TRADE WAR AND THE ECONOMY

BY

CHEAH LYNN
KOH SHIN JIE
LIM YEE YEN

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DECLARATION

We hereby declare that:

(1) This 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.

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Name of Student:	Student ID:	Signature:
1. Cheah Lynn	15ABB04589	_____
2. Koh Shin Jie	15ABB06562	_____
3. Lim Yee Yen	15ABB05796	_____

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BLUE	Best Linear Unbiased estimator
CAFTA	Central America Free Trade Agreement
CCC	Commodity Credit Corporation
CPI	Consumer Price Index
CUSFTA	Canada-United States Free Trade Agreement
EU	European Union
GDP	Gross Domestic Product
GEMs	General Equilibrium Models
NAFTA	North American Free Trade Agreement
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least square
TPP	Trans-Pacific Partnership
US	United States
VER	Voluntary Export Restraint
WTO	World Trade Organization

LIST OF APPENDICES

Page

ABSTRACT

Trade war is mostly known as the economic conflicts between two and or more countries that impose tariff to harm each other's trade. Trade war are no longer a new phenomenon in this century and are often known to economists and individuals. In 2018, United States triggered trade war with China by imposing tariff on Chinese products. This paper attempt to examine the overall impact of trade war between United States and China.

Throughout the past studies about trade war, numerous researches focus more on explaining the impact of tariff war from partial equilibrium perspective, which only analyse some part of the market, assuming other factor remains fixed. Thus, we aim to establish the impact of US-China's trade war as a whole. In the other hand, we identified that trade war may not necessarily leads to economy recession, where sometimes the negative impact could be small or offset.

We are using general equilibrium theory to study the impact of trade war and conducting three scenario analysis to do some prediction on the effect of trade war. These three scenarios included an additional 25% tariff in the United States, then China retaliated with a 25% tariff, and China implemented an expansionary fiscal policy in its country.

According to our result of scenario analysis, it is suggested China could reduce the adverse effects of trade war by increasing in government spending or implementing expansionary fiscal policy. Overview the overall impact of these US and China trade war, China would hurt the most. China eventually would have negative impact far more than United States do if United States impose additional 25% on China import. We presume China take retaliate action by impose 25% on United States's import, in such situation, China have to pay for what it have done China would suffer again.

CHAPTER 1: RESEARCH OVERVIEW

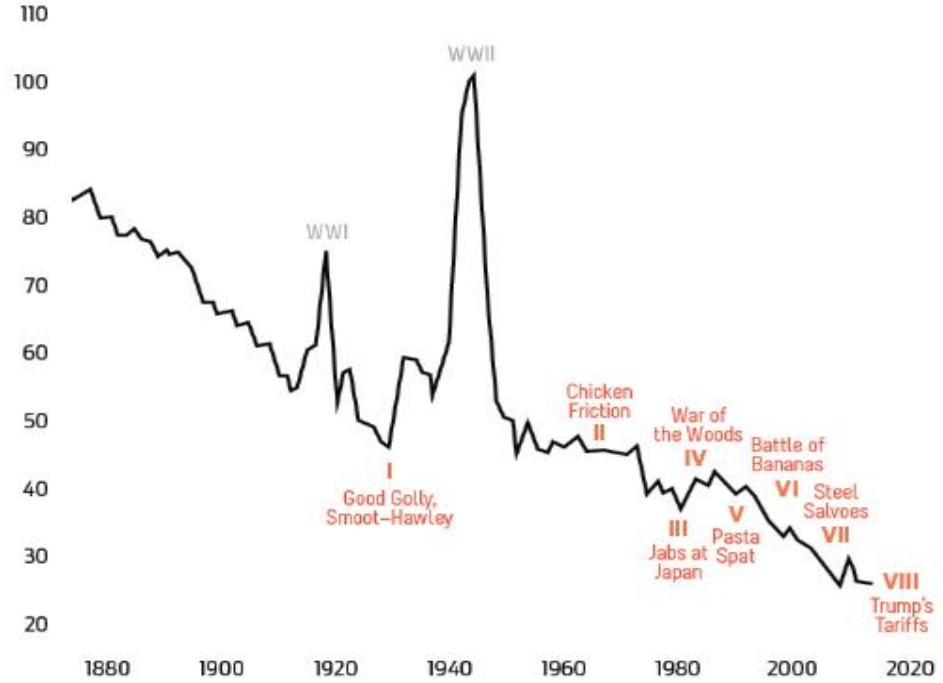
1.1 Research Background

1.1.1 History of Trade War

Trade war is widely known as the economic conflicts between two or more countries that impose tariffs to harm each other's trade. It happens when a country imposes tariffs on imports from foreign countries; then foreign countries take the same action as protectionism to retaliate (Amadeo, 2018b). Trade wars are no longer a new phenomenon in this century and are often known to economists and individuals. Most of the trade war in the past impact the economic, where retaliatory measures are used to counter trade barriers; whilst in a few cases, trade wars can lead to consequences of world change (Desjardins, 2018). Retracing the history of trade wars, most of the famous trade war were found triggered by the United States (US), and the history of US trade wars with their major trade partners started from the 1930's are shown in Figure 1.1.

One of the most notorious examples is the Smoot-Hawley Act. It was imposed during The Great Depression in 1930, by increasing tariffs on over 20,000 imported goods. Soon the trading partners introduced their own retaliatory tariffs, and results in a drop of over 60% of US exports and imports by the following year. As consequences the Smoot-Hawley Act is often blamed for deepening the Great Depression (Pavlak, 2018).

Figure 1.1: The modern history of US trade wars



Source: Desjardins (2018). *A brief history of US trade wars.*
Note: The variation of average trade costs is estimated on two-year windows. Using balanced samples. The coefficients are then chained to obtain an index that covers the entire period.

In the 1980s, trade war happen between US and Japan. As the Japanese exports flooded the US market specifically in the electronic appliance and automobile sectors, this leads to a serious harm to the US auto sales (Pavlak, 2018). Hence, during that time, American business leaders and politicians believed that Japan would soon surpass the United States economy because of its production methods and import barriers (Johnston, 2017). After intense pressure from US, Japan agreed to a Voluntary Export Restraint (VER) agreement that limited sales in the United States (Desjardins, 2018).

The banana war occur in 1993, occurred after Europe imposed heavy tariffs on imports of bananas from Latin America to restrict imports of the fruits to its colonies in Africa and Caribbean (Pavlak, 2018). Since the US companies own most of the banana farms in Latin America, eight separate complaints were filed with the World Trade Organization by US (Amadeo, 2018b; Pavlak, 2018). However, this banana war lasts for 20 years and the eight WTO cases were only formally resolved in 2012 (Pavlak, 2018).

Throughout the years of different trade war, although the impact of US trade wars would sometimes leads to economic deterioration, however, US still insist on implementing trade protectionism for the benefit of their own nation. In fact, in year 2018, US once again triggered trade war with China by imposing tariffs on Chinese products.

1.1.2 Reasons behind US-China Trade War

As the recent world's biggest economy, US economy remains a highly developed and technologically advanced service industry, accounting for about 80% of its output (Focus Economics, n.d.). China has transformed itself from a centrally-planned closed economy to a manufacturing and export hub since it has started the program of economic reforms in the 1970s (Bajpai, 2017). In 2017, China has become the world's biggest exporter by exported $2.2 trillion of its production. At the same time, 18 % of its exports were shipped to US, which in the end has led to a $375 billion of US trade deficit (Amadeo, 2018a). This is happen due to the US exports to China were only $130 billion, whilst the imports from China were $506 billion. In order to reduce trade deficit, US president uses protectionist measures by imposing tariffs on imports from China. In March 2018, he announced to impose a 25% tariff on steel imports and a 10% tariff on aluminium. (Schlesinger, Nicholas, & Radnofsky, 2018). However, on April 2, China retaliates by proposing tariffs on a list of 128 products, including pork, fruit and nuts, steel pipe for the oil industry, and ethanol. These have triggered a tit-for-tat tariffs on goods worth up to $150 billion which has significantly results in trade war.

It is also believed that trade war was triggered by the US Trade Representative Office accusing China of handling unfair trade practices such as technology transfer and intellectual property on March 22, 2018 (Roach, 2018). For example, Trump administration has announced a list of more than 1,300 imported products from China, equivalent to about $50

billion in goods, which may require a 25% tariff on April. In fact, the proposed tariffs are intended to address China's forced technology transfer and inadequate intellectual property protection policies that have harmed the commercial relationship between the two countries (Pavlak, 2018). In the other words, China is being questioned that China acquires technology mostly through forced technology transfer from multinational companies that invest in China and through outright theft (Lardy, 2018). In response to the US tariffs, China has retaliate by producing its own list of 106 American goods, including soybeans, cars and airplanes that could be subject to tariffs of 25 %.

Another reason behind the trade war is also because of ZTE Corporation, the China's second largest telecommunications equipment manufacturer, was found illegally exporting US goods to North Korea and Iran, which violated American sanctions against those countries (Mozur & Swanson, 2018). At first, the company agreed to solve it by paying $1.19 billion in fines and reprimand the employees who involved in the banned sales (Tan, 2018; Mozur & Swanson, 2018). However, it is shocked that ZTE rewarded them instead of reprimanding ZTE staff and senior management who involved in violating the sanctions. On the 16th of April, US Commerce Department in the end implement a seven year ban on all the US firms to export key components to the company (Tan, 2018; Mozur & Swanson, 2018). Hence, it is believed to be also a powerful trigger in trade war.

1.1.3 What is the Current Trend of Trade War?

There are three trade disputes currently happen in the world between US and other country. First, US, Mexico and Canada currently are in trade dispute. Robinson & Thierfelder (2018) found they are in the process of renegotiating North American Free Trade Agreement (NAFTA). In view of the political remarks of the Trump administration, it's emphasizing on "putting America first," the United States is seeking a negotiating position,

which makes it difficult to reach an agreement with Canada and Mexico. Furthermore, the United States recently announced that tariffs will be impose on imported steel and aluminium to protect its domestic industry. These three countries will resume the implementation of the independent trade policy within the overall framework of the World Trade Organization (WTO) if they NAFTA and previous Canada-United States Free Trade Agreement (CUSFTA) was over (Robinson & Thierfelder, 2018). President Trump said that the United States will not take part in any new multilateral trade negotiations, and will not withdraw from the completed Trans-Pacific Partnership (TPP) agreement (Robinson & Thierfelder, 2018). The failure of the North American Free Trade Agreement will make it difficult to reach new bilateral trade agreements because such negotiations are unlikely to begin with potential partners. In this environment, the United States may eventually adopt a more isolated trade policy. However, Canada and Mexico are continuing to embrace the global economy and are seeking new regional and bilateral trade agreements (Robinson & Thierfelder, 2018).

Second, the US President added tariffs on raw material and component costs in Europe in June 2018 (Partington, 2018). Trade tariffs have raised the cost of US manufacturers and exacerbated the slowdown in factories in the euro zone. Since the beginning of the 2007 poll, this has also led to the longest delay in supplying to the factory production line. Against the background of an increasingly bitter dispute between the EU and the US, a parallel survey of euro zone manufacturers found that economic activity fell to the lowest level in June for 18 months, with the worst slowdown coming in Germany, France and Greece (Partington, 2018).

Third, it will be what we concern the most which is trade war between US and China. In 2015, China replaced Canada as the United States' largest trading partner, with a total import and export volume of nearly 500 billion US dollars, about 15% of total US trade (Tan, 2018). On the other hand, the United States has been China's largest trading partner since the 1990s, and in 1998 it surpassed Hong Kong as the largest importer of Chinese goods (Tan, 2018). Although the trade relationship between the two economic

powers is not always smooth, the first wave of tariffs imposed by Washington on the $34 billion tariff on Chinese goods has undergone tremendous changes, prompting Beijing to be immediately retaliated.

Recently, on 7 July 2018, Aleem (2018) reported that the Trump administration again imposed sweeping tariffs on $34 billion worth of Chinese goods, such as aircraft parts, medical devices, and flat-screen televisions. The goods market for tariffs will be tax for 25 when goods are imported to United States. The purpose of US imposed quite high tariff is to revenge China by making its product costly for American consumers and businesses to buy. However, this if China's product become more costly, Americans would switch to other products, this leads to a decrease in China' export. China immediately accused the US of starting “the largest trade war in economic history to date” and responded by imposing 25 percent tariffs on US goods that worth $34 billion, such as soybeans, automobiles, and lobsters (Aleem, 2018).

1.1.4 Can the US-China Trade War be Stopped?

So, when US-China trade war ended? According to Stewart (2018), the trade war between US and China is possible to come to an end, just that there is no exact way to end it, particularly since President Donald Trump first demanded that all this is not obvious and what China willing to give. In modern history, the United States does not impose many of these tariffs on imported products. When it is completed, the issue of the US wanting to lift the tariff is always very clear. For example, the semiconductor tariffs for Japan in the 1980s. The United States imposes a 100% import tariff on Japanese semiconductor imports worth $300 million. The goal is to make the Japanese buy more US semiconductor products. In fact, the United States requires market share targets to account for 20% of the Japanese market, and the dispute is terminated by Japan’s consent (Stewart, 2018). There are other trade disputes, the requirements are a bit more complicated,

but it is always clear what the deal might look like. We look into another historical case, in 1963; The United States imposes a 25% tariff on imported trucks to European Union. This can be traced back to "Chicken War" ("The Chicken War", 1964). The EU excludes American chicken from their market, in order to retaliate, the United States imposes a 25% tariff on trucks. This continues until today. So there is always an exit, but there needs to be a coordinated effort between the two nations to avoid these tariffs becoming a more permanent feature of the environment.

In addition, trade tensions are intensifying and will begin to see politically relevant and other observable suffering. If Trump tries to offset the decline in agricultural exports through the Roosevelt-era Commodity Credit Corporation, Congress will eventually have to spend money to help compensate for the losses of CCC (Stewart, 2018). A farm senator like Chuck Grassley showed little enthusiasm for this idea. Republicans may have to be dragged and screamed to provide a check, but it may end up happening. This may allow ramps to occur in the medium term (Stewart, 2018).

This is only the beginning. More tariffs are coming. Both the US's and China's initial round of tariffs against each other are designed to sting deeply. Therefore, in this report, we are going to provide scenario analysis on how US-China trade war affects our country- Malaysia and also global economics.

1.2 Problem Statement

Throughout the past studies about trade war, numerous researches focus more on explaining the impact of tariff war from partial equilibrium perspective, which only analyse some part of the market, assuming other factor remains fixed. For example, Felbermayr, Jung and Larch (2015) proved that increase on tariff could bring an impact on domestic goods spending. Tariffs also increase the prices of goods and

makes United States investment and production unattractive as many United States manufacturing companies rely on imported goods (Winograd, 2018). At the same time, US dollar is strengthened against others major currencies because of trade war (Rushe, 2018). In spite of that, there is hardly any researches analyse the impact of tariff war on whole macroeconomic throughout the general equilibrium perspective, rather than examine specific markets or sectors.

In the other hand, we identified that trade war may not necessarily leads to economy recession, where sometimes the negative impact could be small or offset. For instance in Mexico, the depreciation of the real exchange rate has brought more exports due to export losses to neighbouring countries in the north (Bouët & Laborde, 2017). Therefore, it is important for us to identify and determine how trade war impacts the overall economy, as well as the conditions that could cause trade war affect the economy.

1.3 Research Objectives

1.3.1 General Objective

The purpose of this study is to look at the impact of tariff war[1] on the economy from the general equilibrium perspective.

1.3.2 Specific Objectives

The specific objectives of this study are

i. To study the overall impact of trade war between United States and China.
ii. To identify the repercussion effect of trade war on the economy of United States and China.

[1] Tariff war and trade war are used interchangeably.

iii. To conduct scenario analysis to understand under what scenario the macroeconomic impacts of trade war could be moderated or escalated.

1.4 Research Questions

Based on the general and specific research objectives above, research question is as a guide for research and investigation of problem statements.

i. What is the overall impact of trade war between United States and China?
ii. What is the repercussion effect of trade war between United States and China?
iii. Under what scenario the macroeconomic impacts of trade war could be moderated or escalated?

1.5 Significance of Study

The impact of trade war between US-China has been an attractive issue to academics and policy makers for a long period. This research is capable to explain how trade war between US-China had a repercussion effect on China and United States economy. We aim to establish the impact of US-China's trade war as a whole.

In this study, we are providing general equilibrium theory and scenario analysis to examine the possible impact of trade war, and forecast the impact of trade war between US and China to domestic and global economics. By using general equilibrium theory or Walrasian general equilibrium, we attempt to explain the functioning of the macroeconomic as a whole, rather than as collections of individual market phenomena. It stands in contrast with partial equilibrium theory, or Marshellian partial equilibrium, which only analyses specific markets or sectors.

Other than that, we will provide a clear picture of how tariff affect domestic economy. We study from general equilibrium perspective which included how it changes demand-supply market, interest rate, foreign exchange rate, investment,

consumption, imported goods and exported goods. Besides, it is crucial for policy makers, firms, and investors to understand the effect of US-China trade war brings to its country and thus enable them to be well prepared and smartly to response to such shock.

Lastly, we also recommended various types of prevention, solutions and remedies for policy makers to overcome and restructure their economy at the aftermath of US-China's trade war.

1.6 Chapter Layout

The remaining chapters of the research are organized as follow. Chapter 2 will provide a comprehensive review on past research result. Chapter 3 demonstrates the econometric methodologies, models and techniques to for in-depth study of the mentioned research topics. Chapter 4 describes the results and findings using model and techniques in the previous chapter. Last but not least, Chapter 5 concludes with the discussion of findings, recommendation and conclusion.

CHAPTER 2: LITERATURE REVIEW

This chapter is a literature review of published and unpublished information on secondary sources of data for this research topic. Therefore, the following will review the incidence of past trade wars with their economic impact on the countries concerned.

2.1 Trade War Incidence in the Past

There are many researchers have captured the impact of trade war. Most of them believe trade war could have significant negative economic impact to both involved country and also the rest of the world. For instance, the researchers have found that a termination of the North American Free Trade Agreement (NAFTA) had significant negative impacts on outputs and unemployment on the involved countries, particularly over the immediate years after termination (Francois & Baughman, 2018; Robinson & Thierfelder, 2018; Walmsley & Minor, 2017). Based on the study of Francois and Baughman (2018), they stated that the US economy and employment was affected by high tariffs on US trade and production. In the short to medium term, US real output fell by 0.6%, and estimate it will results in about 1.8 million of unemployment (Francois & Baughman, 2018).

Furthermore, Robinson and Thierfelder (2018) also explained that a NAFTA trade war does more damage to real GDP in each region, with dramatic effects for Mexico and Canada in the short run. During that period, real GDP declines by 16.27% for Mexico and 10.16% for Canada, and therefore leads to over 8 million of unemployment in Mexico. In the United States, the results are less extreme, with real GDP declining 1.9%, as well as results in almost 3 million of unemployment. At the same time, Walmsley and Minor (2017) get the same result as above, this researcher further claimed that investment and trade could also be affected in NAFTA trade war. The results show that the reversal of NAFTA leads to a decline in real GDP, trade, investment and employment in US, Canada and Mexico, most

of which was due to reciprocity between Canada and Mexico, which was required by the WTO. Overall, three of these NAFTA countries experienced a fall in trade, especially the imports by final consumer in the US, while Mexico experienced the largest decline among those countries (Walmsley & Minor, 2017). According to Imbruno (2016), trade policy instruments, tariffs, seem to be the most appropriate for explaining the level of product imports of Chinese manufactured goods during the period 2000 to 2006. The main results show that the import growth under China's general trading system is mainly due to tariff cuts and license exclusion (Imbruno, 2016).

In addition, it is not only a decline in import, but also export. Another growing strand of literature deals with tariff and export. Robinson and Thierfelder (2018) found that in the NAFTA trade war, Canada and Mexico turn to non-NAFTA regions for trade in the medium run. Real exports decline 9.24%, 11.81% for Mexico and Canada. Exports for Mexico and Canada to NAFTA countries decline by 14.98% and 19.71% respectively and exports to non-NAFTA countries increase by 11.18% for Mexico and 1.91% for Canada. While, US real exports to both NAFTA decline to 25.08% and non-NAFTA 1.05% regions.

2.2 Can Trade War Also be Beneficial?

However, some of studies claim that negative effect of trade on economy may be minimal or even gain a positive impact. In certain condition, it may not necessary hurt the economy negatively. In US-China trade war, US could be better off in welfare, GDP and non-manufacturing production in the condition of China does not take retaliatory measures. If China takes retaliation measures, the US will fail to gain expected positive impact. In addition, Li, He and Lin (2018) further emphasized, as the import tariff rate increases, trade war impact on US will increase at the beginning, but will then decrease. In such situation, it is possible for the US government to improve employment as his expect through import tariff measures. By applying multi-sector multi-country general equilibrium model, Balistreri and Hillberry (2017) showed that both US and Mexico can slightly improve their

welfare by unilaterally increasing their respective bilateral tariffs by assuming there is no retaliation. Furthermore, Balistreri and Hillberry (2017) examine nash equilibrium in which each country imposes an optimal bilateral tariff and treats the optimal relationship of another country as given. Despite the small losses in the US, the US and Mexico have suffered welfare losses in this situation. Yet, China's best response to the best US tariff is to lower its own tariff. In this case, the Nash equilibrium produces moderate US welfare gains and Chinese welfare losses. There must be somebody who gain benefit in this trade war excludes the countries which involved in or we called it as free rider. That is, the countries that benefit from bilateral or trilateral trade wars between the United States and its trading partners. Another trade incident in the Central America Free Trade Agreement (CAFTA) region, where welfare gains in the CAFTA region range from 0.3% to 0.8% in the US trade war with Mexico, China or both (Bouët & Laborde, 2017).

Moreover, trade war also could bring an surprising impact on consumption. Felbermayr, Jung and Larch (2015) has proved that a 40% increase in import tariffs led to a 4.25% increase in domestic goods spending. Unilateral import tariffs in the United States also affected all his trading partners (Felbermayr et al., 2015). All trading partners took a same effect with US, which there was an increase in their share of domestic spending. The smallest changes occurred in Romania and Russia, with 0.13% and 0.16% respectively. Usually, these countries are remote, smaller countries, and have little trade with the United States. In fact, Canada, Mexico and Ireland have larger impact even greater than the US itself. Canada's share of domestic goods is expected to increase by 6.25%, followed by Mexico and Ireland, with the growth of 5.58% and 4.65% respectively.

In addition, (Bouët & Laborde, 2017) stated the negative impact on China and Mexico could be soften or offset. Since the current account should remain constant as a percentage of GDP, the real exchange rate needs to be adjusted through domestic prices. In Mexico, for example, due to export losses to neighbouring countries in the North, the depreciation of the real exchange rate has brought more exports, especially to other trading partners, and imports have reduced GDP before re-establishing the initial current account.

2.3 Who Will Lose?

The most concern of US-China trade war must be who will lose in the end. Guo, Lu, Sheng, and Yu (2018) have simulated four different scenarios which describing how other countries will respond to such trade war. All scenarios show that the trade war will have a devastating effect on international trade. Besides, Guo et al. (2018) claimed that the US will become one of the biggest losers in social welfare, whilst China will only face limited losses. The real wages in the US fall due to high tariffs and import prices. It shows that the US welfare loss rate is 0.66% as measured by the decline in real wages. While, China losses in welfare are smaller than the US welfare losses as its real wages have only dropped by -0.04%. Moreover, Melatos, Raimondos-Møller, and Gibson (2007) further suggested that a large country, in terms of the value of its endowment, will win a trade war which examined by numerical simulation results. The trade channel effect suggest that suggests that if countries with the same technology and preferences have significant differences in the endowment of one factor relative to another, then countries with greater market power will have greater opportunities to trade (Melatos et al., 2007). The countries with greater market power would get welfare gains in the trade war at the expense of their competitors. However, Bouët and Laborde (2017) has the opposite opinion to the statement of US will hurt the most in the trade war. Since the economic size of China is significantly smaller than US and US is the major destination of exports for China. If that is the situation, it will result in potentially high losses for China.

2.4 Gap to be Filled

After investigating the past studies, we found out most of these studies has examined the impact of trade war separately, some of the studies was only concentrate on specific variable that are being affected. For instance, according to Robinson and Thierfelder (2018), there are merely captured trade war impact on real GDP and unemployment. In fact, trade war could bring various impacts toward the economic, consumption, investment, export, import, exchange rate, interest rate

and government spending. Other than that, these variables might also bring repercussion effect to the economy. Thus, our research is capturing all the impact of these variables by applying general equilibrium model. Our research going to review the possible impact of trade war toward both US and China based on scenario analysis.

2.5 Conclusion

Overall, there are number of literature widely discuss about different case of trade war and it could brings significant negative economic impact to both involved country and also the rest of the world. Most of the researchers captured negative impact on GDP, investment, consumption, trade and employment. However, there are also different findings and sayings regarding the negative effect of trade war could be minimal or even gain a positive effect. On the other hand, there are also different perspective on who will be the loser in US and China trade war. The result would be different based on different type of method used to examine. Indeed, most of the literature used partial equilibrium model and Nash equilibrium which only analyses specific markets or sectors and ignore the overall possible impact in the trade war. However, trade war could bring to a series of consequences, the outcome might be different for partial equilibrium and general equilibrium model. Hence, in our study, we are trying to fill the gap by taking all the impact into account by using general equilibrium. After all, this study would use scenario analysis for all possible outcomes in US-China trade war.

CHAPTER 3: METHODOLOGY

In this chapter, Eviews 10 will be used to conduct tests in this study by using secondary data collected from various sources. In this study, we use general equilibrium instead of partial equilibrium to study the impact of trade war as a whole to meet the research objective stated in Chapter 1.

3.1 General Equilibrium Model

According to Starr (2011), equilibrium is where we expect forces in the economy, supply and demand will move the system into an array allocations and prices which is what the economy expected to achieved. Descriptive efficiency properties of economy depend on the economy in a general competitive equilibrium. GEMs deals with all markets and their interactions at the same time, rather than single market. According to Chumacero and Schmidt-Hebbel (2004), General Equilibrium Models (GEMs) are appropriate for understanding economic interactions. GEMs are used for a variety of purposes, including simulating policy changes and responses towards external shocks and forecasting macroeconomic variables.

3.2 A Diagrammatical Illustration

Figure 3.1 shows the effect of shock which is tariff and how it affects the economy as a whole.

Channel 1: Trade Disruption

The trade war between the United States and China began with the imposition of tariffs on Chinese goods. After the tariffs are imposed, the cost of imported goods from China becomes expensive. People need to pay extra for the same amount of goods, which may reduce demand from China.

Reduction in United States imports reflect decline in China's exports. As a result of the decline in exports, the reduction in money flows into China has led to a decline in China's gross domestic product (GDP).

Channel 2: Uncertainty for Aggregate Demand

This study does not stop at the impact of trade on the economy as we know that the biggest trap come from consumption and investment which will bring repercussion effect on the economy. In 2017, consumption accounted for 69.1% of the United States gross domestic product, accounting for the largest share of GDP ("GDP", n.d.). The investment is about 17.2%, negative 2.9% for net exports. China's consumption ratio is about 39.1%, investment is 43.3%, and net exports are about negative 1.9%. Hence, we further consider the impact of trade war on consumption and investment.

When China's economy slows, investment usually slows down. People are only willing to dump money to invest in a stable economy. When the economy is uncertain, people are hesitant to expand their facilities and open new factories in China. The slowdown in investment will have a feedback impact on GDP and further slow down economic growth.

When China's economy slows, it also affects consumption. People will slow down spending because economic uncertainty may cause people to lose their jobs because of falling exports to the United States. Job uncertainty make people tend to be cautious and slow down their spending. A slowdown in consumption will have a feedback impact on GDP and further affect the economic growth.

Channel 3: Interest Rate Effect

When the Chinese economy slows down, the number of transactions is reduced, and people will not ask for so much money, which will lower the real interest rate. The fall in real interest rates will devalue China's currency. People will choose to hold less Renminbi because they will pay lower interest. People will hold dollars because it is safer. Hence, Renminbi depreciate and US dollar appreciates. The depreciation of Renminbi, China goods become cheaper and United States would like to purchase China goods compare to United States good which raise the export of

China. The impact suggests that the imposed high tariffs may have the least impact on the economy. The depreciation of the Renminbi may offset the negative impact of tariffs.

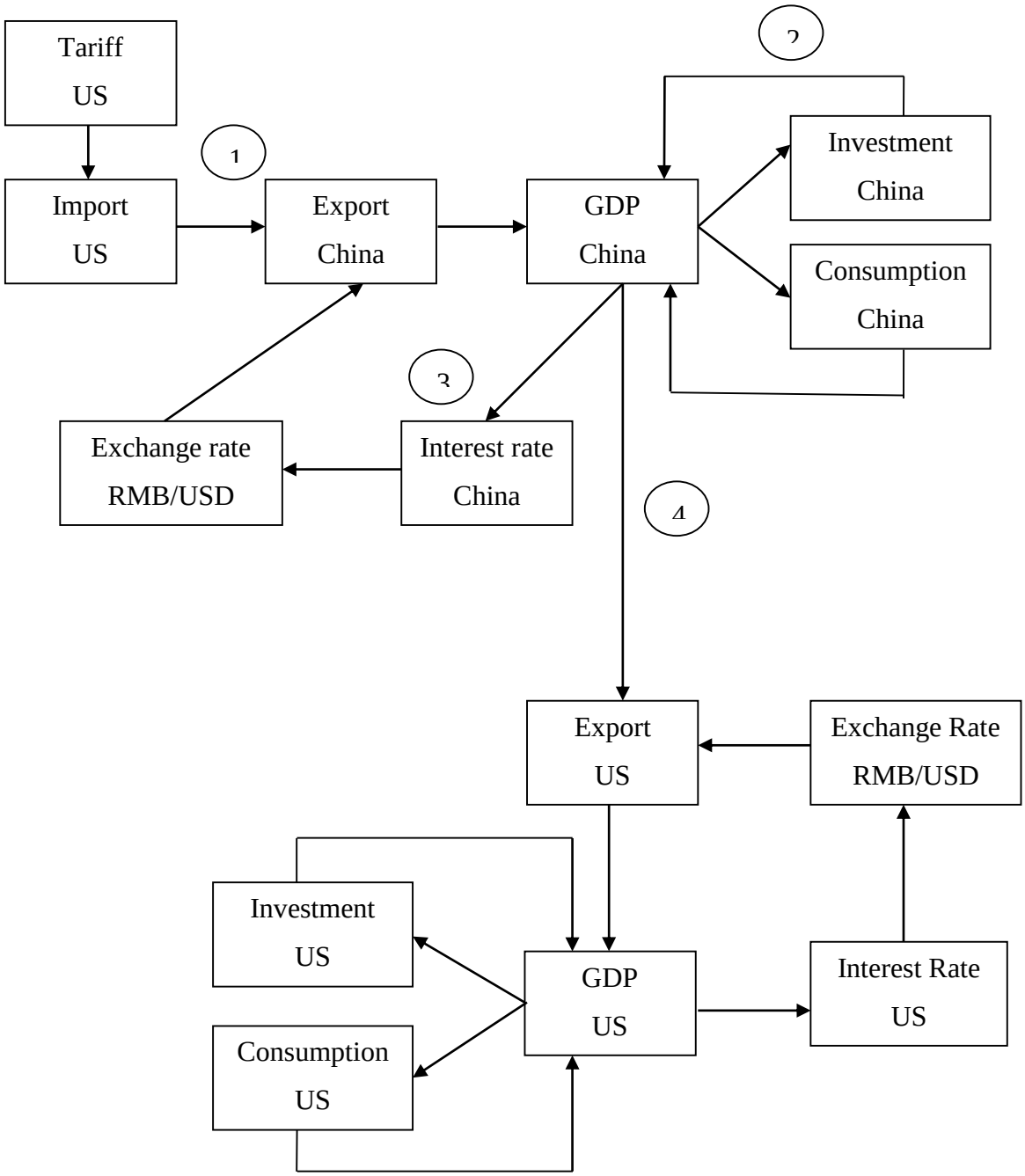
Channel 4: Economic Interdependence

The high tariffs imposed by the United States on China not only affect the Chinese economy, but also affect the domestic economy. When China's economy is underperforming, people tend to spend less and are reluctant to buy things from exports at higher prices. Hence reduce in United States export.

The decline in United States exports has reduced the inflow of funds into the country, which has led to a decline in GDP. When the US economy is affected, it will slow growth of investment and consumption which have a feedback effect on the economy (same case as channel 2). When the domestic economy slows, the real interest rate, Renminbi and export may also been affected. At the end, the impact of high tariff may end up with a minimum impact on economy. The depreciation of US Dollar may offset the negative impact of tariff (same case as channel 3).

In this study, we understand the impact of trade wars from a general equilibrium perspective. The impact of a trade war may be large or minimal, as negative effects may be offset.

Figure 3.1: The Effect of Trade War



3.3 A Sketch of the Model

Endogenous variable for this model is consumption (C), investment (I), export (X), import (M), interest rate (r) and exchange rate (ϵ). Exogenous variable for this model is tariff rate (T). The superscript indicates China and table 3.1 summarize the notation. Tariff act as a shock for the economy.

Table 3.1: ***Notation of the Model***

C_t	Real Consumption
ΔC_t	First difference of Real Consumption
I_t	Real Investment
G_t	Real Government Spending
X_t	Real Export
M_t	Real Import
r_t	Real Interest Rate
ϵ_t	Real Effective Exchange Rate of Chinese Renminbi against US Dollar
$\Delta\epsilon_t$	First difference of Real Effective Exchange Rate of Chinese Renminbi against US Dollar
Y_t	Real Gross Domestic Product
ΔY_t	First difference of Real Gross Domestic Product
T_t	Tariff Rate
α_k	Intercept; k = 1, 2, 3,…,9
β_k	Slope coefficient; k = 1, 2, 3,…,43
μ_k	Error term; k = 1, 2, 3,…,12
t	Number of period

Note: Notation for variables of China is labeled with *.

The consumption function is

$$C_t=\alpha_1+\beta_1 r_t+\beta_2 Y_t+\beta_3 \epsilon_t+\mu_{1t} \quad (1)$$

$$C^*_t=\beta_4 r^*_t+\beta_5 Y^*_t+\beta_6 C^*_{t-1}+\beta_7 G^*_t+\mu_{2t} \quad (2)$$

where $\beta_1 < 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0, \beta_5 > 0, \beta_6 > 0, \beta_7 < 0$

The relationship between real interest rate and real consumption is negative. When real interest rates rise, individuals increase their savings and people tend to reduce their spending. According to marginal propensity to consume, an increase in income will increase in consumption, but at the same time the consumption growth is lower than income growth. Therefore, it is also may increase savings. There is a strong positive correlation between income and consumption (Razzak, 2013). Based on Obstfeld et al. (as cited in Razzak, 2018), they have stated that consumption growth rates differential and the real depreciation rate are positive correlated in this fluctuating real exchange rare world. This implied that when the US Dollar currency appreciates, imported goods become cheap and people tend to reduce their savings by consuming gooods. People will consume back on their interest every period and it is hard for people to change their behaviour in short term. So we can see that consumption is affected by its consumption of last period. Based on (Gali, Lopez-Salido & Valles, 2005), when government spending increases, the decrease in net present value after tax will lead to a decrease in consumption.

The investment function is

$$I_t=\alpha_2+\beta_8 r_t+\beta_9 \Delta Y_{t-1}+\beta_{10} \Delta \epsilon_t+\mu_{3t} \quad (3)$$

$$I^*_t=\beta_{11} r^*_t+\beta_{12} Y^*_t+\beta_{13} I^*_{t-1}+\mu_{4t} \quad (4)$$

where $\beta_8 < 0, \beta_9 > 0, \beta_{10} < 0$ or $\beta_{10} > 0, \beta_{11} < 0, \beta_{12} > 0, \beta_{13} > 0$

The rise in real interest rates has pushed up borrowing costs which discourage investor investment. This implies that real interest rate and investment had a negative relationship. If a country's GDP rises, it means that the economy is in good shape. Countries with good economies will attract investors to invest and increase investment. GDP and investment had a positive relationship. According to Bahmani-Oskooee and Hajilee (2013)., the relationship between exchange rate and investment are stated in different ways and which concludes that exchange rate uncertainty will positive or negative impact on investment. Hartman and Able (as cited in Bahmani-Oskooee & Hajilee, 2013) argued that increase in exchange rate

uncertainty may have investment from competitive risk-neutral firms which increase the investment. In contrast, Pindyck and Bertola (as cited in Bahmani-Oskooee & Hajilee, 2013) argue that increase in exchange rate uncertainty will have effect of risk neutral firm to slow down the investment (Bahmani-Oskooee & Hajilee, 2013). A country with a large investment suggests that the country is performing well and attracting many investors to invest. This effect will bring forward to the following year. With this, we can say that investment for last period had a positive relationship with current investment.

The export function is

$$X_t=\alpha_3+\beta_{14}\epsilon_t+\beta_{15}T^*_t+\beta_{16}M_{t-1}+\mu_{5t} \quad (5)$$

$$X^*_t=\beta_{17}\epsilon_t+\beta_{18}T_t+\beta_{19}M^*_{t-1}+\beta_{20}X^*_{t-1}+\mu_{6t} \quad (6)$$

where $\beta_{14} < 0$, $\beta_{15} > 0$, $\beta_{16} > 0$, $\beta_{17} > 0$, $\beta_{18} < 0$, $\beta_{19} > 0$, $\beta_{20} > 0$

Based on elasticity approach to trade balance, depreciation in currency will increase country export. When a country faces a tariff shock, China's exports become expensive and will reduce US exports. Tariff imposed by another country will have a negative impact on China exports. Import of last period is expected to have positive relationship with export. For example, if there is an increase in import last year such as raw materials, in the following years the production will increase which will lead to an increase in current year export. The increase in exports from the previous period will have an impact on the next period. If a country's increased export means there are people demand for it, then people will choose to consume in the following year too.

The import function is

$$M_t=\alpha_4+\beta_{21}\epsilon_t+\beta_{22}T_t+\beta_{23}Y_t+\mu_{7t} \quad (7)$$

$$M^*_t=\beta_{24}T^*_{t-1}+\beta_{25}M^*_{t-1}+\beta_{26}X^*_{t+1}+\beta_{27}G^*_t+\mu_{8t} \quad (8)$$

where $\beta_{21} > 0$, $\beta_{22} < 0$, $\beta_{23} > 0$, $\beta_{24} > 0$, $\beta_{25} > 0$, $\beta_{26} > 0$, $\beta_{27} > 0$

Based on elasticity approach to trade balance, depreciation in currency will increase country export at the same time drop in import of United States. Due to trade barrier, the imposed of tariff by United States will have a negative impact on import. Tariff on import may increase the price of import which discourages people to buy imported goods. When the economy performs well, people will demand more

foreign goods, which will improve imports. GDP and import have a positive relationship. Intertemporal import are positively correlated as people need time to change their behaviour and may need time to find substitute goods. Expected export for next period is positively correlated with import. For example, if China expects to increase its merchandise exports in the second year, China will import more raw materials this year. Based on (Kuncoro & Pambudi, 2014), in Indonesia, the decline in government spending can drop the imports of Indonesia more than its exports.

Taylor rule shows that

$$r_t=\alpha_5+\beta_{28}r_{t-1}+\beta_{29}\Delta Y_t+\mu_{9t} \quad (9)$$

$$r^*_t=\alpha_6+\beta_{30}r^*_{t-1}+\beta_{31}\Delta C^*_{t-1}+\mu_{10t} \quad (10)$$

where $\beta_{28} > 0$, $\beta_{29} > 0$, $\beta_{30} > 0$, $\beta_{31} < 0$

With reference to the theory of money demand, when the economy performs well, people would demand for more money which increases the interest rate. When economy is performing well, it will increase the pressure of Central Banks to rise the infest rate in slow down the economy and inflation rate. From 2016, Federal Reserve had raised the interest rate to let its economy back to normal situation (Pettinger, 2018). The effect of real interest rate will bring forward from last period so it is say to have a positive relationship. Consumption last period and real interest rate has a positive relationship. When consumption declines, it will affect economic growth. The government can use monetary policy will decrease the real interest rate.

Uncovered interest parity condition

$$\epsilon_t=\alpha_7+\beta_{32}(r^*_t - r_t) +\beta_{33}\epsilon_{t-1}+\mu_{10t} \quad (11)$$

where $\beta_{32} < 0$, $\beta_{33} > 0$, $\beta_{34} > 0$

Uncovered interest parity condition stated that countries with higher interest rates will depreciate domestic currency against foreign currency ("Uncovered Interest Rate", 2018). Real interest rate of China raise, investors will invest in the United States, leading to the appreciation of the US dollar and the depreciation of the Chinese Renminbi. According to Meese and Rogoff (as cited in Dzanan & Masih, 2017), they discovered that exchange rate today is the best way to forecast exchange rate tomorrow, it was proved by a simple statistical model of random walk in that paper.

Demand for domestic goods

$$Y_t=\alpha_8+\beta_{35}C_t+\beta_{36}I_t+\beta_{37}X_t+\beta_{38}M_t+\mu_{11t} \quad (12)$$

$$Y^*_t=\alpha_9+\beta_{39}C^*_t+\beta_{40}I^*_t+\beta_{41}G^*_t+\beta_{42}X^*_t+\beta_{43}M^*_t+\mu_{12t} \quad (13)$$

where $\beta_{35} > 0$, $\beta_{36} > 0$, $\beta_{37} > 0$, $\beta_{38} < 0$, $\beta_{39} > 0$, $\beta_{40} > 0$, $\beta_{41} > 0$, $\beta_{42} > 0$, $\beta_{43} < 0$

Consumption, investment, government spending, export and import had a direct impact on domestic income. When consumption increases, it has a positive impact on domestic income. Similarly, investors invest more in investors, which increases the capital inflow of a country, which contributes to domestic income. Based on expansionary fiscal policy, an increase in government spending will directly increase gross domestic product. Exports have a positive impact on domestic income, while imports have a negative impact on domestic income.

3.4 Data Collection Method

As summarise in table 3.2, secondary data is collected from various sources such as World Bank, Asian Development Bank (ADB), Organisation for Economic Co-operation and Development (OECD) and Federal Reserve Bank of St. Louis for this study. Our data comprises of yearly data of GDP, consumption, investment, import, export, interest rate, exchange rate and tariff rate for United States and China. We used annual data instead of monthly or quarterly data to capture the accuracy of annual performance. General equilibrium is used to examine the repercussion effect of trade war on the economy of United States and China from 1950 to 2018.

Table 3.2: ***Data Collection***

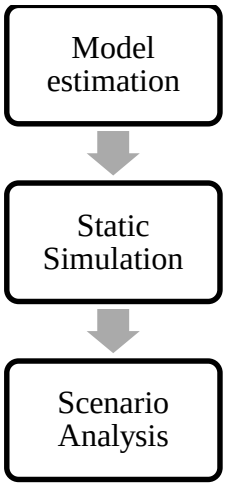
Variable	Indicator	Year	Unit Measurement	Sources
Endogenous Variable				
Real Gross Domestic Product	Y	1960-2017	Constant 2010 US$	World Bank
	Y*	1960-2018	Constant 2010 US$	World Bank
Real Consumption	C	1970-2016	Constant 2010 US$	World Bank
	C*	1995-2017	Constant 2010 US$	World Bank
Real Investment	I	1950-2016	Constant 2010 US$	Federal Reserve Bank of St. Louis
Investment	I*	1960-2017	US$	World Bank
Export	X	1970-2016	US$	Organisation for Economic Co-operation and Development
	X*	1960-2017	US$	Asian Development Bank
Import	M	1970-2016	US$	Organisation for Economic Co-operation and Development
	M*	1982-2017	US$	World Bank
Real Effective Exchange Rate	ϵ	1980-2017	Index (2010=100)	World Bank
Real Interest Rate	r	1961-2016	%	World Bank
	r*	1980-2017	%	World Bank
Exogenous Variable				
Tariff Rate	T	1989-2016	%	World Bank
	T*	1992-2016	%	World Bank
Government spending	G*	1960-2017	US$	World Bank

3.5 Methodology

The methodology is based on Figure 3.2. At first, we used the collected data to do model estimation. The general equilibrium model is used to test the relationship of each variable. We generated six models to see the importance of variables and variables influencing the relationship between the United States and China. The six models include consumption function, investment function, export function, import function, taylor rule and uncovered interest parity condition. Each model equation on the model is estimate using Ordinary least square (OLS) estimator. The properties of the OLS estimator are summarized under Best Linear Unbiased estimator (BLUE). Theory describe that OLS estimator are linear and it is unbiased with a low variance (Martellosio, 2011). Then put the entire model into the system. Demand for domestic goods is used as an identity in the system.

After the models are estimated, models are put into static simulation. Static simulation used to ensure the model can represent the actual behaviour. At last, scenario analysis is conducted to do some prediction on the effect of trade war. Scenario analysis in this study helps us to understand the the overall impact of the trade war on the United States and China, and the effect of tariff increases will be moderated or upgraded. Three scenarios in this study included an additional 25% tariff in the United States, then China retaliated with a 25% tariff, and China implemented an expansionary fiscal policy in its country.

Figure 3.2: Methodology



3.5 Data Processing

All variable in the model with nominal value are converted into real value. Data in real value can eliminate the impact of price level changes on the nominal value of time series data, real value is obtained, resulting in a more realistic economic trend ("Real Value", 2018).

The formula for adjustment from nominal value to real value as below:

$$Real\ Value = Nominal\ Value \div CPI$$

Refer to table 3.2, United States' export, import and China's investment, export and import are nominal in nature. Therefore the value is converting to real value by deflating the CPI.

After convert data into real value, data is transformed into log form to make sure data are normal or near normal distributed. The skewness will also been reducing. Other than that, log transformation can reduce the variability of data especially data set with outlier (Changyong, Hongyue, Naiji, Tian, Hua & Ying, 2014).

3.6 Conclusion

In the nutshell, our test is mainly to solve the proposed research problem in Chapter 1. First we build our general equilibrium model. Then collect data from various sources and data which is nominal in nature are converted to real value. We will precede our test by using OLS model as estimator.

CHAPTER 4: DATA ANALYSIS

4.1 Model Estimation

In this section, we estimate the model according to the model in Chapter 3 by using OLS estimator. According to the table 4.1, real interest rate is negatively significant at coefficient of 0.6626 due to intertemperal consumption. When the real interest rate raise, it induce people to save rather than spending today so consumption drop. When people had an increase in its income level, people tend to spend more. Result shows that real gross domestic product and consumption it is positively correlated at 1% significant level. The real effective exchange rate of Chinese Renminbi against US Dollar is not significant with consumption. According Backus, Smith and Kollmann (as cited in Devereux, Smith & Yetman, 2009), they discover that the consumption and real exchange rate has no cointegartion based on correlation test with very low R2 and coefficient approximate zero.

In our estimation result, real interest rate and consumption have negative relationship. However, the result shows that real interest rate does not affect consumption of China. Real gross domestic product is positively related to consumption with coefficient of 0.1550. China's consumption is highly affected by it consumption last year at 0.01 significant level. Consumer behaviour takes time to change, so if people spend more in the last period of time, it will continue to consume more goods. Government spending and consumption in China has a negative relationship with coefficient of 0.1042. In this study, consumption of China includes non-profit institutions serving households that benefit households such as education and health care.

In United States, about 99.87% of the total variation in consumption can be explained by real interest rate, gross domestic product and exchange rate. In China, about 99.92% of the total variation in consumption can be explained by real interest rate, gross domestic product, last period consumption and government spending. According to Jarque-Bera test, the model meets the normality assumption on the

error term. With 1% significant level, there is a positive autocorrelation problem in consumption function of United States and inconclusive for consumption function of China.

Table 4.1: *Consumption Function*

	United States	China
α	0.8174*	-
	(0.4575)	
r_t	-0.6626***	-0.1074
	(0.1843)	(0.1377)
Y_t	0.9683***	0.1550*
	(0.0152)	(0.0836)
ϵ_t	-0.0087	-
	(0.0093)	
C_{t-1}	-	0.9432***
		(0.0556)
G_t	-	-0.1042**
		(0.0512)
Adjusted R^2	0.9987	0.9992
F-statistic	9292.136	-
Durbin-Watson stat	0.8886	1.1628
Ramsey stat	0.0192	0.0011
Jarque-Bera stat	0.8659	1.0090

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

Where α = intercept; r_t = natural log of real interest rate; Y_t = natural log of gross domestic product; ϵ_t = natural log of Real Effective Exchange Rate of Chinese Yuan against US Dollar; C_{t-1} = natural log consumption for last period; G_t = natural log of government spending

According to table 4.2, in the case of United States and China, if there is an increase in real interest rate, investor may decide to reduce their investment due to higher cost of borrowing. Real effective exchange rate of Chinese Renminbi against US Dollar are significantly negative correlated with investment in United States at the significant level of 10%. This indicates that when there is an appreciation in US Dollar, its import material become more expensive that will lose interest of investor to invest in United States.

If United States perform well in its previous year it will encourage investor to invest more with coefficient of 6.2512. It is the same story in China if China economy performs well, it will attract investor to invest in China. With 1% significant level,

China investment will be influenced by its last year investment. A country with many foreign investors implies that the country is performing well and attracting more investors to invest in future.

49.8% of the total variation of investment in United States can be explain by real interest rate, first difference of last period gross domestic product and first difference of exchange rate. About 99.72% of the total variation of investment in China can be explained by real interest rate, gross domestic product and last period investment. According to Jarque-Bera test, the model meets the normality assumption on the error term. With 1% significant level, there is a positive autocorrelation problem in investment function of United States and inconclusive for investment function of China.

Table 4.2: Investment function

	United States	China
α	28.6327***	-
	(0.0944)	
r_t	-12.9780***	-0.8753**
	(2.5794)	(0.3333)
Y_t	-	0.1965***
		(0.0654)
ΔY_{t-1}	6.2512**	-
	(2.2816)	
$\Delta \epsilon_t$	-0.7101*	-
	(0.4171)	
I_{t-1}	-	0.8004***
		(0.0677)
Adjusted R^2	0.4980	0.9972
F-statistic	12.2409	-
Durbin-Watson stat	0.6306	1.2648
Ramsey stat	0.4100	0.0002
Jarque-Bera stat	0.6890	1.0081

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

Where α = intercept; r_t = natural log of real interest rate; Y_t = natural log of gross domestic product; ΔY_{t-1} =Difference in natural log of gross domestic product for last period; $\Delta \epsilon_t$ = Difference in natural log of Real Effective Exchange Rate of Chinese Yuan against US Dollar; I_{t-1} = natural log of investment for last period

According to export function in table 4.3, it shows that real effective exchange rate of Chinese Renminbi against US Dollar has negative relationship with United States

export and positive relationship with China export at 1% significant level. This indicates that if US Dollar depreciates against Chinese Renminbi, it will leads to cheaper in export and therefore encourage more exports, vice versa. This concept also applicable in China, when Chinese Renminbi depreciates, there will be an increase in export volume.

Besides, the result shows that when the other nation impose additional tariff on their goods and services, it will negatively affect the other nation's export. Export of United States and China become expensive when there is tariff shock impose by another country at significant level of 5%. Import of previous year is positively correlated to current year export with coefficient of 0.3344 for United State and 0.0984 for China at 1% and 10% significant level respectively. The effect of export last period will bring over to the following year as consumer behaviour needs time to change. Thus, people will choose to continue to purchase export products in the next period to meet their satisfaction.

About 92.69% and 99.72% of the total variation of export in United States and China respectively can be explained by its variables. According to Jarque-Bera test, the model meets the normality assumption on the error term. With 1% significant level, there is no autocorrelation problem for export function of United States and China.

Table 4.3: Export function

	United States	China
α	16.8280***	-
	(1.2507)	-
ϵ_t	-0.6020***	0.3988***
	(0.0689)	(0.0727)
T^*_t	-0.4048**	-3.3809**
	(0.1748)	(1.2986)
M_{t-1}	0.3344***	0.0984*
	(0.0492)	(0.0522)
X_{t-1}	-	0.8768***
	-	(0.0528)
Adjusted R^2	0.9269	0.9972
F-statistic	102.4412	-
Durbin-Watson stat	1.7152	1.7225
Ramsey stat	0.7975	0.5571
Jarque-Bera stat	0.8322	1.1211

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

Where α = intercept; ϵ_t = natural log of Real Effective Exchange Rate of Chinese Yuan against US Dollar; T_t = Real Tariff Rate; M_{t-1} = natural log of import for last period; X_{t-1} = natural log of export for last period

In this study as written in table 4.4, the coefficients of real effective exchange rate of Chinese Renminbi against US Dollar are 0.4583 for United States 1% significant level. Based on this result, when US Dollar appreciates, US imports will also increase, vice versa. As tariff causes product prices to rise, tariff rates on imported goods will discourage their imports. If United States GDP rise, it means that the US economy is good and people are more capable of pursuing imports that offer more variety of goods.

The result for China's import reflects that the tariff imposed last year will positively affect the current import at 1% significant level. China is the largest trading country, so when there is an increase in tariff, other country might reduce their price to go in the market of China. In this case it does not hurt the import of China. Export of next period and government spending of China are positively correlated with import at 5% significant level with coefficient of 0.2378 and 0.1531 respectively. Intertemporal import are positive correlated as people need time to change their behaviour.

About 94.74% and 95.73% of the total variation of import in United States and China respectively can be explained by its variables. According to Jarque-Bera test, the model meets the normality assumption on the error term. With 1% significant level, there is a positive autocorrelation problem in import function of United States and no autocorrelation problem for import function of China.

Table 4.4: Import function

	United States	China
α	-17.5632***	-
	(2.3338)	
ϵ_t	0.4583***	-
	(0.0605)	
T_t	-1.8485*	-
	(0.9498)	
T_{t-1}	-	2.2739***
		(0.6425)
Y_t	1.3379***	-
	0.0763	
M_{t-1}	-	0.8334***
		(0.0605)
X_{t+1}	-	0.2378**
		(0.1035)
G_t	-	0.1531**
		(0.0576)
Adjusted R^2	0.9474	0.9573
F-statistic	145.0279	-
Durbin-Watson stat	0.6330	1.6579
Ramsey stat	0.0025	0.0043
Jarque-Bera stat	0.6890	3.9891

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

Where α = intercept; ϵ_t = natural log of Real Effective Exchange Rate of Chinese Yuan against US Dollar; T_t = Real Tariff Rate; T_{t-1} = Real Tariff Rate for last period; Y_t = natural log of gross domestic product; M_{t-1} = natural log of import for last period; X_{t+1} = natural log of export for forward period; G_t = natural log of government spending

According to the result generated for Taylor rule in table 4.5, it implied that Gross Domestic Product of United States has a positive relationship with real interest rate at 1% significant level. This occur as when economy is performing well, Central Bank will increase the real interest rate slow down the growth of the economy and reduce the impact of inflation. Real interest rate of the last period of the United

States and China are positively correlated with current real interest rates with coefficient of 0.8433 and 0.6311 respectively. This situation occur might be due to the effect of increasing in real interest rate will bring forward to the subsequent year. Previous consumption China and real interest rate has positive relationship at significant level of 5%.

Variables of real interest rate can explain the total variation of real interest rate well with 76.75% for United States and 25.07% for China. According to Jarque-Bera test, the model meets the normality assumption on the error term. With 1% significant level, there is no autocorrelation problem for Taylor rule model of United States and China.

Table 4.5: Taylor rule

	United States	China
α	0.0005	-0.0067
	(0.0031)	(0.0127)
r_{t-1}	0.8433***	0.6311**
	(0.0668)	(0.2553)
ΔY_t	0.2196***	-
	(0.0698)	
ΔC_{t-1}	-	0.1014**
		(0.0478)
Adjusted R^2	0.7675	0.2507
F-statistic	58.7666	6.6865
Durbin-Watson stat	1.4688	1.8622
Ramsey stat	0.2628	-
Jarque-Bera stat	4.1875	0.6480

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

Where α = intercept; r_{t-1}= natural log of real interest rate for last period; ΔY_t = Difference in natural log of gross domestic product; ΔC_{t-1} = Difference in natural log of consumption for last period

For uncovered interest parity condition in table 4.6, Real Effective Exchange Rate of Chinese Yuan against US Dollar is affected by its last year rate with coefficient of 0.7455 at significant level of 1%. The exchange rate is greatly affected by the exchange rate from the previous period. This is because changes in the exchange rate will affect people's expenditure efficiency, and will also affect the economy. So at the end the effect may also bring forward to next period.

The estimation for real interest rate of United States and the Real Effective Exchange Rate of Chinese Yuan against US Dollar is positively related while real interest rate of China will negatively affect Real Effective Exchange Rate of Chinese Yuan against US Dollar. However, the result shows that real interest rate for China and United States will not affect the Real Effective Exchange Rate of Chinese Yuan against US Dollar. According to Meese and Rogoff (as cited in Petrovic, 2013) found that real exchange rate and real interest rate differential theoretically there are relationship but it has no statistical significance. Real interest rate and real exchange rate are non-stationary and their cointegration is weak.

Variables of Real Effective Exchange Rate of Chinese Yuan against US Dollar can explain the total variation of Real Effective Exchange Rate of Chinese Yuan against US Dollar about 78.89%. According to Jarque-Bera test, the model meets the normality assumption on the error term. With 1% significant level, there is no autocorrelation problem for uncovered interest parity condition model of United States and China.

Table 4.6: Uncovered interest parity condition

	United States & China
α	0.4721***
	(0.0687)
ϵ_{t-1}	0.7455***
	(0.0687)
r^*_t	-0.4337
	(0.5996)
r_t	1.0011
	(0.6966)
Adjusted R^2	0.7889
F-statistic	43.3634
Durbin-Watson stat	1.8914
Ramsey stat	0.4084
Jarque-Bera stat	0.0418

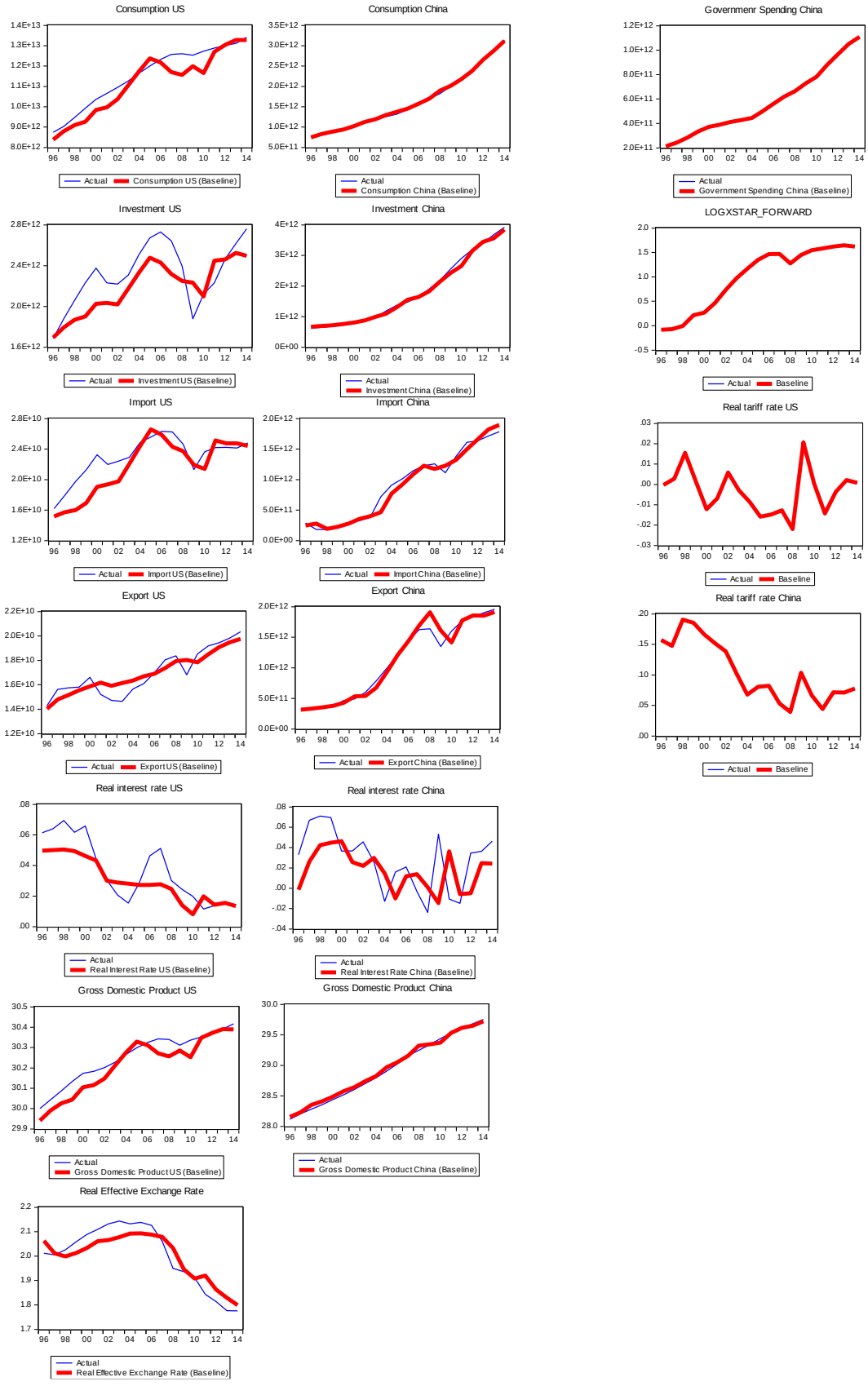
Note: ***, **,* indicates rejection of null hypothesis at 1%, 5% and 10% significant level. Standard Errors are in parentheses.

Where α = intercept; ϵ_{t-1} = natural log of Real Effective Exchange Rate of Chinese Yuan against US Dollar for last period; r^*_t = natural log of real interest rate for last period; r_t = natural log of real interest rate for last period

4.2 Static Simulation

After generate model for all endogenous variables, we proceed with static solution. Static solution used to look at how our models generated provide forecasts of one period in advance of all endogenous variables. Static solution is done by using the actual values of the model exogenous and lagging endogenous variables to see how our model predicts our historical data ("An Example Model", n.d.). The graphs in figure 4.1 show that the artificial data that we got can fit the actual of China's consumption, investment, import and export. For the other endogenous variables were also more or less the same and move in a same direction. These shows that the model generated are good enough to predict the real world with minimum error.

Figure 4.1: Static Simulation for All Endogenous and Exogenous Variables



4.3 Scenario Analysis

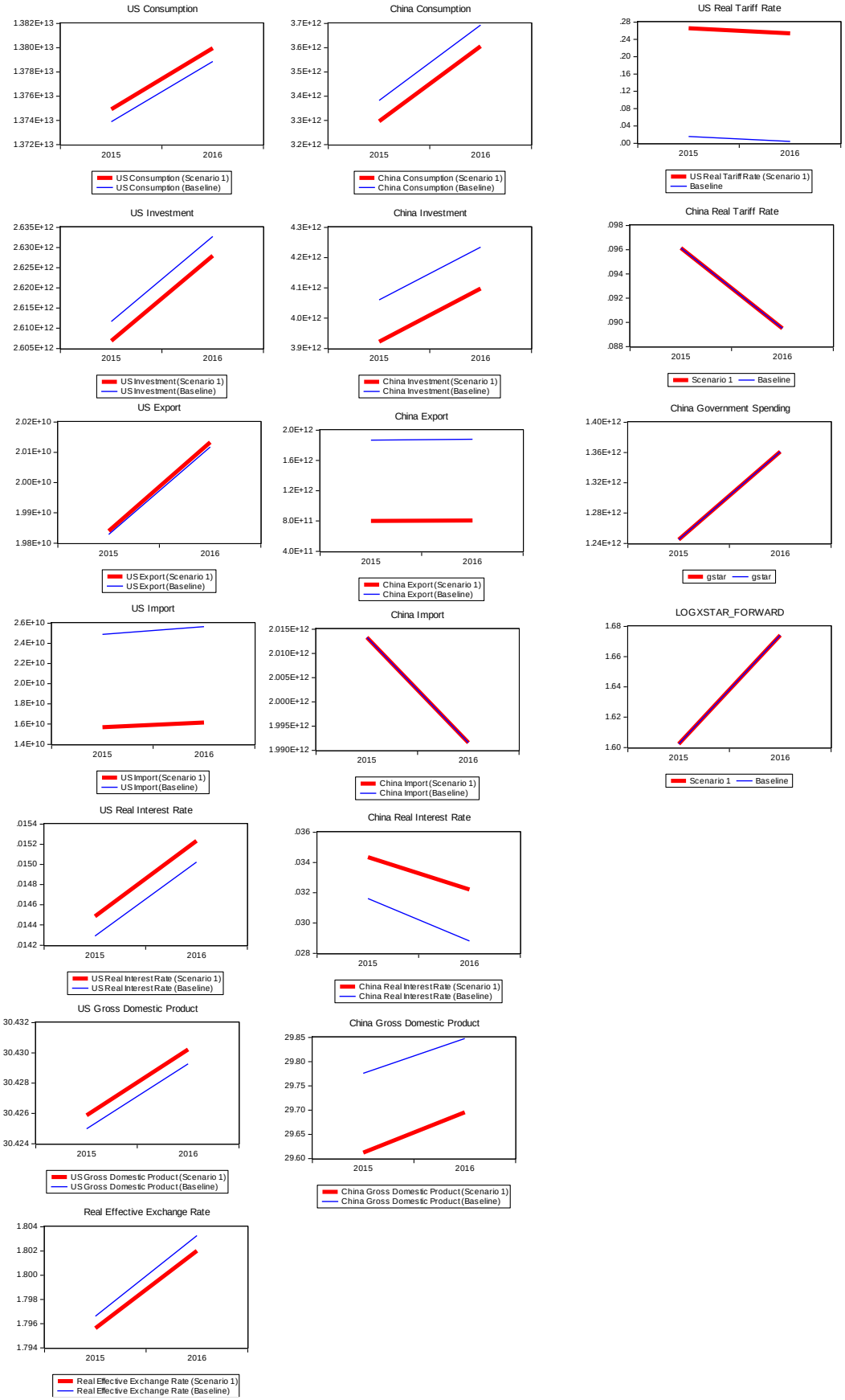
4.3.1 Scenario 1: The United States Imposes an Increase in 25% Tariff

In Figure 4.2, baseline (thinner line) represent situation where there is no additional tariff. Any line deviates from the baseline or demonstrate different slope indicates the impact of tariff on the economy. We derive scenario 1(thicker line) as the United States imposes an increase of 25% tariff.

United States consumption has a slight drop while oppositely consumption of China drops. Real interest rate of Unites States and China rise and it impact the investment negatively due to higher borrowing cost. The impact of real interest rate and investment for China is larger. When the United States imposes tariffs on its imports, it has a direct impact on imports. There is a large reduction in its import of United States at the same time export of China reduces due to less demand for its goods. The United States export and China import have not much different from the baseline. Besides, the exchange rate of Chinese Yuan against US Dollar drop which means there is a Chinese yuan appreciate against US Dollar. We can draw into a conclusion that the increase in tariff on United States' import lead to a better economy performance for United States based on the impact on gross domestic product but the results have caused the Chinese economy to deteriorate.

Finding 1: The United States imposes an increase of 25% tariff has a large negative effect on China economy but slight improve in its own country economy.

Figure 4.2: The United States Imposes an Increase in 25% Tariff



4.3.2 Scenario 2: China Retaliates by Imposing an Increase in 25% Tariff

In Figure 4.3, scenario 1 (thinner line) represent the effect of imposes tariff by United States. We derive scenario 2 (thicker line) as China imposes an increase in 25% tariff for revenge the action of United States in Figure 4.3.

After China imposed a 25% tariff, it has little impact on the United States. Consumption of United States has fallen slightly but China consumption increase in a slower rate. The real interest rate in the United States has fallen and has led to an increase in its investment. China's real interest rate rose slightly, but it has a great impact on its investment. Imports from the United States and export of China have little impact. When China takes retaliation action by imposing tariff, it affect United States export but we can see that import of China has increase, is not hurt of the impose of tariff. This might be due to China is a largest trading country so when China impose tariff, China benefit from it. The exchange rates of the two countries have not changed.

We can see that the estimated line of economic performance drop hardly. The overall change has large impact to the China economy. China is in a deteriorating economic situation when raising import tariffs.

Finding 2: When China retaliate by imposes another 25% tariff on United States imported goods, United States economy drop slightly but China itself hurt the most in this retaliation as its economy worsen even further.

Figure 4.3: China Retaliates by Imposing an Increase in 25% Tariff

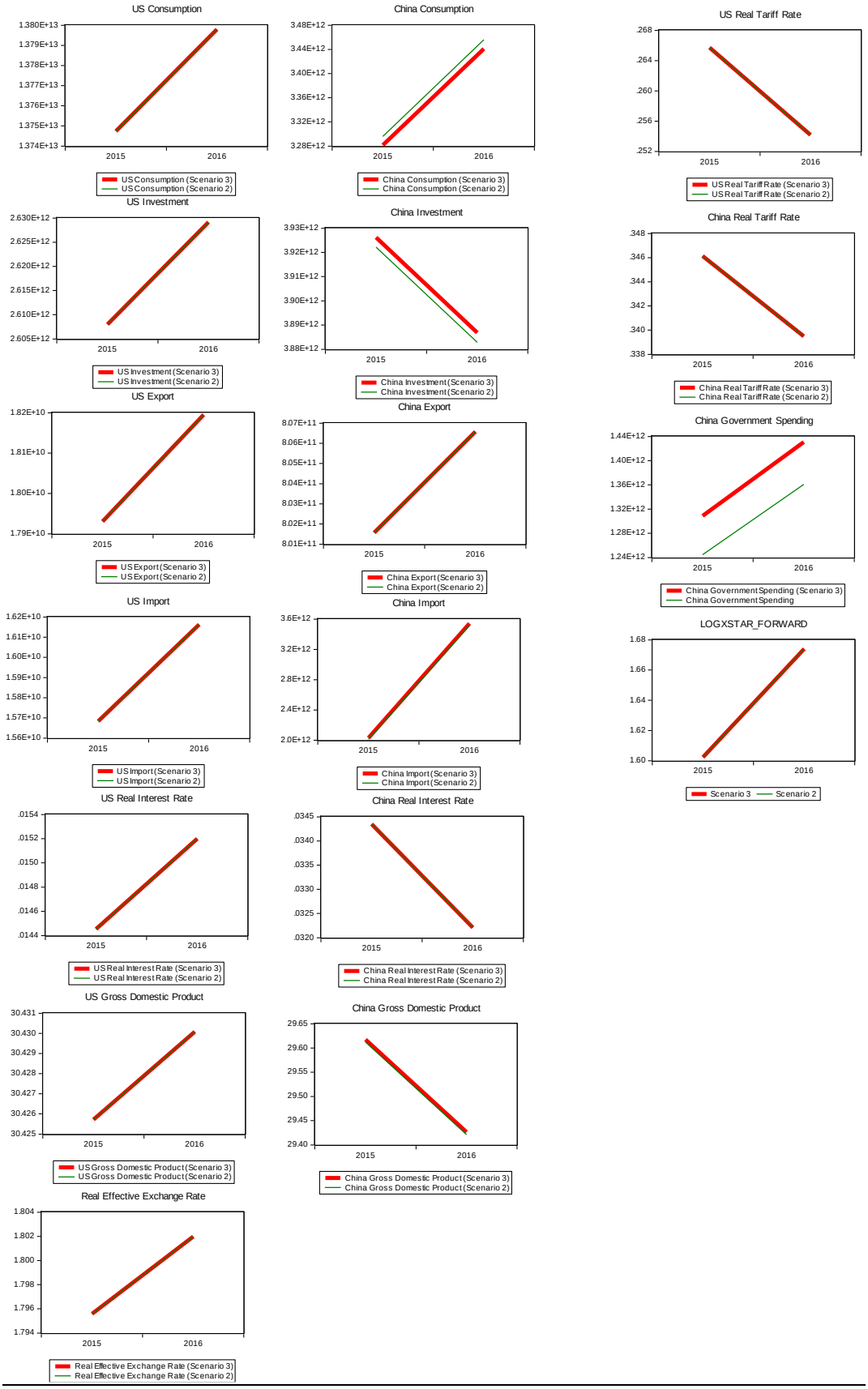
4.3.3 Scenario 3: China Increases Government Spending of 5%

In Figure 4.4, scenario 2 (thinner line) represents the situation when China imposed tariff. We derive scenario 3 (thicker line) as China government increases in government spending (expansionary fiscal policy) to see whether the implementation of government policy can improve the adverse effects on China in Figure 4.4.

Figure 4.4 shows that there is a drop in China consumption but increase in Investment. The endogenous variable other than consumption and investment there are no changes. There also no impact on United States economy and its variable. There is a mint rise in China gross domestic product. The implementing of expansionary fiscal policy has less help in stabilize the economy of China.

Finding 3: China can use expansionary fiscal policies to improve its economy but the effect is small.

Figure 4.4: China Increases Government Spending of 5%



4.3.4 Scenario 4: The End of Trade War and China Increases Government Spending of 5%

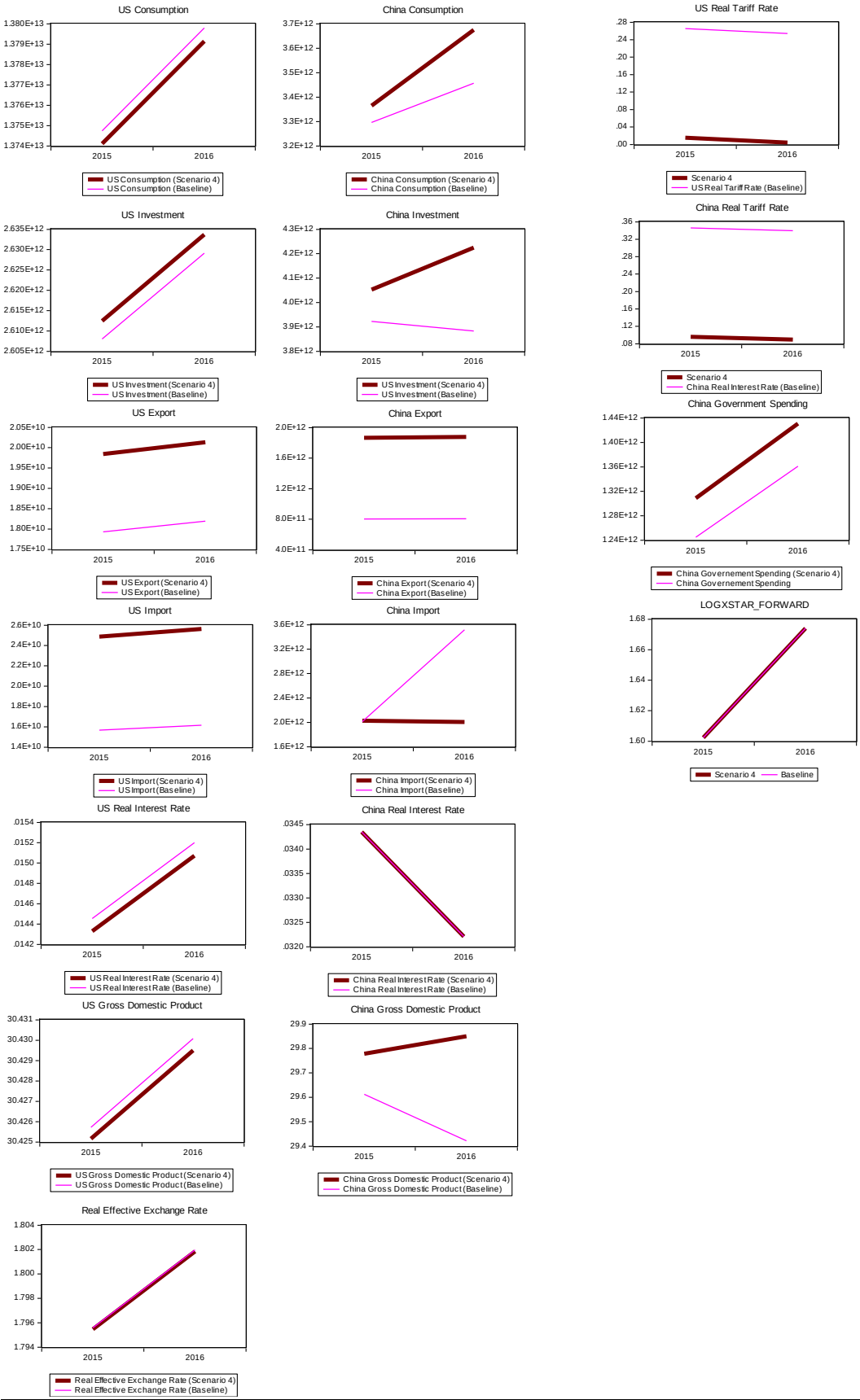
In Figure 4.5, Baseline (thinner line) represents the situation when tariff is absent. We derive scenario 4 (thicker line) as when two country decide to stop trade war and China government increases in government spending (expansionary fiscal policy) to see whether the implementation of government policy can improve the adverse effects after trade wars on China in Figure 4.5.

The results show that the Chinese economy will improve. Consumption and investment of China will be better off, but for United States it reduces the consumption of US citizen. Both countries' exports have grown substantially, which will benefit the country itself. The import of United States rise but drop in import of China. Real interest rate of United States falls but no changes for the case of China. There is no changes in the exchanges rate of both nations.

As far as China is concerned, there are some visual effects that are lower the US economy but China has a better performance. This scenario suggest that China government can solve the effect of economy worsen better by implementing expansionary fiscal policy with discussion with United States to stop trade war.

Finding 4: After the stop of trade war, China can use expansionary fiscal policies to improve its economy. An increases in government spending can minimize the impact of trade wars.

Figure 4.5: The End of Trade War and China Increases Government Spending of 5%



CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

In this Chapter, we are going to summarise on our research. Trade war has been happening frequently in the past century. The US-China trade war has brought up the world's awareness and currently is the hottest issues for plenty of merchants and economists. The impact of trade war have always been uncertain and subsequently leads those affected merchants put their concern on this. Thus, this driven us to explore the impact of tariff war on the economy from the general equilibrium perspective. In the following section, we would make a summary, and suggest few policy implementation for China to ease their pain, and list out our limitation and end our research by provide recommendation for future studies.

5.1 Discussion of Major Findings

The main purpose of our study is to analyse the impact of trade war for both United States and China's economy from general equilibrium perspective. We did achieve all of the 3 objective as we pointed out in Chapter 1. First, we studied the overall impact of trade war between United States and China in Chapter 4. Second, we identified the repercussion effect of trade war on the economy of United States and China. Third, we also conducted scenario analysis to understand under what scenario the macroeconomic impacts of trade war could be moderated or escalated.

There must be some reason for us to conduct this research. We notice that throughout the past studies about trade war, numerous researches focus more on explaining the impact of tariff war from partial equilibrium perspective, which only analyse some part of the market, assuming other factor remains fixed. However, in fact, the impact of trade war doesn’t stop on merely one sector, it will bring a repercussion effect to the economy. Thus, we aim to establish the impact of US-China's trade war as a whole.

Therefore, in our methodology, we tried to build a model to meet our objective. We have constructed general equilibrium model for both United States and China respectively. This is to capture the impact of all markets and their interaction at the same time rather than single market. Endogenous variable for the model are consumption, investment, export, import, interest rate and exchange rate. Exogenous variable for this model is tariff rate and government spending. For our model, we used ordinary least square to determine unknown parameters. Regarding our data collection, we are actually using secondary data and most of the data are collected from World Bank, Asian Development Bank (ADB), Organisation for Economic Co-operation and Development (OECD) and Federal Reserve Bank of St. Louis for this study. Our data set is sort by annually from 1950 to 2018.

Following to scenario analysis, we did have four different scenario in total. At the beginning we conducted only two scenario analysis to know the impact of tariff imposed to both US and China economy. While the third scenario analysis is to examine whether does it benefits China's economy from trade war, if China increases its government spending, or implement expansionary fiscal policy. The forth scenario examine what could happen if trade war has come to the end at the same time China implement expansionary fiscal policy. For the first two results, we found that no matter which country imposes tariff on each other, it will still have larger impact on China's economy, which causes its economy to deteriorate as compared to US. In the other hand, we derive the third scenario analysis and found that implementing expansionary fiscal policy do not help China economy a lot, China economy only slightly better compared to scenario two. However, from scenario four, China is suggested to solve the adverse effects of trade wars on China by implementing expansionary fiscal policy with the discussion with US to stop this trade war.

5.2 Policy Implication of the Study

After examine the overall impact of trade war from general equilibrium perspective and from scenario analysis, our results showed that China in the end will still deteriorating more in economy than US regardless of tariff imposed from US towards China or China itself to US. Therefore, this leads us to conduct the third scenario analysis to know that could China minimize the impact of trade war to their economy by increasing their government spending.

From the results of third scenario analysis, it is suggested that China could reduce the adverse effects of trade war by increasing in government spending or implementing expansionary fiscal policy. The results shows that China would be better off where people may willing to invest more in China since China government may spend more in facilitate the country's welfare. Although the rise in imports and real interest rate is not a good situation, however, since it does not worsen the economy, it can be said that it may only bring minimal effect towards China overall performance.

In spite of that, the best way to slow down the negative impacts of trade war is by conducting negotiation among both countries to stop the trade war. This is not only to benefits China or US, but also to the economies of both countries.

5.3 Limitation, Future Research, Conclusion

In fact, we are facing data constraint issues because of insufficient sample size. It is quite challenge for us to have an unanimous data set from 1960 to 2018 for every endogenous and exogenous variable due to inadequate qualification to access those data. With a smaller sample size, it could reduce the power of the study and increases the margin of error.

Inability to analyze the impact of United States and China trade war on other related country would be one of our weaknesses. In this research, we did concentrate on

what could happen to United States and China's economic situation. Indeed, this trade war would bring subsequent impact to the rest of the world.

Future researchers are advice to capture the impact of this trade war to the rest of the world and furthermore come out with action plan to react with this trade war. Future researchers could also create more different scenario to see what is going to happen.

In conclusion, China would hurt the most in this trade war. China eventually would have negative impact far more than United States do if United States imposes additional 25% on China import. We presume China take retaliate action by impose 25% on United States' import, in such situation, China have to pay for what it have done, and China would suffer again. China expansionary fiscal policy only works better in improving economy growth if the negotiation for the stop of trade war is successful.

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APPENDICES

Appendix A: *Consumption Function of United States*

Dependent Variable: LOG(C01)
Method: Least Squares
Date: 01/31/19 Time: 09:31
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.817365	0.457458	1.786754	0.0835
LR	-0.662622	0.184300	-3.595349	0.0011
LY	0.968250	0.015202	63.69040	0.0000
LYUANDOLLAR	-0.008702	0.009282	-0.937412	0.3556

R-squared	0.998853	Mean dependent var	29.87190
Adjusted R-squared	0.998746	S.D. dependent var	0.294319
S.E. of regression	0.010423	Akaike info criterion	-6.185201
Sum squared resid	0.003476	Schwarz criterion	-6.009255
Log likelihood	115.3336	Hannan-Quinn criter.	-6.123791
F-statistic	9292.136	Durbin-Watson stat	0.888573
Prob(F-statistic)	0.000000	Wald F-statistic	5560.705
Prob(Wald F-statistic)	0.000000		

Appendix B: *Consumption Function of China*

Dependent Variable: LOG(CSTAR)
Method: Least Squares
Date: 02/08/19 Time: 23:38
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CSTAR(-1))	0.943243	0.055592	16.96721	0.0000
LYCHINA	0.154959	0.083569	1.854264	0.0727
LOG(GSTAR)	-0.104233	0.051193	-2.036089	0.0498
LRCHINA	-0.107400	0.137691	-0.780006	0.4409

R-squared	0.999310	Mean dependent var	27.52523
Adjusted R-squared	0.999247	S.D. dependent var	0.898976
S.E. of regression	0.024663	Akaike info criterion	-4.465229
Sum squared resid	0.020073	Schwarz criterion	-4.291076
Log likelihood	86.60674	Hannan-Quinn criter.	-4.403832
Durbin-Watson stat	1.162855		

Appendix C: *Investment Function of United States*

Dependent Variable: LOG(I)
Method: Least Squares
Date: 01/31/19 Time: 00:01
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	28.63268	0.094449	303.1533	0.0000
LR	-12.97796	2.579448	-5.031295	0.0000
D(LY(-1))	6.251189	2.281581	2.739850	0.0101
D(LYUANDOLLAR)	-0.710083	0.417104	-1.702412	0.0987

R-squared	0.542251	Mean dependent var	28.21472
Adjusted R-squared	0.497953	S.D. dependent var	0.367383
S.E. of regression	0.260310	Akaike info criterion	0.253324
Sum squared resid	2.100601	Schwarz criterion	0.431078
Log likelihood	-0.433170	Hannan-Quinn criter.	0.314685
F-statistic	12.24092	Durbin-Watson stat	0.630606
Prob(F-statistic)	0.000019	Wald F-statistic	19.94371
Prob(Wald F-statistic)	0.000000		

Appendix D: *Investment Function of China*

Dependent Variable: LOG(ISTAR)
Method: Least Squares
Date: 02/08/19 Time: 23:46
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ISTAR(-1))	0.800418	0.067749	11.81449	0.0000
LRCHINA	-0.875292	0.333285	-2.626256	0.0129
LYCHINA	0.196489	0.065387	3.005016	0.0050

R-squared	0.997316	Mean dependent var	27.43144
Adjusted R-squared	0.997158	S.D. dependent var	1.112844
S.E. of regression	0.059328	Akaike info criterion	-2.733882
Sum squared resid	0.119672	Schwarz criterion	-2.603267
Log likelihood	53.57681	Hannan-Quinn criter.	-2.687834
Durbin-Watson stat	1.264800		

Appendix E: *Import Function of United States*

Dependent Variable: LOG(M)
Method: Least Squares
Date: 01/31/19 Time: 00:03
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.56322	2.333829	-7.525499	0.0000
LYUANDOLLAR	0.458287	0.060511	7.573657	0.0000
RT	-1.848546	0.949828	-1.946190	0.0651
LY	1.337926	0.076347	17.52438	0.0000

R-squared	0.953956	Mean dependent var	23.78083
Adjusted R-squared	0.947378	S.D. dependent var	0.222988
S.E. of regression	0.051152	Akaike info criterion	-2.962373
Sum squared resid	0.054948	Schwarz criterion	-2.767353
Log likelihood	41.02966	Hannan-Quinn criter.	-2.908283
F-statistic	145.0279	Durbin-Watson stat	0.633039
Prob(F-statistic)	0.000000	Wald F-statistic	111.3464
Prob(Wald F-statistic)	0.000000		

Appendix F: *Import Function of China*

Dependent Variable: LOG(MSTAR)
Method: Least Squares
Date: 02/09/19 Time: 00:06
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MSTAR(-1))	0.833434	0.060460	13.78479	0.0000
LOGXSTAR_FORWARD	0.237763	0.103523	2.296708	0.0326
RTCHINA(-1)	2.273876	0.642483	3.539198	0.0021
LOG(GSTAR)	0.153072	0.057623	2.656446	0.0152

R-squared	0.962855	Mean dependent var	27.22339
Adjusted R-squared	0.957283	S.D. dependent var	0.846423
S.E. of regression	0.174939	Akaike info criterion	-0.497750
Sum squared resid	0.612071	Schwarz criterion	-0.301408
Log likelihood	9.973004	Hannan-Quinn criter.	-0.445661
Durbin-Watson stat	1.657863		

Appendix G: *Export Function of United States*

Dependent Variable: LOG(X)
Method: Least Squares
Date: 01/31/19 Time: 13:58
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.82803	1.250735	13.45452	0.0000
LYUANDOLLAR	-0.601982	0.068926	-8.733728	0.0000
RTCHINA	-0.404841	0.174810	-2.315891	0.0308
LOG(M(-1))	0.334361	0.049195	6.796694	0.0000

R-squared	0.936039	Mean dependent var	23.51472
Adjusted R-squared	0.926901	S.D. dependent var	0.161184
S.E. of regression	0.043579	Akaike info criterion	-3.282836
Sum squared resid	0.039882	Schwarz criterion	-3.087816
Log likelihood	45.03545	Hannan-Quinn criter.	-3.228746
F-statistic	102.4412	Durbin-Watson stat	1.715188
Prob(F-statistic)	0.000000	Wald F-statistic	215.6063
Prob(Wald F-statistic)	0.000000		

Appendix H: *Export Function of China*

Dependent Variable: LOG(XSTAR)
Method: Least Squares
Date: 02/08/19 Time: 23:38
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(XSTAR(-1))	0.876821	0.052814	16.60215	0.0000
LYUANDOLLAR	0.398838	0.072702	5.485949	0.0000
RT	-3.380856	1.298559	-2.603545	0.0166
LOG(MSTAR(-1))	0.098390	0.052222	1.884065	0.0735

R-squared	0.992796	Mean dependent var	27.36513
Adjusted R-squared	0.991767	S.D. dependent var	0.849751
S.E. of regression	0.077105	Akaike info criterion	-2.141661
Sum squared resid	0.124847	Schwarz criterion	-1.946641
Log likelihood	30.77077	Hannan-Quinn criter.	-2.087571
Durbin-Watson stat	1.722483		

Appendix I: *Taylor Rule for United States*

Dependent Variable: LR
Method: Least Squares
Date: 01/31/19 Time: 00:06
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000475	0.003125	0.152113	0.8800
LR(-1)	0.843262	0.066820	12.61984	0.0000
D(LY)	0.219607	0.069824	3.145146	0.0035

R-squared	0.780779	Mean dependent var	0.045157
Adjusted R-squared	0.767493	S.D. dependent var	0.021491
S.E. of regression	0.010363	Akaike info criterion	-6.221578
Sum squared resid	0.003544	Schwarz criterion	-6.089618
Log likelihood	114.9884	Hannan-Quinn criter.	-6.175520
F-statistic	58.76657	Durbin-Watson stat	1.468821
Prob(F-statistic)	0.000000	Wald F-statistic	161.3792
Prob(Wald F-statistic)	0.000000		

Appendix J: *Taylor Rule for China*

Dependent Variable: LRCHINA
Method: Least Squares
Date: 02/12/19 Time: 13:25
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.012206	0.020978	-0.581833	0.5646
LRCHINA(-1)	0.518345	0.161116	3.217228	0.0029
D(LOG(CSTAR(-1)))	0.249951	0.223153	1.120088	0.2708

R-squared	0.238868	Mean dependent var	0.019638
Adjusted R-squared	0.192738	S.D. dependent var	0.034312
S.E. of regression	0.030828	Akaike info criterion	-4.041110
Sum squared resid	0.031363	Schwarz criterion	-3.909150
Log likelihood	75.73998	Hannan-Quinn criter.	-3.995053
F-statistic	5.178223	Durbin-Watson stat	1.858209
Prob(F-statistic)	0.011069		

Appendix K: *Uncovered Interest Parity Condition*

Dependent Variable: LYUANDOLLAR
Method: Least Squares
Date: 01/31/19 Time: 00:06
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LYUANDOLLAR(-1)	0.745543	0.068650	10.86002	0.0000
LRCHINA	-0.433648	0.599606	-0.723222	0.4750
LR	1.001085	0.696606	1.437090	0.1607
C	0.472092	0.145372	3.247472	0.0028

R-squared	0.807561	Mean dependent var	1.938207
Adjusted R-squared	0.788938	S.D. dependent var	0.194652
S.E. of regression	0.089426	Akaike info criterion	-1.883604
Sum squared resid	0.247906	Schwarz criterion	-1.705850
Log likelihood	36.96306	Hannan-Quinn criter.	-1.822243
F-statistic	43.36343	Durbin-Watson stat	1.891352
Prob(F-statistic)	0.000000	Wald F-statistic	69.53173
Prob(Wald F-statistic)	0.000000		

Appendix L: *Real Tariff of United States*

Dependent Variable: D(RT)
Method: Least Squares
Date: 01/30/19 Time: 23:38
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RT(-1)	-0.725621	0.244988	-2.961860	0.0070

R-squared	0.369530	Mean dependent var	-0.000229
Adjusted R-squared	0.369530	S.D. dependent var	0.013162
S.E. of regression	0.010451	Akaike info criterion	-6.243481
Sum squared resid	0.002512	Schwarz criterion	-6.194396
Log likelihood	75.92177	Hannan-Quinn criter.	-6.230459
Durbin-Watson stat	1.972466		

Appendix M: *Real Tariff of China*

Dependent Variable: RTCHINA3
Method: Least Squares
Date: 01/30/19 Time: 23:34
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RTCHINA3(-1)	0.838797	0.075165	11.15942	0.0000

R-squared	0.615485	Mean dependent var	0.113135
Adjusted R-squared	0.615485	S.D. dependent var	0.053799
S.E. of regression	0.033360	Akaike info criterion	-3.922140
Sum squared resid	0.025597	Schwarz criterion	-3.873054
Log likelihood	48.06568	Hannan-Quinn criter.	-3.909117
Durbin-Watson stat	1.453697		