C = constant; α = arch term; β = garch term; γ = asymmetric coefficient

Table 4.19 above showed the results about China raises retaliatory tariffs on $60 billion products on 1st June 2019. Singapore still showed the insignificant results in leverage effect. While South Korea did not show any spillover effect in this tariff. However, Malaysia has the largest increase in this tariff which is 0.1311.

4.4.1 Summary of Leverage and Spillover Effect from the Trade War

From the EGARCH result, we can see that every country showed significant results in leverage effect from the first scenario until the last scenario except Singapore and Hong Kong in certain scenario. It means Japan, Malaysia, South Korea and Taiwan has more impact towards unexpected negative news than unexpected positive news in these scenarios. Singapore has insignificant result from the first scenario until the last scenario. It can be explained by Singapore's economic strength has served Singaporean well in the current trade tensions. For example, Singapore has a powerful network of trading that allow the companies in Singapore to withstand disruptions and seek new opportunities as well as alternative suppliers and demand markets. Singapore also has a stronger and closer economic ties with emerging markets to diversify their sources of demand and supply chains. International linkages are best shielded by robust arrangement of WTO rules, just as a system of Free Trade Agreements (FTAs) that Singapore will proceed to extend and develop.

Besides, all countries show significant results in spillover effect excluding South Korea. It is because most of these Asia countries are the largest trading partner with US and

China, so their stock market return will at least have some impact when the implementation of the tariff. Based on the results, Malaysia and Singapore have the bigger of shock compared to other countries. Due to this scenario, there is a probability that there are other factors affecting the stock return of Singapore other than the US China trade war. While for volatility persistence, all of the countries showed significant results except Singapore in first until the seventh scenario.

In conclusion, the results from ARCH and GARCH model are not consistent. There are few reasons that lead to inconsistent result. First of all, since we use stock market return of China and US as our independent variable, there is a possibility that we omitted important variables that influence the stock market return of Asia countries we studied. Second, the sample size is not big enough to capture the effect of trade war thoroughly is also one of the reason for inconsistent result.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

In this chapter, we are going to summarize our research. Other than that, we will suggest some policy implementations for US and China Trade War, list out the limitations that we faced in our research and recommend some suggestion for future studies. As US and China are the largest trading partners in the world and almost all the countries have trade relationship with them. Without a doubt the countries' stock return will be affected by the tariffs of the trade war. Thus, this has driven us to find out the spillover and leverage effect of those countries.

5.1 Discussion of Major Findings

The purpose of this research is to study the overall impact of US and China trade war on stock market performance in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia. We did achieve the objectives of our research which are studying the spillover effect of trade war on the performance of stock market, estimate the stock market reaction of the six Asia countries and analyze which county's stock performance will be benefited or hurt the most in the trade war.

Moving on, in Chapter 2 which is literature review, we did a lot of research of journals on past trade war that has happened and how it had affected other countries and also the impact of the current trade war on other countries. After that, we also did a timeline of the trade war that started from the implementation of the tariffs on solar panel and washing machine by President Trump which is the first battle until the third battle which is the unfair trade practices of technology and accusation of intellectual property by the United States on China. The period that we decided to do the research on was from 31st October 2017 to 13th August 2019. We also included previous researcher results and outcome on this trade war. Then, in order for us to have a better

understanding on how a trade war will affect other countries, we did a mechanism of the trade war. Mechanism of the trade war is another perspective of the dominos effect on what will happen next when something happens. We did six different channels in this mechanism of the trade war and one of the example is the trade effect channel, whereby when the tariffs were imposed, the exported goods of China will decrease which in turn will decrease the GDP of China. One of our objectives of this research was to capture the spillover effect from this trade war. Therefore, we briefly explained what stock market spillovers was, the mechanism of stock market spillovers and also included some past events on the stock market spillovers that has happened in Asia and Europe.

Therefore, in Chapter 3 methodology, we tried to build our own model to meet our objectives. To investigate the spillover effect of the Asia countries, we obtained stock market return of Top 5 Asia export countries (excluded China) which are Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia as our dependent variables, while independent variables are stock market return of US and China. We also included eight dummies inside our model which represent eight scenarios of the implementation of tariffs. The dummies are used to capture the different episode of trade war. The data we collected is the closing stock market indices which from 1st December 2016 to 30th June 2019. There are total 694 days from this period excluded the Saturday and Sunday. Regarding the data collection, we are using secondary data and it was collected from Bloomberg. The methods that chose to use are Panel Least Square, Autoregressive Conditional Heteroscedasticity (ARCH), Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential GARCH (EGARCH) models to estimate our data.

First of all, in Chapter 4, we had undergo Panel Least Square model to estimate our data using Eviews. As the data we collected is panel data because it is the combination of time series and cross sectional data. The Panel Least Square method showed us the result of overall effect on stock return of US China Trade War on the six Asia countries. As this model cannot capture the spillover effect of the individual country, so we had

proceeded to ARCH and GARCH models to analyse the spillover effect of six Asia countries separately. From ARCH and GARCH results, it showed Hong Kong and Taiwan have the largest impact on spillover effect. Furthermore, we had used EGARCH to estimate our data as ARCH and GARCH models did not capture the asymmetric assumption. It can use to overcome the limitations of symmetric assumption. From EGARCH results, we can know that Malaysia has the largest and positive impact of spillover effect and Japan has the smallest and positive impact of spillover effect on US China Trade War. While South Korea has showed insignificant result in spillover effect for all the scenarios. For the leverage effect, every country showed significant results except Singapore and Hong Kong in certain scenario.

5.2 Policy of Study

In this section, we are going to review the policy of others countries have done in order to minimize the impact of trade war. Besides, we provides some recommendation for the policy makers in order to overcome the conflict between China and US as well.

5.2.1 China Exempted Intermediate Goods in Retaliation List

The trade tension has caused negative impact on both US and China, and the escalation of tariff has amplified the damage and spillover to global economy. The tariff imposed by Trump on imported good has increased the price of intermediate goods and the additional cost reduced the competitiveness of producer in the global market. With higher cost, the price increased, the additional cost was absorbed by consumer and reduced the demand of goods from consumers (Robinson & Thierfelder, 2019).

In order to minimize the impact of tariff, China has taken policy to exclude some intermediate goods from the tariff retaliation list implemented on June 2019. With the exemption of intermediate goods, the tariff has less direct impact on producers and

consumers. The exemption of intermediate goods brings positive impact on manufacturing sector and GDP. China also diverted their export from US to other markets such as Europe, East and Southeast Asia countries. The diversion of trade resulted in an increase in total export of China (Robinson & Thierfelder, 2019).

5.2.2 Taiwan Established Reshoring Incentive Plan

From the result of our estimation of EGRACH, all Asia countries show positive spillover effect from trade war. The countries will be benefited when they adjusted to the relocation of supply chain and shifting of capital and labor substitution. In Taiwan, Tsai government established 3 years reshoring incentive plan to attract Taiwanese business shift back to Taiwan. The objective of this policy is to strengthen the domestic industry in Taiwan by providing support and suitable environment for the returned business and manufacturers. The coverage of this program including land, power and water supplies, financing, labor and taxation which is aimed to overcome the five long-lasting shortages which are supply of land, water, electricity, labor, and skilled management. The program gets a good achievement especially on land where 873 hectares of land is expected to be available before 2021. The government ensured the sufficient supply of electricity and water as well (Fulco, 2019).

During trade war, the incentive program has attracted the Taiwanese manufactures to shift their production back to Taiwan. It is because the labor cost in Taiwan is no longer higher than the labor cost in China's developed coastal area and Taiwan has strong supply chain fundamental. At the same time, the incentive program to boost local economy create business opportunities when investment shift back from China during trade war. There are 84 company applications approved by Ministry of Economic Affairs to repatriate to Taiwan. This may bring US$14 billion of investment and provide more than 39,000 job opportunities to Taiwan. The policy of Taiwan to prepare themselves with ideal production base for investment and improve their limitation has

bring benefits to local economy even when trade war has affected the global economy (Fulco, 2019).

5.2.3 The Negotiation of Bilateral Trade Agreement to Evade Tax

The increment on tariff as president trump put US as the first priority has been disadvantage to other country especially for japan that on the middle of the war. Japan holding this opportunity to renegotiate with US about the trade agreement on goods as well as services while the main concerns of US is reciprocity and the reduction of the bilateral trade deficits. In the negotiation, Japan reflect that 25% tariff on steel and aluminum will harm their main vehicles export industry and US request of agriculture's liberalization to be a part in economic partnership agreements. At the end, both of the countries had made a deal that Japan can be evade on 25% tariff while US can be access on digital economy. This negotiation creates another meeting to further discuss about reoriented trade strategies (Mireya, 2019).

A good negotiation can avoid trade war happen and also able to decrease the trade deficit. Both countries can stand to benefit from avoiding trade conflict and friction rather than impose tariff with each other. It may be workable in short-term but it definitely will get hurt in long term (Mireya, 2019).

5.2.4 WTO as a Platform to Solve Trade Dispute

The trade war has come into effect and some countries would like to have own policy or strategies to lower down the impact. In fact, the best way to stop the trade war is to put a full stop. As one of the suggestions is the world trade organization should monitor the trade between US and China in order to solve the conflict. WTO main functions is to resolve the trade conflict and also setting the rules to protect all international trade countries. Any of members in the WTO can raise up an issue or complaint about another

member if it is violating or unfairly subsidizing in the trade agreement (Meltzer & Shenai, 2019).

WTO as a bridge for countries to have negotiation with the implemented tariff and also as a platform to set trade agreement that concern on the trade welfare. The bilateral trade between US and China moving aside of WTO had damage the trading welfare. As US president Donald Trump ignored the WTO process and directly imposed 25% tariff on the steel and 10% of aluminum, the steel and aluminum industry will be suffered as US is the world largest steel importer. The moves ignore WTO as an institution in terms of rules and trade dispute process to deal with China before it imposed tariff. Both countries have to put commitment so that WTO can be reviews on the unfairly subsidizing or violate on trade agreement (Meltzer & Shenai, 2019).

5.3 Limitation

In this section, we are going to examine the limitation when carrying out this research. We review our limitation from two perspectives which are the data and methodology we used and the variables we used to capture the impact of trade war.

5.3.1 Data and Methodology

At the beginning, we planned to use the ARCH and GARCH family to estimate stock return from 1 December 2016 to 30 June 2019 (excluded Saturday and Sunday) in Japan, Hong Kong, South Korea, Singapore, Taiwan and Malaysia. The data we used initially is panel data. However, panel data did not allow us to access ARCH and GARCH method. Therefore, we used the panel least square for our estimation. We realized that our result could not define clearly which countries are harm or gain from this trade war. Therefore, we separated our panel data into time series data in order to run ARCH and GARCH method. We solved the problem and successful to capture the

spillover effect from each tariff imposed by US and China from this trade war. However, GARCH method assume symmetric model. This indicate that positive and negative impact of spillover effect will show the equal result. GARCH method cannot capture the leverage effect. Therefore, we suggest to use EGARCH because EGARCH assumes asymmetric effect able to capture the leverage effect. In the end, we successful capture the leverage effect and differentiate which country are the most benefit or suffer from this trade war. We able to fulfill all our research objective by using the ARCH method, GARCH method and EGARCH method.

5.3.2 Variables

In the beginning, we choose the stock return of China and stock return of US as our independent variable because these two countries are the largest stock market in the whole. We expect that the changes of these two largest markets will impact the stock return of six Asia countries. Therefore, we only have 2 independent variables in our model. Based on our expectation, probably may lead to misspecification biased. This indicate we omitted the important variable such as GDP, interest rate, inflation and other factors.

5.4 Future Research and Conclusion

Future researchers are advised to include more independent variables such as interest rate, GDP, inflation and other factors. The stock market return will not only impact by US and China's stock price even they are the largest economy in the world. The future researchers able to get more accurate result rather than only using two largest stock market return.

In conclusion, the biggest winner from this trade war are Hong Kong and Taiwan. The result showed that stock return of Hong Kong has positive spillover effect from China,

and Taiwan has the positive spillover effect from US. This indicates that Hong Kong and Taiwan gained during trade war. However, the result could not show which country is the most suffered in this trade war. This may probably due to the lack of important variables as we only use the two variables which are stock return of US and China. Based on investigation of the leverage and spillover effect from the trade war, Japan, South Korea, Taiwan and Malaysia have leverage effect while Singapore and Hong Kong have no leverage effect. This indicates that Japan, South Korea, Taiwan and Malaysia have more impact towards unexpected negative news such as implementation of tariffs than unexpected positive news in these scenarios.

Besides, we able to fulfil all our research objectives to capture spillover effect of trade war from the performance of stock market in Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia using GARCH family model, stock market reaction of Japan, South Korea, Hong Kong, Singapore, Taiwan and Malaysia toward the implementation of tariff and find out the county who benefited or hurt the most in the trade war from the stock performance.

References

Abiad, A., Baris, K., Bernabe, J. A., Bertulfo, D. J., Camingue, S., Feliciano, P. N., & Mercer-Blackman, V. (2018). The impact of trade conflict on developing Asia. *Asian Development Bank Economics Working Paper Series*, (566).

Agénor, P. R., & Pereira da Silva, L. A. (2018). Financial spillovers, spillbacks, and the scope for international macroprudential policy coordination. *BIS Paper*, (97).

Ali, G. (2013). EGARCH, GJR-GARCH, TGARCH, AVGARCH, NGARCH, IGARCH and APARCH models for pathogens at marine recreational sites. *Journal of Statistical and Econometric Methods*, *2*(3), 57-73.

Aloui, R., Aïssa, M. S. B., & Nguyen, D. K. (2011). Global financial crisis, extreme interdependences, and contagion effects: The role of economic structure?. *Journal of Banking & Finance*, *35*(1), 130-141.

Alsakka, R., ap Gwilym, O., & Vu, T.N. (2014). The sovereign-bank rating channel and rating agencies' downgrades during the European debt crisis. *Journal of International Money and Finance*, *49*, 235-257.

Angkinand, A. P., Barth, J. R., Kim, H., & Gup, B. (2009). Spillover effects from the US financial crisis: Some time-series evidence from national stock returns. The Financial and Economic Crises: An International Perspective, 24-52.

Bae, K. H., & Zhang, X. (2015). The cost of stock market integration in emerging markets. *Asia‐Pacific Journal of Financial Studies*, *44*(1), 1-23.

Ben Slimane, F., Mehanaoui, M., & Kazi, I. (2013). How does the financial crisis affect volatility behavior and transmission among European stock markets?. *International Journal of Financial Studies*, *1*(3), 81-101.

Bollen, J., & Rojas-Romagosa, H. (2018). Trade wars: economic impacts of US tariff increases and retaliations. An international perspective. *CPB Background Document*.

Bolt, W., Mavromatis, K., & van Wijnbergen, S. (2019). The global macroeconomics

of a trade war: the EAGLE model on the US-China trade conflict.

Bown, C.P. & Kolb, M. (2019). Trump's trade war timeline: an up-to-date guide. Retrieved from https://www.piie.com/blogs/trade-investment-policy-watch/trump-trade-war-china-date-guide

Carvalho, M., Azevedo, A., & Massuquetti, A. (2019). Emerging countries and the effects of the trade war between US and China. *Economies,7*(2), 45. doi:10.3390/economies7020045

Chong, T. T. L., & Li, X. (2019). Understanding the China–US trade war: causes, economic impact, and the worst-case scenario. *Economic and Political Studies*, *7*(2), 185-202.

Ciuriak, D., & Xiao, J. (2018). Quantifying the impacts of the US Section 232 steel and aluminum tariffs.

Dungey, M., & Gajurel, D. (2014). Equity market contagion during the global financial crisis: Evidence from the world's eight largest economies. *Economic Systems*, *38*(2), 161-177.

Dutta, A. (2014). Modelling volatility: symmetric or asymmetric garch models. Journal *of Statistics: Advances in Theory and Applications*, *12*(2), 99-108.

Engle, R, F. (1982). Engle's ARCH test. Retrieved from https://www.mathworks.com/help/econ/engles-arch-test.html

Ftiti, Z., Mazek, K. M., & Benzarti, Y. (2017). Spillover effects of stock markets volatility, and einancial contagion: evidence from European sovereign debt crisis.

Francois, J., & Baughman, L. M. (2003). The unintended consequences of US steel import tariffs: A quantification of the impact during 2002. *Study prepared for the CITAC Foundation, Trade Partnership Worldwide, Washington, DC*.

Fulco, M. (2019). Is Taiwan winning the U.S.-China trade war? Retrieved from https://topics.amcham.com.tw/2019/08/taiwan-winning-trade-war/

Furceri, D., Hannan, S. A., Ostry, J. D., & Rose, A. K. (2018). *Macroeconomic consequ ences of tariffs* (No. w25402). National Bureau of Economic Research.

Gabriel, A. S. (2012). Evaluating the forecasting performance of GARCH models. Evid ence from Romania. *Procedia-Social and Behavioral Sciences*, *62*, 1006-1010.

Gulzar, S., Mujtaba Kayani, G., Xiaofeng, H., Ayub, U., & Rafique, A. (2019). Financi al cointegration and spillover effect of global financial crisis: a study of emerging Asian financial markets. Economic Research-Ekonomska Istraživanja, 32(1), 187-218.

Hamao, Y., Masulis, R.W. and Ng, V. (1990), "Correlations in price changes and volati lity across international stock markets", The Review of Financial Studies, Vol. 3 No. 2, pp. 281-307.

Hanousek, J., & Kočenda, E. (2011). Foreign news and spillovers in emerging Europea n stock markets. *Review of International Economics*, *19*(1), 170-188.

Ho, K. K. (2003). Trading rights and wrongs: The 2002 Bush steel tariffs. *Berkeley Jou rnal of International Law*, *21*(3), 825.

Hoover, K., & Fergusson, I. F. (2018). Softwood lumber imports from Canada: current issues. Congressional Research Service, [Library of Congress].

Hung, N. T. (2019). Return and volatility spillover across equity markets between Chin a and Southeast Asian countries. *Journal of Economics, Finance and Administrative Science*. doi:10.1108/JEFAS-10-2018-0106

Kaizoji, T., & Miyano, M. (2018). Stock market crash of 2008: An empirical study of the deviation of share prices from company fundamentals. *Applied Economics Letters*, *26*(5), 362-369. doi: 10.1080/13504851.2018.1486004

Koutmos, G., & Booth, G. G. (1995). Asymmetric volatility transmission in internatio nal stock markets. *Journal of international Money and Finance*, *14*(6), 747-762.

Lin, J. Y., & Wang, X. (2018). Trump economics and China–US trade imbalances. *Jou rnal of Policy Modeling, 40*(3), 579-600.

Rastogi, S. (2014). The financial crisis of 2008 and stock market volatility–analysis an d impact on emerging economies pre and post crisis. *Afro-Asian Journal of Finance and Accounting, 4*(4), 443-459.

Robinson, S. & Thierfelder, K. (2019). Us-china trade war: both countries lose, world markets adjust, others gain. Policy Brief 19-17 (November). Washington: Peterson Institute for International Economics. Retrieved from https://www.piie.com/publications/policy-briefs/us-china-trade-war-both-countries-lose-world-markets-adjust-others-gain

Rosyadi, S. A., & Widodo, T. (2018). Impact of Donald Trump's tariff increase against Chinese imports on global economy: Global Trade Analysis Project (GTAP) model. *Journal of Chinese Economic and Business Studies, 16*(2), 125-145. doi:10.1080/14765284.2018.1427930

Samad, A., Ashhari, Z., & Othman, M. (2009). Determinants of MDF Exports: A panel data analysis. *International Business Research, 2*(3). doi: 10.5539/ibr.v2n3p58

Shinagawa, Y. (2014): "Determinants of financial market spillovers: the role of portfoli o diversification, trade, home bias, and concentration", IMF Working Papers, no 14/187, October, 2014.

Tao, J. (2014). The impact of the likely U.S. rate hike on Asian equity markets. Retrieve d from https://sg.morningstar.com/ap/news/Market-Watch/129998/Th e-Impact-of-the-Likely-U.S.-Rate-Hike-on-Asian-Equity-Markets.aspx

Tsouma, E. (2007). Stock return dynamics and stock market interdependencies. *Applie d Financial Economics, 17*(10), 805-825.

Tsutsumi, M. (2018). The economic consequences of the 2018 US-China Trade Conflic t: A CGE Simulation Analysis.

Will, K. (2018). GARCH process. Retrieved from https://www.investopedia.com/terms/g/generalalizedautogregressiveconditionalheteroskedasticity.asp

Will, K. (2019). Autoregressive conditional heteroskedasticity (ARCH). Retrieved from https://www.investopedia.com/terms/a/autoregressive-conditional-heteroskedasticity.asp

Yildirim, J., & Ocal, N. (2016). Military expenditures, economic growth and spatial spillovers. *Defence and Peace Economics, 27*(1), 87-104.

Zhang, D., & Hussain, A. (2004). Impact of US-Canada softwood lumber trade dispute on forest products companies: a stock market perspective. *Auburn, AL: School of Forestry, and Wildlife Sciences, Auburn University. Unpublished paper*.

Zhou, X., Zhang, W., & Zhang, J. (2012). Volatility spillovers between the Chinese and world equity markets. *Pacific-Basin Finance Journal, 20*(2), 247-270.

Appendices

Appendix 1: The battle of washing machine impact on six Asia countries stock market return

Dependent Variable: RS
Method: Panel Least Squares
Date: 02/18/20 Time: 17:28
Sample (adjusted): 11/02/2016 6/28/2019
Periods included: 693
Cross-sections included: 6
Total panel (balanced) observations: 4158

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RCHINA	0.239137	0.029659	8.062819	0.0000
RUS	0.160875	0.036947	4.354175	0.0000
D1CHINA	0.085951	0.032016	2.684592	0.0073
D1US	-0.056679	0.040108	-1.413158	0.1577
DUM1	-0.014140	0.015214	-0.929405	0.3527

R-squared	0.184412	Mean dependent var	0.018771
Adjusted R-squared	0.183626	S.D. dependent var	0.798138
S.E. of regression	0.721145	Akaike info criterion	2.185248
Sum squared resid	2159.767	Schwarz criterion	2.192864
Log likelihood	-4538.131	Hannan-Quinn criter.	2.187942
Durbin-Watson stat	2.137971		

Appendix 2: The battle of steel and aluminium war impact on six Asia countries stock market return

Dependent Variable: RS
Method: Panel Least Squares
Date: 02/18/20 Time: 17:29
Sample (adjusted): 11/02/2016 6/28/2019
Periods included: 693
Cross-sections included: 6
Total panel (balanced) observations: 4158

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RCHINA	0.315938	0.023797	13.27642	0.0000
RUS	0.092994	0.025100	3.704963	0.0002
D2CHINA	-0.005600	0.026971	-0.207633	0.8355
D2US	0.032004	0.030646	1.044315	0.2964
DUM2	-0.018066	0.016212	-1.114322	0.2652

R-squared	0.182965	Mean dependent var	0.018771
Adjusted R-squared	0.182179	S.D. dependent var	0.798138
S.E. of regression	0.721784	Akaike info criterion	2.187020
Sum squared resid	2163.597	Schwarz criterion	2.194635
Log likelihood	-4541.814	Hannan-Quinn criter.	2.189714
Durbin-Watson stat	2.133674		

Appendix 3: United State implement tariffs on steel and aluminium impact stock market of Hong Kong

Dependent Variable: RHK
Method: ML - ARCH
Date: 02/18/20 Time: 22:26
Sample (adjusted): 3 694
Included observations: 692 after adjustments
Convergence achieved after 37 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RCHINA	0.647020	0.049261	13.13455	0.0000
RUS	0.121745	0.047638	2.555630	0.0106
D2CHINA	-0.111691	0.056536	-1.975571	0.0482
D2US	0.039785	0.070488	0.564428	0.5725
DUM_2	-0.100040	0.056264	-1.778056	0.0754
LAGHK	-0.007704	0.032497	-0.237077	0.8126
C	0.077135	0.040069	1.925063	0.0542
Variance Equation				
C	0.025447	0.014971	1.699809	0.0892
RESID(-1)^2	0.034841	0.015133	2.302346	0.0213
GARCH(-1)	0.918466	0.037258	24.65126	0.0000

R-squared	0.405865	Mean dependent var	0.032396
Adjusted R-squared	0.400661	S.D. dependent var	0.971028
S.E. of regression	0.751741	Akaike info criterion	2.259543
Sum squared resid	387.1030	Schwarz criterion	2.325144
Log likelihood	-771.8018	Hannan-Quinn criter.	2.284915
Durbin-Watson stat	2.014558		

Appendix 4: United State implement tariffs on steel and aluminium impact stock market of Japan

Dependent Variable: RJAPAN
Method: ML - ARCH
Date: 02/18/20 Time: 22:24
Sample (adjusted): 3 694
Included observations: 692 after adjustments
Convergence achieved after 26 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*RESID(-1)^2 + C(10)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RCHINA	0.220791	0.057106	3.866307	0.0001
RUS	0.200383	0.046238	4.333754	0.0000
D2CHINA	0.047451	0.064036	0.741011	0.4587
D2US	0.062507	0.065003	0.961590	0.3363
DUM_2	-0.053360	0.065281	-0.817383	0.4137
LAGJAPAN	0.025816	0.042376	0.609205	0.5424
C	0.076363	0.043765	1.744863	0.0810
Variance Equation				
C	0.091966	0.016618	5.533945	0.0000
RESID(-1)^2	0.120614	0.018549	6.502481	0.0000
GARCH(-1)	0.761644	0.029391	25.91418	0.0000

R-squared	0.128207	Mean dependent var	0.031282
Adjusted R-squared	0.120571	S.D. dependent var	1.006808
S.E. of regression	0.944163	Akaike info criterion	2.579604
Sum squared resid	610.6394	Schwarz criterion	2.645205
Log likelihood	-882.5431	Hannan-Quinn criter.	2.604976
Durbin-Watson stat	2.323277		

Appendix 5: Implementation of tariff in first phase impact on Singapore stock market return

Dependent Variable: RSINGAPORE
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/20/20 Time: 12:19
Sample (adjusted): 3 694
Included observations: 692 after adjustments
Convergence achieved after 29 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RCHINA	0.277870	0.033030	8.412585	0.0000
RUS	0.065432	0.032996	1.983018	0.0474
D4CHINA	-0.017521	0.039329	-0.445506	0.6560
D4US	0.064085	0.044552	1.438425	0.1503
DUM_4	-0.043200	0.047672	-0.906179	0.3648
LAGSINGAPORE	-0.027114	0.030220	-0.897224	0.3696
C	0.038792	0.030449	1.273970	0.2027
Variance Equation				
C	0.166871	7.479886	0.022309	0.9822
GARCH(-1)	0.549473	20.19587	0.027207	0.9783

R-squared	0.191267	Mean dependent var	0.024318
Adjusted R-squared	0.184183	S.D. dependent var	0.677035
S.E. of regression	0.611515	Akaike info criterion	1.870055
Sum squared resid	256.1564	Schwarz criterion	1.929096
Log likelihood	-638.0392	Hannan-Quinn criter.	1.892890
Durbin-Watson stat	2.087915		

Appendix 6: Second phase tariffs between US and China impact on Taiwan stock market return

Dependent Variable: RTAIWAN
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/20/20 Time: 12:27
Sample (adjusted): 3 694
Included observations: 692 after adjustments
Convergence achieved after 31 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(8) + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RCHINA	0.314353	0.032321	9.725856	0.0000
RUS	0.010686	0.039226	0.272409	0.7853
D5CHINA	0.000465	0.037847	0.012295	0.9902
D5US	0.113029	0.054067	2.090541	0.0366
DUM_5	-0.068272	0.055135	-1.238274	0.2156
LAGTAIWAN	-0.074722	0.027030	-2.764451	0.0057
C	0.050437	0.035936	1.403520	0.1605
Variance Equation				
C	0.058535	0.027315	2.142972	0.0321
GARCH(-1)	0.868382	0.060946	14.24846	0.0000

R-squared	0.202305	Mean dependent var	0.023203
Adjusted R-squared	0.195317	S.D. dependent var	0.763123
S.E. of regression	0.684553	Akaike info criterion	2.077005
Sum squared resid	320.9997	Schwarz criterion	2.136046
Log likelihood	-709.6438	Hannan-Quinn criter.	2.099840
Durbin-Watson stat	2.108525		

Appendix 7: The Chinese's Revenge on US products impact on South Korea stock market return

Dependent Variable: RSK
Method: ML - ARCH
Date: 02/18/20 Time: 22:32
Sample (adjusted): 3 694
Included observations: 692 after adjustments
Convergence achieved after 41 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(8) + C(9)*ABS(RESID(-1)/@SQRT(GARCH(-1))) +
C(10)*RESID(-1)/@SQRT(GARCH(-1)) +
C(11)*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RCHINA	0.274421	0.038766	7.078883	0.0000
RUS	0.169255	0.045542	3.716459	0.0002
D3CHINA	-0.013284	0.043350	-0.306436	0.7593
D3US	-0.047970	0.056906	-0.842977	0.3992
DUM_3	-0.042114	0.044757	-0.940953	0.3467
LAGSK	-0.057352	0.039752	-1.442742	0.1491
C	0.026225	0.032119	0.816471	0.4142
Variance Equation				
C(8)	-0.053221	0.030526	-1.743447	0.0813
C(9)	0.022610	0.024317	0.929835	0.3525
C(10)	-0.052251	0.015496	-3.371834	0.0007
C(11)	0.957481	0.022461	42.62798	0.0000

R-squared	0.199311	Mean dependent var	0.010672
Adjusted R-squared	0.192298	S.D. dependent var	0.744368
S.E. of regression	0.668981	Akaike info criterion	2.030192
Sum squared resid	306.5617	Schwarz criterion	2.102353
Log likelihood	-691.4463	Hannan-Quinn criter.	2.058101
Durbin-Watson stat	2.075617		

Appendix 8: The rise of tariffs by China on 1st June 2019 impact on Malaysia stock market return

Dependent Variable: RMALAYSIA
Method: ML - ARCH
Date: 02/18/20 Time: 22:36
Sample (adjusted): 3 694
Included observations: 692 after adjustments
Convergence achieved after 37 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(8) + C(9)*ABS(RESID(-1)/@SQRT(GARCH(-1))) +
C(10)*RESID(-1)/@SQRT(GARCH(-1)) +
C(11)*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RCHINA	0.057346	0.024301	2.359812	0.0183
RUS	-0.006996	0.023795	-0.294030	0.7687
D3CHINA	0.037734	0.033873	1.113989	0.2653
D3US	0.029437	0.033831	0.870125	0.3842
DUM_3	-0.009809	0.035810	-0.273917	0.7841
LAGMALAYSIA	0.082951	0.037396	2.218175	0.0265
C	-0.002113	0.019560	-0.108027	0.9140
Variance Equation				
C(8)	-0.117866	0.021249	-5.546988	0.0000
C(9)	0.129744	0.023478	5.526242	0.0000
C(10)	-0.045815	0.017533	-2.613051	0.0090
C(11)	0.986079	0.008007	123.1467	0.0000

R-squared	0.047785	Mean dependent var	0.001087
Adjusted R-squared	0.039445	S.D. dependent var	0.515088
S.E. of regression	0.504827	Akaike info criterion	1.356560
Sum squared resid	174.5722	Schwarz criterion	1.428721
Log likelihood	-458.3697	Hannan-Quinn criter.	1.384469
Durbin-Watson stat	2.085542		