**Dissertation for the Degree of Doctor of Philosophy**

# The Effects of Exchange Rate, Labor Skill and Product Quality on Vietnam's Trade: An Industry Level Analysis

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Pukyong National University

August 2019

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# 환율, 노동기능과 제품질량이 베트남 무역에 대한 영향: 업종종층차분석

Advisor: Prof. Utai Uprasen

by

Yan Tan

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Pukyong National University

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# Abstract

*This thesis scrutinizes three issues. Firstly, it explores the effect of fluctuations in the exchange rate of Vietnamese Dong (VND) and the composition of labor skill on Vietnam's trade balance with selected trading partners, over the period 2001 to 2016. Our results indicate statistically significant effect of the depreciation of VND on promoting Vietnam's trade balance. However, the effect is not obvious. We also find out that the depreciation of the VND worsens the trade deficit of the high labor-skill produced commodities, and medium-skill white collar labor-produced commodities. We further prove that climbing up the labor skill ladder and facilitating the none-price competitiveness of the high labor-skill produced commodities and medium-skill white-collar labor-produced commodities can have a positive impact Vietnam's total trade balance. Nevertheless, boosting the low-skill labor-produced commodities and medium-skill blue collar-labor produced commodities can hardly contribute to Vietnam's total trade balance.*

*Secondly, the thesis empirically investigates the impacts of the intra-industry trade and products quality on the exchange rate pass-through (ERPT) into Vietnam's import prices from China, using annual data from 2001 to 2016. The weighted GL index reveals a deepening degree of intra-industry trade between Vietnam and China. We also detect that the quality of goods which Vietnam export to China is generally lower than the quality of goods China export to Vietnam, based on the results of Kernel density estimations. The regression results based on fixed effect model suggest that the increase of intra-industry trade between Vietnam and China reduces the effect of exchange rate on Vietnam's import prices from China. Moreover, the goods quality has a significant impact on the ERPT in Vietnam's import prices from China. More specifically, the lower quality commodities of Vietnam in relative to China have higher ERPT effects into the import prices than the higher quality commodities. In addition, no significant impact of the horizontal intra-industry trade on the ERPT can be documented.*

*Thirdly, the thesis examines the asymmetric effects of exchange rate movements on Vietnam's import prices from China. Specifically, the experiments are conducted at an industry level by using the Non-Linear Auto Regressive Distributed Lags (ARDL) model. The sample data is monthly covering from July 2011 to December 2017. We find that the ERPT into import prices are heterogenous across industries. The asymmetric ERPT effects are detected in many industries. The import prices of 35 industries react more sensitively to the appreciation of VND against Chinese Ren Min Bi (RMB), while the prices of other 22 are more sensitive to the depreciation of VND.*

# Dedication

致父母，
To my parents

爸爸妈妈，家赋予了我无穷的力量
Home gives me infinite power.

妈妈，感谢您因为爱，将我带到这美好的世界。
To my mother, thank you for bringing me into this beautiful world, because of love

爸爸，您永远是我人生的楷模，感谢您一直为我们遮风挡雨。
To my father, you are always my role model, thank you for sheltering mom and me from the winds and rains of life.

我将这份最珍贵的礼物献给你们，从今天开始，请允许我为你们张开双臂。
This thesis is a most special and valuable gift from your only daughter, now it is time for me to open my arms for you.

爸爸妈妈，我爱你们！
I love you.

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# Chapter 1 Introduction

## 1.1 Background and Motivations

As a crucial tool of a Country's monetary policy, exchange rate policy has been implemented by many central banks in the world to intervene a country's economic and to achieve financial goals.

As the rapid pace of the international integration of Vietnam, her foreign currency markets, as well as the amount of currency in circulation, will be strongly affected. Owning to the interactions and connections between the domestic and the global market, slight alterations of the exchange rate in the international market can result in massive change in the local market of Vietnam. As a result, the capacity of Hanoi to manage the exchange rate will be challenged.

The failures of monetary policy can cause serious consequences. One of the main driving factors of the finical recessions in the 1990's is believed to be the inflexible monetary policy put forward by central banks.

For example, in the early 1990's, the East and West Germany merged. To develop the economics in the eastern region, Germany increased her discount rate in 1992. As a result, the German Mark exchange rate began to rise, resulting in a one-year turbulence in the European exchange rate mechanism.

Another example is the Mexico finial crisis in 1994. On December 1994, Mexico suddenly announced that the change range of Mexican Peso against the US Dollar would be expanded to 15. This move has triggered a crisis of confidence in the market. The Mexican Peso was sold off and depreciated by 30 in early 1995. Accordingly, it has caused the fall of the stock market, the increasing inflation rate, the reduced domestic demand, the business failure and the increasing unemployment rate.

The well-known Asian finial crisis also originated from the depreciation of the currency. The domino effect created by the sharp devaluation of Thailand's currency finally spread the crisis to a wide range of the world. The Russian financial crisis in 1998, the Brazil financial crisis in 2000 and the more recent finial crisis in 2008-which has slowed down a global recovery-are also connected to the unsuccessful monetary policy.

The above cases have told a story about how significant the exchange rate can be to a country. Vietnam, as a new burgeoning economy, the exchange rate not only has impacts on imports and exports but also has impacts on the national debt, gross domestic product, inflation, trade balance, foreign direct and indirect investment and the public confidence.

When the exchange has experienced unfavorable fluctuation, the National Bank of Vietnam has implemented a series of policies to intervene. The followings are some examples. In March 2009, the National Bank of Vietnam expanded the exchange rate range to (-5, 5). In February 2010, the change range was adjusted to (-3, 3). In April 2010, then it was required that all head offices and company groups sold the foreign currencies to the National Bank of Vietnam. At the same time, Vietnamese authorities strictly controlled the foreign exchange transactions. The National Bank of Vietnam has adjusted the interbank exchange rate to rise to 2, and the Vietnamese Dong (VND) depreciated from 18544 VND per US Dollar (USD) to 18932 VND per USD. With these solutions, the foreign exchange market has gradually been stabilized, and the gap of the exchange rate between the official market and the free market has been narrowed down. As a result, the finance market has been gradually standardized.

Owing to the implementation of a flexible exchange rate policy by the National Bank of Vietnam, the exchange rate has been stabilized since 2012. Also, the improved trade balance has contributed to the stabilization of exchange rate. In summary, the research on the exchange rate is with great significance to Vietnam's economic improvement.

## 1.2 Objectives and Contributions

### 1.2.1 Objectives

This thesis has the following objectives. Keeping in view the significant role of exchange rate on Vietnam, and to propose comprehensive and effective exchange rate policies and developing policies to promote Vietnam's trade performance, this thesis aims to estimate the effects of exchange rate on Vietnam's trade performance.

Firstly, we consider the labor skill composition when we quantify the impacts of exchange rate on the balance of trade of Vietnam, because labor skill is an essential factor for a developing economy like Vietnam.

Secondly, we are keen to explore whether the exchange rate pass-through into Vietnam's import prices from China are affected by the degree of intra-industry trade and product quality.

Thirdly, we intend to examine whether the heterogeneities of exchange rate pass-through into Vietnam's import prices from China come from different industries. Fourthly, we aim to explore the non-linear effects of exchange rate pass-through into Vietnam's import prices from China.

To be more specific, **chapter 3** aims to analyze the effects of exchange rate and labor still on Vietnam's trade balance with her main trading patterner, from 2001 to 2016. In **chapter 4**, we calculate the dynamic patterns of Vietnam's intra-industry trade with China and intend to explore the effects of exchange rate and the degree of intra-industry trade on Vietnam's import prices from China, on an aggregated level. The primary purpose of **chapter 5** is to investigate asymmetric exchange rate pass-through into Vietnam's import prices from China. More specifically, the examinations will be applied to an industry level to solve the aggregation bias.

### 1.2.2 Contributions

Thus, differing from the existing researches, in **Chapter 3** we analyze the influences of exchange rate on the balance of Vietnam's trade with her twenty main trading partners. Specifically, it is the first work to examine the exchange rate effects on an industry level based on labor skill classification. This chapter is also the first work to test whether the labor skill composition and non-price competitiveness affect Vietnam's trade balance.

In **chapter 4**, firstly we decompose Vietnam's trade with China by different types of intra-industry trade, using the most recent 6-digit Harmonized System (HS) trade data, from 2001~2016. Then we test the exchange rate pass-through into Vietnam's import prices from China from the perspective of intra-industry trade.

The contributions from **chapter 5** are as follows. Firstly, we estimate the exchange rate pass-through into Vietnam's import prices from China at an industry level, overcoming the aggregation bias. Second, the asymmetric exchange rate pass-through effect is investigated by the most recent econometric technique non-linear ARLD.

## 1.3 Methodology

In chapter 3, to investigate the composition of labor skill on Vietnam's trade balance, we have followed the labor skill classification of merchandise trade proposed by Peneder (1999). To test the non-price competitiveness of industry on Vietnam's trade balance, we apply the revealed comparative advantages (RCA) index, which is initially invented by Balassa (1965) and modified by Dettmer et al. (2009), Kowalski and Dihel (2009) and Bhat et al. (2008). Finally, we implement a modified version of the Kundu (2015) framework of the gravity model, which takes the relative forms of the standard gravity variables. The model of Kundu (2015) is argued to be more effective for developing countries which can hardly gain trade surplus.

In **chapter 4**, to examine the degree of intra-industry trade between Vietnam and China, we compute the weighted Grubel and Lloyd (GL) index, which is initially from Grubel and Lloyd (1971). The GL index is calculated from the HS 6-digit level. In order to decompose the inter-industry and intra-industry trade, we apply the AER index put forward by Abd-el-Rahman (1991). We further compute the percentages of Vietnam's vertical and horizontal intra industry trade, by following the unit value index premised by Stiglitz (1987) and supported by abundant of literature (Azhar and Elliott 2008a, 2008b; Aturupane, Djankov, and Hoekman 1999; Flam and Helpman 1987). To test the exchange rate pass-through into Vietnam's import prices from China based on the intra-industry trade, we lastly adopt the conventional fixed effect model for panel data.

In **chapter 5**, we apply the new methodology invented by Shin, Yu, and Greenwood-Nimmo (2014) called the non-linear ARDL, by which to explore the asymmetric exchange rate pass-through into Vietnam's import prices from China, at an industry level. We aim to overcome the aggregation bias and explore the asymmetries effects of ERPT.

## 1.4 Summary of The Findings

The major findings of chapter 3 are as follows.

Firstly, exchange rate plays a very limited role on Vietnam's trade balance. Depreciation of the VND will deteriorate the trade balance of high-skill labor-produced commodities and medium-skill white-collar labor-produced commodities. The underlying reason is that Vietnam does not have competitiveness in these two groups. The exports of these two groups depend heavily on the imported intermediate goods. Secondly, in recent years, Vietnam's exports to most of her main trading partners are moving up the labor skill ladder, which is proved by the increasing export shares of high-skill labor-produced commodities and medium-skill white-collar labor-produced commodities. The RCAs of these two groups vis-à-vis most of her trading partners witness improving patterns, as well. Thirdly, our empirical findings support that optimizing the trade structure and improving the none-price competitiveness of high-skill labor-produced commodities and medium-skill white-collar labor-produced commodities are crucial to improve Vietnam's trade balance. Lastly, the other results of the gravity model also indicate that the relative GDP and the import weighted distance have negative impact on Vietnam's trade balance, whereas the relative income has a positive effect on the trade balance of Vietnam.

The finding of chapter 4 are as follows.

According to the results of the weighted GL index, the degree of intra-industry trade between Vietnam and China is increasing, from 2001 to 2016. The vertical intra-industry trade accounts for more than 80 percent of the intra-industry trade between Vietnam and China. However, the percentage of high quality vertical intra-industry trade is still quite low between

Vietnam-China trade. In general, the goods quality Vietnam export to China is lower than the goods quality China export to Vietnam, according to the Kernel density estimations.

According to the results of the estimated equations, firstly we find out that the deepening of intra-industry trade between Vietnam and China weakens the impact of exchange rate on Vietnam's import prices from China. Secondly, the goods quality plays a significant role on the ERPT in Vietnam's import prices from China. More specially, the lower quality commodities of Vietnam in relative to China have higher ERPT effects into the import prices than the higher quality commodities. Thirdly, we cannot detect any impact of the horizontal intra-industry trade on the ERPT.

The findings of chapter 5 are as follows.

Firstly, the long-run nonlinear pass-though is that for 35 industries, once the VND appreciates against RMB, the import prices of these products from China to Vietnam will decline when the import prices stay relatively stable when VND depreciates against RMB. In other words, for these industries, once RMB depreciates, the Chinese products will have more advantages in price in the Vietnam market. It may somehow deteriorate the trade imbalance between both countries. When RMB appreciates, Chinese exporters tend to adjust the profit-markup and stabilize the prices in Vietnam, to maintain the market share.

Secondly, another crucial finding is that in 22 industries, the import prices of Vietnam from China response more sensitively to the real depreciation than appreciation of VND. It indicates when VND depreciates against RMB, the import products of these industries will be more expensive, while the appreciation of VND could slightly or could not make these products cheaper in the Vietnam domestic market. Alternately, exporters may encounter quantity constraints or high adjustment cost

To summary, exporters of China adopt the asymmetric pricing strategy in Vietnam, based on our estimation results. Most of Vietnam’s estimated industries are more sensitive to the appreciation of VND against RMB (or depreciation of RMB). Once RMB depreciates, the import prices of 36 industries in Vietnam will go down, which covers more than 60 per cent of Vietnam-China trade. It is beneficial for Chinese exporters to gain market share in Vietnam. However, it might have a negative impact on the Vietnamese domestic producers.

## 1.5 Structure of The Thesis

The rest of the thesis is as follows. Chapter 2 presents the basis trade patterns and exchange rate regimes of Vietnam, from 2001 to 2011. Chapter 3 explores the impacts of exchange rate together with labor skill composition on the trade balance of Vietnam with top twenty trading partners. In chapter 4, the relationship between Vietnam's intra-industry trade and ERPT with China are examined. In chapter 5, the Heterogeneity of exchange rate pass-through into Vietnam's export prices to China are explored. the non-linear ERPT effects are also tested. Chapter 6 summarizes the main findings and makes the policy recommendations. The limitations and further research directions are also put forward.

# Chapter 2 Vietnam's Trade and Exchange Rate Regime

## 2.1 The Evolution of Vietnam's Trade

This section gives the general graph of Vietnam's distribution of trade, including the main trade partners and the main trading industries.

### 2.1.1 Vietnam's Main Trade Partners

Table 2-1 shows the main trading partners of Vietnam, in 2016. China ranks Top 1 in terms of total trade, followed by United States and Korea, Rep. The biggest export destination of Vietnam is the United States, when her largest importer is China and Korea, Rep.

**Table 2-1 Vietnam's Main Trading Partners in 2016**

**(Unit: Per cent)**

| Partner | EX% | IM% | TT% |
|---|---|---|---|
| China | 11.38 | 29.19 | 20.31 |
| United States | 21.25 | 4.84 | 13.02 |
| Korea, Rep. | 6.00 | 17.54 | 11.79 |
| Japan | 8.50 | 8.59 | 8.55 |
| Thailand | 2.03 | 5.03 | 3.53 |
| Germany | 3.45 | 1.78 | 2.61 |
| Singapore | 1.68 | 3.17 | 2.43 |
| Malaysia | 2.04 | 2.75 | 2.40 |
| Hong Kong, China | 3.85 | 0.83 | 2.34 |
| Netherlands | 3.18 | 0.40 | 1.79 |
| United Arab Emirates | 3.16 | 0.29 | 1.72 |
| Indonesia | 1.61 | 1.68 | 1.65 |
| United Kingdom | 2.82 | 0.43 | 1.62 |
| India | 1.52 | 1.58 | 1.55 |
| Australia | 1.70 | 1.31 | 1.51 |
| Italy | 1.81 | 0.84 | 1.32 |
| France | 1.77 | 0.71 | 1.24 |
| Brazil | 0.82 | 1.22 | 1.02 |
| Cambodia | 1.36 | 0.49 | 0.92 |
| Philippines | 1.25 | 0.57 | 0.91 |
| Canada | 1.49 | 0.25 | 0.87 |
| Austria | 1.42 | 0.22 | 0.82 |
| Argentina | 0.22 | 1.42 | 0.82 |

| | | | |
|---|---|---|---|
| Spain | 1.36 | 0.25 | 0.80 |
| Russian Federation | 0.90 | 0.55 | 0.73 |
| Belgium | 1.11 | 0.28 | 0.69 |
| Mexico | 1.01 | 0.28 | 0.65 |
| Saudi Arabia | 0.27 | 0.67 | 0.47 |
| Turkey | 0.79 | 0.09 | 0.44 |
| Israel | 0.32 | 0.54 | 0.43 |
| Sweden | 0.55 | 0.16 | 0.35 |
| South Africa | 0.56 | 0.08 | 0.32 |
| Chile | 0.43 | 0.15 | 0.29 |
| Lao PDR | 0.30 | 0.27 | 0.28 |
| Switzerland | 0.24 | 0.32 | 0.28 |
| Poland | 0.35 | 0.11 | 0.23 |
| Ireland | 0.07 | 0.39 | 0.23 |
| New Zealand | 0.20 | 0.22 | 0.21 |
| Denmark | 0.17 | 0.17 | 0.17 |
| Pakistan | 0.25 | 0.08 | 0.17 |
| Portugal | 0.17 | 0.03 | 0.10 |
| Egypt, Arab Rep. | 0.19 | 0.01 | 0.10 |
| Norway | 0.07 | 0.14 | 0.10 |
| Finland | 0.07 | 0.13 | 0.10 |
| Panama | 0.16 | 0.01 | 0.08 |
| Nigeria | 0.05 | 0.11 | 0.08 |
| Algeria | 0.15 | 0.00 | 0.08 |
| Hungary | 0.05 | 0.09 | 0.07 |
| Romania | 0.06 | 0.07 | 0.06 |
| Greece | 0.11 | 0.02 | 0.06 |

| | | | |
|---|---|---|---|
| Bulgaria | 0.03 | 0.07 | 0.05 |
| Czech Republic | 0.04 | 0.03 | 0.04 |
| Total | 94.33 | 90.47 | 92.40 |
| Rest of the World | 5.67 | 9.53 | 7.60 |
| World | 100.00 | 100.00 | 100.00 |

Note: EX and IM indicate export and import, respectively.
Source: Author’s compilation based on data from World Integrated Trade Solution (WITS)

When regarding the trading region, it is portrayed in Table 2-2 that Vietnam’s trade depends heavily on Asian market. More than 50 per cent of Vietnam’s total trade goes to Asia, followed by American and Oceania and Europe.

### Table 2-2 Vietnam’s Trade Composition, Classified by Region[1], in 2016 (Unit: Per Cent)

| Region | EX% | IM% | TT% |
|---|---|---|---|
| Asia | 40.12 | 68.02 | 54.31 |
| America and Oceania | 27.75 | 9.64 | 18.78 |
| Europe | 19.74 | 6.52 | 13.19 |
| Asia-Low Income | 4.78 | 4.12 | 4.47 |
| Africa | 0.85 | 0.23 | 0.54 |

[1] Please see Table A-2 in Appendix for detailed classification.

| | | | |
|---|---|---|---|
| Total | 93.24 | 88.53 | 91.30 |
| Rest of the World | 6.76 | 11.47 | 8.70 |
| WLD | 100.00 | 100.00 | 100.00 |

Note: EX and IM indicate export and import, respectively.
Source: Source: Author’s compilation based on data from World Integrated Trade Solution (WITS)

Table 2-3 shows that most of Vietnam’s export goes to high income countries and upper middle-income countries, when Vietnam’s import has the same pattern, in 2016.

## Table 2-3 Vietnam's Trade Composition, Classified by Income Level[2], in 2016 (Unit: Per Cent)

| Income Level | EX(%) | IM(%) | TT(%) |
|---|---|---|---|
| High Income | 67.04 | 45.24 | 56.19 |
| Upper Middle | 21.44 | 40.57 | 30.96 |
| Low and Lower | 6.23 | 4.72 | 5.48 |
| TOTAL | 94.71 | 90.54 | 92.63 |
| ROW | 5.29 | 9.46 | 7.37 |
| WLD | 100.00 | 100.00 | 100.00 |

Note: 1. EX and IM indicate export and import, respectively.
Source: Author's compilation based on data from World Integrated Trade Solution (WITS)



[2] Please see Table A-2 in Appendix for detailed classification.

### 2.1.2 Vietnam's Merchandise Trade

The SITC 7 (Machinery & transportation goods) accounts for around 39.01 per cent of Vietnam's export in 2016, followed by SITC 8 (Manufactured articles) and SITC 0 (Food and live animals). Regarding to Vietnam's import, SITC (Machinery & transportation goods) accounts for 43.51 per cent of Vietnam's total import, when SITC6 (Manufactured articles) and SITC (Chemicals and related products) represents 22.03 per cent and 12.00 per cent of Vietnam's total import in 2016, respectively.

**Table 2-4 Vietnam's Merchandise Trade, Classified by Industry, in 2016 (Unit: Per Cent)**

| SITC | Industry | EX% | IM% | TT% |
|---|---|---|---|---|
| 7 | Machinery & transportation | 39.01 | 43.51 | 41.23 |
| 8 | Manufactured articles | 31.46 | 5.66 | 18.71 |
| 6 | Manufactured goods | 9.85 | 22.03 | 15.87 |
| 0 | Food and live animals | 11.89 | 7.23 | 9.59 |
| 5 | Chemicals and related products | 2.31 | 12.00 | 7.09 |
| 3 | Mineral Fuels, lubricants | 2.56 | 4.57 | 3.55 |
| 2 | Crud materials | 2.43 | 4.15 | 3.28 |
| 4 | Animal and vegetable oils & fat | 0.13 | 0.43 | 0.28 |
| 1 | Beverage and tabaco | 0.29 | 0.25 | 0.27 |
| 9 | Commodities not classified | 0.07 | 0.18 | 0.12 |
| **Total** | | 100 | 100 | 100 |

Note: EX and IM indicate export and import, respectively.
Source: Author's compilation based on data from World Integrated Trade Solution (WITS)

## 2.2 The Evolution of Vietnam's Exchange Rate Regime

From 1999, the Vietnam government restricted that only the State Bank of Vietnam (SBV), nationalized banks, joint-stock, and joint-venture banks and the subsidiaries of foreign banks could get involved in the interbank market. Moreover, the changing range of the exchange rate had to be regulated daily by the SBV. Banks involved in the interbank market were required to quote the rates according to the permitted trading band in comparison with the official rate of the previous day.

To make the market exchange rate more flexible, the Vietnam authority has adjusted the trading band for serval times. Two periods with the most significant fluctuations are worth mentioning. The first one was during the 2009 financial crisis. The second one was in in 2015, which was under high pressure from the worldwide market.

In 1999, it was announced by the SBV that Vietnam's exchange rate anchor was based on a basket of currencies. However, it was recognized by the International Monetary Fund (IMF) since 2012. Nevertheless, the bilateral exchange rate of VND/USD has a strong impact on Vietnam's Nominal Effective Exchange Rate (NEER). The gap between the Real Effective Exchange Rate (REER) and NEER is becoming larger, indicating that the official exchange rate probably underestimates the real value of the currency. In other words, Vietnam is somehow losing her export competitive.

**Table 2-5 The Evolution of Vietnam's Exchange Rate Regime**

| Time | Exchange Rate Regime | Remark |
|---|---|---|
| 1999 | Pegged exchange rate within horizontal bands | Exchange rate anchor |
| 20002 | Managed floating with no preannounced path for the exchange rate | IMF supported or other Monetary program |
| 2006 | Conventional pegged arrangement | Exchange rate anchor (against US. dollar) |
| 2008 | Stabilized arrangement | |
| 2009 | Other managed arrangement | |
| 2010 | Stabilized arrangement | |
| 2012 | | Exchange rate anchor (a basket of currencies) |

Source: IMF Website

# Chapter 3 The Roles of the Exchange Rate and Labor Skill on Vietnam's Trade Balance: An Industry Level Analysis

## 3.1 Introduction

After more than twenty years of Vietnam's renovation, the country has become a member of the "Tiger Club Economies" by following the same export-driven model which the wealthy heights-tech industrialized states have adopted. Consequently, Vietnam has gained a high growth rate in export. However, the more impressive import growth rate at the same time caused Vietnam a long-time trade deficit. The trade deficit is getting worse from 2007 onwards, hitting the maximum point at 21774 million USD in 2008 according to the statistics from WITS (World Integrated Trade Solution). From 2012, the longtime trade deficit turned in to a small trade surplus, but it is terminated in 2016.

To promote the trade situation, Vietnamese government has intervened by enforcing the exchange rate policy. However, as discussed in section II, the role of exchange rate policy on improving the performance of trade balance is ambiguous. Some literature concluded that exchange rate policy played a significant role on the trade balance of Vietnam, which was in line with economic theory expectation. The depreciation of VND (Vietnamese Dong) can accelerate Vietnam's trade deficit. On the other hand, some papers recently pointed out that weakening of the VND made Vietnam’s trade balance worse, which was against the theoretical prediction. Further, present papers also proposed suggestions that alternative government proposals should be implemented to facilitate Vietnam's balance of trade. On the contrary, exchange rate policy is not preferable to improve Vietnam’s trade. For instance, enhancing the commodities’ competitiveness and climbing up the global value chain can be the underlying new schemes.

In short, large proposition of the research works on Vietnam's trade balance and exchange rate were estimated at the aggregate level leading to the protentional aggregation bias. Moreover, most of the papers suggested that other proposals should be put forward to improve Vietnam’s trade. Strengthening the competitiveness of products, optimizing trade structure and getting involved in a higher level of global value chain were some examples. However, very limited researcher papers have incorporated these variables in their econometrics estimations.

The contributions of this research are therefore obvious. It is different from the existing experiments in three aspects. Firstly, the effect of exchange rate on Vietnam's trade balance is examined at a disaggregated level, according to labor skill classification. The industry level experiment is beneficial to decrease the bias coming from aggregation data. Secondly, as expected, the role of exchange rate on the trade balance of Vietnam is proved to be limited in first part of our empirical model, to seek for alternative solutions, the structural factor is considered by our model obviously, and the Vietnam's labor skill composition of trade is offered as a proxy. As far as we know, this research is the first attempt to introduce the labor skill in scrutinizing the trade balance of Vietnam. Labor skill is one of the remarkable prerequisites for a country to be competitive in an industry (Peneder, 1999), it is also a vital factor for gaining high income and sustainable economic growth. As a result, it is essential to incorporate the labor skill in exploring the trade balance of Vietnam. Thirdly, we compute the RCA (Revealed Comparative Advantage) indices to acquire the none-price competitiveness of different groups of labor skill-produced goods of Vietnam with her 20 major trading partners. Then, we include the RCA indices in our empirical models to estimate the linkage between the trade balance of Vietnam and the none-price competitiveness across labor skill-produced products.

The rest of the paper is organized as follows. Section II reviews the empirical literature exploring the trade balance of Vietnam and the fluctuation of VND. Section III discusses Vietnam's trade patterns with her 20 major trading partners. The followed section IV specifies the models and data. In the same part, the dynamic evolution of the labor skill structure of Vietnam’s bilateral trade with her trading partners are portrayed. Empirical results are reported, and discussions are provided in section V. Finally, section VI makes the conclusions of the paper.

### 3.2 Literature Review

The well-known Marshall- Lerner (ML) condition gives the conclusion that the success of reducing the trade deficit by weakening the currency depends on the sum of import and export elasticities. Only when it is bigger than 1 can the devaluation of the home currency be effective in improving the trade balance. Many empirical works have researched the role of exchange rate on trade balance. The literature can be put into two groups based on the empirical findings. The first group supported the prediction of economic theory (Bahmani-Oskooee and Cheema, 2009; Bahmani-Oskooee and Ratha, 2007; Musila and Newark, 2003; Singh, 2002; Bahmani-Oskooee, 1991), when the second group went against the theory (Vo, 2015; Narayan, 2004; Rose and Yellen, 1989): the weakened currency failed to promote the trade. These mixed results might be owing to the aggregation bias problem, the selected sample and the methodologies which adopted in the researches.

To investigate if Vietnam's trade deficit can be reduced by weakening the currency, massive researches have explored the sensitivity of the trade balance of Vietnam to the fluctuation of VND. The empirical researches have generally documented a significantly positive effect of VND on the trade balance of Vietnam. It indicates that a real depreciation of VND can promote the trade balance of Vietnam. However, many of them argued that exchange rate policy is not effective on adjusting the trade balance of Vietnam. For example, by using SVAR or Structural Vector Autoregressive, Hoang (2016) pointed out that the movement of Vietnam’s trade cannot be explained by the changing of the real effective exchange rate. It is argued in this paper that in the long run only the nominal export was affected in the long run. The research made policy implication that exchange rate policy should not be used as the main channel to improve the trad. The ARDL（the Autoregressive Distributed Lags) was implemented in the work of Trinh (2014) to test the function of real effective exchange rate on the trade balance of Vietnam both in the long and short run. It was concluded in this paper that the depreciation of VND could lead to a positive impact on the trade balance of Vietnam. Nevertheless, the parameter of the real effective exchange rate was so small that the effectiveness of exchange rate intervention was still uncertain. Similar evidences and policy recommendations in the case of Vietnam were documented and proposed by Le and Ishida (2016), Nguyen (2015) and Hoang (2013).

On the other hand, some evidence documented a negative impact of depreciation of VND on the country's trade balance. A real depreciation of the VND leads to the worsening of the trade balance of Vietnam. For example, in the work of My, Sayim and Rahman (2017), they conducted the ARDL model to test the impact of exchange rate on the trade balance of Vietnam. Their results confirmed that there was no J-curve effect. The depreciation of VND worsened the trade balance of Vietnam. Similarly, By applying the techniques of FMOLS (Fully Modified Ordinary Lease Square) together with DOLS (Dynamic Ordinary Least Square), Phan and Jeong (2015) argued that depreciation of VND deteriorated the trade balance of Vietnam. This was because Vietnam's trade was dependent heavily on the imports.

These inconsistent results stimulate us to explore the trade balance of

Vietnam from a disaggregated perspective. The main currently of the industry classifications are the SITC (Standard International Trade Classification), the ISIC (International Standard Industrial Classification) and the HS (Harmonized System). On this basis, we follow the recent manner which analyzes the trade balance according to technology level. For example, Hooy et al. (2016), Hooy et al. (2015) and Cimoli et al. (2013) have terrified that the impacts of exchange rate on ASEAN's (Association of Southeast Asian Nations) trade performance are heterogenous between industries classified by technology complexity. They classified the products based on technology because ASEAN members were highly active in the production fragmentation worldwide.

In our work, following Peneder (1999), we categorize the merchandise trade according to the quality of skill labor required for producing the relative goods. The system proposed by Peneder (1999) was empirically proved that it can disclose the technology restraints in the corresponding industries. It also emphasized the importance of the labor skill-which was recognized as the intangible factor-on trade. According to Peneder (1999), labor skill was one of the most remarkable factors for the competitiveness of industry, as well as conclusive factors for achieving high income and sustainable economic growth. Vietnam, as an emerging economy, is pursuing the upgrading of industry and the promoting of trade performance. Hence, it is crucial and necessary to re-explore the topic of exchange rate on the trade balance of Vietnam based on the current background.

To summarize, some limitations of the existing experimental works are worth noting. To begin with, most of the works are conducted at an aggregate level when researching the role of exchange on the trade balance of Vietnam. Furthermore, few explicit evidences are documented which supports the connections between the trade balance of Vietnam, structural factors and the non-price competitiveness of product. Lastly, most of the works implemented aggregate trade data instead of bilateral trade data. Therefore, the following three aspects distinguish us from the previous researches. Firstly, a disaggregated level analysis is conducted in this work according to the labor skill classification. Secondly, we future include the other factors which may affect the trade balance of Vietnam. The structural factor and none-price competitiveness of products are incorporated in our model, which are proxied by labor skill composition and RCA index, respectively. These factors allow us to investigate alternative proposals to improve the trade balance of Vietnam, given that the role of exchange rate is ambiguous in improving the trade balance of Vietnam. Finally, it is worth mentioning that only one paper (Phan and Jeong, 2015) can be found which used panel data at a bilateral basis when exploring the trade balance of Vietnam. The bilateral trade data is more informative than the aggregate trade data, as a result, a panel of 20 major trading partners with Vietnam are taken into our model, which accounts for than 80 per cent of Vietnam's total trade.

## 3.3 The Trade Patterns between Vietnam and Main Trade Partners

This part portrays Vietnam's trade patterns with her main trading partners and the dynamic development of the trade balance of Vietnam and the exchange rate.

### 3.3.1 Vietnam's Trade Patterns with Top 20 Trading Partners

Table 3-1 reports the biggest 20 markets worldwide of Vietnam in 2016. These 20 countries cover bigger than 80 per cent of Vietnam's total trade. The top three trading partners of Vietnam are China, United States and Korea, accounting for 20.49 per cent, 13.43 per cent and 12.41 per cent of Vietnam's total trade in 2016, respectively. The trade volume between Vietnam and ASEAN-6 accounts for 11.40 per cent of Vietnam's trade. Thailand, Malaysia and Singapore are the most substantial partners in ASEAN for Vietnam. Japan and EU-5 (5 major European Union members) represent 8.47 per cent and 7.26 per cent of Vietnam's total trade, respectively. The total trade shares of Hong Kong_China, the United Kingdom, India, Australia and South Africa are significant, too. Furthermore, it is noticeable that the main sources of Vietnam's trade deficit are from Asian markets. Vietnam suffers the biggest trade deficit against China for a long time. Korea, Japan, Thailand, Malaysia, Singapore and Indonesia also contribute considerably to Vietnam's trade deficit.

Since the top 20 trade partners cover more than 80 per cent of Vietnam's total trade and Vietnam has both trade surplus and deficit across them, it is reasonable to include them to test the role of exchange rate and labor skill composition on the trade balance of Vietnam.

## Table 3-1 Vietnam's Trade with Top 20 Trading Partners in 2016 (Unit: per cent)

| Partners | EXSH | IMSH | TTSH | TB |
|---|---|---|---|---|
| **China** | 12.43 | 28.62 | 20.49 | -39.02 |
| **U.S. (the United States)** | 21.79 | 4.98 | 13.43 | 63.07 |
| **Korea, Rep.** | 6.46 | 18.41 | 12.41 | -47.68 |
| **Japan** | 8.31 | 8.64 | 8.47 | -1.43 |
| **Hong Kong_China** | 3.45 | 0.86 | 2.16 | 60.46 |
| **U.K. (United Kingdom)** | 2.77 | 0.41 | 1.60 | 74.23 |
| **India** | 1.52 | 1.57 | 1.55 | -1.07 |
| **Australia** | 1.62 | 1.39 | 1.51 | 8.24 |
| **South Africa** | 0.49 | 0.09 | 0.29 | 70.64 |
| **ASEAN-6** | 9.34 | 13.49 | 11.40 | -17.69 |
| Thailand | 2.09 | 5.06 | 3.57 | -41.16 |
| Malaysia | 1.89 | 2.96 | 2.42 | -21.52 |
| Singapore | 1.37 | 2.73 | 2.05 | -32.67 |
| Indonesia | 1.48 | 1.71 | 1.60 | -6.68 |
| Philippines | 1.26 | 0.61 | 0.93 | 35.36 |
| Cambodia | 1.25 | 0.42 | 0.83 | 50.22 |
| **EU-5 (European Union)** | 10.68 | 3.82 | 7.26 | 47.77 |
| Germany | 3.38 | 1.63 | 2.51 | 35.30 |
| Netherlands | 3.40 | 0.39 | 1.90 | 79.76 |
| Italy | 1.85 | 0.82 | 1.33 | 39.18 |
| France | 1.71 | 0.66 | 1.19 | 44.57 |
| Switzerland | 0.34 | 0.32 | 0.33 | 3.68 |

| | | | | |
|---|---|---|---|---|
| **Total Top 20 Partners** | 78.86 | 82.27 | 80.56 | -1.62 |
| **Rest of the World** | 21.14 | 17.73 | 19.44 | 9.05 |
| **Total** | 100.00 | 100.00 | 100.00 | 0.49 |

Note: 1. EXSH%, IMSH%, TTSH% and TB% indicate export share, import share, total share and trade balance in relative with main trading partners, receptively.

2. TB%=(EX-IM)/(EX+IM) *100%, where TB, EX and IM indicate the trade balance, export and import, respectively.

Source: Calculations by Author using data from WITS database.

### 3.3.2 Vietnam's Trade Balance and Exchange Rate

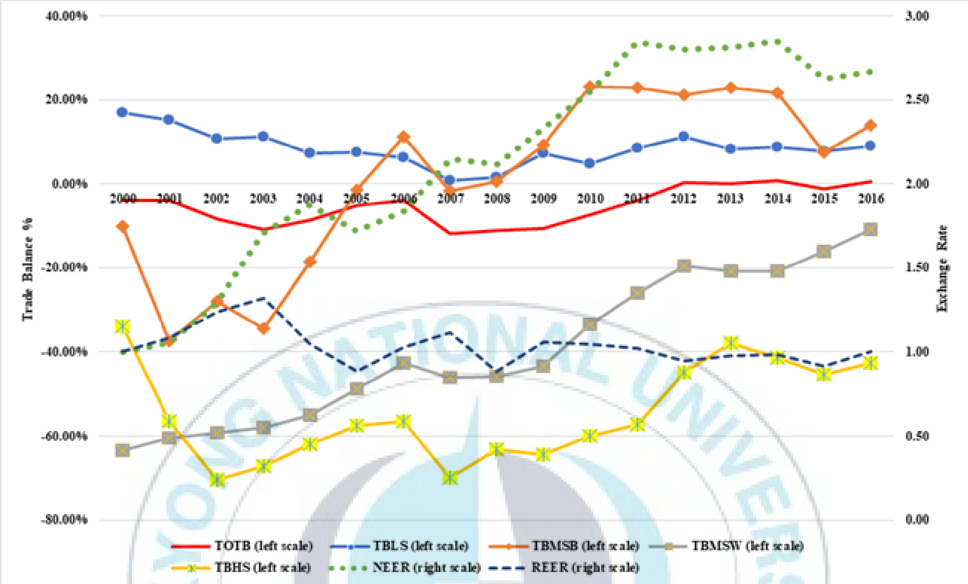
Figure 3-1 connects the trade balance of Vietnam to NEER (nominal effective exchange rate) and REER (real effective exchange rate). Also, the total trade balance is decomposed into four groups based on labor skill: the trade balance of low-skill labor-produced commodities, medium-skill blue-collar labor-produced commodities, medium-skill white-collar labor-produced commodities and high-skill labor-produced commodities.

Vietnam suffered long time trade deficit from 2000 to 2011. From 2012, Vietnam started to enjoy a slight trade surplus, but it was not sustainable. When we connect the total trade balance to exchange rate, some contradictions between the theory and the trade performance in Vietnam can be observed. That is the depreciation of VND does not come along with obvious improvement of Vietnam's total trade balance. During the whole sample period, Vietnam strived to deprecate the VND in order to promote export and constrain import, which can be seen in the increasing of NEER of VND. In 2007, Vietnam announced a stronger exchange rate policy in depreciating the home currency. However, because the depreciation of US dollar, huge capital poured into Vietnam. As a result, Vietnam's exchange rate policy did not seem to function. As can be seen, from 2007, the NEER and REER move away from each other. Even though the NEER depreciates, in fact the VND appreciates in the real term. From 2012, a series of policies have been implemented to stabilize the exchange rate.

When the trade balance is decomposed into four groups based on labor skill, Vietnam gains trade surplus from low-skill labor-produced goods and medium-skill blue-collar labor-produced goods, while she suffers from trade deficits in medium-skill white-collar labor-produced and high-skill labor-produced commodities. Although Vietnam is a developing country with low income level, constrained technology and resources, the trade deficit of medium-skill white-collar labor-produced commodities and high-skill labor-produced commodities is improving, whereas the trade surpluses of low-skill labor-produced goods witnesses a decrease. In addition, it can be seen from Figure 3-1 that the movement of trade balance of each group according to exchange rate does not share a pattern in common.

To summary, since the trade balance of Vietnam does not follow the moving trend of exchange rate significantly and Vietnam's trade structure has experienced an improvement in terms of labor skill, it motivates our interest in further researching the other determinants of the trade balance of Vietnam in the following parts.

# Figure 3-1 Vietnam's Trade Balance vis-a`-vis Exchange Rate




Note: 1. TOTB: Total trade balance, TBLS: Trade balance of low-skill labor-produced goods; TBMSB: Trade balance of medium-skill blue-collar labor-produced goods; TBMSW: Trade balance of medium-skill white-collar labor-produced good; TBHS: Trade balance of high-skill labor-produced commodities.

2. NEER indicates the nominal exchange rate index and REER indicates the real effective exchange rate index.

3. An increase (decrease) in the exchange index indicates a depreciation (appreciation) of VND.

4. TB%=(EX-IM)/(EX+IM) *100%, where TB, EX and IM indicate the trade balance, export and import of good n at time t, respectively.

Source: Author's calculation using data from WITS, General Statistics Office of Vietnam, State Bank of Vietnam and IMF databases.

## 3.4 Theoretical Framework

This section discusses the related theories of exchange rate and trade balance.

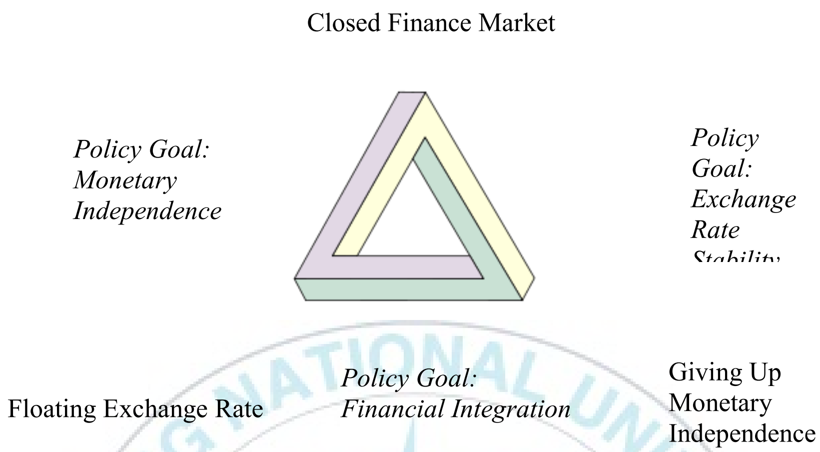
### 3.4.1 The Impossible Trinity

"Impossible triangle" refers to the great difficulties in choosing the fiscal and financial policies to achieve the three economic goals-monetary independence, exchange rate stability and financial integration-simultaneously. The "impossible triangle" means that a country cannot simultaneously achieve the freedom of capital flow, the independence of monetary policy and the stability of the exchange rate. If the authority of a state intends to allow capital flows and requires an independent monetary policy, it is difficult to maintain exchange rate stable. If exchange rate stability and capital flows are preferable, an independent monetary policy must be given up.

In most developed economies, a floating exchange rate mechanism is adopted, with the exchange rate managing by the market relationship between the supply and demand. Most developed countries have liberalized their use of capital flows. Therefore, the country's monetary policy is independent, and their primary responsibility is not to keep the exchange rate stable. In Vietnam, China and some other developing countries, the fixed or managed floating exchange rate policies are taken. When the supply and demand of foreign currencies fluctuate, the central bank immediately intervenes in the foreign exchange market, to keep the exchange rate stable within certain range. Thus, the impossible triangle has become a concern for developing countries in which the fixed exchange rate regime is adopted.

In recent years, Vietnam has intervened in the foreign exchange market through two tunnels, namely the capital controls and the foreign exchange transactions. For example, in October 2012, the state bank of Vietnam has bought USD 100 million from the market to keep the VND from rising. Clearly, the central bank's monetary policy is no longer independent in order to keep the exchange rate stable. If Vietnam now stresses that the sole goal of adjusting the exchange rate is to support exports, it is not favorable to support Vietnam's long-term development. That means there is only one way to go, which will make the market always expect the VND continue to depreciate, putting Vietnam's monetary policy in a dilemma. Therefore, multiple policies should be developed by Vietnam to manage the "impossible triangles". Only in the way, will the low inflation rate, good investment environment, and sustainable economic growth be established.

## Figure 3-2 The Impossible Triangle




Source: Boughton, (2003)

### 3.4.2 The Marshall-Lerner Condition

The relationship between exchange rate changes and the trade balances is the core content of the traditional elastic theory of trade balance. Under the assumption that the price level at home and the foreign country remains constant, the depreciation of the local currency will cause the price of domestic products in the international market relatively cheaper, and at the same time will make the prices of foreign goods in the domestic market relatively more expensive. Therefore, the depreciation of the local currency will stimulate exports and reduce imports, while the appreciation of the local currency will cause a change in the opposite direction.

However, since the trade balance is a net difference between export and import denominated in currencies, the change in the quantity of exports and imports in the direction of improving or worsening the trade balance cannot guarantee that the export and import volume can also move in the same direction. Therefore, the depreciation of the local currency does not necessarily increase the trade balance. Similarly, the appreciation of the local currency does not necessarily reduce the trade balance. The impact of exchange rate changes on trade balances depends critically on the elasticity of supply and demand of export and import.

The critical elastic conditions under which exchange rate fluctuations have different effects on trade balances are examined below. Equation (3-1) represents the relationship between the export supply and the export price. The export supply is an increasing function of the export price in the local currency.

$$EX_s = EX_s(P_{ex}) \tag{3-1}$$

And in Equation, export demand is expressed as a decreasing function of the export price in foreign currency.

$$EX_d = EX_d\left(P_{exf}\right) \tag{3-2}$$

Where,

$$P_{exf} = P_{ex}/r \tag{3-3}$$

Where $EXP_s$ and $EXP_d$ are the export supply and export demand, respectively. $P_{ex}$ is the supply export price in local currency, while $P_{exf}$ represents the demand price in foreign currency. r is the bilateral exchange rate. In this research, the direct quotation is implemented.3 The equilibrium condition of export market is expressed as:

$$EX_s(P_{ex}) - EX_d\left(P_{exf}\right) = 0 \tag{3-4}$$

Regarding the import market, the relationship between import and price can be expressed as follows. The import supply is an increasing function

[3] In direction quotation, a unit of foreign currency is represented by several local currencies. The increase of exchange rate denotes the deprecation of the local currency, vice versa.

of import price in the foreign currency, as equation (3-5):

$$\mathrm{IM}_s = \mathrm{IM}_s\left(msP_{imf}\right) \tag{3-5}$$

When the import demand is decreasing function of import price in the home currency, as equation (3-6):

$$\mathrm{IM}_d = \mathrm{IM}_d(P_{im}) \tag{3-6}$$

Where,

$$P_{im} = P_{imf}/r \tag{3-7}$$

Similarly, $\mathrm{IMP}_s$, $\mathrm{IMP}_d$, $P_{imf}$, $P_{im}$, r represents import supply, import demand, import supply price in foreign currency, import demand price in home currency and bilateral exchange rate, respectively. The equilibrium condition of the export market is expressed as:

$$IM_s\left(P_{imf}\right) - IM_d(P_{im}) = 0 \tag{3-8}$$

As a result, the trade balance in the home currency can be represented as

$$\mathrm{TB} = P_{ex}EX_s(P_{ex}) - P_{im}IM_d(P_{im}) \qquad (3\text{-}9)$$

In fact, equation (3-4) , equation (3-8) and equation (3-9) are three implicit functions with different variables. Based on the implicit function theorem, we that the derivative of r of equation (3-4) , equation (3-8) and equation (3-9), respectively, and gain the follows:

$$\frac{dEX_s}{dP_{ex}}\frac{dP_{ex}}{dr} - \frac{dEX_d}{dP_{exf}}\left(\frac{r\frac{dP_{ex}}{dr} - P_{ex}}{r^2}\right) = 0 \qquad (3\text{-}10)$$

$$\frac{dIM_s}{dP_{imf}}\left(\frac{r\frac{dP_{im}}{dr}}{r^2}\right) - \frac{dIM_d}{dP_{im}}\frac{dP_{im}}{dr} = 0 \qquad (3\text{-}11)$$

$$\frac{dTB}{dr} = P_{ex}\frac{dEX_s}{dP_{ex}}\frac{dP_{ex}}{dr} + EX_s\frac{dP_{ex}}{dr} - P_{im}\frac{dIM_d}{dP_{im}}\frac{dP_{im}}{dr} - IM_d\frac{dP_{im}}{dr} \tag{3-12}$$

We rearrange equation (3-10), equation (3-11) and equation (3-12), and put them into matrix form for simplicity:

$$\begin{bmatrix} \frac{dEX_s}{dP_{ex}} - \frac{1}{r}\frac{dEX_d}{dP_{exf}} & 0 & 0 \\ 0 & \frac{1}{r}\frac{dIM_s}{dP_{imf}} - \frac{dIM_d}{dP_{im}} & 0 \\ P_{ex}\frac{dEX_s}{dP_{ex}} + EX_s & -\left(P_{im}\frac{dIM_d}{dP_{im}} + IM_d\right) & -1 \end{bmatrix} \begin{bmatrix} \frac{dP_{ex}}{dr} \\ \frac{dP_{im}}{dr} \\ \frac{dTB}{dr} \end{bmatrix} = \begin{bmatrix} -\frac{dEX_d}{dP_{exf}}\frac{P_{ex}}{r^2} \\ \frac{dIM_s}{dP_{imf}}\frac{P_{im}}{r^2} \\ 0 \end{bmatrix} \tag{3-13}$$

Because the import supply (demand) increases (decreases) with the price, monotonically, we let elasticity of export demand as:

$$\theta_{exd} = -\frac{dEX_d}{dP_{exf}}\frac{P_{exf}}{EX_d} \tag{3-14}$$

The elasticity of export supply is expressed as:

$$\partial_{exs} = \frac{dEX_s}{dP_{ex}} \frac{P_{ex}}{EX_s} \tag{3-15}$$

The elasticity of import demand is expressed as:

$$\theta_{imd} = -\frac{dIM_d}{dP_{im}} \frac{P_{im}}{IM_d} \tag{3-16}$$

And the elasticity of import supply is expressed as:

$$\partial_{ims} = \frac{dIM_s}{dP_{imf}} \frac{P_{imf}}{IM_s} \tag{3-17}$$

Under the assumption of equilibrium condition, we let:

$$EX_s = EX_d = EX \quad (3\text{-}18)$$

$$IM_s = IM_d = IM \quad (3\text{-}19)$$

As well as the follows,

$$P_{ex} = rP_{exf} \quad (3\text{-}20)$$

$$P_{im} = rP_{imf} \quad (3\text{-}21)$$

As a result, the follow matrix can be yield,

$$\begin{bmatrix} \frac{EX}{P_{ex}}(\theta_{exd} + \partial_{exs}) & 0 & 0 \\ 0 & \frac{IM}{P_{im}}(\theta_{imd} + \partial_{ims}) & 0 \\ EX(1 + \partial_{exs}) & IM(\theta_{imd} - 1) & -1 \end{bmatrix} \begin{bmatrix} \frac{dP_{ex}}{dr} \\ \frac{dP_{im}}{dr} \\ \frac{dTB}{dr} \end{bmatrix} = \begin{bmatrix} \theta_{exd}\frac{EX}{r} \\ \partial_{ims}\frac{IM}{r} \\ 0 \end{bmatrix} \quad (3\text{-}22)$$

We solve equation (3-22) based on the Cremer law, and yield the follows. A unit change in export price caused by a unit change in exchange rate can be represented as:

$$\frac{dP_{ex}}{dr} = \frac{P_{ex}}{r} \frac{\theta_{exd}}{\theta_{exd} + \partial_{exs}} > 0 \tag{3-23}$$

A unit change in import price caused by a unit change in exchange rate can be represented as:

$$\frac{dP_{im}}{dr} = \frac{P_{im}}{r} \frac{\partial_{ims}}{\theta_{imd} + \partial_{ims}} > 0 \tag{3-24}$$

A unit change in trade balance caused by a unit change in exchange rate can be represented as:

$$\frac{dTB}{dr} = \frac{EX}{r} \frac{\theta_{exd}(1 + \partial_{exs})}{\theta_{imd} + \partial_{ims}} + \frac{IM}{r} \frac{\partial_{ims}(\theta_{imd} - 1)}{\theta_{imd} + \partial_{ims}} \tag{3-25}$$

If the initial situation is $\mathrm{TB} = \mathrm{EX} - \mathrm{IM} = 0$, if the depreciation of the home currency can improve the trade balance, then:

$$\frac{dTB}{dr} = \frac{EX}{r}\frac{\theta_{exd}(1+\partial_{exs})}{\theta_{imd}+\partial_{ims}} \tag{3-26}$$

$$+\frac{IM}{r}\frac{\partial_{ims}(\theta_{imd}-1)}{\theta_{imd}+\partial_{ims}} > 0$$

That is:

$$\frac{\theta_{exd}(1+\partial_{exs})}{\theta_{imd}+\partial_{ims}}+\frac{\theta_{imd}(1+\partial_{ims})}{\theta_{imd}+\partial_{ims}} > 1 \tag{3-27}$$

Equation (3-27) is called the Bickerdike-Robinson-Metzler Condition, which is the general critical condition for improving trade balance by depreciating the home currency. When $\partial_{exs} \to 0$ and $\partial_{ims} \to 0$, that is the elasticity of export supply, and the elasticity of import supply are sufficiently large, we find the result of the limit of equation (3-27), and yield:

$$\partial_{exs} + \partial_{ims} > 1 \tag{3-28}$$

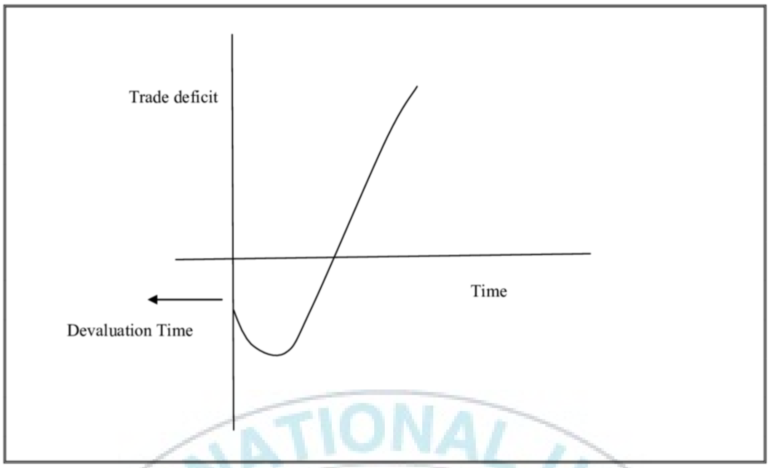
Equation (3-28) is the well-known Marshall-Lerner Condition. The success of improving a country's trade balance by depreciating the home currency depends on the condition that the sum of export and import demand elasticity is greater than one. However, in the short run, because consumers' habits cannot be changed easily, commodities are generally inelastic, the Marshall-Lerner Condition does not hold. That is depreciating the home currency cannot improve the trade balance. Nevertheless, in the long term, the consuming habits of customers are changed, the Marshall-Lerner condition is therefore applicable.

Nevertheless, some researchers argued that the Marshall-Lerner condition is more effective in the developed countries than in the developing countries. The underlying reason is that products of developed countries are more competitive than the those of developing counties. The devaluation of the home currency can significantly promote the trade balance. The effect is not that obvious in the developing countries, the depreciation of the home currency can even deteriorate a country's trade balance if the country heavily depends on imported intermediate goods.

### 3.4.3 The Trade Balance and "J" curve

In international trade, the "J" curve portrays the time path which the trade balance of a country follows, when the home currency depreciates. A depreciated currency makes the imports expensive. Given the assumption that the change of import and export is small initially, the depreciation of home currency can cause a decrease in the current account, resulting in deteriorative trade deficit or a tiny improvement of trade surplus. After a period, the export volume may begin to increase because of their cheaper and more competitive supplied prices to foreign markets. Moreover, local customers may consume less imported products because of the higher imported prices. Finally, if the condition occurs, the trade balance should be turned into a smaller deficit or a bigger trade surplus in comparison with the initial situation. The inverted "J" curve will be yielded if the home currency is appreciated. Figure 3-3 shows the "J" curve of trade balance.

## Figure 3-3 The J Curve




Source: Rode (2012): pp. 125

The total volume of import will rise, immediately following the deprecating of the local currency, while the exports remain constant. This situation can be partially owing to the signed contracts, which manufacturers must comply with.

In the short run, the depreciation of home currency makes the import price expensive. A time lag exists when the consumption of imports changes. As a result, this leads to an immediate decrease of trade balance until the customers stop importing the expensive imported products accompanied by increasing in exports. Then the long run effects prevail, and the current account starts to be improved. Furthermore, in the short run, the demand of more expensive imported products is price inelastic, because it takes time for consumers to respond and look for more economical substitutions (which might not necessarily exist).

In the long run, depreciation of the home currency can be favorable to the trade balance. Local consumers might expect swift their expenditure to domestic commodities and stop buying the high price imported products and services, under the assumptions that the equivalent local substitutions exist. Similarly, many foreign customers may start to buy cheaper imported goods compared to the expensive local products and services.

According to Krugman’s (1991) discussion on the J curve and the trade balance, there are also some other factors which may affect the trade balance.

Firstly, the capacity of producing the substitutions of imported goods is crucial for adjusting the trade balance through devaluating the home currency. For some developing countries- Vietnam as an example-it is relatively difficult for them to seek domestic alternatives of imported goods. As a result, even the imported goods become expensive, the demand will not change too much, or the time lag will be longer.

Secondly, the proportion of goods eligible for exporting also plays an essential role in applying the policy of depreciating the home currency to promote a country's trade balance. In general, depreciating the home currency is more effective for developed countries, because the percentage of eligible goods for international trade is higher in developed countries than in developing countries, for example, Vietnam. Consequently, the degree of improvement of the trade balance in the developed counties is usually more prominent than in the developing counties.

Thirdly, how much proportion of the importing goods accounts for the unit cost of the domestic goods can also affect a country's trade balance, when intervening by exchange rate policy. Particularly, the proportion of imports in Vietnam is quite high. 70 per cent of the unit value of the domestic goods comes from importing. In other words, Vietnam is highly dependent on import. Therefore, the advantages of exporting at a low price will be offset by the high cost of import, when the home currency is depreciated. As a result, devaluing the home currency does not necessarily increase the export volume.

Fourthly, the flexibility of the wage system is another factor. The home currency depreciation would raise the consumer price index (CPI). If the wage system of manufacturing is flexible, the wages should also be increased domestically, which mean that the unit cost of products will grow too. Therefore, the advantages of low-price domestic products will be eliminated.

In summary, it is generally believed that devaluing the home currency is more effective in developed countries than in developing countries, since the in the average developing countries are heavily dependent on imports and the elasticity of import demand is low.

## 3.5 Model Specification and Data

Empirical models are specified in this section. Moreover, variables are defied, and the sources of data are introduced.

### 3.5.1 Labor Skill Composition of Merchandise Trade

Following the system of Peneder (1999), the merchandise trade is categorized into four classifications based on 2-digit level of SITC products, namely low-skill labor-produced goods, medium-skill blue collar-labor produced goods, medium-skill white collar labor-produced goods, and high-skill labor-produced commodities. The classifications are based on the quality of skill labor required for producing the corresponding commodities. This methodology can reveal the technology restraints in the relative industries. The improving in the none-price competitiveness of a country's trading commodities can be owing to the climbing up on the skill ladder, which is expected to be in favor of the trade balance. On the contrary, the specialization on low skill labor required industry can lead to a negative impact on the trade balance, because of a country's trading position at the bottom of the global value chain.

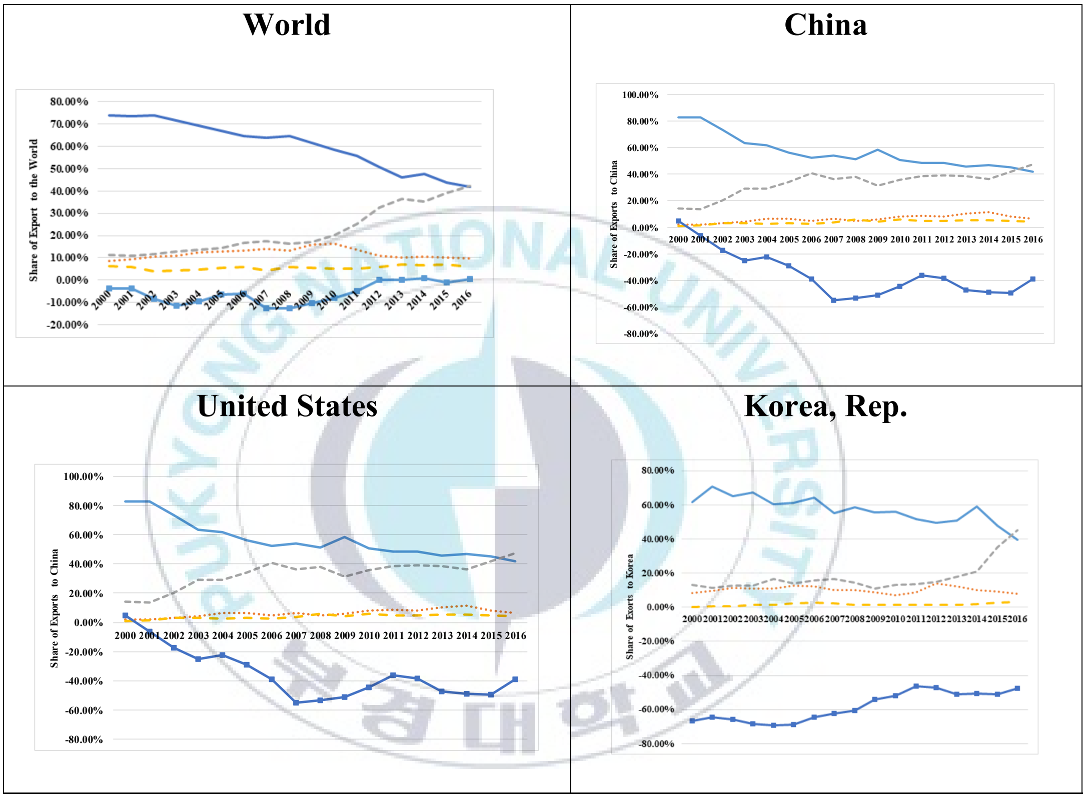
Figure 3-1 portrays the labor skill composition of export of Vietnam to her main trading partners from 2000 to 2016. The trade balance vis-a`-vis main trading partners is also plotted for the purpose of comparison. For Vietnam's aggregated export, the export shares of low-skill labor-produced goods and medium-skill blue collar-labor produced goods reduce over time while the shares of medium-skill white collar labor-produced and high-skill labor-produced goods start to increase since 2010. This situation suggests that Vietnam’s aggregated export has climbed up the labor skill ladder. Correspondingly, Vietnam's total trade deficit has been improved, slightly. When we look at the bilateral level, except for Japan and ASEAN-6, Vietnam's export to most of her trading partners has shifted from low-skill labor-produced goods to medium-skill white collar labor-produced goods.

Vietnam enjoyed trade surpluses with the U.S., Hong Kong_China, the U.K., Australia, South Africa and the EU-6 during the referenced period. In these countries, Vietnam's export has witnessed moving up the labor skill ladder because of increasing export shares of the medium-skill white collar labor-produced and high-skill labor-produced goods. In the Indian market, it is also true that the moving up the labor skill ladder of export comes together with decreasing trade deficit. This fact implies that optimizing the export structure by upgrading the labor skill composition is advantageous for the trade balance of Vietnam.

For China, Korea, Japan and ASEAN-6, even though the export share of medium-skill white collar labor-produced good has increased, there is no significant improvement in the trade deficit with these countries. The underlying reason can be that the export of medium-skill white collar labor-produced good relies on large imports of intermediate goods. The import offsets the positive impact of export on the trade balance.

In sum, in the Figure 3-4, in general, when the export of Vietnam has experienced an upward trend in the labor skill ladder, the trade balance would be improved. However, this phenomenon is not obvious in the cases of China, Korea, Japan and ASEAN-6. Therefore, we calculate the RCA index which takes both the export and import into account. The index is used to capture the evolution of Vietnam's none-price competitiveness of the four groups of labor skill-produced goods, aiming at providing a more sophisticated discussion of the impact of structural factors on the trade balance of Vietnam.

## Figure 3-4 Vietnam's Trade Balance and Labor Skill Composition of Export to Main Trading Partners（Unit: Per cent)



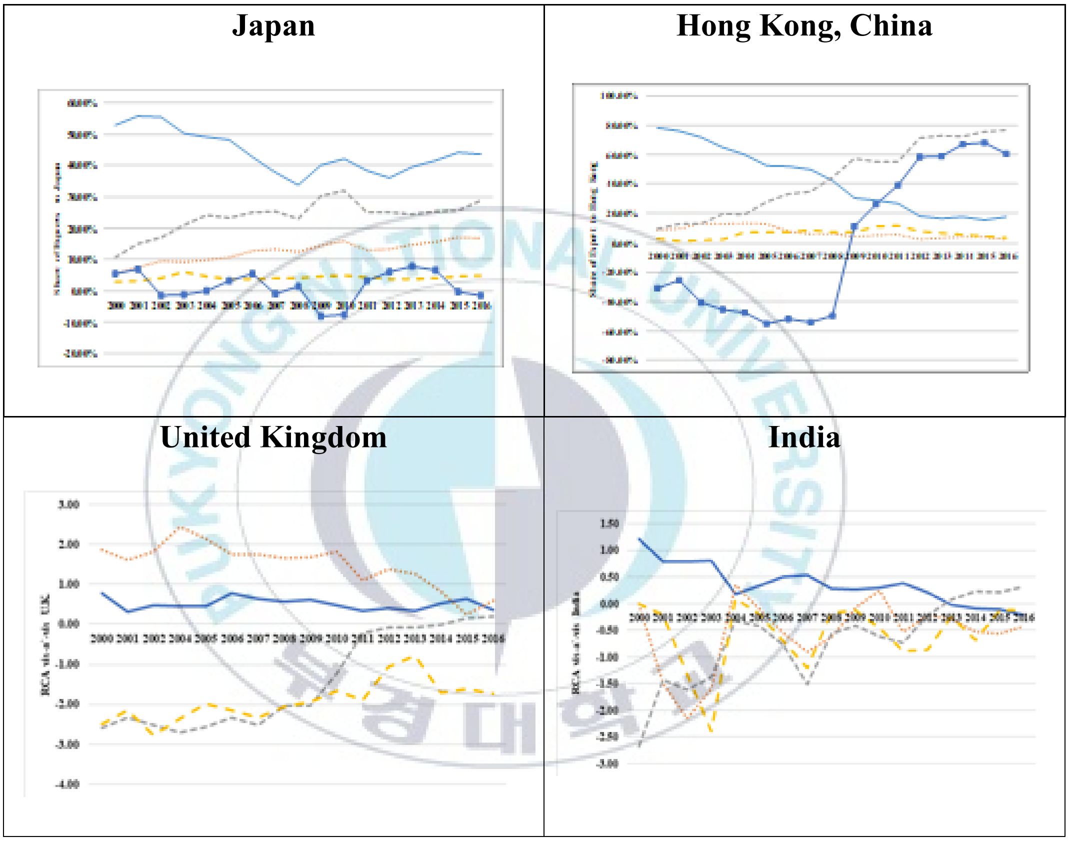

Note:1. Low-skilled Medium-skilled blue collar Medium-skilled white collar High-skilled TB

2. ASEAN-6 includes Thailand, Malaysia, Singapore, Indonesia, Philippines and Cambodia. EU-5 includes Germany, Netherlands, Italy, France and Switzerland. Due to limited space, the results of these countries are aggregated as ASEAN-6 and EU-5.

Source: Author's calculation using data from WITS database.

## Figure 3-5 (cont'd): Vietnam's Trade Balance and Labor Skill Composition of Export to Main Trading Partners

## (Unit: Per cent)



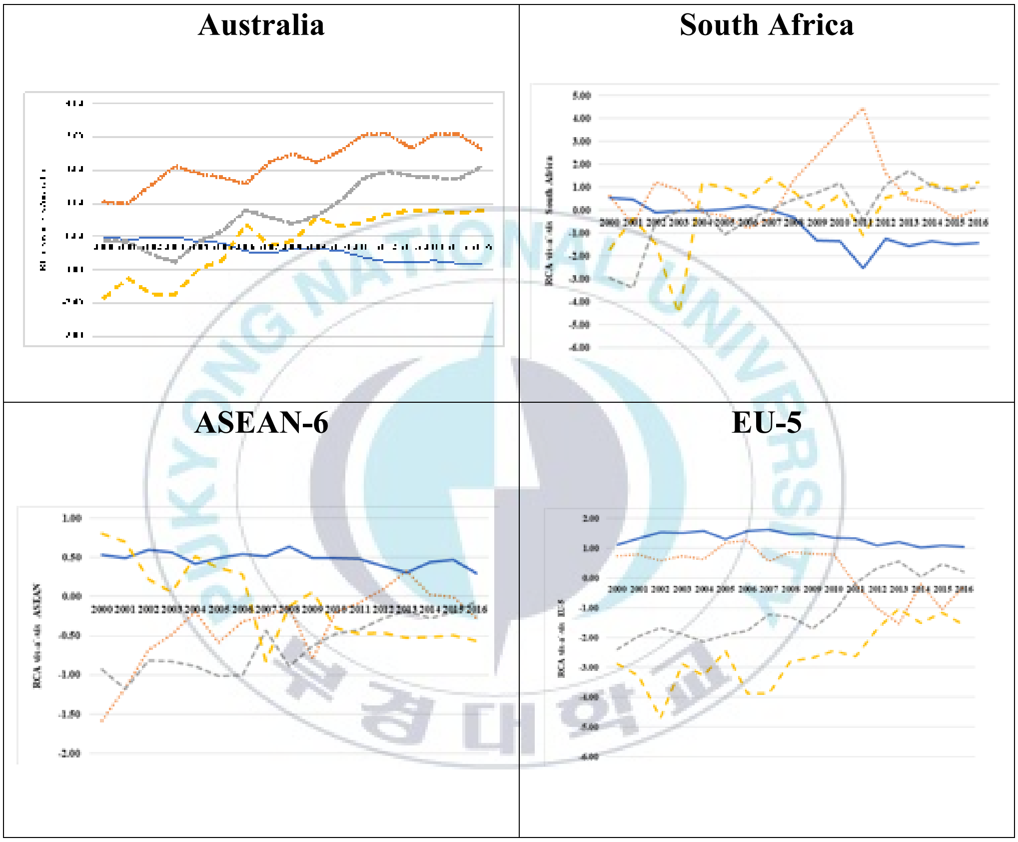

Note:1. Low-skilled, Medium-skilled blue collar, Medium-skilled white collar, High-skilled, TB

2. ASEAN-6 includes Thailand, Malaysia, Singapore, Indonesia, Philippines and Cambodia. EU-5 includes Germany, Netherlands, Italy, France and Switzerland. Due to limited space, the results of these countries are aggregated as ASEAN-6 and EU-5.

Source: Author's calculation using data from WITS database.

## Figure 3-6 (cont'd): Vietnam's Trade Balance and Labor Skill Composition of Export to Main Trading Partners

**(Unit: Per cent)**




Note:1. Low-skilled, Medium-skilled blue collar, Medium-skilled white collar, High-skilled, TB

2. ASEAN-6 includes Thailand, Malaysia, Singapore, Indonesia, Philippines and Cambodia. EU-5 includes Germany, Netherlands, Italy, France and Switzerland. Due to limited space, the results of these countries are aggregated as ASEAN-6 and EU-5.

Source: Author's calculation using data from WITS database.

### 3.5.2 RCA (Revealed Comparative Advantage)

According to Phan and Jeong (2015), there were mainly two channels through which authorities could improve a country's trade balance. The first one depended on exchange rate policy, which was basically devaluating the home currency. The second one rested on the policy from the supply-side, for example, to improve the competitiveness of products by enhancing labor productivity or quality. Therefore, we calculate the RCA index of each labor skill category to capture the none-price competitiveness of Vietnam vis-a`-vis her 20 main trading partners over time. And by doing so, we intend to observe the link between Vietnam's none-price competitiveness and her trade balance, based on labor skill composition. According to the factor endowments argument, a country will focus on those industries in which she possesses comparative advantages, in terms of technology, capital or labor (Balassa, 1965). By following Dettmer et al. (2009), Kowalski and Dihel (2009) and Bhat et al. (2008), the RCA for an industry can be calculated by equation (3-29).

$$RCA_{nt} = ln\left[\frac{ex_{nt}}{im_{nt}} / \frac{\sum_n ex_{nt}}{\sum_n im_{nt}}\right] \qquad (3\text{-}29)$$

Where n codes the different industry, $ex_{nt}$ indicates the export value of industry $n$ at time $t$, and $im_{nt}$ represents the import value of industry $n$ at time $t$. When the value of RCA is bigger than zero, it means a country holds comparative advantage in industry $n$, while a negative value discloses a comparative disadvantage. An increasing value of the RCA index reveals an improvement of the none-price competitiveness of an industry, which is expected to improve the trade balance of Vietnam.

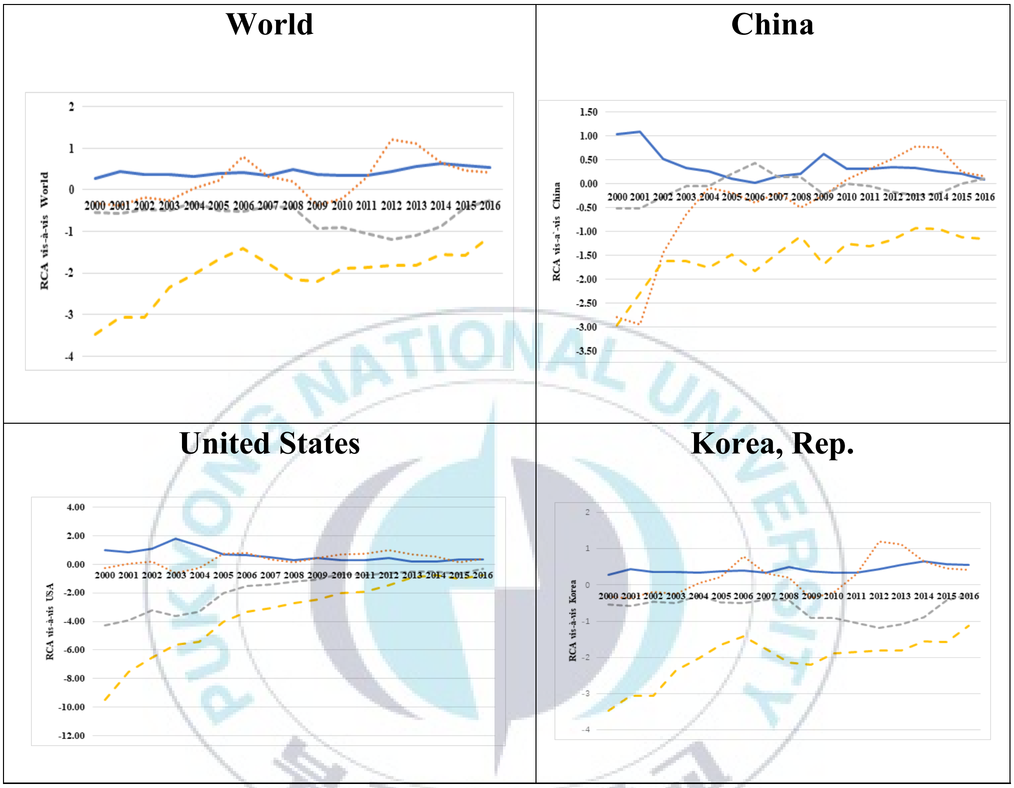
The results of Vietnam's RCA based on labor skill composition vis-a`-vis main trading partners are reported in Figure 3-4. At the aggregate level, Vietnam has revealed comparative disadvantage in medium-skill white collar labor-produced and high-skill labor-produced goods, while she possesses revealed comparative advantages in the other two groups. It is in accordance with the fact that Vietnam suffers from trade deficits in the medium-skill white collar labor-produced and high-skill labor-produced goods, but she enjoys trade surpluses in the other two groups.

At the bilateral level, the values of RCA index of medium-skill white collar labor-produced and high-skill labor-produced goods have significantly increased vis-a`-vis the U.S., Hong Kong_China, the U.K. India, Austria, South Africa and the EU-5, while the RCA indexes of the other two lower skill groups have decreased over time. Especially, Vietnam has started to gain revealed comparative advantages in medium-skill white collar labor-produced goods over the partners. Specifically, Vietnam has trade surplus with these trading partners in which she has gained an improvement in RCA of medium-skill white collar labor-produced and high-skill labor-produced goods.

On the contrary, in China, Japan, Korea and ASEAN-6, Vietnam does not have substantially improvement in RCA in the medium-skill white collar labor-produced and high-skill labor-produced goods. In other words, Vietnam fails to improve the competitiveness of these two-group goods vis-a`-vis the abovementioned trading partners. These partners are also the main sources of Vietnam's trade deficits. The underlying reason is that Vietnam's export of the of higher-skill labor-produced goods depends heavily on the import from these markets. The low none-price competitiveness of the two higher skill groups might lead to Vietnam's trade deficit with these counties.

In summary, graphically, there is a positive relationship between Vietnam's trade balance and the RCA indexes of medium-skill white collar labor-produced and high-skill labor-produced goods, rather than that of the lower-skill labor-produced goods. It further implies that climbing up the labor skill ladder and improving the none-price competitiveness of medium-skill white collar labor-produced and high-skill labor-produced goods can have a positive impact on the trade balance. As a result, we include these variables directly into our empirical models in next part aiming at providing further statistic evidence of our arguments.

## Figure 3-7 Vietnam's RCA Based on Labor Skill Composition *Vis-à-Vis* Main Trading Partners

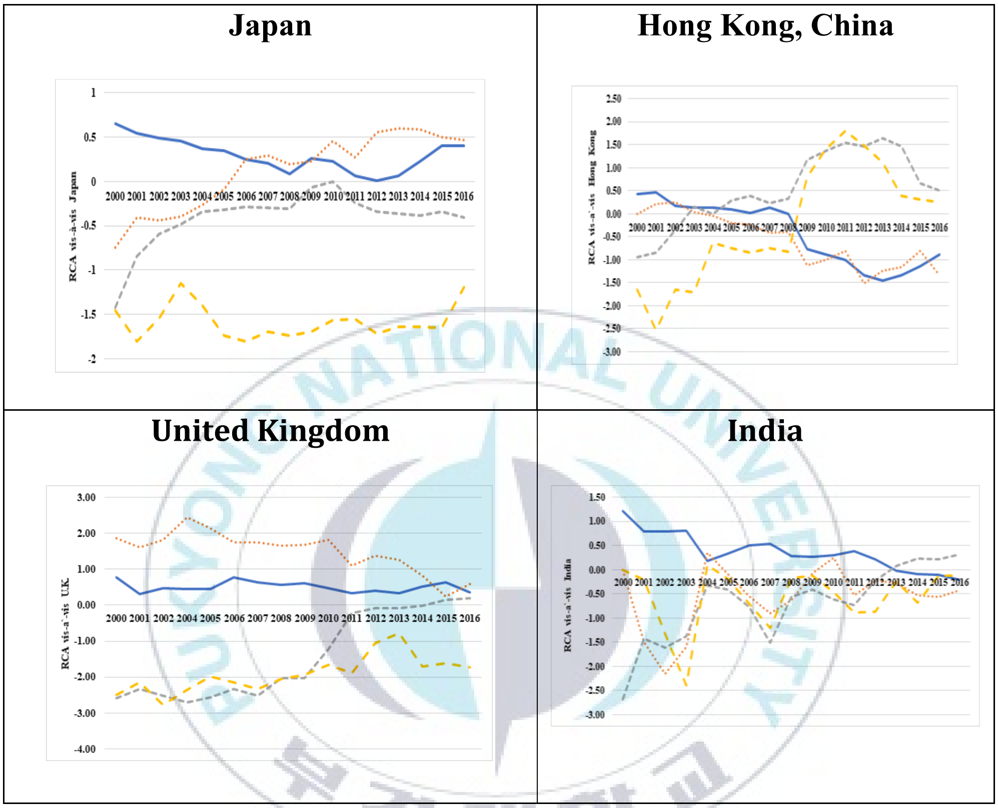



Note: 1. Low-skilled  Medium-skilled blue collar  Medium-skilled white collar  High-skilled

2.ASEAN-6 includes Thailand, Malaysia, Singapore, Indonesia, Philippines and Cambodia. EU-5 includes Germany, Netherlands, Italy, France and Switzerland. Due to limited space, the results of these countries are aggregated as ASEAN-6 and EU-5.

Source: Author's calculation using data from WITS database.

## Figure 3-8 (cont'd) Vietnam's RCA Based on Labor Skill Composition *Vis-à-Vis* Main Trading Partners

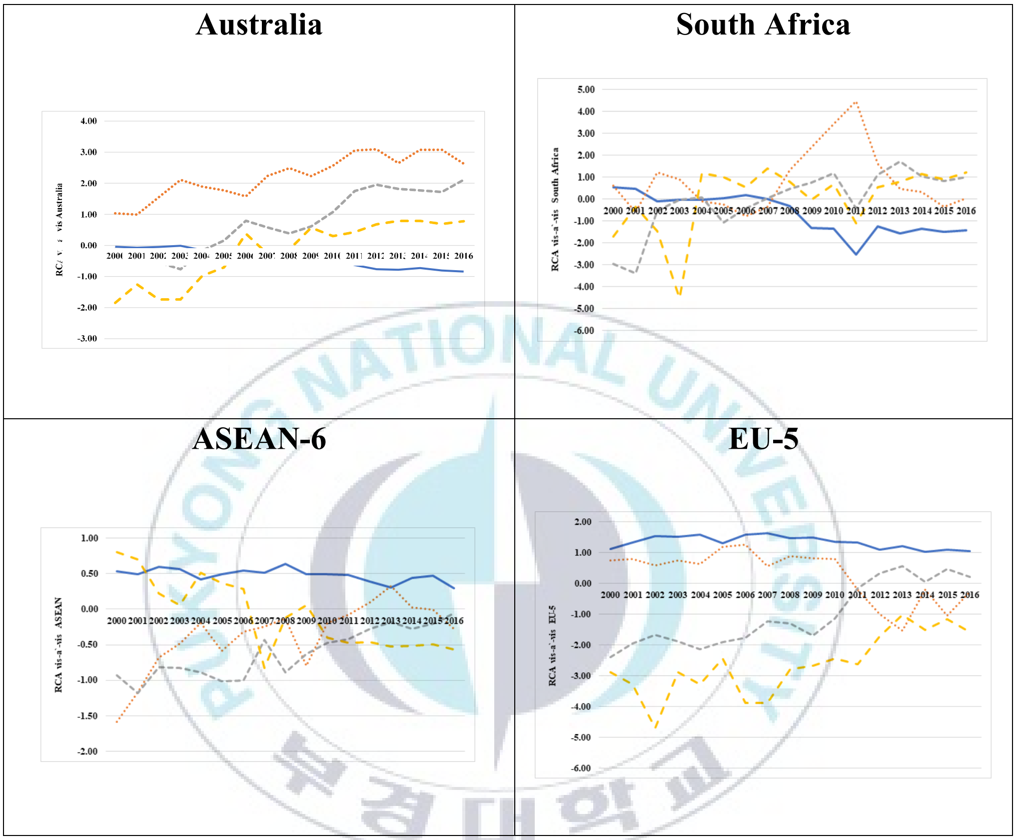



Note: 1. Low-skilled   Medium-skilled blue collar   Medium-skilled white collar   High-skilled

2.ASEAN-6 includes Thailand, Malaysia, Singapore, Indonesia, Philippines and Cambodia. EU-5 includes Germany, Netherlands, Italy, France and Switzerland. Due to limited space, the results of these countries are aggregated as ASEAN-6 and EU-5.

Source: Author's calculation using data from WITS database

## Figure 3-9 (cont'd) Vietnam's RCA Based on Labor Skill Composition *Vis-à-Vis* Main Trading Partners




Note: 1. Low-skilled ⋯⋯ Medium-skilled blue collar – – – Medium-skilled white collar — — High-skilled

2.ASEAN-6 includes Thailand, Malaysia, Singapore, Indonesia, Philippines and Cambodia. EU-5 includes Germany, Netherlands, Italy, France and Switzerland. Due to limited space, the results of these countries are aggregated as ASEAN-6 and EU-5.

Source: Author's calculation using data from WITS database

### 3.5.3 The Determinants of Vietnam's Trade Balance: A Gravity Model Approach

#### 3.5.3.1 The Role of Exchange Rate on Vietnam's Trade Balance

We adopt an extended gravity approach to estimate the role of exchange rate and the other determinants of Vietnam's trade balance based on labor skill classification. By following Kundu (2015), Khan and Hossain (2010) and Anderson and Wincoop (2003), the basic function of the determinants of trade balance can be expressed as follows:

$$\begin{aligned}\ln TB_{ijt} = \beta_0 &+ \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} \\ &+ \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} \\ &+ \mu_{it}\end{aligned} \tag{3-30}$$

Where $TB_{ijt}$ is Vietnam's trade balance with partner country $j$ at time $t$. Following the previous studies (Thapa, 2002; Bahmani-Oskooee, 2001; Bahmani-Oskooee, 1991), the trade balance is defined as $\frac{ex_{ijt}}{im_{ijt}}$, which is a unit free ratio and can be explained as both nominal and real terms.

$RER_{ijt}$ is the bilateral real exchange rate between Vietnam and a trading partner *j* at time *t*. In this paper, the bilateral exchange rate is defined as $\frac{VND_t}{ER_{it}}$, that is Vietnamese Dong over the exchange rate ($ER_{it}$) of partner *j* at time *t*. An increase (decrease) of $ER_{it}$ reveals a depreciation (appreciation) of VND vis-a-vis the currency of trading partner *j*. Therefore, the anticipated sign of $RER_{ijt}$ is positive. That is a real decrepitation of VND will promote the trade balance. The real bilateral exchange rate is calculated as $RER_{ijt} = \frac{NER*CPI_{it}}{CPI_{jt}}$. The nominal bilateral exchange rate is represented as $NER$. $CPI_{it}$ and $CPI_{jt}$ are consumer price indexes for Vietnam and country *j* at time *t*, respectively.

$RGDP_{jit}$ is calculated as $\frac{GDP_{jt}}{GDP_{it}}$, which indicates the relative GDP of country $j$ (partner country) over country $i$ (home country) at time *t*. $RPGNI_{jit}$ is the relative gross net income per capita, calculated as $\frac{PGNI_{jt}}{PGNI_{it}}$ , which means the income gap between partner country *j* and home country *i* at time *t*. It reveals a partner country's ability to “absorb" import. According to Kundu (2015) and Khan and Hossain (2010), for developing countries which can hardly gain trade surplus with low income and insufficient resources, the relative economic factors in relative to partner countries can better explain the determinants of trade balance than the absolute value adopted in the conventional gravity model. The $\beta_2$ is expected to be negative. It means that the bigger the $RGDP_{jit}$ is, the stronger the capacity a partner country $j$ can produce domestically than Vietnam. Hence the partner country $j$ has a stronger ability to meet her own domestic demand and export, which will lessen Vietnam's trade balance. The sign of $\beta_3$ is not unforeseeable. If $\beta_3$ is positive, it indicates that a rise in the income per capita of country $j$ in relative to Vietnam will lead to an increase in the import from Vietnam. A negative sign of $\beta_3$ reveals that the partner country $j$ will import less from Vietnam when she has a relative higher income than Vietnam.

$WDIS_{ijt}$ is the import weighted distance between country $i$ and country $j$ at time $t$. It is used as a proxy of transportation cost. Based on Kundu (2015) and Khan and Hossain (2010), this import weighted distance can better explain the transportation cost, as a nation does not trade equally with every trading partner. In most of the customs in the world, export volume is usually recorded in FOB (free on board) price and import volume is recorded in CIF (cost, insurance and freight) price. Therefore, trading transportation cost is usually related to import. As a result, it is appropriate to weight the distance by import volume and offer it as a delegate of transportation cost.

At the beginning of May 2011, the Vietnamese government was unable to maintain a fixed exchange rate regime anymore. Meanwhile, the State Bank of Vietnam (SBV) announced a deprecation of VND. In 2012, the exchange rate reform turned out to be effective in stabilizing VND exchange rate. From 2013 until now, the exchange rate experiences a stable period, which is plotted in Figure 3-1. Correspondingly, the trade balance has witnessed an improvement, turning into a slight surplus. To test how the exchange rate regime reform functions, we modify the basic empirical model by adding up a dummy variable, as follows:

$$\begin{aligned}\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} \\ + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} \\ + \beta_5 lnRER_{ijt} * D_{rgm} + \mu_{it}\end{aligned} \tag{3-31}$$

Where $D_{rgm} = 0$ before 2012; $D_{rgm} = 1$ from 2012 to 2016 is a dummy variable to capture the effect of exchange rate regime reform. To test the effect of exchange rate on the trade balance of the four groups of labor skill-produced goods, equation (3-32) to equation (3-35) are conducted, as follows:

$$\ln TBhs_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \mu_{it} \quad (3\text{-}32)$$

$$\ln TBmsw_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \mu_{it} \quad (3\text{-}33)$$

$$\ln TBmsb_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \mu_{it} \quad (3\text{-}34)$$

$$\ln TBls_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \mu_{it} \quad (3\text{-}35)$$

Where $\ln TBhs_{ijt}$, $TBmsw_{ijt}$, $TBmsb_{ijt}$ and $TBls_{ijt}$ are Vietnam's trade balance of high-skill labor-produced goods, medium-skill white collar labor-produced goods, medium-skill blue collar-labor produced goods and low-skill labor-produced goods with country *j* at time *t*, respectively. The trade balance of these four groups of labor skill-produced goods are also calculated as a ratio of export over import.

#### 3.5.3.2 The Role of Labor Skill Composition on Vietnam's Trade Balance

Based on the estimated results of last part, it is proved that exchange rate plays a limited role on Vietnam's trade balance in general. Hence, we seek for alternative policy proposal which can improve Vietnam's trade deficit. Moving up the labor skill ladder can be a choice to improve Vietnam's trade balance. Hence, we further include the export shares of the four labor skill classifications as proxies of structural factors into the basic gravity equation to test our assumption. The models are as follows:

$$\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} \tag{3-36}$$

$$+ \beta_2 lnRGDP_{jit}$$

$$+ \beta_3 lnRPGNI_{jit}$$

$$+ \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt}$$

$$* D_{rgm} + \beta_6 EXs\hbar hs_{ijt} + \mu_{it}$$

$$\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} \tag{3-37}$$

$$+ \beta_2 lnRGDP_{jit}$$

$$+ \beta_3 lnRPGNI_{jit}$$

$$+ \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt}$$

$$* D_{rgm} + \beta_6 EXs\hbar msw_{ijt}$$

$$+ \mu_{it}$$

$$
\begin{aligned}
\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} \qquad\qquad & (3\text{-}38) \\
+ \beta_2 lnRGDP_{jit} & \\
+ \beta_3 lnRPGNI_{jit} & \\
+ \beta_4 lnWDIS_{ijt} & \\
+ \beta_5 lnRER_{ijt} * D_{rgm} & \\
+ \beta_6 EXs\hbar msb_{ijt} + \mu_{it} &
\end{aligned}
$$



$$
\begin{aligned}
\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} \qquad\qquad & (3\text{-}39) \\
+ \beta_2 lnRGDP_{jit} & \\
+ \beta_3 lnRPGNI_{jit} & \\
+ \beta_4 lnWDIS_{ijt} & \\
+ \beta_5 lnRER_{ijt} * D_{rgm} & \\
+ \beta_6 EXs\hbar ls_{ijt} + \mu_{it} &
\end{aligned}
$$

Where $EXs\hbar hs_{ijt}$, $EXs\hbar msw_{ijt}$, $EXs\hbar msb_{ijt}$ and $EXs\hbar hs_{ijt}$ indicate

Vietnam's export shares of high-skill labor-produced goods, medium-skill white collar labor-produced goods, medium-skill blue collar-labor produced goods and low-skill labor-produced goods to country j at time t.

#### 3.5.3.3 The Role of RCA on Vietnam's Trade Balance

In this part, we aim to test how none-price competitiveness can affect Vietnam' trade balance. RCA indexes are used as proxies of none-price competitiveness of the four-labor skill-produced goods, which are as follows:

$$\begin{aligned}\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} \\ + \beta_2 lnRGDP_{jit} \\ + \beta_3 lnRPGNI_{jit} \\ + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} \\ * D_{rgm} + \beta_6 RCAhs_{ijt} + \mu_{it}\end{aligned} \tag{3-40}$$

$$\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \beta_6 RCAmsw_{ijt} + \mu_{it} \tag{3-41}$$

$$\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \beta_6 RCAmsb_{ijt} + \mu_{it} \tag{3-42}$$

$$\ln TB_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnRGDP_{jit} + \beta_3 lnRPGNI_{jit} + \beta_4 lnWDIS_{ijt} + \beta_5 lnRER_{ijt} * D_{rgm} + \beta_6 RCAls_{ijt} + \mu_{it} \tag{3-43}$$

where $RCAhs_{ijt}$, $RCAmsw_{ijt}$, $RCAmsb_{ijt}$, and $RCAls_{ijt}$ indicate Vietnam's RCA of high-skill labor-produced goods, medium-skill white collar labor-produced goods, medium-skill blue collar-labor produced goods and low-skill labor-produced goods vis-à-vis country *j* at time *t*, respectively.

### 3.5.4 Data

Balanced panel data from 2000 to 2016 is adopted in this paper. Vietnam's 20 main trading partners include China, United States, Korea, Japan, Hong Kong_China, the United Kingdom, India, Australia, South Africa, Thailand, Malaysia, Singapore, Indonesia, Philippines, Cambodia, Germany, Netherlands, Italy, France and Switzerland. Bilateral trading data is from

WITS database. Bilateral exchange rate data is extracted from IMF (International Monetary Fund). Nominal exchange rate and real effective exchange rate indexes of Vietnam are from the State Bank of Vietnam. The data of CPI (2000=100), GDP and GNI is from the website of World Bank. The distance data between Vietnam and her trading partner is from CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) database.

## 3.6 Estimation Results and Discussions

Estimation results of the role of exchange rate, skill composition and RCA are reported and discussed in this part. There are three types of panel data model: pooled effect, fixed effect and random effect. According to the high value of Hausman $\chi 2$ statistics of all estimation equations, the fixed effect models are preferable. The results of pooled effect and random effect are also provided for the purposes of comparison and robustness check.

### 3.6.1 The Role of Exchange Rate on Vietnam's Trade Balance

Table 3-2 reports the estimation results from equation (3-31) to equation (3-35). In terms of Vietnam's total trade balance, the significant and positive coefficient of exchange rate ($RER_{ijt}$) reveals that 1 per cent appreciation (depreciation) of the bilateral exchange rate will cause 0.05 per cent decrease (increase) of the total trade balance ratio. The empirical result is in line with our expectations. Nevertheless, the small value of coefficient of real bilateral exchange rate ($RER_{ijt}$) also proves that exchange rate policy is not a very efficient tool in adjusting Vietnam's bilateral trade balance with her main trading partners. We get significant positive coefficient of regime variable ($D_{rgm}$), which affirms that the exchange rate regime reform in 2012 helps to improve the total trade balance.

The sign for relative GDP ($RGDP_{jit}$) is negative, it reveals that when Vietnam's trade partners have a greater production capacity compared to Vietnam, they will consume less from Vietnam. This deteriorates Vietnam's trade balance. On the contrary, there is a significant positive parameter for relative PGNI (P$RGNI_{jit}$). The relative PGNI (P$RGNI_{jit}$) is included in the equation to measure a Vietnam's trading partner's ability to absorb imports. The empirical results manifest that the higher income Vietnam's trading partners have, the more they will import from Vietnam. Moreover, it also reveals the differences in factor endowment between Vietnam and her trading partners.

The signs of coefficients for relative GDP and relative GNI per capita are different, the explanations are as follows. First, even though there is closed connection between a country's GDP and GNI per capita, sometimes these two indexes do not move in the same direction or proportion. Take China as an example, even She has the second biggest GDP in the world, the GNI per capita of China is still relatively low. Moreover, unlike the previous papers, we adopt the relative concept when evaluating the GDP and GNI per capita. The relative GDP ($RGDP_{jit}$) is used to measure the gap of production capacity between Vietnam and her trading partner $j$, when the relative GNI per capita (P$RGNI_{jit}$) is adopted to capture the gap of income level between Vietnam and her main trading partner $j$. The "gap" here is relative value rather than absolute value. In consequence, relative GDP and relative GNI per capita can have different impact on Vietnam's trade balance in terms of both directions and magnitudes.

The weighted distance ($WDIS_{ijt}$) gives significant negative coefficient. The variable is proxied for transportation cost of Vietnam. This result shows that Vietnam tends to import more from her neighbors than she exports, resulting in negative impacts on Vietnam's trade balance.

As a result, three main findings are worth mentioning. Firstly, a real deprecation of VND and series of exchange rate reforms since 2012 are beneficial for Vietnam's trade balance, even though the effect is small.

Secondly, the higher production capacity Vietnam's trade partners have compared to Vietnam, the less they will import from Vietnam. Thirdly, the higher income of trade partners in relative to Vietnam, the more they will import from Vietnam. It also proves that in the case of Vietnam, the Hecker-Ohlin effect prevails over the Linder effect. Thirdly, the transportation cost tends to deteriorate Vietnam's trade balance.

When we decompose the trade, balance based on labor skill classification, unlike the total trade balance, real bilateral exchange rate ($RER_{ijt}$) has negative impact on the trade balance of high-skill labor-produced and medium-skill white-collar labor-produced goods. It reveals that the depreciation of VND will worsen the trade balance of high-skill labor-produced and medium-skill white-collar labor-produced goods. The underlying reason can be that Vietnam's exports of these two more-sophisticated labor skill-produced groups are highly dependent on the imported intermediate products. Because of limited capacity of getting domestic substituted goods, the depreciation of VND makes the imported goods more expensive. As a result, the weakening of currency deteriorates Vietnam's trade balance of these two groups. Conversely, the depreciation of VND can promote the trade balance of low-skill labor-produced and medium-skill blue-collar labor-produced goods.

Considering the role of exchange rate on Vietnam's trade balance, three points are noteworthy. Firstly, devaluation of VND has limited effect on promoting Vietnam's total trade balance, in general. Secondly, the deprecation of VND can only promote Vietnam's trade balance of low-skill labor-produced and medium-skill blue-collar labor-produced goods, while it will worsen the trade balance of medium-skill white-collar labor-produced and high-skill labor-produced goods, which are the main sources of Vietnam's long-lasting trade deficit. Thirdly, the exchange rate regime reform since 2012 is in favor of Vietnam's trade balance. The $R^2$, adjusted $R^2$ and $F$ statistics for each equation are provided. The diagnostic tests demonstrate that all equations are valid and significant at 5 per cent level.

## Table 3-2 Determinants of Vietnam's Total and Disaggregated Trade Balance Based on Labor Skill Composition

| No. Eq | Equation (3-31) | | | Equation (3-32) | | |
|---|---|---|---|---|---|---|
| Dep / Ind | $\ln TB_{ijt}$ | | | $\ln TBhs_{ijt}$ | | |
| | Pooled | Fixed | Ran | Pooled | Fixed | Ran |
| c | 1.74c (0.21) | 2.02 (0.78) | 1.96a (0.38) | -9.17a (1.818) | -14.18a (2.34) | -12.46a (1.92) |
| $lnRER_{ijt}$ | -0.01 (0.01) | 0.05c (0.03) | 0.04a (0.01) | 0.00 (0.01) | -0.06a (0.01) | -0.01b (0.01) |
| $lnRGDP_{jit}$ | -0.43a (0.05) | -0.68a (0.24) | -0.15c (0.09) | -0.36a (0.05) | -1.50a (0.38) | -0.54a (0.14) |
| $lnRPGNI_{ijt}$ | 0.18a (0.04) | 0.62b (0.28) | -0.05 (0.09) | 0.05 (0.06) | 1.22a (0.42) | 0.03 (0.17) |
| $lnWDIS_{ijt}$ | -0.78a (0.06) | -0.86a (0.07) | -0.77a (0.07) | -0.31a (0.07) | -0.30a (0.08) | -0.41a (0.07) |
| $lnRER_{ijt} * D_{rgm}$ | 0.08a (0.01) | 0.03a (0.01) | 0.05a (0.01) | 0.04b (0.02) | 0.03b (0.01) | 0.01 (0.01) |
| *N* | 340 | 340 | 340 | 340 | 340 | 340 |
| $R^2$ | 0.45 | 0.83 | 0.39 | 0.26 | 0.75 | 0.39 |
| Adj-$R^2$ | 0.44 | 0.81 | 0.38 | 0.25 | 0.73 | 0.38 |
| *F*-stat | 55.49a | 63.02a | 44.04a | 23.21a | 39.92a | 42.76a |
| *HSM* | 45.90a | | | 34.82a | | |

| Model | Fixed | Fixed |
|---|---|---|

Note: 1. Pooled, Fixed and Ran indicate pooled effect, fixed effect and random effect, respectively.
2. Dep and Ind represent dependent and independent variables, respectively.
3. a, b and c indicate 1%, 5% and 10% level of significance, respectively. Standard errors are provided in the parentheses. N indicates numbers of observations.
4. $R^2$, adjusted $R^2$ and F statistic for each equation are provided.
5. HSM represents chi-square statistic of Hausman test.

Source: Author's estimation using data from WITS, General Statistics Office of Vietn

## Table 3-3 (cont'd): Determinants of Vietnam's Total and Disaggregated Trade Balance Based on Labor Skill Composition

| No. Eq | Equation (3-33) | | | Equation (3-34) | | | Equation (3-35) | | |
|---|---|---|---|---|---|---|---|---|---|
| Dep | $\ln TBmsw_{ijt}$ | | | $\ln TBmsb_{ijt}$ | | | $\ln TBls_{ijt}$ | | |
| Ind | Pooled | Fixed | Ran | Pooled | Fixed | Ran | Pool | Fixed | Ran |
| c | -8.64a | -12.15a | -12.15a | -11.59a | -13.53a | -10.73a | -8.40a | 9.57a | 5.98a |
| | (0.96) | (1.48) | (1.14) | (0.79) | (1.30) | (0.90) | (1.58) | (1.93) | (1.64) |
| $lnRER_{ijt}$ | -0.01 | -0.35b | -0.05 | 0.01 | 0.67a | 0.11a | 0.02 | 0.41a | 0.29a |
| | (0.02) | (0.16) | (0.05) | (0.79) | (1.30) | (0.90) | (0.03) | (0.05) | (0.05) |
| $lnRGDP_{jit}$ | -0.16a | -0.70a | -0.24a | -0.11a | -0.49b | -0.01 | -0.17a | 0.24 | -0.11 |
| | (0.03) | (0.24) | (0.07) | (0.02) | (0.21) | (0.05) | (0.04) | (0.26) | (0.11) |
| $lnRPGNI_{ijt}$ | -0.001 | 0.55b | 0.05 | 0.18a | 0.41c | 0.33a | 0.28a | -0.62b | -0.06 |
| | (0.03) | (0.26) | (0.09) | (0.03) | (0.23) | (0.06) | (0.05) | (0.28) | (0.13) |
| $lnWDIS_{ijt}$ | 0.30a | -0.52a | -0.44a | -0.40a | -0.60a | -0.37a | -0.31a | 0.64a | 0.44a |
| | (0.04) | (0.07) | (0.05) | (0.03) | (0.05) | (0.03) | (0.07) | (0.10) | (0.09) |
| $lnRER_{ijt} * D_{rgm}$ | 0.04a | 0.02b | 0.02a | -0.02c | 0.01 | 0.01 | -0.02 | 0.02b | 0.02b |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| N | 340 | 340 | 340 | 340 | 340 | 340 | 340 | 340 | 340 |
| $R^2$ | 0.38 | 0.74 | 0.56 | 0.49 | 0.74 | 0.32 | 0.22 | 0.86 | 0.13 |
| Adj-$R^2$ | 0.37 | 0.72 | 0.55 | 0.48 | 0.72 | 0.31 | 0.21 | 0.85 | 0.11 |
| F-stat | 40.09a | 36.53a | 85.92a | 65.20a | 38.59a | 31.57a | 18.85a | 82.42a | 9.78a |
| HSM | 12.68b | | | 34.82a | | | 32.16a | | |
| Model | Fixed | | | Fixed | | | Fixed | | |

Note: 1. Pooled, Fixed and Ran indicate pooled effect, fixed effect and random effect, respectively.

2. Dep and Ind represent dependent and independent variables, respectively.

3. a, b and c indicate 1%, 5% and 10% level of significance, respectively. Standard errors are provided in the parentheses. N indicates numbers of observations.

4. $R^2$, adjusted $R^2$ and F statistic for each equation are provided.

5. HSM represents chi-Square statistic of Hausman test.

Source: Author's estimation using data from WITS, General Statistics Office of Vietnam and IMF databases.

### 3.6.2 The Role of Labor Skill Composition on Vietnam’s Trade Balance

The export shares of the four labor skill groups are used as proxies to capture the structural factors on Vietnam's trade balance. Table 3-2 illustrates results of equation (3-36) to equation (3-39), which are employed to test the role of labor skill composition on Vietnam's trade balance.

The coefficients for export shares of high-skill labor-produced and medium-skill white-collar labor-produced goods ($EXsh\_hs_{ijt}$ and $EXsh\_msw_{ijt}$) are significant and positive. The empirical results confirm that moving up the labor skill ladder can facilitate Vietnam's trade balance.

Moreover, the coefficient of the export share of medium-skill blue-collar labor-produced good ($EXsh\_msb_{ijt}$) is not significant. And the coefficient of export share of low-skill labor-produced ( $EXsh\_ls_{ijt}$ ) is significant and negative. The results confirm that focusing on low skill-produced goods is not sustainable for promoting Vietnam's trade balance. The coefficients of other variables are not different significantly from those of last part, the F-statistics and relatively high $R^2$ and adjusted $R^2$ confirm that all models are va

## Table 3-4 Vietnam's Trade Balance and the Role of Labor Skill Composition on Trade

| No. Eq | Equation (3-36) | | | Equation (3-37) | | |
|---|---|---|---|---|---|---|
| Dep / Ind | $\ln TB_{ijt}$ | | | $\ln TB_{ijt}$ | | |
| | **Pooled** | **Fixed** | **Ran** | **Pooled** | **Fixed** | **Ran** |
| $c$ | 10.77a | 7.99a | 10.32a | 10.70a | 9.14a | 10.59a |
| | (0.31) | (1.20) | (0.55) | (0.31) | (1.01) | 0.52 |
| $lnRER_{ijt}$ | 0.03a | 0.23a | 0.07a | 0.01a | 0.05a | 0.02a |
| | (0.01) | (0.04) | (0.02) | (0.00) | (0.01) | (0.00) |
| $lnRGDP_{jit}$ | -0.02 | -1.81a | -0.53a | -0.06 | -1.99a | -0.54a |
| | (0.07) | (0.38) | (0.13) | (0.07) | (0.36) | (0.13) |
| $lnRPGNI_{ijt}$ | 0.18a | 0.52 | -0.32b | 0.21a | 0.96b | -0.22c |
| | (0.05) | (0.44) | (0.14) | (0.05) | (0.42) | (0.14) |
| $lnWDIS_{ijt}$ | -0.57a | -0.51a | -0.70a | -0.57a | -0.45a | -0.63a |
| | (0.08) | (0.12) | (0.11) | (0.08) | (0.11) | (0.10) |
| $lnRER_{ijt} * D_{rgm}$ | 0.13a | 0.05a | 0.07a | 0.13a | 0.03b | 0.05a |
| | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) | (0.01) |
| $EXs\hbar hs_{ijt}$ | 2.24a | 1.85a | 2.61a | - | - | - |
| | (0.39) | (0.35) | (0.33) | - | - | - |
| $EXs\hbar msw_{ijt}$ | - | - | - | 1.28a | 1.44a | 1.71a |
| | - | - | - | (0.23) | (0.19) | (0.18) |
| $N$ | 340 | 340 | 340 | 340 | 340 | 340 |
| $R^2$ | 0.48 | 0.80 | 0.56 | 0.48 | 0.81 | 0.58 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Adj-$R^2$ | 0.48 | 0.78 | 0.55 | 0.47 | 0.79 | 0.57 |
| *F*-stat | 52.22a | 49.90a | 69.56a | 51.83a | 53.34a | 76.78a |
| *HSM* | 76.98a | | | 74.96a | | |
| Model | Fixed | | | Fixed | | |

Note: 1. Pooled, Fixed and Ran indicate pooled effect, fixed effect and random effect, respectively.
2. Dep and Ind represent dependent and independent variables, respectively.
3. a, b and c indicate 1%, 5% and 10% level of significance, respectively. Standard errors are provided in the parentheses.
4. N indicates numbers of observations.
5. $R^2$, adjusted $R^2$ and F statistic for each equation are provided.
6. HSM represents chi-Square statistic of Hausman test.

Source: Author's estimation using data from WITS, General Statistics Office of Vietnam and IMF databases.



## Table 3-5 (cont'd) Vietnam's Trade Balance and the Role of Labor Skill Composition

| **No. Eq** | **Equation (3-38)** | | | **Equation (3-39)** | | |
|---|---|---|---|---|---|---|
| **Dep** / **Ind** | $\ln TB_{ijt}$ | | | $\ln TB_{ijt}$ | | |
| | **Pooled** | **Fixed** | **Ran** | **Pooled** | **Fixed** | **Ran** |
| c | -0.05<br>(0.11) | 0.14<br>(0.38) | 0.04<br>(0.20) | 13.65a<br>(0.36) | 7.57a<br>(1.36) | 12.86a<br>(0.56) |
| $lnRER_{ijt}$ | 0.00<br>(0.00) | -0.01<br>(0.00) | -0.01a<br>(0.00) | 0.13a<br>(0.03) | 0.98a<br>(0.16) | 0.22a<br>(0.06) |
| $lnRGDP_{jit}$ | 0.19a<br>(0.03) | -0.33a<br>(0.14) | 0.08c<br>(0.05) | -0.02<br>(0.07) | -1.46a<br>(0.33) | -0.49a<br>(0.12) |
| $lnRPGNI_{ijt}$ | 0.10a<br>(0.02) | 0.36b<br>(0.16) | 0.00<br>(0.05) | 0.14a<br>(0.05) | 0.27<br>(0.38) | -0.30b<br>(0.13) |

| | | | | | | |
|---|---|---|---|---|---|---|
| $lnWDIS_{ijt}$ | 0.37a (0.03) | 0.40a (0.04) | 0.36a (0.04) | -0.53a (0.08) | -0.53a (0.10) | -0.68a (0.09) |
| $lnRER_{ijt} * D_{rgm}$ | 0.04a (0.01) | 0.02a (0.01) | 0.03a (0.00) | 0.12a (0.02) | 0.04a (0.01) | 0.06a (0.01) |
| $EXshmwb_{ijt}$ | -0.43 (0.27) | -0.13 (0.23) | 0.04 (0.22) | - - | - - | - - |
| $EXshbl_{ijt}$ | - - | - - | - - | -3.14 (0.35) | -2.77a (0.27) | -3.48a (0.25) |
| N | 340 | 340 | 340 | 340 | 340 | 340 |
| $R^2$ | 0.43 | 0.79 | 0.34 | 0.54 | 0.85 | 0.66 |
| Adj-$R^2$ | 0.42 | 0.78 | 0.32 | 0.53 | 0.83 | 0.65 |
| F-stat | 42.46a | 48.43a | 27.97a | 64.81a | 69.44a | 106.67a |
| HSM | 29.11a | | | 80.45a | | |
| Model | Fixed | | | Fixed | | |

Note: 1. Pooled, Fixed and Ran indicate pooled effect, fixed effect and random effect, respectively.
2. Dep and Ind represent dependent and independent variables, respectively.
3. a, b and c indicate 1%, 5% and 10% level of significance, respectively. Standard errors are provided in the parentheses.
4. N indicates numbers of observations.
5. $R^2$, adjusted $R^2$ and F statistic for each equation are provided.
6. HSM represents chi-Square statistic of Hausman test.

Source: Author's estimation using data from WITS, General Statistics Office of Vietnam and IMF databases.

### 3.6.3 The Role of RCA on Vietnam's Trade Balance

In this section, we aim to test the relationship between products' none-price competitiveness and Vietnam's trade balance by implementing equation (3-40) to equation (3-43) and the results are displayed in Table 3-6. The RCA index is employed to capture the evolution of Vietnam's none-price competitiveness of the four labor skill groups. According to the empirical results, when the values of RCA of high-skill labor-produced and medium-skill white-collar labor-produced goods ($RCAhs_{ijt}$) and ($RCAmsw_{ijt}$) increase, the trade balance of Vietnam will be improved. It indicates that the improvement of none-price competitiveness of high-skill labor-produced and medium-skill white-collar labor-produced goods has a positive impact on Vietnam's trade balance.

The RCA indexes of medium-skill blue-collar labor-produced and low-skill labor produced goods are also included in the equations. The coefficients of RCA of the medium-skill blue-collar labor-produced and low-skill labor-produced goods ($RCAmsb_{ijt}$ and $RCAls_{ijt}$) are either insignificant or negative at 1 per cent level. Therefore, it signifies that facilitating the none-competitiveness of higher skill labor-produced goods can be a prominent approach to improve Vietnam's trade balance, rather than developing the competitiveness of the medium-skill blue-collar labor-produced and low-skill labor-produced goods. All estimation equations are valid at 5 per cent significant level according to the F-statistic.

## Table 3-6 Vietnam's Trade Balance and the Role of RCA

| No. Eq | Equation (3-40) | | | Equation (3-41) | | |
|---|---|---|---|---|---|---|
| Dep \ Ind | $\ln TB_{ijt}$ | | | $\ln TB_{ijt}$ | | |
| | **Pooled** | **Fixed** | **Ran** | **Pooled** | **Fixed** | **Ran** |
| c | 11.38a (0.29) | 4.68a (1.53) | 10.77a (0.52) | 1.76 (0.22) | 0.58 (0.97) | 1.74a (0.46) |
| $lnRER_{ijt}$ | 0.00a (0.00) | 0.06a (0.01) | 0.01a (0.00) | 0.03a (0.02) | 0.38a (0.12) | 0.19a (0.05) |
| $lnRGDP_{jit}$ | 0.10 (0.07) | -1.90a (0.38) | -0.43a (0.12) | 0.44a (0.05) | -0.64a (0.24) | 0.12 (0.10) |
| $lnRPGNI_{ijt}$ | 0.16a (0.05) | 0.39 (0.44) | -0.34a (0.12) | 0.21b (0.04) | 0.56b (0.28) | -0.09 (0.11) |
| $lnWDIS_{ijt}$ | -0.59a (0.08) | -0.45a (0.12) | -0.70a (0.10) | -0.78a (0.06) | -0.92a (0.08) | -0.81a (0.07) |
| $lnRER_{ijt} * D_{rgm}$ | 0.18a (0.02) | 0.08a (0.01) | 0.13a (0.01) | 0.09a (0.01) | 0.03a (0.01) | 0.05a (0.01) |
| $RCAhs_{ijt}$ | 0.36a (0.05) | 0.12a (0.04) | 0.24a (0.04) | - - | - - | - - |
| $RCAmsw_{ijt}$ | - - | - - | - - | 0.09b (0.04) | 0.07a (0.03) | 0.04 (0.03) |

| | | | | | | |
|---|---|---|---|---|---|---|
| N | 340 | 340 | 340 | 340 | 340 | 340 |
| $R^2$ | 0.52 | 0.80 | 0.51 | 0.47 | 0.83 | 0.83 |
| Adj-$R^2$ | 0.51 | 0.78 | 0.50 | 0.46 | 0.82 | 0.82 |
| F-stat | 59.71a | 50.39a | 57.19a | 48.56a | 62.89a | 38.44a |
| HSM | 131.88a | | | 46.15a | | |
| Model | Fixed | | | Fixed | | |

Note: 1. Pooled, Fixed and Ran indicate pooled effect, fixed effect and random effect, respectively.
2. Dep and Ind represent dependent and independent variables, respectively.
3. a, b and c indicate 1%, 5% and 10% level of significance, respectively. Standard errors are provided in the parentheses.
4. N indicates numbers of observations.
5. $R^2$, adjusted $R^2$and F statistic for each equation are provided.
6. HSM represents chi-Square statistic of Hausman test.
Source: Author's estimation using data from WITS, General Statistics Office of Vietnam and IMF databases.

## Table 3-7 (cont'd) Vietnam's Trade Balance and the Role of RCA

| No. Eq | Equation (3-42) | | | Equation (3-43) | | |
|---|---|---|---|---|---|---|
| Dep / Ind | $\ln TB_{ijt}$ | | | $\ln TB_{ijt}$ | | |
| | Pooled | Fixed | Ran | Pooled | Fixed | Ran |
| c | 1.72a (0.22) | 0.34 (1.04) | 1.72a (0.43) | 1.83a (0.22) | 2.09a (0.80) | 2.09a (0.38) |
| $lnRER_{ijt}$ | 0.03 (0.02) | 0.39a (0.13) | 0.15a (0.05) | 0.04c (0.02) | 0.10c (0.10) | 0.18b (0.04) |
| $lnRGDP_{jit}$ | 0.40a (0.05) | -0.65a (0.24) | 0.16c (0.09) | 0.44a (0.05) | 0.29 (0.20) | 0.07a (0.08) |
| | 0.16a | 0.52c | -0.05 | 0.21a | 0.03 | 0.09 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $lnRPGNI_{ijt}$ | (0.04) | (0.28) | (0.10) | (0.04) | (0.23) | (0.09) |
| $lnWDIS_{ijt}$ | -0.75a (0.06) | -0.85a (0.08) | -0.78a (0.07) | -0.77a (0.06) | -0.83a (0.06) | -0.89a (0.06) |
| $lnRER_{ijt} * D_{rgm}$ | 0.10a (0.01) | 0.04a (0.01) | 0.05a (0.01) | 0.08a (0.01) | 0.03a (0.01) | 0.04a (0.01) |
| $RCAmsb_{ijt}$ | -0.17a (0.05) | -0.04 (0.05) | 0.02 (0.04) | - - | - - | - - |
| $RCAls_{ijt}$ | - - | - - | - - | -0.08 (0.07) | -0.04a (0.05) | -0.03a (0.05) |
| N | 340 | 340 | 340 | 340 | 340 | 340 |
| $R^2$ | 0.48 | 0.83 | 0.40 | 0.46 | 0.89 | 0.61 |
| Adj-$R^2$ | 0.47 | 0.82 | 0.39 | 0.45 | 0.88 | 0.60 |
| F-stat | 50.51a | 61.70a | 36.77a | 47.37a | 101.16a | 85.49a |
| HSM | 54.15a | | | 47.12a | | |
| Model | Fixed | | | Fixed | | |

Note: 1. Pooled, Fixed and Ran indicate pooled effect, fixed effect and random effect, respectively.
2. Dep and Ind represent dependent and independent variables, respectively.
3. a, b and c indicate 1, 5 and 10 level of significance, respectively. Standard errors are provided in the parentheses.
4. N indicates numbers of observations.
5. $R^2$, adjusted $R^2$ and F statistic for each equation are provided.
6. HSM represents chi-Square statistic of Hausman test.

Source: Author's estimation using data from WITS, General Statistics Office of Vietnam and IMF databases.

## 3.7 Conclusion

This chapter is the first work to scrutinize the roles of both exchange rate and labor skill composition on Vietnam's trade balance with her main trading partners, aiming at seeking for solutions to improve Vietnam's long-lasting trade deficit. We conduct a gravity model including the pooled OLS, the fixed and the random effect regressions, by using bilateral trading data with Vietnam's 20 main trading partners.

The major findings of our works are as follows. Firstly, exchange rate plays a very limited role on Vietnam's trade balance. Depreciation of the VND will deteriorate the trade balance of high-skill labor-produced and medium-skill white-collar labor-produced goods. The underlying reason is that Vietnam does not have competitiveness in these two groups. The exports of these two groups depend heavily on the imported intermediate goods. Secondly, in recent years, Vietnam's exports to most of her main trading partners are moving up the labor skill ladder, which is proved by the increasing export shares of high-skill labor-produced and medium-skill white-collar labor-produced goods. The RCAs of these two groups vis-a`-vis most of her trading partners witness improving patterns, as well. Thirdly, our empirical findings support that optimizing the trade structure and improving the none-price competitiveness of high-skill labor-produced and medium-skill white-collar labor-produced goods are crucial to improve Vietnam's trade balance. Lastly, the other results of the gravity model also indicate that the relative GDP and the import weighted distance have negative impact on Vietnam's trade balance, whereas the relative income has a positive impact on Vietnam's trade balance.

Consequently, policy implications can be drawn based on our empirical findings. Firstly, Vietnam should be very cautious to implement the exchange rate policy to adjust the trade balance. Secondly, concentrating on medium-skill blue-collar labor-produced and low-skill labor-produced goods is not a sustainable developing plan for Vietnam's trade. Thirdly, the alternative policy proposal for promoting Vietnam's trade balance can be moving up the labor skill ladder. Fourthly, promoting the none-price competitiveness of high-skill labor-produced and medium-skill white-collar labor-produced goods can be also beneficial for Vietnam's trade balance, rather than boosting the competitiveness of medium-skill blue-collar labor-produced and low-skill labor-produced goods. Fifthly, the capacity of producing imported substitutions of high-skill labor-produced and medium-skill white-collar labor-produced products should be enhanced. Lastly, the coefficient of relative GDP suggests that Vietnam should enhance her own production capacity. The negative impact of import weighted distance indicates that Vietnam should pay more efforts on upgrading her logistics system to reduce transportation cost. The result of relative GNI per capita states that Vietnam's trade balance improves between countries with different income levels. As a result, Vietnam should diversify her trading markets with higher income countries to felicitate her trade balance.

# Chapter 4 The Heterogenous Exchange Rate Pass-Through into Vietnam's Import Prices from China

## 4.1 Introduction

Exchange rate pass-though (ERPT) indicates the impacts of effective exchange rate change on the trading prices of a country's trading commodities. After more than two decades of Doi Moi, Vietnam has highly been involved in international economies. The trade performance is expected to be promoted dramatically, since Vietnam has signed up bilateral and multilateral FTA with many trade partners. This trend is believed to offer Vietnam lots of opportunities, at the same time, many challenges will be brought to Vietnam's economy and enterprises. Because of the economic integration, huge changes will be brought in to the relationship between Vietnamese Dong (VND) and the currencies of her main trading partners. The risk from outside coming into the local economy is expected to increase significantly.

China is one of the most significant trade markets of Vietnam. This country is also the biggest source of Vietnam's trade deficit. As the RMB's (Chinses Renminbi) internationalization, it is empirically proved that RMB is an invoicing currency of Vietnam when Vietnam is importing goods from abroad (Nguyen and Tran, 2017). However, the research on the exchange rate pass-through into Vietnam's import prices from China is quite limited. The empirical studies on Vietnam-China trading prices do not draw enough attention.

As we mention in part 4.2, most of the studies on the ERPT focus on the developed countries, for example the United State or Western Europe. In Asia, most of the studies attempt to research the cases of Japan, Korea and China. In regarding to the case of Vietnam, the empirical works are still quite rare. To the best of our knowledge, only one paper researches the case between Vietnam and China (Nguyen and Tran, 2017). However, this paper only researches the manufacturing industries. As a result, the main objective of this part is to research the heterogenous ERPT into Vietnam's import prices from China, by using highly disaggregated 6-digit HS data, from 2001 to 2016.

Based on our preliminary research, two main findings are noteworthy. Firstly, the degree of intra-industry has been increasing between Vietnam-China trade. More specifically, the vertical intra-industry trade accounts for the biggest proportion of Vietnam-China intra-industry trade. Secondly, most of Vietnam's trading goods are in the position of low quality, in relative to China. Nevertheless, the goods quality of Vietnam has witnessed an improvement from 2001 to 2016.

The results of most recent papers on the issues of ERPT documented that the intra-industry trade and goods quality were the main factors which led to the heterogeneities of ERPT. Therefore, to distinguish us from the existing papers, we further research the roles of vertically differentiated production and goods quality on the ERPT into Vietnam's import prices from China.

The rest of chapter 4 is arranged as follows. The following section 4.2 is the literature review. Section 4.3 discusses the thermotical framework of exchange rate pass-through. Section 4.4 defines the empirical models and illustrates the data. Results are discussed in section 4.5 and section 4.6 concludes chapter 4.

## 4.2 Literature Review

### 4.2.1 Literature Review on the Exchange Rate Pass-Through

Modelling and examining the connections between the exchange rates and trading prices have received considerable attention during the last three decades (Hong and Zhang 2016; Moon 2015; Goldhammer, Abrashkina, and Busse 2008; Kim 2007; Wickremasinghe and Silvapulle 2004; Pollard and Coughlin 2003; Knetter 1994; Marston 1990; Knetter 1989). However, results of the policy taken by some developing countries to weaken the home currencies were disappointing since they failed to achieve the desirable economic goals, refuting the theoretical expectations that depreciation of a currency would promote exports and reduce imports, leading to an equilibrium in the trade balance of a country. In the case of Vietnam, although the Vietnamese Dong (VND) was depreciating, Vietnam had a significant trade deficit against China for a long time. It indicates that the fluctuation in exchange rates were not completely transferred into import prices. Pioneering studies to exchange rate pass-through relationship stemmed from exploring the import/export demand and supply elasticities (Branson 1972).

According to the theory, incomplete pass-through is mainly owning to market structure and product differentiation (Menon, 1996). Under the assumption of a market with a perfect competition, in which the imported and domestic goods can substitute each other perfectly. In the real world, usually the imperfectly competitive market exists. A markup can be added up to the cost by a firm to gain extra profits. This mark-up can be changed according to the degree of the degree of substitutions between the domestic goods and imported goods. The degree of substitutions is determined by the product differentiation and the level of market integration and separation

A plethora of empirical papers have researched the ERPT by adopting different methodologies and data across various economies in the past three decades. They are classified into two groups based on the results.

In the first group, the ERPT into import prices were found to be incomplete. Aron et al. (2014) explored the exchange rate pass-through to the monthly import price index in South Africa from 1980 to 2009. The results shown that the average pass-through was about 50 per cent within a year, and 30 per cent in six months, which indicated that exchange rate pass-through to import prices to South Africa was incomplete.

Similarly, Campa and Sebastiá-Barriel (2006) estimated the exchange rate pass-through into import prices utilizing the industry level data from European Union countries. The results from error correction model confirmed that ERPT was incomplete. Furthermore, the pricing behavior of manufacturing industries was different from the homogenous products produced in the primary industries.

Menon (1993) explored the ERPT to import prices of automobiles adopting the Engle-Granger's cointegration tests and the model of error correction models. The paper concluded that ERPT to import prices of automobiles was incomplete in the long-run. Two possible explanations are given in the paper for the incomplete pass-through: the existing of quantitative limitations and the pricing behaviors on intra-firm sales by multinational companies.

Twelve European countries were examined in the work of Lutz and Reilly (1997). They found that the exchange rate pass-through was smaller than 50 percent for all 20 selected countries. It was also revealed that the low level of pass-through was not connected to the market share of domestic companies, or non-tariff barriers. However, in the work of Adolfson (2001), he argued that the pricing to market behavior in the most of industries was the reason for incomplete pass- through.

In the second group, the ERPT into import prices were found to be complete. For example, in the work of Dwyer, Kent and Peace (1994), the exchange pass-through into both export and import prices of the docks was complete for Australian manufactured industries. Another work of Dwyer and Lam (1994) also had the similar conclusion.

### 4.2.2 Literature Review on the Heterogenous Exchange Rate Pass-Through

Recently, researches started to conduct the examinations of ERPT into trading prices from the perspective of the commodity heterogeneity. They believed that the product-specific characteristic significantly contributed to the heterogeneous exchange rate pass-through (Auer, Chaney, and Sauré, 2018; Chen and Juvenal, 2016; Bernini and Tomasi, 2015; Antoniades and Zaniboni, 2016; Han and Shen, 2016; Auer and Chaney, 2009; Bacchetta and van Wincoop, 2005; Yang, 1997; Athukorala and Menon, 1994 Dornbush, 1987).

All the above-mentioned papers support the assumption that the production differentiation led to the hetergeneous ERPT to trading prices. In the work of Auer, Chaney, and Sauré (2018), they explored the pricing-to-market behaviors of firms in vertically differentiated industries. They incorporated the goods quality and consumers' income in the empirical models. Their conclusions shed light on that the decisions of pricing-to-market could be attributed to the interaction of income of consumer and product quality.

Chen and Juvenal (2016) scrutinized the impacts of real exchange rate changes on the pricing behaviors of firms exporting various commodities with heterogeneous quality. Their result suggested that the prices of lower quality products were more exposed to the real exchange rate variation while the prices of higher quality responded less sensitively to the real exchange rate.

By using the HS data at 6-digit level from 1991~2001, Auer and Chaney (2009) esitimated the ERPT into the impor prices of products with different quanlity level in the US. They found out the import prices of low quanlity products were more sensitive to the variation of real exchange rate than the high quanlity products.

Athukorala and Menon (1994) argued that the reaction of the intermediate goods in response to the exchange rate determined the exchange rate pas-though into different industries. The degree of the dependence on the intermediate goods affected the degree of exchange rate pass-through. The industries with high degree of intra industry had lower ERPT. Examples are electronics and mechanical industries. On the contrary, industries like chemicals had higher ERPT because of the low degree of intra industry trade.

### 4.2.3 Literature Review on the Case of Vietnam

As can be seen, most of the literature on the ERPT into the trading prices is focusing on the developed countries. The studies on the case of Vietnam are scarce. As Vietnam's biggest trade partner, the studies on Vietnam-China trading prices do not receive enough attention either. Only one paper can be found which studied Vietnam's import prices from China (Nguyen and Tran, 2017), to the best of our knowledge. In their work, they adopted the fixed effect model by using monthly data from December 2007 to December 2015. They concluded that Chinses RMB was one of the invoicing currencies for Vietnam. The price-to-market decisions were detected across the manufacturing industries in the imports of Vietnam from China.

Regarding to the papers on exchange rate pass-through into Vietnam's import prices from China, the following limitations are notable. Firstly, the empirical evidence supporting the exchange rate pass through into Vietnam's import prices from China is scarce. Secondly, the heterogeneities of exchange rate pass-through into Vietnam's import prices from China are never studied from the perspective of the products differentiation.

Therefore, our work attempts to contribute to the existing literature as the follows. Firstly, we conduct the experiment from the perspective of intra-industry. International trade can be divided into two types: inter-industry trade and intra-industry trade. The difference in factor endowment between two countries leads to inter-industry trade, while the economies of scale and product differentiation result in intra-industry trade. The production differentiation is implemented to measure the degree of intra-industry trade in many empirical works (Azhar and Elliott 2008a, 2008b; Ghosh and Rajan 2007; Aturupane, Djankov, and Hoekman 1999; Krugman 1979), and so as to estimate the role of production differentiation on exchange rate pass-through (Auer, Chaney, and Sauré 2018; Athukorala and Menon; 1994).

Based on our preliminary studies in section 4.4, the degree of intra-industry trade between Vietnam and China is increasing significantly, over time. Therefore, it is necessary to re-investigate the ERPT in this context, by using the G-L (Grubel-Lloyd index) index to measure the degree of intra-industry trade. So far as we know, it is for the first time to include this factor when analyzing the ERPT in the case of Vietnam.

Secondly, we apply the factor of goods quality into our empirical model, to test the heterogeneous ERPT across products with different quality. Based on our preliminary results in section 4.4, the quality of Vietnam's goods is generally lower than that of China's. However, the gap of goods quality between these two countries is shrinking. According to (Chaney and Sauré, 2018; Chen and Juvenal, 2016; Han and Shen, 2016), the quality is both theoretically and empirically proved to affect the ERPT. Therefore, it stimulates our interests in investigating the ERPT to Vietnam's import prices from China by including the goods quality, which is also the first work conducted in the case of Vietnam-China.

## 4.3 Theoretical Framework

The exchange rate pass-through effects into trading prices originate from the Law of One Price. Based on the assumptions of inexistence of trade barriers in international trade, the domestic price of a product in a country is equal to the price in the international markets. Under the premise of profit maximization, the basic production function of producer can be written as:

$$\mathrm{MAX}\ \Pi_i = P_i^x Q_i - C_i(Q_i, INP_I) \qquad (4\text{-}1)$$

Where $\Pi_i$ represents the maximized profit of industry i. $P_i^x$ denotes the trading price in the home currency in foreign country x. $C_i$ represents the cost of production, which is a function of quantity ($Q_i$) and intermediate input price $INP_i$. When we connect the production function in international trade, the trading price should be exchanged into the currency of the foreign market, as follows

$$\text{MAX } \Pi_i = eP_i^x Q_i - C_i(Q_i, INP_i) \tag{4-2}$$

Equation (4-2) can be interpreted in the same way, but now the export price is expressed as $eP_i^x Q_i$, e represents the bilateral exchange rate. In other words, the export price is now represented in the foreign currency. To get the optimal price which can maximize exporter producers' profit, we make the first-order derivative of equation (4-2) against price, and get equation (4-3):

$$P_i^x = \frac{MC_i}{e} * \frac{\varphi_i}{\varphi_{i-1}} = \frac{MC_i}{e} * \theta_i \tag{4-3}$$

Where $P_i^x$ is the export price of the exporting producers with maximized profit, pricing on the currency of the foreign market, in our case, in Chinses Renminbi; When a domestic trading firm prices an export commodity, it is assumed that a markup $Q_i$, which is an equation of the price elasticity of demand $\varphi_i$ in the foreign market-will be added to the marginal cost ($MC_i$) of production. e is the exchange rate, defined as units of local currency per unit of foreign currency. When e increases (decrease), it means the depreciation (appreciation) of the domestic currency. As a result, when we take the natural logarithm of both sides of equation (4-3), the basic exchange rate pass-through effects into export price can be written as equation (4-4)

$$\log(P_i) = \beta_1 + \beta_2 \log(MC_i) + \beta_3 \log(ER_i) + \varepsilon_t \quad (4\text{-}4)$$

Where $\varepsilon_t$ is the error term, $\beta_1$ is the constant. $\beta_2$ is the parameter for export producers' marginal cost. It indicates how much the marginal cost of producers will change the export price. $\beta_3$ is the degree of exchange rate pass-through to export price. There are five possible occasions of $\beta_3$.

Firstly, if $\beta_3$ equals to -1, it reflects the complete exchange rate pass through. To be more detailed, if there is 1 per cent depreciation (1 per cent increase in exchange rate) in domestic currency, the export price (priced by the foreign currency) will decrease for 1per cent, the exchange rate fluctuation effect is wholly transmitted to export price. On the opposite case, if there is 1 per cent appreciation of the domestic currency (1% decrease in exchange rate), the export price quoted by the foreign currency will increase for the same level, which is also 1%, the appreciation of domestic currency is thoroughly passed through to the export price.

Secondly, if -1< $\beta_3$ <1, in this case, the fluctuation of exchange rate is not 100 per cent passed through to the export price. In other words, the exchange rate variation is only partially delivered to the export price in the export market. When the domestic currency depreciates (appreciates) for 1 per cent, the export price in foreign currency will decrease (increase) less than 1 per cent. The closer $\beta_3$ is to -1, the larger exchange pass-through effect is. The closer $\beta_3$ is to 0, the smaller exchange pass-through effect is.

Thirdly, if $\beta_3$ equals to 0, the export price is not affected by the exchange rate fluctuation. Fourthly, $\beta_3$< -1 denotes excessive exchange rate transfer. 1 per cent depreciation or appreciation will cause more than 1 per cent fluctuation in the export price. Fifthly, if $\beta_3 > 0$, it indicates the exchange rate is reversely pass through to the export price. For example, 1 per cent depreciation in the domestic currency will lead to increase in the export price.

When the Law of One Price holds, the exchange rate pass-through should be complete and symmetric and $\beta_3 = -1$. one per cent depreciation in home currency will decrease the export price in foreign currency by 1 per cent. 1 per cent appreciation in home currency will lead to the same magnitude change in export price but the opposite side of the depreciation. However, in the reality of international trade, the Law of one price is difficult to be realized. Krugman (1986) is the pioneer who proposed the Pricing to-Market theory in this topic. He argues that in the real world economic, most of the industries are facing imperfect competition. To keep the market share, some industry producers will adjust their marginal profits or cost makeups to absorb the fluctuations of the exchange rate. Consequently, the export prices for the same products to different destinations vary, and the ERPT is usually incomplete, with the assumption of profit maximization.

## 4.4 Methodology and Data

### 4.4.1 Intra and Inter-Industry Trade

By following the considerable literature on the evaluation of the degree of intra-industry trade originating from the work of Balassa (1986) and Grubel and Lloyd (1971). We adopt the weighted G-L index to capture the level of intra-industry trade between Vietnam and China, from 2001 to 2016.

$$\mathrm{GL}_{it} = 1 - \frac{|X_{it} - M_{it}|}{X_{it} + M_{it}} \tag{4-5}$$

where $X_{it}$ indicates the export of commodity i from Vietnam to China, at time *t*, $M_{it}$ denotes the import of industry *i* from Vietnam to China, at time *t*. The index will range from 0 to 1. The closer it is to 1, the deeper level of intra-industry trade of industry *i* between Vietnam and China is. Suggested by WTO (World Trade Organization), it is more accurate to calculate the G-L index from SITC-3-digit level, therefore, we compute the weighted the G-L index based on HS 6-digit level.

Following Abd-el-Rahman (1991), we adopt his index to distinguish the inter- and intra-industry trade, as follows.

$$\text{AER}_{it} = \frac{\min\,(X_{it}, M_{it})}{\max\,(X_{it}, M_{it})} > \alpha \tag{4-6}$$

Where $\alpha = 0.1$ or $\alpha = 0.2$, by following the previous literature, we adopt $\alpha = 0.1$. As a result, we can get the standard to distinguish the inter- and intra-industry trade as follows.

$$\text{AER}_{it} > 0.1, IIT = 1; Otherwishe\ IIT = 0 \tag{4-7}$$

Where $IIT = 1$ indicates the existing of intra-industry trade; Otherwise, it is inter-industry trade.

### 4.4.2 Vertical and Horizontal Intra Industry Trade

A quality-based methodology was proposed to capacitate the researcher to scrutinize the dynamic patterns of import and exports of quality-varied goods. The interindustry trade can be divided into vertical IIT (VIIT) and horizontal IIT (HIIT), based on goods quality (Azhar and Elliott, 2008;

Greenaway, Hine, and Milner, 1995, 1994; Abd-el-Rahman, 1991). They argued, the differentiated-quality of goods distinguish the VIIT from HIIT. Quality differentiation leads to VIIT while the variety of customers taste results in HIIT.

By following the above-mentioned papers, we adopt the unit price ratio to measure goods quality, as follows

$$\frac{UVX_{it}}{UVM_{it}} \tag{4-8}$$

Where $UVX_{it}$ is the unit price of Vietnam's export to China of commodity *i* at time *t*; $UVM_{it}$ is the unit price of Vietnam's import price of the same commodity *i* at time *t*. If the $\frac{UVX_{it}}{UVM_{it}} > 1$, it reveals that Vietnam's commodity *i* has a better quality than the same commodity *i* of China. If the price ratio lies between the interval of $(\frac{1}{1+\alpha},\ 1+\alpha)$, it is recognized as *HIIT*. The equation is as follows.

$$\frac{1}{1+\alpha} \leq \frac{UVX_{it}}{UVM_{it}} \leq 1+\alpha \tag{4-9}$$

Similarly, the high quality vertical intra-industry trade (*HVIIT*) is defied by the following equation

$$\frac{UVX_{it}}{UVM_{it}} > 1 + \alpha \qquad (4\text{-}10)$$

The low quality vertical intra-industry trade *VIIT* (*LVIIT*) is defied by the following equation:

$$\frac{UVX_{it}}{UVM_{it}} < \frac{1}{1+\alpha} \qquad (4\text{-}11)$$

The $\alpha = 0.15$ or $\alpha = 0.25$, in our work we adopt $\alpha = 0.15$

### 4.4.3 Empirical Model Specification

Based on the discussions of the theoretical framework, the basic empirical model to test the ERPT into Vietnam's import price from China can be written as follows.

$$\mathrm{UVM}_{it} = \alpha_{it} + \beta RER_{it} + \gamma MC_{it} + \delta CP_{it} + \varepsilon_{it} \qquad (4\text{-}12)$$

Where $\mathrm{UVM}_{it}$ is the import price from China to Vietnam, in VND. $RER$ is the real bilateral exchange between Vietnam and China, which can be calculated as $RER_t = \frac{NER*CPI_{VNM}}{CPI_{CHN}}$. The nominal bilateral exchange rate is written as $NER$. The increase (decrease) of $NER$, which indicates the depreciation (appreciation) of VND/RMB, will result in import prices going down (going up). $CPI_{VNM}$ and $CPI_{CHN}$ are consumer price indexes for Vietnam and China at time $t$, respectively. $MC_{it}$ is the marginal cost of exporter of China, which is proxied by PPI (Producer Price Index) of China.

We let the lower case to represent the nature logarithmic forms of the variables and the equation (4-12) can be re-written as follows.

$$\mathrm{uvm}_{it} = \alpha_{it} + \beta_1 rer_{it} + \beta_2 mc_{it} + \beta_3 cp_{it} + \varepsilon_{it} \quad (4\text{-}13)$$

To test the role of goods quality on the heterogenous ERPT into Vietnam's import prices from China, an interaction term $rer_{it} * \mathrm{Quality}_{it}$ is added in to is added to the (4-13), as equation (4-14), where Quality is proxied by the price ratio $\frac{UVX_{it}}{UVM_{it}}$

$$\text{uvm}_{it} = \alpha_{it} + \gamma_1 rer_{it} + \gamma_2 mc_{it} + \gamma_3 cp_{it} + \gamma_4 rer_{it} * \text{Quality}_{it} + \varepsilon_{it} \tag{4-14}$$

To test the degree of intra-industry trade on the ERPT into Vietnam's import prices from China, an interaction term $rer_{it} * GL_{it}$ is added to the equation (4-13), as equation (4-15), where $GL_{it}$ denotes the *GL* index of commodity *i* at time *t*.

$$\text{uvm}_{it} = \alpha_{it} + \gamma_1 rer_{it} + \gamma_2 mc_{it} + \gamma_3 cp_{it} + \gamma_4 rer_{it} * GL_{it} + \varepsilon_{it} \tag{4-15}$$

To test the HIIT on the ERPT into Vietnam's import prices from China, an interaction term $rer_{it} * HIIT$ is added to the (4-13), as (4-16), where *HIIT* is a dummy variable, which equals to 1 if industry *i* is recognized at *HIIT* at time *t*, otherwise 0.

$$\text{uvm}_{it} = \alpha + \delta_1 rer_{it} + \delta_2 mc_{it} + \delta_3 cp_{it} + \delta_4 rer_{it} * HIIT + \varepsilon_{it} \tag{4-16}$$

To test the LVIIT on the ERPT into Vietnam's import prices from China, an interaction term $rer_{it} * LVIIT$ is added to the (4-13), as (4-16), where *LVIIT* is a dummy variable, which equals to 1 if industry *i* is recognized at *LVIIT* at time *t*, otherwise 0.

$$\mathrm{uvm}_{it} = \alpha + \theta_1 rer_{it} + \theta_2 mc_{it} + \theta_3 cp_{it} + \theta_4 rer_{it} * LVIIT + \varepsilon_{it} \qquad (4\text{-}17)$$

To test the HVIIT on the ERPT into Vietnam's import prices from China, an interaction term $rer_{it} * HVIIT$ is added to the equation (4-13), as equation (4-16), where *HVIIT* is a dummy variable, which equals to 1 if industry *i* is recognized at *HVIIT* at time *t*, otherwise 0.

$$\mathrm{uvm}_{it} = \alpha + \varphi_1 rer_{it} + \varphi_2 mc_{it} + \varphi_3 cp_{it} + \varphi_4 rer_{it} * HVIIT + \varepsilon_{it} \qquad (\,4\text{-}18)$$

### 4.4.4 Variable and Data

Variables and data are defined in this part. Table 4-1 outlines the names and definitions of variables. Table 4-2 gives the sources of data of variables.

The $\mathrm{uvm}_{it}$ is the unit price of import price from China to Vietnam. $rer_{it}$ is the bilateral real effective exchange rate? $mc_{it}$ denotes the marginal cost of exporters, which is proxied by China's PPI. $cp_{it}$ represent the competitors' price in Vietnam, proxied by Vietnam's PPI. The $\mathrm{Quality}_{it}$ is the price ratio, which is used to measure Vietnam's goods quality. The $\mathrm{GL}_{\mathrm{it}}$ is the GL index measuring the degree of intra-industry trade between Vietnam and China. *HIIT, HVIIT* and *LVIIT* are dummy variables.

The span of data is from 2001 to 2016. Trade data is at 6-digit HS level, allowing us to have a sample of around 40 000 observations. All data is abstracted from recognized databases.

**Table 4-1 Variable and Description**

| Variable | Description |
|---|---|
| $uvm_{it}$ | Unit Value of import, which is calculated by dividing the trade value by the quantity. |
| $rer_{it}$ | Real bilateral exchange rate between Vietnam and China |
| $mc_{it}$ | Marginal cost is proxied by PPI (Producer Price Index) of China |
| $cp_{it}$ | Domestic competitor's price is proxied by PPI of Vietnam |
| $Quality_{it}$ | Price ratio is calculated by Vietnam's export unit price over import unit price |
| $GL_{it}$ | GL index of commodity i at time t |
| HIIT | Dummy variable of HIIT |
| HVIIT | Dummy variable of HVIIT |
| LVIIT | Dummy variable of LVIIT |

**Table 4-2 Data**

| Variable | Period | Source |
|---|---|---|
| $uvm_{it}$ | 2001~2016 | China's General Administration |

| | | |
|---|---|---|
| | | of Customs |
| $rer_{it}$ | 2001~2016 | IMF, World Bank |
| PPI_CHN | 2001~2016 | Statistical bureau of China |
| PPI_VNM | 2001~2016 | General statistics office of Vietnam |
| $Quality_{it}$ | 2001~2016 | Authors' own calculation based on data from China's General Administration of Customs |
| $GL_{it}$ | 2001~2016 | |
| HIIT | 2001~2016 | |
| HVIIT | 2001~2016 | |
| LVIIT | 2001~2016 | |

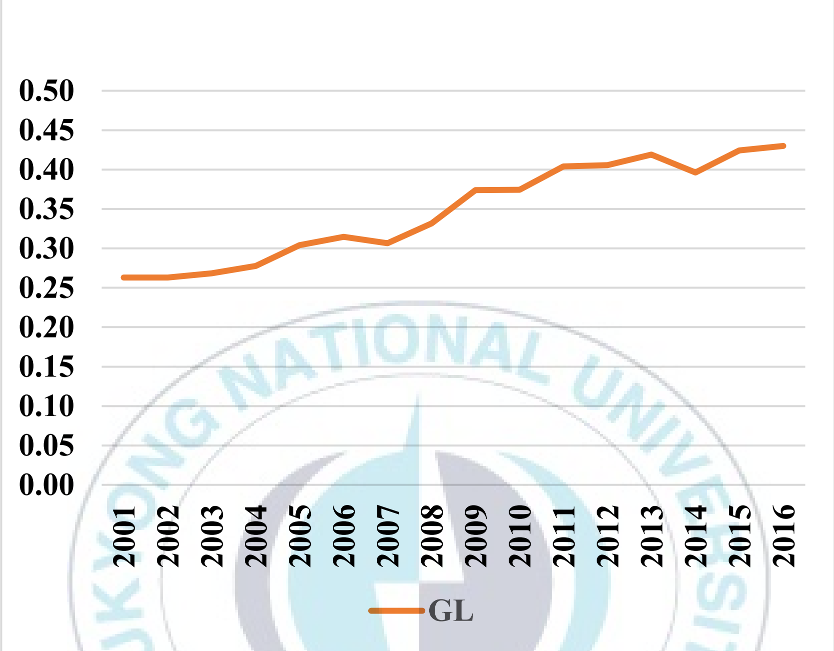
## 4.5 Estimation Results

This section reports the both the qualitative and quantitative results based on the above methodologies. The discussions are also offered.

### 4.5.1 GL index of Vietnam *Vis-à-Vis* China

Figure 4-1 portrays the GL index of Vietnam *vis-à-vis* China, from 2001 to 2016. As suggested by WTO, it is more accurate to measure the degree of intra-industry trade from 3-digit SITC level, at least. If the data is aggregate, the degree of intra-industry trade will be over-estimated. Therefore, we compute the GL index based on HS 6-digit level data, and aggregate to the country level by the weight of trade volume of each commodity. It is clear in Figure 4-1 that the GL index of Vietnam *vis-à-vis* China witness an increasing trend from 2001 to 2016.

**Figure 4-1[4] The Weighted GL Index of Vietnam *Vis-à-Vis* China, 2001~2016**




Note: Author's calculation based on HS 6-digit level data from China's General Administration of Customs.

[4] Detail classification of sectors see appendix.

## Table 4-3 The Weighted GL Index of Vietnam *Vis-à-Vis* China, 2001~2016

| Year | Sector 1 | Sector 2 | Sector 3 | Sector 4 | Sector 5 | Sector 6 | Sector 7 |
|---|---|---|---|---|---|---|---|
| 2001 | 0.01 | 0.35 | 0.19 | 0.68 | 0.54 | 0.21 | 0.61 |
| 2002 | 0.01 | 0.35 | 0.19 | 0.68 | 0.54 | 0.21 | 0.61 |
| 2003 | 0.11 | 0.58 | 0.13 | 0.78 | 0.66 | 0.17 | 0.61 |
| 2004 | 0.25 | 0.72 | 0.19 | 0.81 | 0.77 | 0.10 | 0.53 |
| 2005 | 0.36 | 0.68 | 0.52 | 0.73 | 0.71 | 0.07 | 0.50 |
| 2006 | 0.43 | 0.65 | 0.72 | 0.76 | 0.72 | 0.06 | 0.49 |
| 2007 | 0.45 | 0.59 | 0.53 | 0.86 | 0.74 | 0.04 | 0.45 |
| 2008 | 0.40 | 0.61 | 0.47 | 0.77 | 0.80 | 0.03 | 0.52 |
| 2009 | 0.43 | 0.61 | 0.69 | 0.70 | 0.81 | 0.04 | 0.55 |
| 2010 | 0.34 | 0.54 | 0.41 | 0.63 | 0.88 | 0.04 | 0.62 |
| 2011 | 0.32 | 0.50 | 0.53 | 0.73 | 0.94 | 0.07 | 0.64 |
| 2012 | 0.30 | 0.40 | 0.43 | 0.75 | 0.89 | 0.08 | 0.64 |
| 2013 | 0.29 | 0.30 | 0.35 | 0.82 | 0.91 | 0.08 | 0.72 |
| 2014 | 0.33 | 0.26 | 0.25 | 0.72 | 0.86 | 0.09 | 0.84 |
| 2015 | 0.42 | 0.22 | 0.24 | 0.79 | 0.88 | 0.14 | 0.81 |
| 2016 | 0.41 | 0.20 | 0.23 | 0.83 | 0.86 | 0.14 | 0.75 |

Note: Author's calculation based on HS 6-digit level data from WITS.

## Table 4-4 (cont'd) The Weighted GL Index of Vietnam *Vis-à-Vis* China, 2001~2016

| Year | Sector 8 | Sector 9 | Sector 10 | Sector 11 | Sector 12 |
|---|---|---|---|---|---|
| 2001 | 0.16 | 0.30 | 0.27 | 0.35 | 0.43 |
| 2002 | 0.16 | 0.30 | 0.27 | 0.35 | 0.43 |
| 2003 | 0.13 | 0.36 | 0.15 | 0.28 | 0.38 |
| 2004 | 0.12 | 0.53 | 0.08 | 0.23 | 0.36 |
| 2005 | 0.10 | 0.70 | 0.06 | 0.17 | 0.40 |
| 2006 | 0.08 | 0.83 | 0.08 | 0.14 | 0.50 |
| 2007 | 0.13 | 0.86 | 0.07 | 0.14 | 0.72 |
| 2008 | 0.41 | 0.90 | 0.05 | 0.12 | 0.85 |
| 2009 | 0.62 | 0.91 | 0.06 | 0.15 | 0.90 |
| 2010 | 0.79 | 0.82 | 0.05 | 0.20 | 0.92 |
| 2011 | 0.84 | 0.70 | 0.08 | 0.25 | 0.94 |
| 2012 | 0.84 | 0.59 | 0.07 | 0.31 | 0.87 |
| 2013 | 0.81 | 0.55 | 0.11 | 0.34 | 0.81 |
| 2014 | 0.77 | 0.42 | 0.15 | 0.38 | 0.82 |
| 2015 | 0.75 | 0.46 | 0.12 | 0.42 | 0.78 |
| 2016 | 0.81 | 0.47 | 0.07 | 0.45 | 0.71 |

Note: Author's calculation based on HS 6-digit level data from WITS.

## Table 4-5 (cont'd) The Weighted GL Index of Vietnam *Vis-à-Vis* China, 2001~2016

| Year | Sector 13 | Sector 14 | Sector 15 | Sector 16 | Sector 17 | Sector 18 | Sector 20 |
|---|---|---|---|---|---|---|---|
| 2001 | 0.10 | 0.27 | 0.11 | 0.10 | 0.00 | 0.01 | 0.31 |
| 2002 | 0.10 | 0.27 | 0.11 | 0.10 | 0.00 | 0.01 | 0.31 |
| 2003 | 0.10 | 0.15 | 0.10 | 0.13 | 0.02 | 0.05 | 0.37 |
| 2004 | 0.11 | 0.07 | 0.10 | 0.17 | 0.10 | 0.06 | 0.34 |
| 2005 | 0.09 | 0.09 | 0.06 | 0.18 | 0.23 | 0.06 | 0.33 |
| 2006 | 0.08 | 0.06 | 0.04 | 0.19 | 0.30 | 0.05 | 0.27 |
| 2007 | 0.06 | 0.07 | 0.03 | 0.17 | 0.15 | 0.04 | 0.25 |
| 2008 | 0.10 | 0.10 | 0.03 | 0.14 | 0.08 | 0.03 | 0.27 |
| 2009 | 0.29 | 0.18 | 0.03 | 0.15 | 0.06 | 0.05 | 0.28 |
| 2010 | 0.32 | 0.12 | 0.04 | 0.14 | 0.08 | 0.06 | 0.29 |
| 2011 | 0.34 | 0.22 | 0.09 | 0.19 | 0.16 | 0.06 | 0.34 |
| 2012 | 0.28 | 0.31 | 0.10 | 0.22 | 0.23 | 0.16 | 0.35 |
| 2013 | 0.21 | 0.30 | 0.08 | 0.27 | 0.31 | 0.22 | 0.39 |
| 2014 | 0.21 | 0.16 | 0.06 | 0.29 | 0.40 | 0.19 | 0.47 |
| 2015 | 0.24 | 0.09 | 0.05 | 0.29 | 0.56 | 0.42 | 0.58 |
| 2016 | 0.25 | 0.12 | 0.04 | 0.31 | 0.33 | 0.65 | 0.59 |

Note: Author's calculation based on HS 6-digit level data from WITS.

### 4.5.2 Vietnam's Goods Quality

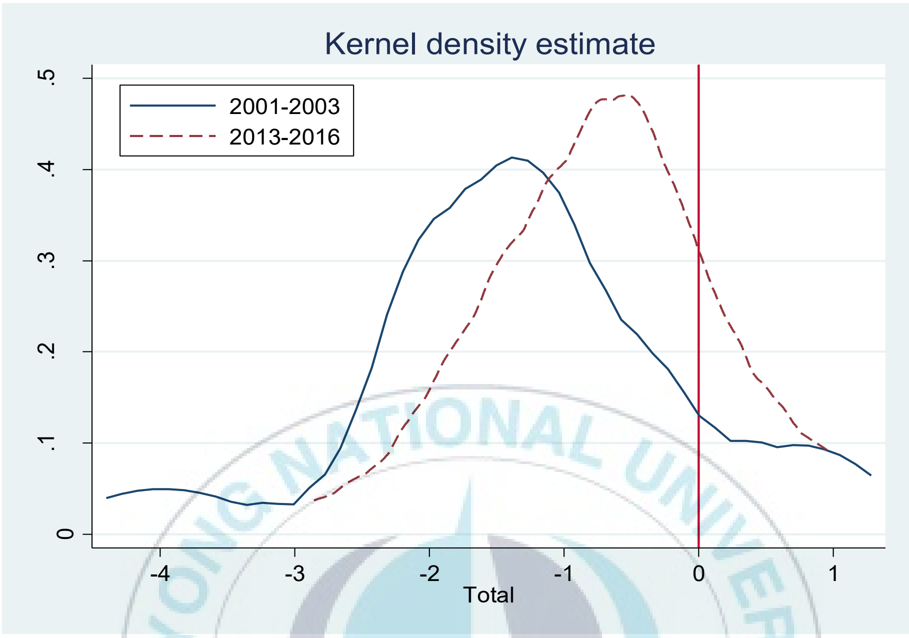
To shed lights on the dynamic patterns of Vietnam's good quality, we conduct the Kernel density non-parameter estimations of Vietnam's total commodities and 12 industries. For comparison, we plot the density curves of 2001~2003 and 2013~2016, respectively. Kernel density estimation is a non-parametric statistical methodology to estimate the probability density function of a variable.

For the convenience, we take the nature logarithm of the price ration, as follows. If it is bigger than 0, it indicates that the price of Vietnam's commodity $i$ is bigger than the import price from China of the same commodity. As a result, Vietnam's commodity $i$ is in a higher quality position than China, and vice versa.

$$\ln\left(\frac{UVX_{it}}{UVM_{it}}\right) > 0 \text{ or } \ln\left(\frac{UVX_{it}}{UVM_{it}}\right) < 0 \tag{4-19}$$

As shown in Figure 4-2, the Kernel density curves of two subsamples distribute on the left-hand side of 0. It reveals that most of Vietnam's trading commodities has lower quality than China. By comparing the two subsamples, the curve of 2013~2016 moves closer than 0 than 2001~2013. It denotes that the quality of Vietnam's trading commodity is improving in relative to China.

## Figure 4-2 The Density Estimation for All Commodities

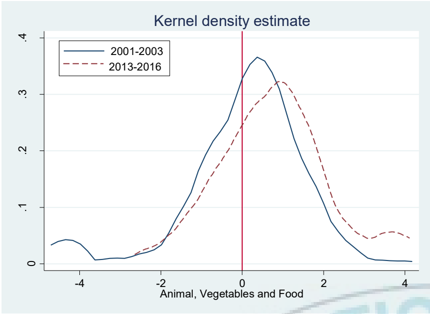
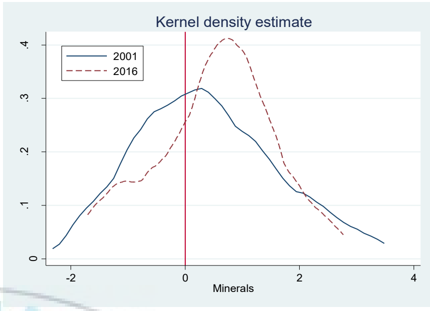
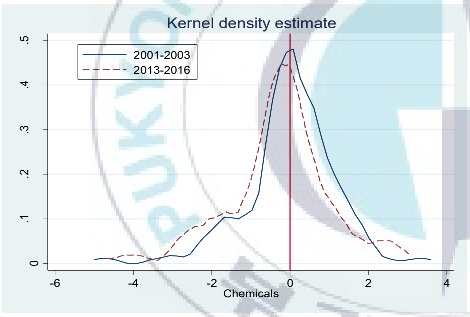
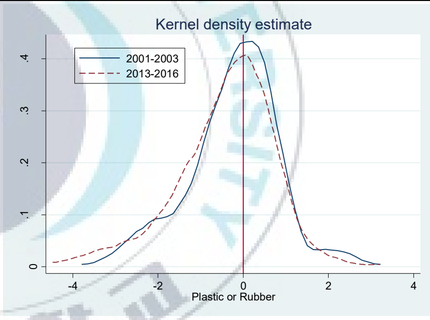



Note: Author's estimation based on HS 6-digit level data from WITS.

Figure 4-3 shows the results of the kernel density estimations of 12 main industries of Vietnam. The curves of 8 industries are distributed on the left-hand side of 0, they are hides and skins, texiles and clothing, footwear, stones and glass, metals, mach and elec, and transportation. It indicates that for these industires, the prices of Vietnam’s export to China is small than the same comodieties that China export to Vietnam. The goods quanlity of these industries of Vietnam’s is relatively lower than China.

On the contrary, the goods quality of Vientam’s export to China in animals, vegetables and food, minerals. Chemicals, plastic or rubber, and wood is relatively higher than China’s export to Vietnam.

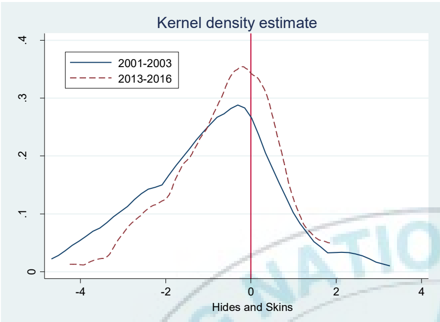
## Figure 4-3 The Density Estimation, at an Industry Level

| Animals, Vegetables and Food | Minerals |
| --- | --- |
|  |  |
| **Chemicals** | **Plastic or Rubber** |
|  |  |

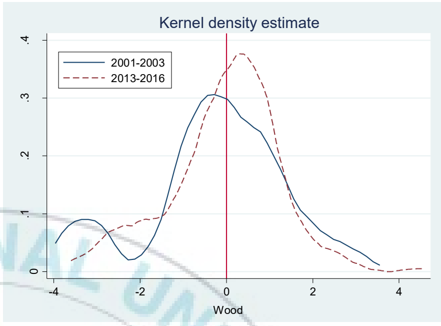
Note: Author's estimation based on HS 6-digit level data from WITS.

# Figure 4-4 (cont'd)The Density Estimation, at an Industry Level

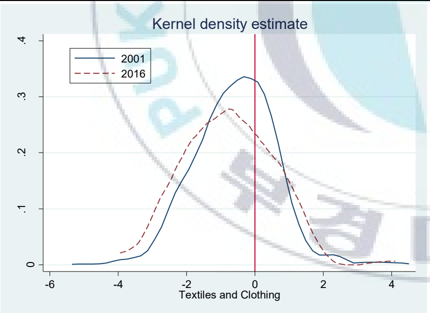
**Hides and Skins**



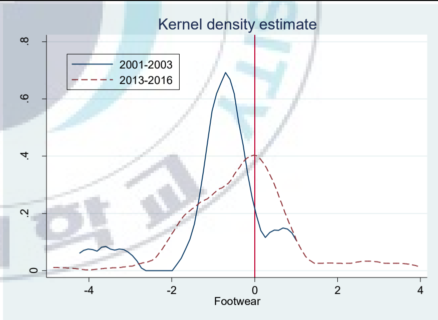

**Wood**




**Texiles and Clothing**



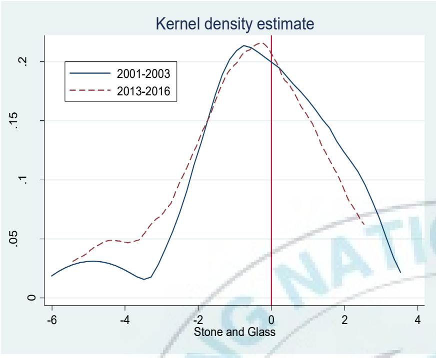

**Footwear**



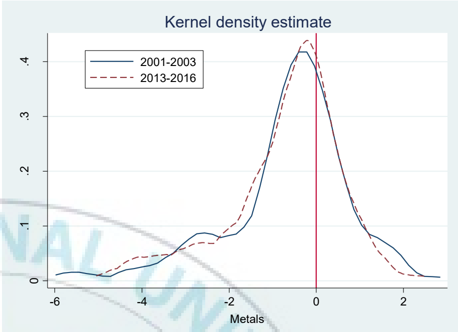

Note: Author's estimation based on HS 6-digit level data from WITS.

# Figure 4-5 (cont'd)The Density Estimation, at an Industry Level

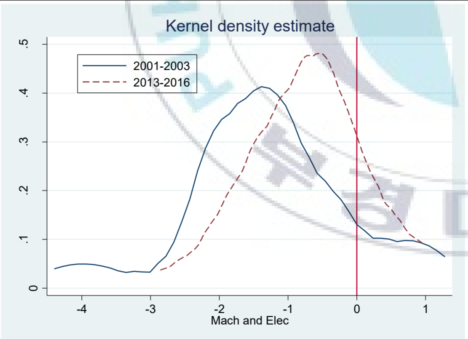
**Stones and Glass**



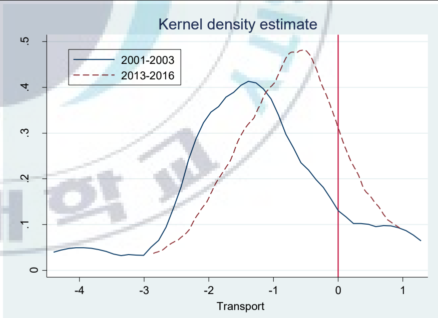

**Metals**




**Mach and Elec**




**Transportation**




Note: Author’s estimation based on HS 6-digit level data from WITS.

### 4.5.3 The Composition of Vietnam’s Intra-Industry Trade *Vis-à-Vis* China

Table 4-6 reports the composition of Vietnam’s intra-industry trade vis-à-vis China, from 2001~2016. The percentage of intra-industry trade over Vietnam’s total trade with China is more than 50 per cent, except for 2006~2010. It reveals that the intra-industry trade plays a significant role on Vietnam-China trade. More specially, the intra-industry trade is mainly vertically distributed. The vertical intra-industry trade accounts for more than 70 per cent of the intra-industry trade, from 2001~2016. However, the percentage of the high quality vertical intra-industry trade is relatively low, ranging from 2 per cent to 20 per cent of the VIIT, from 2001~2016.

In summary, even the intra-industry trade become a major form between Vietnam-China trade, big proportion of Vietnam’s export to China is relatively lower in quality than China’s export to Vietnam. But the gap of quality between the goods of Vietnam and China shrinks, from 2001 to 2016.

## Table 4-6 The Composition of Vietnam's Intra-Industry Trade *Vis-à-Vis* China, 2001~2016 (Unit: Per Cent)

| Year | IIT% | VIIT% | HVIIT% |
|---|---|---|---|
| 2001 | 57.59 | 90.16 | 5.67 |
| 2002 | 58.14 | 90.69 | 11.13 |
| 2003 | 69.06 | 81.73 | 3.34 |
| 2004 | 71.77 | 79.41 | 10.47 |
| 2005 | 59.83 | 75.86 | 8.13 |
| 2006 | 37.06 | 63.69 | 21.66 |
| 2007 | 37.58 | 77.48 | 18.07 |
| 2008 | 42.85 | 87.07 | 12.37 |
| 2009 | 21.53 | 84.64 | 12.11 |
| 2010 | 42.49 | 83.73 | 18.85 |
| 2011 | 56.65 | 76.87 | 20.67 |
| 2012 | 56.72 | 95.77 | 7.39 |
| 2013 | 60.09 | 72.04 | 6.28 |
| 2014 | 51.74 | 76.44 | 5.17 |
| 2015 | 58.42 | 73.57 | 4.91 |
| 2016 | 59.84 | 74.10 | 9.76 |

Note: 1. Author's calculation based on HS 6-digit level data from WITS.
2. IIT: The percentage of intra-industry trade over Vietnam's total export to China
VIIT: The percentage of vertical intra-industry trade over Vietnam's total intra industry trade.
HVIIT: The percentage of high-quality intra-industry trade over vertical intra industry trade.

### 4.5.4 The Heterogenous Exchange Rate Pass-Through into Vietnam's Import Prices from China

Regression results are reported in Table 4-7 and Table 4-8, based on equation (4-14) to ( 4-18). Equation (4-14) is used to test the goods quality on the exchange rate pass-through into Vietnam's import prices from China. Generally, the we can see that the ERPT is incomplete but relatively high in absolute value (0.55). It reveals that when the exchange rate fluctuates, Vietnam's importers take more than 50 per cent of the risk. The positive value of the quality index reveals that the higher the goods quality is, the less the imported goods from China are exposed to the exchange rate movement.

Equation (4-15) is implemented to test the degree of intra-industry trade on the ERPT into Vietnam's import prices from China. The positive coefficient (0.15) is statistically significant at 5 per cent level. It reveals that the tendency of intra-industry trade between Vietnam and China decreases the ERPT into Vietnam's import prices from China. It is consistent with the previous literature that the production fragmentation and the existence of intra-industry trade affect the degree of ERPT into a country's trading prices. As discussed by Athukorala (1994), the industries with higher degree intra-industry level in Japan had lower degree of ERPT, because the correlative independence of industries decreases the variation of trading prices in response to exchange rate. The similar explanation can be offered to the case of Vietnam.

Equation (4-16) reveals that the horizontal intra-industry does not affect the ERPT into Vietnam's import prices, significantly. The underlying reason can be that the proportion of horizontal intra-industry trade between Vietnam and China is small.

Regarding to the results of equation (4-17) and equation ( 4-18), it is proved that the ERPT are heterogenous across the vertically differentiated goods imported from China to Vietnam. It further supports that the goods quality significantly play a significant role on the ERPT into Vietnam's import prices from China. The negative coefficient (-0.91) of the dummy variable of LVIIT reveals that the LVIIT significantly increases the ERPT of Vietnam's imports from China. On the contrary, the HVIIT (0.14) significantly decreases the ERPT of Vietnam's imports from China. In other words, the import prices of LVIIT of Vietnam from China are at greater ricks of the fluctuation of exchange rate, while the import prices of HVIIT of Vietnam from China are more stable in response to exchange rate.

In sum, the level of intra-industry trade is a significant factor which can affect the ERPT into Vietnam's import prices from China. The increase of the degree of intra industry trade reduces the level of ERPT into Vietnam's import prices from China, in general.

Furthermore, the ERPT effects are heterogenous across commodities based on quality. The degree of ERPT of commodities in which Vietnam has a lower position in quality than China is bigger. The underlying explanation is as follows. When importing a commodity from China, if Vietnam has a lower quality position, it means that the corresponding commodity imported from China is with higher quality and has smaller price elasticity of demand in Vietnam. Chinese exporters can pass most proportion of risk to Vietnam and maintain their profit markup. Therefore, the level of ERPT into the import prices of this commodity from China to Vietnam is larger, when Vietnam's commodity is in the lower quality position in relative to China. Lastly, no impact of the HIIT on the ERPT into Vietnam's import prices from China is detected.

The F-statistics reveals that all models are valid, at 5 per cent significate level. Based on the Hausman test, fixed effect models are selected for all estimations. Adjusted R square and the number of observations is also provided to support the effectiveness of the model.

## Table 4-7 The Heterogenous Exchange Rate Pass-Through into Vietnam's Import Prices from China, 2001~2016

| Equation | (4-14) | (4-15) | (4-16) |
|---|---|---|---|
| | $\mathbf{uvm}_{it}$ | $\mathbf{uvm}_{it}$ | $\mathbf{uvm}_{it}$ |
| $\mathrm{rer}_{\mathrm{it}}$ | $-0.55^{**}$ | -0.56* | -0.47*** |
| | (3.24) | (2.43) | (5.14) |
| $\mathrm{cp}_{\mathrm{it}}$ | 3.24 | 8.25* | 7.98 |
| | (1.69) | (1.74) | (1.69) |
| $\mathrm{mc}_{\mathrm{it}}$ | $0.821^{*}$ | $1.33^{***}$ | $1.23^{**}$ |
| | (2.12) | (3.41) | (3.17) |
| $\mathrm{rer}_{\mathrm{it}} * \mathrm{Quality}_{\mathrm{it}}$ | $0.03^{***}$ | | |
| | (15.48) | | |
| $\mathrm{rer}_{\mathrm{it}} * \mathrm{GL}_{\mathrm{it}}$ | | $0.15^{**}$ | |
| | | (2.62) | |
| $\mathrm{rer}_{\mathrm{it}} * \mathrm{HIIT}$ | | | 3.87 |
| | | | (0.97) |
| $\mathrm{rer}_{\mathrm{it}} * \mathrm{HVIIT}$ | | | |
| | | | |
| $\mathrm{rer}_{\mathrm{it}} * \mathrm{LVIIT}$ | | | |
| | | | |
| _cons | -8.15 | $-1.66^{**}$ | $-3.30^{***}$ |
| | (-0.73) | (-2.70) | (-3.53) |
| Model | Fixed | Fixed | Fixed |
| R2-Adj | 0.10 | 0.08 | 0.11 |
| F-stats | 15.01 | 14.99 | 13.29 |
| N | 42557 | 42557 | 42557 |

Note: 1. *t* statistics are in the parentheses, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$
2. Author's own estimation.

**Table 4-8 (cont'd) The Heterogenous Exchange Rate Pass-Through into Vietnam's Import Prices from China, 2001~2016**

| Equation | (4-17) | ( 4-18) |
|---|---|---|
| | $uvm_{it}$ | $uvm_{it}$ |
| $rer_{it}$ | -0.36*** | -0.67*** |
| | (5.00) | (4.98) |
| $cp_{it}$ | 7.75 | 7.84 |
| | (1.64) | (1.66) |
| $mc_{it}$ | 1.31*** | 1.32*** |
| | (3.35) | (3.37) |
| $rer_{it} * Quality_{it}$ | | |
| | | |
| $rer_{it} * GL_{it}$ | | |
| | | |
| $rer_{it} * HIIT$ | | |
| | | |
| $rer_{it} * HVIIT$ | | 0.14** |
| | | (2.61) |
| $rer_{it} * LVIIT$ | -0.91** | |
| | (-2.64) | |
| _cons | -4.78*** | -4.66*** |
| | (-3.77) | (-3.69) |
| Model | Fixed | Fixed |
| R2 Adjusted | 0.09 | 0.10 |
| F-stats | 16.64 | 15.79 |
| N | 42557 | 42557 |

Note: 1. $t$ statistics are in the parentheses, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$
2. Author's own estimations.

## 4.6 Conclusion

By utilizing the HS 6-digit level data from 2001 to 2016, we calculate the GL index between Vietnam and China. Moreover, we distinguish the trade between Vietnam and China into intra- and inter-industry trade. Lastly, we decompose the intra-industry trade based on quality, into horizontal intra-industry trade, high quality vertical intra-industry trade and low quality vertical intra-industry trade. We, for the first time in the case of Vietnam, incorporate all these factors into our empirical models to estimate the heterogenous exchange rate pass-through into Vietnam's import prices from China.

The main findings are as follows. According to the results of the weighted GL index, the degree of intra-industry trade between Vietnam and China is increasing, from 2001 to 2016. The vertical intra-industry trade accounts for more than 80 percent of the intra-industry trade between Vietnam and China. However, the percentage of high quality vertical intra-industry trade is still quite low between in Vietnam-China trade. In general, the goods quality Vietnam export to China is lower than the goods quality China export to Vietnam, according to the Kernel density estimations.

According to the results of the estimated equations, firstly we find out that the deepening of intra-industry trade between Vietnam and China weakens the effect of exchange rate on Vietnam's import prices from China. Secondly, the goods quality plays a significant role on the ERPT in Vietnam's import prices from China. More specially, the lower quality commodities of Vietnam in relative to China have higher ERPT effects into the import prices than the higher quality commodities. Thirdly, we cannot detect any impact of the horizontal intra-industry trade on the ERPT.

Based on our findings, the policy implications are proposed as follows. At the macro level, exchange rate policy is still a crucial tool to adjust Vietnam's import prices from China. However, the deepening of intra-industry trade between the two countries might make the exchange rate policy less effective. The heterogenous ERPT based on quality also suggests that implementing the exchange rate policy alone might lead to the deterioration of the trade imbalance of some industries.

Therefore, more specific polices should be considered. For example, improving the goods quality can be one practical tool. Especially, we detect that Vietnam's commodities are with lower quality in the industries of hides and skins, textiles and clothing, footwear, stones and glass, metals, machinery and electronics, and transportation equipment, compared to

China. As a result, Vietnam should strive to accelerate product upgrades and improve product quality of these industries, to promote the positions of enterprises in international trade and strengthen the pricing power in the Chinese market.

Lastly, from the perspective of import enterprises of Vietnam, our work is vital to show them their positions in the Vietnam-China trade, regarding to the products quality, as well as how much degree exchange rate will affect their trading prices. This information can be instructive for the Vietnamese trading enterprises to make appropriate pricing strategies, when trading with Chinese companies.

# Chapter 5 Asymmetric Exchange Rate Pass-Through into Vietnam's Import Prices from China: An Industry Level Analysis

## 5.1 Introduction

Since the Doi Moi reform, Vietnam has involved actively into the international economic integration. The accession into the WTO in 2007 is a milestone for Vietnam's international trade. China is the biggest import market for Vietnam up to now, the bilateral trade between Vietnam and China is increasing over time. However, it brings both challenge and risks to Vietnam micro economy, as well as domestic enterprises. The influence of bilateral exchange rate change on the import prices from China will probably transmit the uncertainties into Vietnam, domestically. In this content, it is necessary to explore to what degree the bilateral exchange rate will affect the import prices . This study aims to provide Vietnamese importers with beneficial information to avoid exchange rate risks. Moreover, our work is crucial for exchange rate policy proposals.

As we have discussed in 5.2, the previous research papers on ERPT proposed that the depreciation of the home currency would increase the import prices, and the appreciation of the home currency would decrease the import prices. They assumed that the ERPT effects are symmetric. To be specific, 1 per cent depreciation of home currency will result in equal change (in absolute value but different signs) in import prices as 1 per cent appreciation of the home currency.

Yet, the latest research works proposed theoretical and empirical explanations on the asymmetric ERPT into trading prices. They found that the direction and the size of movement of bilateral exchange rate had impact on the trading prices. This phenomenon is stated as asymmetric ERPT into trading prices. Market share planning and binding quantity constrains are the main explanations that domestic firms react asymmetrically to the exchange rate movement.

There are some outstanding reviews in the literature regarding the ERPT into Vietnam's import prices (Tho and Trang, 2016; Trang and Cuong, 2012; Hang and Thanh, 2010; Minh, 2009). However, most of them investigated the ERPT at a broad macro level, which failed to provide detail discussions on an industry level. A few studies have been conducted on an industry level, for example the work of Nhung (2017, 2014, 2010). But they only focused on specific industries and none of them can test the asymmetric effect of ERPT.

Therefore, this part contributes to the previous works in two aspects. Firstly, this paper is the first work which takes the asymmetric effects into account, when analyzing the ERPT into Vietnam's import prices from China, at an industry level. Secondly, the non-linear ARDL is implemented for asymmetric effects estimation. The non-linear ARDL model can give a more straightforward estimation results than the latter case, by decomposing the exchange rate fluctuation into depreciations and appreciation partial sums.

The rest of the chapter 5 is structured as follows: 5.2 is the literature review. 5.3 demonstrates the methodology and the definitions of variables. 5.4 offers the empirical findings and discussion. 5.5 concludes this chapter.

## 5.2 Literature Review

From the 1990's, plenty papers have been devoted to the topic of the ERPT into the trading prices. Normally, they empirically discussed this topic in both micro and macro level. Concerning the macro level, researchers investigated the determinants of ERPT, for example the monetary policy, inflation rate, the volatility of exchange rate and the worldwide competition.

Concerning the papers on the micro level, researchers try to give explanations to ERPT by considering the quality of export products, the scale of production, the capital constraint, the productivity, market structure and market pricing strategies, etc.

The macro researchers are more inclined to offer implications for exchange rate policy and monetary policy. The micro researches pay more attention to the study of the industrial structure and industrial policy and provide micro implications for the choice of industrial policy. We categorize the papers into four group, as follows.

The first flow papers research on the macro level, by utilizing the aggregated trade data. For example, by implementing the bilateral data ranging from 1990 to 1995, Sasaki (2002) test the ERPT in Japan's export prices to the U.S, EU and selected Asian countries. This research found out the highest Price to market (PTM) in the U.S, while the PTM was low in selected Asian and EU countries. Similarly, Ohn (2014)

The second group of works is at a more micro level by using the industrial level trade data. As argued by Goldhammer, Abrashkina and Busse (2008), the aggregated data may cause the estimation bias if the industrial heterogeneity is not taken into account. Therefore, empirical works on an industrial level are necessary.

Athukorala and Menon (1994) put forward the pioneering work researching on ERPT into export prices, at sectoral level. In this research, Korean manufacturing export prices were examined, by using data from 1980 to 1989. This research figured out that ERPT into export prices of specific manufacturing products were about 28 per cent. By using panel data at the industrial level, from 1990 to 2011, Choi (2013) found that there are incomplete exchange pass-through effects, which is -0.25 to -0.49 across 30 manufacturing industries.

The third flow is the works referring to ERPTs into trading prices of a country to her main trading partners, at industrial level. For example, bound test is implemented by Lee (2014) to estimate South Korea's ERPT into trade prices to its trading patterns, namely Japan and the U. S. This research concluded that ERPT was in-completed, but asymmetrically. Hong Seung-Gee and Park Won-Shik (2017) used panel data estimating ERPT into Korea's trading prices for more than two main trading partners. They found out that the ERPT effects are low for most of the destinations. At the same time, exchange rate pass-through estimates were the same for different trade partners in 11 industries.

The fourth flow comes from the second and third flow, in which researchers started to include the direction and size of the fluctuation of the exchange rate affecting the trading prices. Some works have documented the asymmetric ERPT into trade prices in different countries (Jammazi, 2015; Cheung, 2013; Delatte and López-Villavicencio, 2012; Karoro, 2009; Bugamelli, 2008). However, some other works failed to detect asymmetric ERPT (Mann,1986; Feinberg, 1989).

From what has been discussed above, it should be noted that very little work has been conducted on ERPT into Vietnam's import prices from her biggest trading partner—China, at an industrial level from an asymmetric perspective. Therefore, we aim to contribute to the existing empirical papers from the following aspects: First, we are the first work including the asymmetric effects into ERPT into import prices from Vietnam to China, from the perspective of an industrial level. Second, the bound test approach is conducted, which enable us to test for long-term co-integration for the mix of I(0) and I(1) economic indications, when comparing with the conventional co-integration methodology. When considering the asymmetric effects, we employ a more advanced non-linear ARDL model, while most of the papers only include a dummy variable to distinguish the appreciation and depreciation periods of the bilateral exchange rate. Third, we use highly reliable monthly data from November 2011 to December 2017, including 78 months in total, which offers updated estimation results.

## 5.3 Model Specification and Data

### 5.3.1 The ARDL Model

When instigating the ERPT into import prices, it is necessary to analyze the behavior of exporter. Following the previous empirical works (Hong and Park, 2017; Hong and Zhang 2016; Karoro, Aziakpono and Cattaneo, 2009; Karoro, Aziakpono, and Cattaneo 2009; Yi 2004;Gil-Pareja 2003), the essential model in the long-run of ERPT into export prices from Vietnam to China is as following equation (5-1):

$$p_t^i = \beta_0 + \beta_1 mc_t^i + \beta_2 er_t + \beta_3 fd_t + \varepsilon_t \quad (5\text{-}1)$$

where $p_t^i$ is Vietnam's export price of commodity i at time t. When exporters' marginal cost ($mc_t^i$) goes up, the export price rises, so the sign for $\beta_1$ is expected to be positive. ERPT into export price ($\beta_2$) is suposed to be negative, because depreciation of VND against RMB ( $er_t$

increases) results in the drop down in export prices, and vice versa. The $\beta_3$ should be positive sign since the if the demand of China ($fd_t$) goes up, the export prices from Veitnam to China should increase. Four potential scenarios of $\beta_2$ are list in Table 5-1.

**Table 5-1: Scenario of ERPT**

| Scenario | Definition |
|---|---|
| $\beta_2$=-1 | Complete pass-through |
| -1<$\beta_2$<0 | Incomplete pass-through |
| $\beta_2$=0 | No pass-through |

Note: Summarized by authors.

In this part, ARDL (Auto Regressive Distributed Lages) model is adopted. The advantages of ARDL model are as follows. Firstly, the model can be applicable when the time series variables are a mixture of I(0) or I(1) or both (Pesaran, Shin and Smith, 2001). Secondly, ARDL model is able to offer long-run and short-run parameters, if the variables pass the bound test. Thirdly, when the sample size is relatively small, ARLD model can be are liable mechanism. Equation (5-1) represents the ARDL long-run model. To gain the short-run parameters, the related Unrestricted Error Correction Model (UECM) is written as equation

$$\Delta p_t^i = \beta_0 + \sum_{n=1}^{k1} \beta_{1n} \Delta p_{t-n}^i + \sum_{n=0}^{k2} \beta_{2n} \Delta mc_{t-n}^i + \sum_{n=0}^{k3} \beta_{3n} \Delta er_{t-n}^i + \sum_{n=0}^{k4} \beta_{4n} \Delta fd_{t-n}^i + \phi ECM_{t-1} + \mu_t \tag{5-2}$$

Where the first difference operator is represented as $\Delta$, $\phi$ indicates the speed of adjustment, the optimal lag number chosen by the Akaike Information Criterion (AIC) is K. The one lag form of the error term in equation (5-1) is gained as equation (5-3) (Pesaran, Shin and Smith, 2001):

$$\varepsilon_{t-1} = p_t^i - \beta_0 - \beta_1 mc_{t-1}^i - \beta_2 er_{t-1} - \beta_3 fd_{t-1} \tag{5-3}$$

Replacing the $ECM_{t-1}$ in equation by equation (5-3) we can gain the equation which can be used to detect if a long-term relationship exist among variables, as follows:

$$\Delta p_t^i = \beta_0 + \sum_{n=1}^{k1} \beta_{1n} \Delta p_{t-n}^i + \sum_{n=0}^{k2} \beta_{2n} \Delta mc_{t-n}^i + \sum_{n=0}^{k3} \beta_{3n} \Delta er_{t-n}^i + \sum_{n=0}^{k4} \beta_{4n} \Delta fd_{t-n}^i + \lambda_0 p_{t-1}^i + \lambda_1 mc_{t-1}^i + \lambda_2 er_{t-1}^i + \lambda_3 fd_{t-1}^i + \mu_t \quad (5\text{-}4)$$

Two steps are involved in testing the co-integration relations in the long-run. Firstly, based on the AIC, optimal lags are chosen. Secondly, F-test should be employed by proposing:

$$H_0: \lambda_0 = \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$$

$$H_1: \lambda_0 \neq 0, \lambda_1 \neq 0, \lambda_2 \neq 0, \lambda_3 \neq 0, \lambda_4 \neq 0$$

If the co-integrated is built, the long-run parameters can be gained by forcing the short-run terms of equation (5-4) into zero, accordingly equation (5-5) and equation (5-6) are gained as follows:

$$\widehat{\lambda_0}p_{t-1}^i+\widehat{\lambda_1}mc_{t-1}^i+\widehat{\lambda_2}er_{t-1}^i+\widehat{\lambda_3}fd_{t-1}=0 \tag{5-5}$$

$$p_{t-1}^i = -\frac{\widehat{\lambda_1}}{\widehat{\lambda_0}}mc_{t-1}^i\text{-}\frac{\widehat{\lambda_2}}{\widehat{\lambda_0}}er_{t-1}^i\text{-}\frac{\widehat{\lambda_3}}{\widehat{\lambda_0}}fd_{t-1}\text{-}=0 \tag{5-6}$$

For simplicity, we rewrite equation (5-6) in the following form, where $\beta_1$ to $\beta_3$ are the parameters in the long-term.

$$p_t^i = \beta_0 + \beta_1 mc_t^i+\beta_2 er_t+\beta_3 fd_t + \varepsilon_t \tag{5-7}$$

### 5.3.2 The Non-Linear ARDL Model

The conventional ARDL model fails to consider the asymmetric EPRT. To be specific, when $\beta_2 = -1$, it indicates that one percent deprecation of VND against RMB results in 1 per cent decrease of Vietnam's export prices to China, and vice versa. However, the fluctuation of exchange rate may have asymmetric shocks to the trading prices. Consequently, a non-linear ARDL is adopted to seize the asymmetric effect.

By following the pioneering work (Bahmani-Oskooee and Bahmani 2015; Shin, Yu, and Greenwood-Nimmo 2014; Delatte and López-Villavicencio 2012), the exchange rate can be decomposed into two parts, namely positive and negative sums, as equation (5-8):

$$lner_t = lner_0 + lner_t^{+} + lner_t^{-} \qquad (5\text{-}8)$$

where,

$$POS = lner_t^{+} \qquad (5\text{-}9)$$

$$= \sum_{J=1}^{t} \Delta lner_j^{+}$$

$$= \sum_{J=1}^{t} \max(\Delta lner_{j,}\ 0)$$

$$NEG = lner_t^- \tag{5-10}$$

$$= \sum_{J=1}^{t} \Delta lner_j^-$$

$$= \sum_{J=1}^{t} \min(\Delta lner_{j,}\ 0)$$

According to Bahmani-Oskooee and Bahmani (2015) and Shin, Yu and Greenwood-Nimmo (2014), the partial sums are introduced into equation (5-4), which is written as equation (5-11).

$$\Delta p_t^i = \beta'_0 + \sum_{n=1}^{k1} \beta'_{1n} \Delta p_{t-n}^i \tag{5-11}$$

$$+ \sum_{n=0}^{k2} \beta'_{2n} \Delta mc_{t-n}^i$$

$$+ \sum_{n=0}^{k3} \beta'_{3n} \Delta POS_{t-n}^i$$

$$+ \sum_{n=0}^{k4} \beta'_{4n} \Delta NEG_{t-n}^i$$

$$+ \sum_{n=0}^{k5} \beta'_{5n} \Delta fd_{t-n}^i + \rho_0 p_{t-1}^i$$

$$+ \rho_1 mc_{t-1}^i + \rho_2 POS_{t-1}^i$$

$$+ \rho_3 NEG_{t-1}^i + \rho_4 fd_{t-1}^i + \mu_t$$

Equation (5-12) and equation (5-13) are the equations of dynamic multipliers, which can capture the dynamic characteristics of asymmetric pass through in the long-run, short run or both.

$$m_h^{+} = \sum_{j=0}^{h} \frac{\partial p_{t+j}}{\partial POS_t}, h = 0, 1, 2, 3 \dots \dots \tag{5-12}$$

$$m_h^{-} = \sum_{j=0}^{h} \frac{\partial p_{t+j}}{\partial NEG_t}, h = 0, 1, 2, 3 \dots \dots \tag{5-13}$$

### 5.3.3 Variable and Data

The prices of 65 sectors in the classification of HS (Harmonized System) code are adopted in this part. All data covers 78 months from July 2011 to December 2017. The definitions of varibales and data sources are disguessed as follows.

Import price (P). Our theoretical frame work is based on the exporters' point of view. Yet this chapter aims to study the Vietnam's import prices from China. Since the trade data is not available from Vietnam's side, the trade data is gained from China’s side. Following Bugamelli and Tedeschi (2008), the monthly import prices from China can be computed by dividing the currency value over quantities. The data is abstracted from China's General Administration of Customs.

Marginal cost (PPI). According to the previous papers (Ohn 2016; P. Hong and Zhang 2016), the marginal cost of exporter is proxied by China’s PPI (Producer Price Index). The data comes from Wind database.

Real exchange rate (ER). The real bilateral exchange rate between VND and RMB is adopted in this part, which is computed as $\mathrm{RER} = \mathrm{ER} * \mathrm{CPI}^{China}/CPI^{Vietnam}$. ER represents the nominal bilateral exchange rate, when CPI is the consumer price index for China and Vietnam, respectively. Exchange rate is represented as the price of VND in RMB, that is VND/RMB. The going up of RER reveals the real appreciation of VND against RMB ,and vise versa. The data of monthly nominal bilateral exchange rate comes from the website of Bank for International Settlements. The data of monthly consumer price index of China is from DRCNET (The Information Website of Development Research Center of the State Council of China), and Vietnam monthly CPI is taken from General Statistics Office of Vietnam. All CPIs are changed into the fixed base index, (2010=100).

Domestic demand (IPI). GDP (Gross Domestic Product) is usually adopted to proxy the demand of a country. Since the montly GDP is not avaible, the demand of Vietnam is proxed by IPI (Industrial Production Index), monthly. The data is from CEIC database (2010=100).All variables are transformed into the natural logarithmic form.

## 5.4 Estimation Results and Discussions

### 5.4.1 Unit Root Test

To prevent the so-called spurious regression, in this part, the unit root test called Augmented Dickey-Fuller (ADF) test is used. The results of test are presented in Table 5-2. Consequently, there is no I(2) variable, ARDL approach is appropriate for this study.

**Table 5-2: Unit Root Test**

| HS | Vietnam Export Price Industry | ADF test Level | ADF test 1st-diff | I(n) |
|---|---|---|---|---|
| p03 | Fish & crustacean, mollusk & other | -5.87a | | I(0) |
| p05 | Products of animal origin, nes | -9.03a | | I(0) |
| p06 | Live tree & other plant; bulb, root | -5.82a | | I(0) |
| p07 | Edible vegetables and certain roots | -4.89a | | I(0) |

| | | | | |
|---|---|---|---|---|
| p08 | Edible fruit and nuts; peel of citrus | -3.98b | | I(0) |
| p09 | Coffee, tea, matt and spices | -3.13 | -15.54a | I(1) |
| p10 | Cereals | -2.28 | -6.32a | I(1) |
| p11 | Prod.mill.indust; malt; starches | -2.11 | -7.69a | I(1) |
| p12 | Oil seed, oleaginous fruits | -9.76a | | I(0) |
| p14 | Vegetable plaiting materials; vegetable | -2.37 | -6.93a | I(1) |
| p15 | Animal/veg fats & oils | -6.95a | | I(0) |
| p17 | Sugars and sugar confectionery | -5.70a | | I(0) |
| p18 | Cocoa and cocoa preparations | -6.77a | | I(0) |
| p19 | Preparation of cereal, flour, starch/milk | -5.30a | | I(0) |
| p20 | Prep of vegetable, fruit, nuts | -0.84 | -8.06a | I(1) |
| p21 | Miscellaneous edible preparations | -3.73b | | I(0) |
| p22 | Beverages, spirits and vinegar | -5.73a | | I(0) |
| p23 | Residues & waste from the food industry | -2.20 | -8.56a | I(1) |
| p25 | Salt; sulphur; earth & ston; plaster | -1.09 | -7.90a | I(1) |
| p26 | Ores, slag and ash | -0.79 | -6.24a | I(1) |
| p27 | Mineral fuels, oils & product | -2.66c | -9.84a | I(1) |
| p28 | Inorgn chem; compds of prec mtl | -6.70a | | I(0) |
| p31 | Fertilizers | -7.35a | | I(0) |
| p32 | Tanning/dyeing extract; tannins | -7.11a | | I(0) |
| p33 | Essential oils & resinoids; perf | -9.31a | | I(0) |
| p34 | Soap, organic surface-active agents | -3.26c | | I(0) |
| p35 | Albuminoidal subs; modified starches | -2.69 | -7.28a | I(1) |
| p38 | Miscellaneous chemical products | -3.78b | | I(0) |
| p39 | Plastics and articles thereof. | -4.44a | | I(0) |
| p40 | Rubber and articles thereof | -3.06 | -10.60a | I(1) |
| p41 | Raw hides and skins | -5.19a | | I(0) |

| | | | | |
|---|---|---|---|---|
| p42 | Articles of leather; saddlery/harness | -6.06a | | I(0) |
| p44 | Wood and articles of wood; wood | -2.75 | -9.89a | I(1) |
| p46 | Manufactures of straw, esparto/other | -7.07a | | I(0) |
| p48 | Paper & paperboard; art of paper | -3.53b | | I(0) |
| p49 | Printed books, newspapers, pictures | -7.09a | | I(0) |
| p50 | Silk | -5.65a | | I(0) |
| p52 | Cotton | -2.89 | -9.17a | I(1) |
| p53 | Other vegetable textile fibers; pap | -2.24 | -3.86b | I(1) |
| p54 | Man-made filaments | -4.27a | | I(0) |
| p55 | Man-made staple fibers | -5.38a | | I(0) |
| p56 | Wadding, felt & nonwoven; yarns | -1.27 | -3.47b | I(1) |
| p58 | Special woven fab; tufted textile fab | -4.08a | | I(0) |
| p59 | Impregnated, coated, cover/laminate | -1.96 | -10.53a | I(1) |
| p60 | Knitted or crocheted fabrics | -1.46 | -3.16c | I(1) |
| p61 | Art of apparel & clothing access | -2.62 | -7.09a | I(1) |
| p62 | Art of apparel & clothing access, n | -1.39 | -4.08a | I(1) |
| p63 | Other made up textile articles; set | -1.17 | -8.98a | I(1) |
| p64 | Footwear, gaiters and the like; par | -1.47 | -3.47b | I(1) |
| p65 | Headgear and parts thereof | -3.16c | | I(0) |
| p68 | Art of stone, plaster, cement, asbestos | -7.45a | | I(0) |
| p69 | Ceramic products | -2.63 | -3.47b | I(1) |
| p70 | Glass and glassware. | -7.98a | | I(0) |
| p71 | Natural/cultured pearls, precious stone | -2.76 | -6.20a | I(1) |
| p72 | Iron and steel. | -4.08a | | I(0) |
| p73 | Articles of iron or steel | -2.09b | | I(0) |
| p76 | Aluminum and articles thereof. | -2.20 | -15.79a | I(1) |
| p78 | Lead and articles thereof. | -9.23a | | I(0) |

| | | | | |
|---|---|---|---|---|
| p82 | Tool, implement, cutlery, spoon & fork | -2.04 | -12.64 | I(1) |
| p83 | Miscellaneous articles of base metal | -3.47b | | I(0) |
| p84 | Nuclear reactors, boilers, machinery | -2.69 | -10.46 | I(1) |
| p94 | Furniture; bedding, mattress, matt | -1.31 | -3.59b | I(1) |
| p95 | Toys, games & sports requisites | -3.86b | | I(0) |
| **Other Variables** | | | | |
| rer | Real Exchange Rate | -2.10 | -7.49a | I(1) |
| ppi_China | Producer Price Index of China | 0.66 | -7.24a | I(1) |
| ipi_Vietnam | Industrial Price Index of Vietnam | -4.08a | | I(0) |

Note: 1. a, b, and c represent 1%, 5%, and 10%, respectively.
2. 1st-diff is the first difference form, I(n) represents the Integrated order of each variable. P (n) = Import price of product n in HS classification.

### 5.4.2 The Model Selection and Diagnostic Test

Table 5-3 reports the results of model selections and the diagnostic tests for 57 models. 5 industries fail the bound test, they are HS 09 (Coffee, tea, matt and spices), HS 33 (Essential oils & resinoids; perf), HS 44 (Wood and articles of wood; wood) and HS 62 (Art of apparel & clothing access), while the rest of the industries pass the bound test.

The parameters of $ECM_{t-1}$ in equations are negative and significant, at 5 per cent level. Consequently, a correction is running from short-run to long-run equilibrium. The different magnitudes of $ECM_{t-1}$ indicates the different speed of adjustments.

The CUMSUM (Cumulative Sum of Recursive Residuals) and CUMSUM-Square (Cumulative Sum of Squares of Recursive Residual) test are employed to test whether the models are stable overtime. Most of the equations pass both CUMSUM and CUMSUM-square tests at 5 per cent statistic significant level. Therefore, most models are stable over time. In summary, most models are stable and valid.

### 5.4.3 The Long Run Coefficients

This part provides the detailed discussion on the long-run parameters, which are reported in Table 5-4. As can be seen, the degree of ERPT effects are heterogenous between industries. In general, the depreciation (appreciation) of VND against RMB increases (decreases) the import prices of Vietnam from China, as expected.

A main finding of the long-run non-linear pass-though is that for some industries, the import prices react more sensitively to the real appreciation of VND against RMB. The Table 5-5 shows the summary of our findings. This phenomenon is detected in 35 industries in total. That means once the VND appreciates against RMB, the import prices of these products from China to Vietnam will decline when the import prices will stay relatively stable when VND depreciates against RMB. In other words, for these industries, once RMB depreciates, the Chinese products will have more advantages in price in the Vietnam market. It may somehow deteriorate the trade imbalance between these countries. When RMB appreciates, Chinese exporters tend to adjust the profit-markup and stabilize the prices in Vietnam, in order to maintain the market share.

Another crucial finding of the long-run asymmetric pass-though is that the import prices of Vietnam from Vietnam response more sensitively to the real depreciation than appreciation of VND. This situation is found in 22 industries. It indicates when VND depreciates against RMB, the import products of these industries will be more expensive, while the appreciation of VND could slightly or could not make these products cheaper in the Vietnam domestic market. Alternately, exporters may encounter quantity constraints or high adjustment cost

To summary, exporters of China adopt the asymmetric pricing strategy in Vietnam, based on our estimation results. Most of Vietnam's estimated industries are more sensitive to the appreciation of VND against RMB (or depreciation of RMB). Once RMB depreciates, the import prices of 36 industries in Vietnam will go down, which covers more than 60 per cent of Vietnam-China trade. It is beneficial for Chinese exporters to gain market share in Vietnam. However, it might have a negative impact on the Vietnamese domestic producers.

### 5.4.4 The Dynamic Multipliers

The Figure 5-1 provides dynamic multipliers in both short-run and long-run. The dynamic multipliers offer the evolution characteristics of adjudgment, based on the depreciation and appreciation VND against RMB. It is obvious from the figures that all the estimations converge to the long-run equilibrium, which further supports the diagnostic tests of $ECM_{t-1}$. The speeds of adjustment for different industries can be obtained from the parameters of the $ECM_{t-1}$.

## Table 5-3: Model Selection and Diagnostic Test

| HS | Industry | Model Selection | Bound | ECM | R-adj | CS | SQ |
|---|---|---|---|---|---|---|---|
| 03 | Fish & crustacean, mollusc & other | ARDL(4, 2, 2, 0, 3) | 10.18a | -0.74a (-6.09) | 0.55 | S | S |
| 05 | Products of animal origin, nes | ARDL(1, 0, 4, 2, 4) | 15.07a | -1.08a (-8.35) | 0.52 | S | US |
| 06 | Live tree & other plant; bulb, root | ARDL(3, 4, 0, 1, 3) | 8.01a | -0.58a (-4.09) | 0.48 | S | US |
| 07 | Edible vegetables and certain roots | ARDL(1, 0, 0, 0, 0) | 7.00a | -0.70a (-5.65) | 0.29 | S | S |
| 08 | Edible fruit and nuts; peel of citrus | ARDL(1, 0, 0, 0, 0) | 5.82a | -0.66a (-5.91) | 0.24 | S | S |
| 09 | Coffee, tea, matt and spices | | 2.67F | | | | |
| 10 | Cereals | ARDL(2, 0, 0, 1, 0) | 3.83a | -0.13c (-1.78) | 0.20 | S | S |
| 11 | Prod.mill.indust; malt; starches | ARDL(2, 0, 2, 0, 0) | 3.01b | -0.20a (-2.75) | 0.20 | S | S |
| 12 | Oil seed, oleagi fruits | ARDL(1, 0, 0, 3, 2) | 13.78a | -0.93a (-8.22) | 0.48 | S | S |
| 14 | Vegetable plaiting materials; vegetable | ARDL(2, 1, 0, 0, 2) | 4.14a | -0.53a (-3.97) | 0.41 | S | S |
| 15 | Animal/veg fats & oils | ARDL(3, 1, 0, 4, 3) | 4.80a | -0.85a (-4.64) | 0.47 | S | S |
| 17 | Sugars and sugar confectionery | ARDL(2, 0, 3, 3, 0) | 5.06b | -0.53a (-3.52) | 0.36 | S | S |
| 18 | Cocoa and cocoa preparations | ARDL(2, 4, 0, 4, 4) | 10.83a | -0.66a (-7.24) | 0.46 | S | S |
| 19 | Prep.of cereal, flour, starch/milk | ARDL(1, 0, 0, 0, 0) | 13.89a | -0.94a (-8.64) | 0.49 | S | S |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | Prep of vegetable, fruit, nuts | ARDL(1, 0, 0, 0, 0) | 13.26a | -0.93a (-8.05) | 0.45 | S | US |
| 21 | Miscellaneous edible preparations | ARDL(1, 0, 4, 3, 1) | 7.38a | -0.65a (-5.72) | 0.38 | S | S |
| 22 | Beverages, spirits and vinegar | ARDL(4, 1, 0, 0, 0) | 6.79a | -0.94a (-5.82) | 0.39 | US | US |
| 23 | Residues & waste from the food | ARDL(1, 0, 0, 0, 0) | 15.94a | -0.50a (-5.26) | 0.50 | S | US |
| 25 | Salt; sulphur; earth & stone; plaster | ARDL(4, 4, 1, 0, 4) | 4.38a | -0.69a (-4.18) | 0.69 | S | S |
| 26 | Ores, slag and ash | ARDL(2, 0, 0, 1, 0) | 3.93a | -0.79a (-4.84) | 0.48 | S | S |
| 27 | Mineral fuels, oils & product | ARDL(1, 2, 1, 0, 0) | 5.22a | -0.55a (-5.09) | 0.29 | S | US |
| 28 | Inorgn chem; compds of prec mtl | ARDL(1, 2, 3, 0, 0) | 10.51a | 0.45 | -0.88a (-7.07) | S | US |
| 31 | Fertilizers | ARDL(4, 4, 4, 3, 2) | 8.39a | -0.40a (-4.97) | 0.60 | S | S |
| 32 | Tanning/dyeing extract; tannins | ARDL(3, 3, 0, 0, 0) | 10.08a | -0.64a (-6.93) | 0.65 | S | US |
| 33 | Essential oils & resinoids; perf | | 3.04F | | | | |
| 34 | Soap, organic surface agents | ARDL(4, 2, 0, 0, 3) | 4.89a | -0.45 (-4.72) | 0.46 | S | US |
| 35 | Albuminoidal subs; modified starches | ARDL(1, 0, 1, 0, 3) | 9.45a | -0.58a (-8.80) | 0.58 | S | US |
| 38 | Miscellaneous chemical products | ARDL(1, 1, 2, 3, 4) | 14.14a | -0.89a (-8.20) | 0.55 | S | S |
| 39 | Plastics and articles thereof. | ARDL(1, 0, 0, 0, 0) | 5.37a | -0.53a (-5.06) | 0.22 | S | S |
| 40 | | ARDL(4, 1, 0, 4, 0) | 6.68a | -0.67a | 0.35 | S | S |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Rubber and articles thereof | | | (-5.91) | | | |
| 41 | Raw hides and skins | ARDL(1, 0, 3, 0, 0) | 6.73a | -0.62a<br>(-5.71) | 0.37 | S | US |
| 42 | Articles of leather; saddlery/harness | ARDL(1, 0, 0, 4, 0) | 6.24a | -0.61a<br>(-5.54) | 0.42 | S | S |
| 44 | Wood and articles of wood; wood | | 3.01F | | | | |
| 46 | Manufactures of straw, esparto/other | ARDL(2, 1, 4, 0, 0) | 12.94a | -0.22a<br>(-7.82) | 0.52 | S | US |
| 48 | Paper & paperboard; art of | ARDL(1, 0, 0, 4, 1) | 6.49a | -0.55a<br>(-5.45) | 0.35 | S | US |
| 49 | Books, newspapers, pictures | ARDL(4, 0, 2, 2, 0) | 4.16c | -0.81a<br>(-3.48) | 0.58 | S | S |
| 50 | Silk | ARDL(3, 4, 0, 3, 4) | 6.42a | -0.82a<br>(-5.14) | 0.47 | S | S |
| 52 | Cotton | ARDL(1, 0, 0, 0, 3) | 4.65b | -0.32a<br>(-3.50) | 0.21 | S | S |
| 53 | Other vegetable textile fibres; pap | ARDL(3, 0, 0, 3, 3) | 3.72c | -0.60b<br>(-2.50) | 0.26 | S | S |
| 54 | Man-made filaments | ARDL(3, 3, 4, 3, 3) | 4.49b | -0.48a<br>(-3.33) | 0.46 | S | S |
| 55 | Man-made staple fibres | ARDL(4, 0, 0, 3, 0) | 3.62c | -0.30b<br>(-2.56) | 0.36 | S | US |
| 56 | Wadding, felt & nonwoven; yarns | ARDL(1, 0, 3, 4, 0) | 8.73b | -0.79a<br>(-6.53) | 0.42 | S | S |
| 58 | Special woven fab; tufted textile fab | ARDL(1, 2, 3, 0, 4) | 17.29a | -0.99a<br>(-8.31) | 0.44 | S | S |
| 59 | Impregnated,coated, cover/laminate | ARDL(3, 0, 1, 2, 0) | 4.63b | -0.32a<br>(-3.01) | 0.25 | S | S |
| 60 | | ARDL(3, 0, 0, 0, 0) | 3.92c | -0.23a | 0.26 | S | S |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Knitted or crocheted fabrics | | | (-2.67) | | | |
| 61 | Art of apparel & clothing access | ARDL(1, 0, 0, 0, 0) | 12.10a | -0.27 (-3.37) | 0.12 | S | S |
| 62 | Art of apparel & clothing access, n | | 1.38F | | | | |
| 63 | Other made up textile articles; set | ARDL(1, 1, 0, 0, 0) | 4.11b | -0.49a (-2.77) | 0.16 | S | US |
| 64 | Footwear, gaiters and the like; par | ARDL(2, 3, 1, 0, 1) | 4.57b | -0.27a (-2.84) | 0.30 | S | US |
| 65 | Headgear and parts thereof | ARDL(1, 0, 0, 3, 2) | 10.34a | -0.86a (-7.12) | 0.51 | S | S |
| 68 | Art of stone, plaster, cement, asbestos | ARDL(1, 1, 2, 0, 3) | 7.58a | -0.61a (-5.64) | 0.30 | S | S |
| 69 | Ceramic products | ARDL(2, 0, 0, 1, 0) | 10.06a | -0.58a (-5.65) | 0.39 | S | S |
| 70 | Glass and glassware. | ARDL(4, 0, 0, 0, 1) | 3.92c | -0.29c (-1.76) | 0.66 | S | US |
| 71 | Natural/cultured pearls, prec stone | ARDL(3, 0, 0, 3, 1) | 4.57c | -0.58b (-2.00) | 0.65 | S | US |
| 72 | Iron and steel. | ARDL(3, 4, 1, 1, 0) | 7.29a | -0.99a (-5.96) | 0.63 | S | US |
| 73 | Articles of iron or steel | ARDL(1, 0, 1, 1, 0) | 8.95a | -0.81a (-6.81) | 0.37 | S | S |
| 76 | Aluminum and articles thereof. | | 1.65F | | | | |
| 78 | Lead and articles thereof. | ARDL(4, 0, 0, 0, 0) | 3.62c | -0.51a (-5.07) | 0.26 | S | S |
| 82 | Tool, implement, cutlery, spoon & for | ARDL(3, 0, 0, 0, 0) | 0.49a | -0.54a (-3.49) | 0.49 | S | S |
| 83 | Miscellaneous articles of basemetal | ARDL(1, 0, 0, 3, 0) | 6.19a | -0.67a (-5.38) | 0.32 | S | US |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 84 | Nuclear reactors, boilers, machinery | ARDL(1, 1, 1, 0, 0) | 3.90c | -0.20a (-3.00) | 0.18 | S | S |
| 94 | Furniture, bedding, mattress, matt | ARDL(3, 4, 0, 4, 0) | 3.64c | -0.61a (-4.51) | 0.41 | S | S |
| 95 | Toys, games & sports requisites | ARDL(1, 3, 1, 0, 0) | | -0.34a (-3.83) | 0.36 | S | S |

Notes: 1. Optimal lag lengths are presented.
2. F-statistics are provided. a, b and c denote 1 per cent, 5 per cent and 10 per cent significant level, respectively.
3. "F" indicates that the industry failed the test.
4. The coefficients of $ECM_{t-1}$ and the t-statistics are resented in the table.
5. CS and SQ represents the CUSUM and CUSUM Square, respectively. S means "Stable" while US means "Unstable".
6. All variables are in natural logarithmic form.

## Table 5-4：Long Run Coefficients

| HS | Industry | POS | NEG | ipi_vtn | ppi_chn |
|---|---|---|---|---|---|
| 03 | Fish & crustacean, mollusc & other | -0.62b (-2.44) | -0.98 (-1.54) | 1.02 (1.16) | 2.32a (2.89) |
| 05 | Products of animal origin, nes | 0.01 (0.98) | -0.01 (-1.15) | -8.94a (-2.83) | 11.60a (4.66) |
| 06 | Live tree & other plant; bulb, root | -0.97c (1.79) | -0.88c (1.72) | -6.83b (-2.43) | -2.11 (-0.83) |
| 07 | Edible vegetables and certain roots | -0.45a (-4.38) | 0.37 (1.52) | 0.21 (0.79) | 0.41 (1.03) |
| 08 | Edible fruit and nuts; peel of citrus | -0.57a (-5.21) | -1.34a (-5.14) | 0.09 (0.35) | 0.08 (0.20) |
| 09 | Coffee, tea, matt and spices | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| 10 | Cereals | -0.10 (-0.12) | -2.42c (-1.91) | -0.61 (-0.31) | 1.36c (1.76) |
| 11 | | -0.34b | 0.35 | -0.15 | -0.01 |

| | | | | | |
|---|---|---|---|---|---|
| | Prod.mill.indust; malt; starches | (-2.06) | (-0.85) | (-0.36) | (-0.04) |
| 12 | Oil seed, oleagi fruits | -4.96 | -8.36 | 1.29a | -3.24 |
| | | (-0.75) | (-1.21) | (2.66) | (-0.82) |
| 14 | Vegetable plaiting materials; vegetable | -0.78a | 0.27 | 0.81a | -3.38 |
| | | (-2.57) | (1.56) | (5.33) | (-1.02) |
| 15 | Animal/veg fats & oils | -0.98 | -2.09c | -1.29 | -0.63 |
| | | (-1.55) | (-1.81) | (-1.17) | (-0.71) |
| 17 | Sugars and sugar confectionery | 0.50 | -0.62a | -9.14 | -1.50c |
| | | (1.13) | (-2.06) | (-1.40) | (-1.78) |
| 18 | Cocoa and cocoa preparations | 0.63 | -0.29b | 0.94b | 2.91c |
| | | (0.94) | (-2.69) | (2.35) | (1.95) |
| 19 | Prep.of cereal, flour, starch/milk | -0.09a | -0.10a | -0.93a | -0.12 |
| | | (-3.89) | (-5.32) | (-2.96) | (-0.27) |
| 20 | Prep of vegetable, fruit, nut | -0.41 | -2.73b | 1.91 | -1.88a |
| | | (-0.86) | (-2.41) | (1.56) | (-2.74) |
| 21 | Miscellaneous edible preparations | -2.06a | -0.95a | -1.14 | 0.01 |
| | | (-2.78) | (-2.72) | (-0.69) | (0.01) |
| 22 | Beverages, spirits and vinegar | -0.93b | 1.13 | -2.30 | 1.51c |
| | | (2.32) | (1.43) | (-0.91) | (1.61) |
| 23 | Residues & waste from the food industry | -0.11b | 0.02 | -0.97 | -3.29c |
| | | (-0.66) | (0.26) | (-0.69) | (-1.73) |
| 25 | Salt; sulphur; earth & stone; plaster | -1.75b | -0.65 | 1.06 | -2.62a |
| | | (-2.32) | (-1.50) | (1.49) | (-3.44) |
| 26 | Ores, slag and ash | -2.83a | -2.02 | 5.02c | -6.14b |
| | | (-3.89) | (-1.16) | (1.90) | (-2.28) |
| 27 | Mineral fuels, oils & product | -0.21a | -5.44 | 1.79 | -2.89b |
| | | (-2.92) | (-0.27) | (0.91) | (-2.02) |

| | | | | | |
|---|---|---|---|---|---|
| 28 | Inorgn chem; compds of prec mtl | -0.01b | -0.22c | 0.10b | 2.59a |
| | | (-2.04) | (-1.92) | (2.05) | (3.03) |
| 31 | Fertilizers | -0.37a | -0.23 | 0.32 | -0.17 |
| | | (-3.24) | (-0.91) | (1.01) | (-0.51) |
| 32 | Tanning/dyeing extract; tannins | 0.23 | -0.70a | 3.79c | 2.64b |
| | | (0.80) | (-3.38) | (1.76) | (2.36) |
| 33 | Essential oils & resinoids; perf | N/A | N/A | N/A | N/A |
| | | N/A | N/A | N/A | N/A |
| 34 | Soap, organic surface-active agents | -0.70b | -0.26 | 0.60 | 0.61a |
| | | (-2.52) | (-0.13) | (1.36) | (5.12) |
| 35 | Albuminoidal subs; modified starches | -0.43b | 1.19 | 0.28 | 1.55c |
| | | (-2.72) | (0.81) | (0.13) | (1.61) |
| 38 | Miscellaneous chemical products | -1.32a | -3.16a | 0.80a | 1.12a |
| | | (-3.57) | (-4.02) | (4.69) | (5.66) |
| 39 | Plastics and articles thereof. | -0.37c | 1.10b | 0.48 | 12.46a |
| | | (-1.87) | (2.35) | (1.00) | (3.38) |
| 40 | Rubber and articles thereof | -1.42a | 0.40a | -1.67b | 0.91a |
| | | (-6.12) | (3.99) | (-2.61) | (9.54) |
| 41 | Raw hides and skins | -0.14b | -0.12c | 1.03a | -1.24 |
| | | (-2.83) | (-1.86) | (3.84) | (-1.01) |
| 42 | Articles of leather; saddlery/harness | -0.93b | -3.34 | -0.34 | 1.71b |
| | | (-2.27) | (0.98) | (-0.29) | (2.04) |
| 44 | Wood and articles of wood; wood | N/A | N/A | N/A | N/A |
| | | N/A | N/A | N/A | N/A |
| 46 | Manufactures of straw, esparto/other | -0.38 | -1.36b | 0.11 | 2.11 |
| | | (-1.36) | (-2.95) | (0.05) | (0.69) |
| 48 | | -0.34b | -0.35c | 0.56c | -4.53 |

| | | | | | |
|---|---|---|---|---|---|
| | Paper & paperboard; art of paper | (-2.03) | (-1.59) | (1.57) | (-1.39) |
| 49 | Printed books, newspapers, pictures | 0.44 | -0.18c | -1.45 | -1.28c |
| | | (1.09) | (-1.96) | (-1.52) | (-1.92) |
| 50 | Silk | 0.02 | -0.10b | -1.87 | 0.28b |
| | | (0.20) | (-2.13) | (-1.04) | (2.75) |
| 52 | Cotton | -0.31b | 0.26 | -0.09 | 1.69a |
| | | (-2.34) | (0.83) | (-0.53) | (5.89) |
| 53 | Other vegetable textile fibres; pap | -0.18c | -0.08 | 1.36c | -1.00 |
| | | (-1.96) | (-0.59) | (1.95) | (-1.24) |
| 54 | Man-made filaments | -1.75b | -3.80b | 3.67 | -3.07 |
| | | (-2.12) | (-2.07) | (1.45) | (-1.32) |
| 55 | Man-made staple fibres | -0.50b | 0.02 | 1.01b | 2.89b |
| | | (-2.55) | (0.03) | (2.44) | (2.59) |
| 56 | Wadding, felt & nonwoven; yarns | N/A | N/A | N/A | N/A |
| | | N/A | N/A | N/A | N/A |
| 58 | Special woven fab; tufted textile fab | -2.91a | -4.75 | -0.76 | -1.23 |
| | | (-3.64) | (-0.97) | (-0.66) | (-0.51) |
| 59 | Impregnated, coated, cover/laminate | -0.35b | -0.62b | 1.51a | 0.81 |
| | | (-2.30) | (-2.11) | (3.52) | (0.31) |
| 60 | Knitted or crocheted fabrics | -0.28b | 0.66 | -1.91a | 2.69 |
| | | (-2.42) | (0.18) | (-3.42) | (0.68) |
| 61 | Art of apparel & clothing access | -1.84b | -1.41c | -3.18 | 2.37 |
| | | (-2.91) | (-2.60) | (-1.32) | (0.32) |
| 62 | Art of apparel & clothing access, n | N/A | N/A | N/A | N/A |
| | | N/A | N/A | N/A | N/A |
| 63 | Other made up textile articles; set | 1.06 | -0.28b | -4.65 | -0.92a |
| | | (0.81) | (-2.38) | (-0.44) | (-2.82) |

| | | | | | |
|---|---|---|---|---|---|
| 64 | Footwear, gaiters and the like; par | -0.71c | 0.30 | -1.14 | 2.10a |
| | | (-1.95) | (0.63) | (-0.22) | (2.91) |
| 65 | Headgear and parts thereof | -1.22b | 1.75 | 1.62 | -1.26b |
| | | (-2.08) | (1.26) | (0.81) | (-6.78) |
| 68 | Art of stone, plaster, cement, asbestos | -2.24c | 2.48 | -0.77 | -3.43 |
| | | (-1.98) | (0.86) | (-0.19) | (-0.42) |
| 69 | Ceramic products | -2.50a | -5.93 | -1.78c | 2.87a |
| | | (-4.03) | (-0.97) | (-1.62) | (4.31) |
| 70 | Glass and glassware. | -1.67 | -1.15b | 5.12 | 0.24c |
| | | (-0.72) | (-2.60) | (0.25) | (1.79) |
| 71 | Natural/cultured pearls, prec stone | -0.47b | 0.48 | 2.55c | -9.81 |
| | | (-2.00) | (0.83) | (1.80) | (-0.96) |
| 72 | Iron and steel. | -0.13c | -0.10a | 2.53c | -1.85a |
| | | (-1.74) | (-3.39) | (1.71) | (-3.76) |
| 73 | Articles of iron or steel | -2.07a | -8.21 | 2.26c | -0.46 |
| | | (-2.94) | (-1.65) | (1.85) | (-0.18) |
| 76 | Aluminium and articles thereof. | N/A | N/A | N/A | N/A |
| | | N/A | N/A | N/A | N/A |
| 78 | Lead and articles thereof. | -0.73b | -1.44c | 0.08 | 1.12 |
| | | (-2.13) | (-1.66) | (0.09) | (0.85) |
| 82 | Tool, implement, cutlery, spoon & fork | -1.70b | -3.74b | -0.72 | 1.90a |
| | | (-2.50) | (-2.19) | (-0.41) | (4.38) |
| 83 | Miscellaneous articles of base metal | -0.58c | -0.37c | -1.76 | 1.03b |
| | | (-1.84) | (-1.87) | (-1.42) | (2.36) |
| 84 | Nuclear reactors, boilers, machinery | -0.31b | -0.13b | 3.10 | 1.82a |
| | | (-2.28) | (-2.27) | (0.62) | (2.68) |
| 94 | | -0.47b | 2.01 | 1.53a | -2.80 |

| | | | | | |
|---|---|---|---|---|---|
| | Furniture, bedding, mattress, matt | (2.01) | (0.86) | (2.67) | (-1.58) |
| 95 | Toys, games & sports requisites | -0.22c | -0.16b | 1.04c | 2.15a |
| | | (1.66) | (-2.13) | (1.74) | (2.80) |

Notes: 1. a, b and c denote 1 per cent, 5 per cent and 10 per cent significant level, respectively.
2. t-statistics are in the parentheses.

## Table 5-5 Summary of the Findings

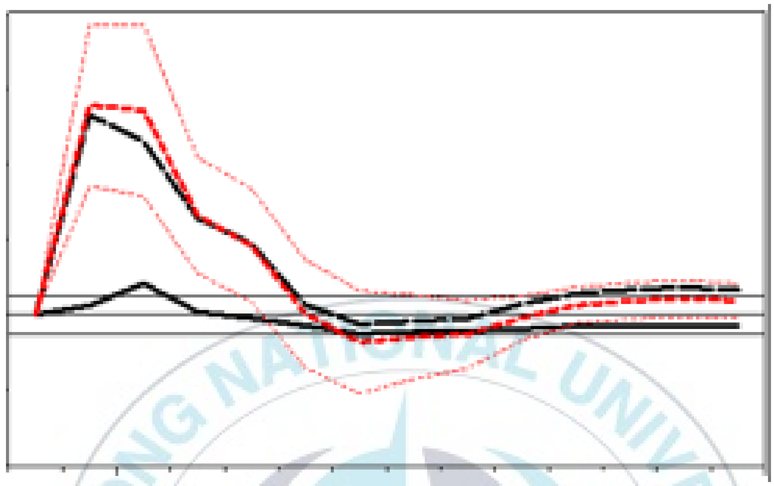
| HS | POS>NEG | HS | NEG>POS |
|---|---|---|---|
| 03 | Fish & crustacean, mollusc & other | 05 | Products of animal origin, nes |
| 06 | Live tree & other plant; bulb, root | 08 | Edible fruit and nuts; peel of citrus |
| 07 | Edible vegetables and certain roots | 10 | Cereals |
| 11 | Prod.mill.indust; malt; starches | 12 | Oil seed, oleaginous fruit |
| 14 | Vegetable plaiting materials; vegetable | 15 | Animal/veg fats & oils |
| 21 | Miscellaneous edible preparations | 17 | Sugars and sugar confectionery |
| 22 | Beverages, spirits and vinegar | 18 | Cocoa and cocoa preparations |
| 23 | Residues & waste from the food industry | 19 | Prep.of cereal, flour, starch/milk |

| | | | |
|---|---|---|---|
| 25 | Salt; sulphur; earth & stone; plaster | 20 | Prep of vegetable, fruit, nut |
| 26 | Ores, slag and ash | 28 | Inorgn chem; compds of prec mtl |
| 27 | Mineral fuels, oils & product | 32 | Tanning/dyeing extract; tannins |
| 31 | Fertilizers | 38 | Miscellaneous chemical products |
| 34 | Soap, organic surface-active agents | 39 | Plastics and articles thereof. |
| 35 | Albuminoidal subs; modified starches | 46 | Manufactures of straw, esparto/other |
| 40 | Rubber and articles thereof | 48 | Paper & paperboard; art of paper |
| 41 | Raw hides and skins | 49 | Printed books, newspapers, pictures |
| 42 | Articles of leather; saddlery/harness | 50 | Silk |
| 52 | Cotton | 54 | Man-made filaments |
| 53 | Other vegetable textile fibres; pap | 59 | Impregnated, coated, cover/laminate |
| 55 | Man-made staple fibres | 63 | Other made up textile articles; set |

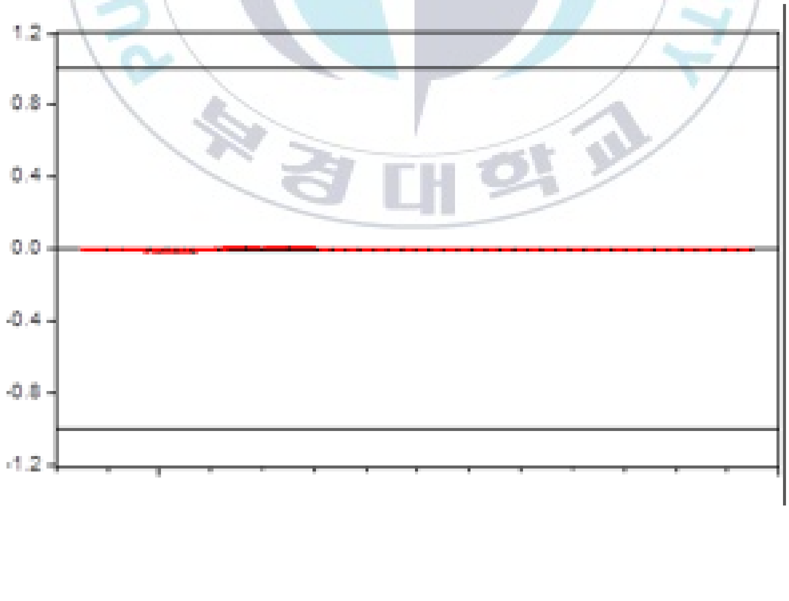
| | | | |
|---|---|---|---|
| 58 | Special woven fab; tufted textile fab | 70 | Glass and glassware. |
| 60 | Knitted or crocheted fabrics | 82 | Tool, implement, cutlery, spoon & fork |
| 61 | Art of apparel & clothing access | | |
| 64 | Footwear, gaiters and the like; par | | |
| 65 | Headgear and parts thereof | | |
| 68 | Art of stone, plaster, cement, asbestos | | |
| 69 | Ceramic products | | |
| 71 | Natural/cultured pearls, prec stone | | |
| 72 | Iron and steel. | | |
| 73 | Articles of iron or steel | | |
| 78 | Lead and articles thereof. | | |
| 83 | Miscellaneous articles of base metal | | |
| 84 | Nuclear reactors, boilers, machinery | | |
| 94 | Furniture, bedding, mattress, matt | | |
| 95 | Toys, games & sports requisites | | |

## Figure 5-1: Dynamic Multipliers: Asymmetric Model

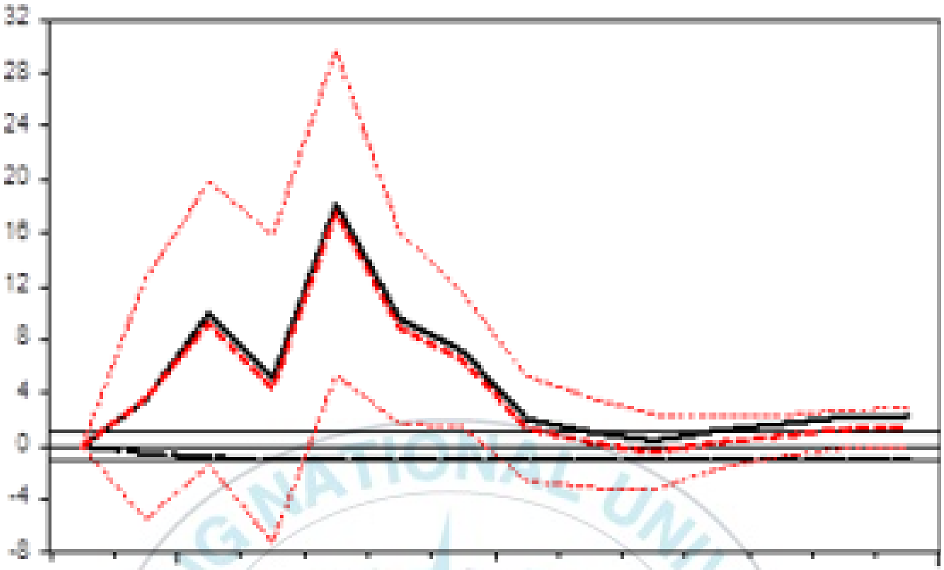
**HS 03**



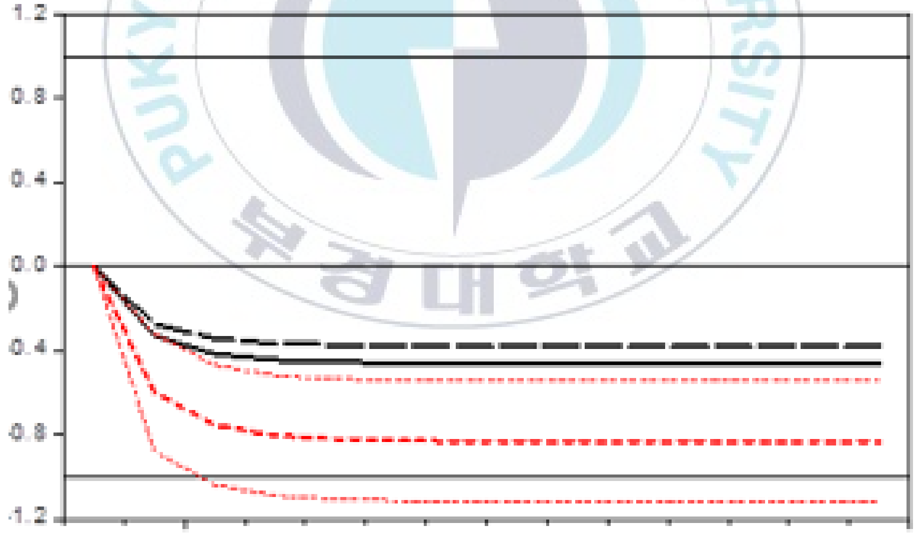
**HS 05**



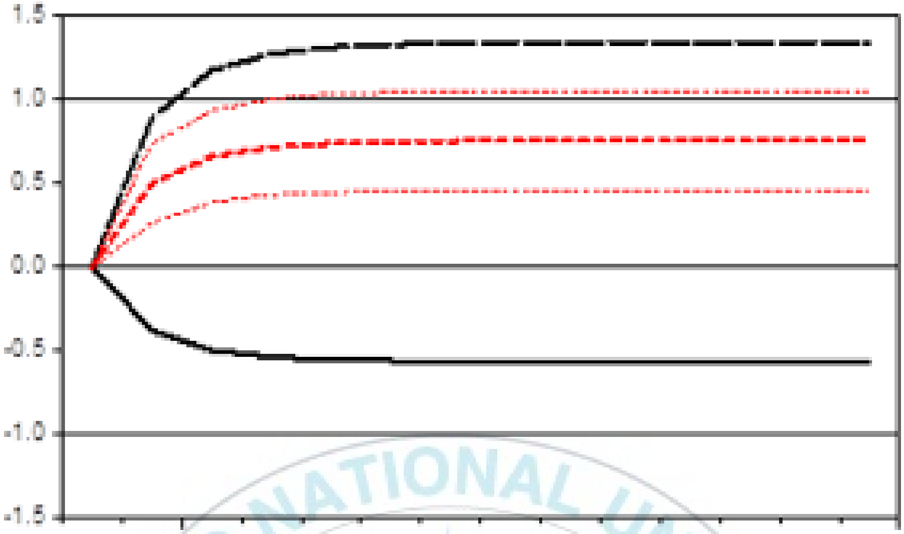
**HS 06**



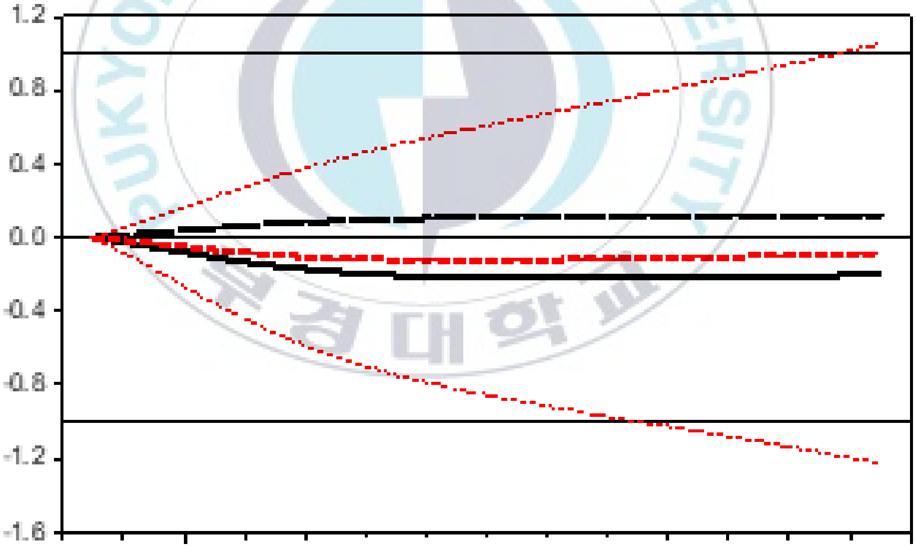

**HS 07**



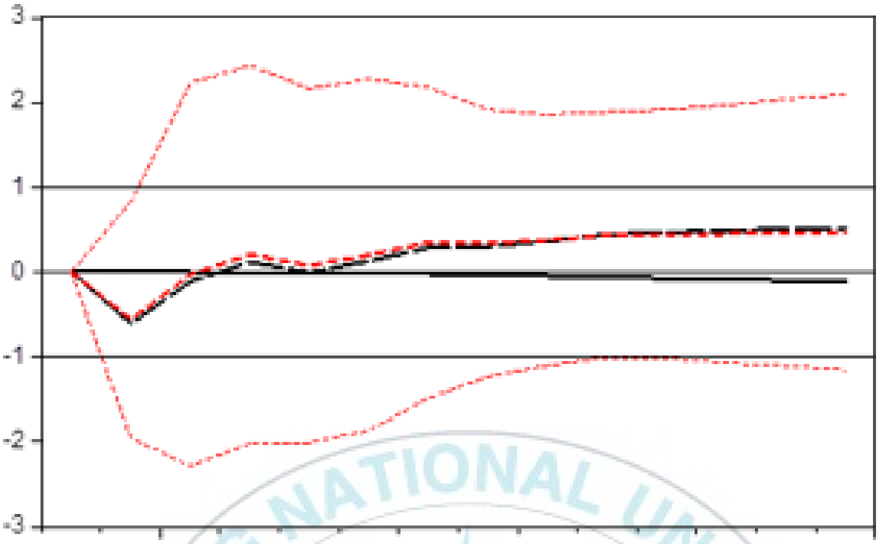
**HS 08**



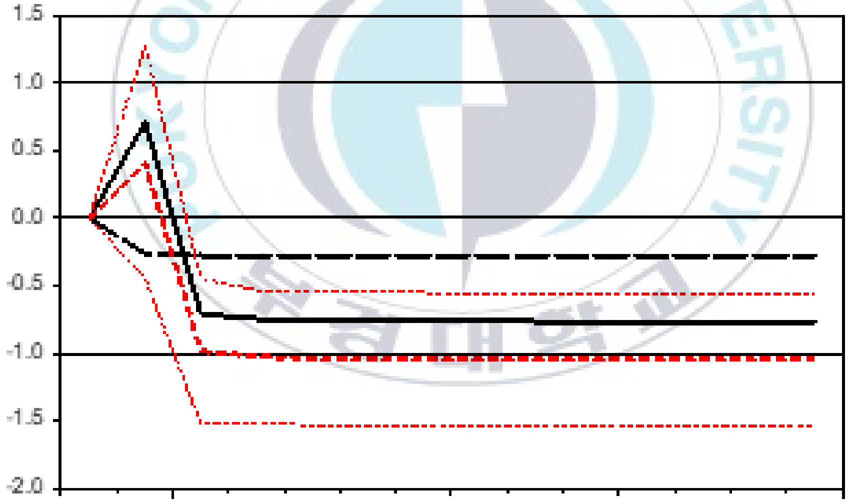

**HS 10**



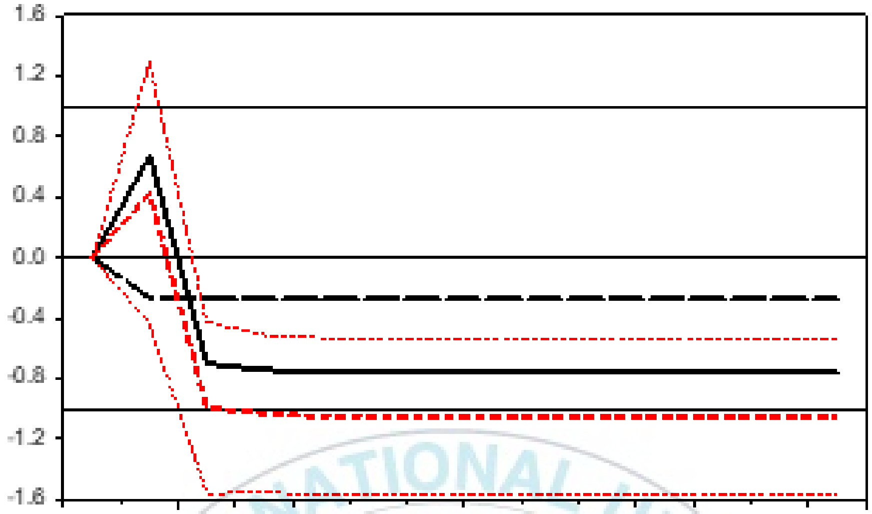
**HS 11**



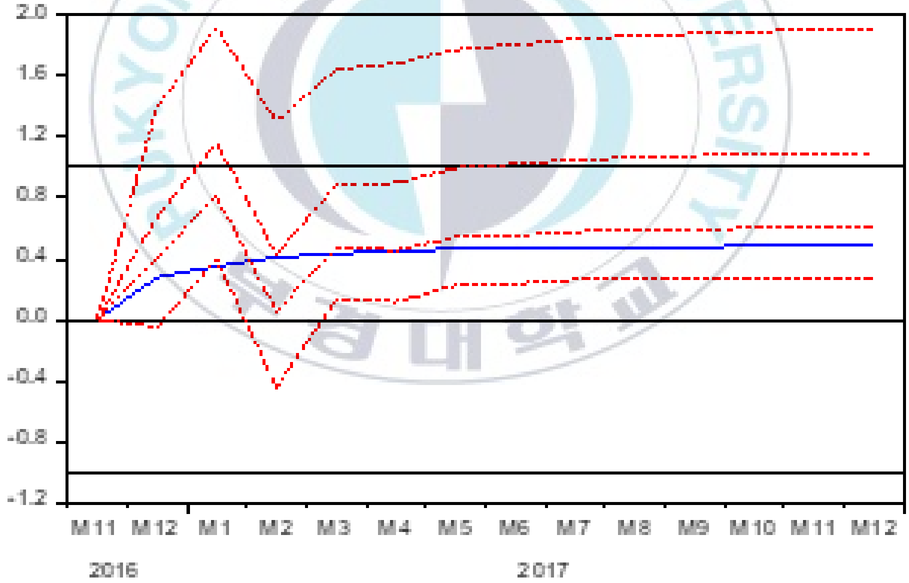

**HS 12**



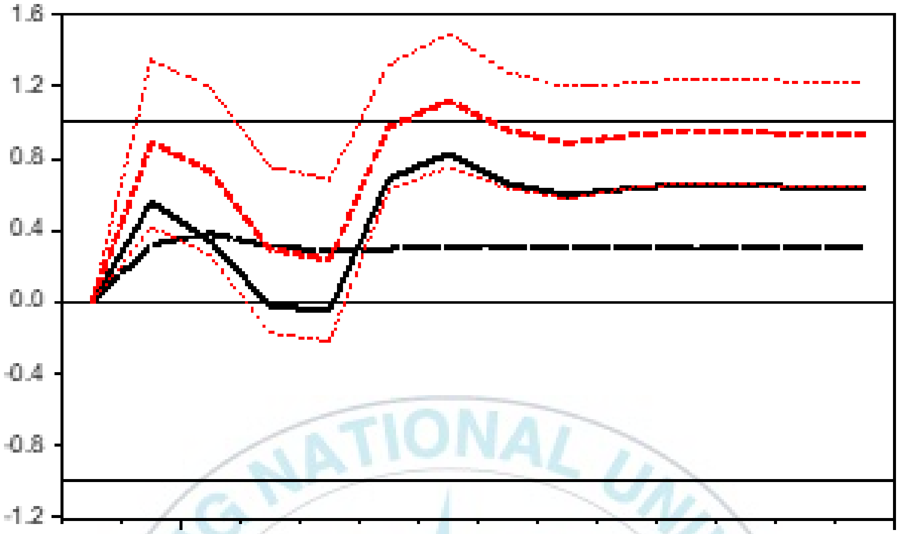
**HS 15**


1.6
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-1.6

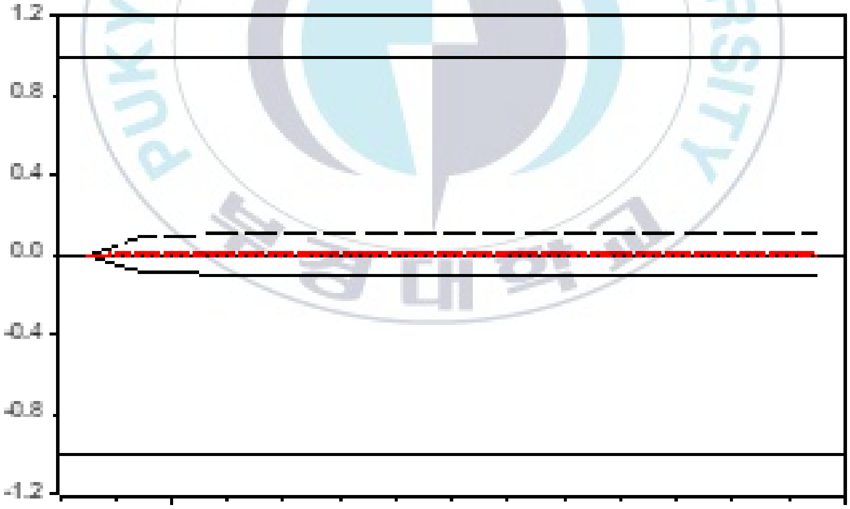
**HS 17**


2.0
1.6
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
M11 M12 M1 M2 M3 M4 M5 M6 M7 M8 M9 M10 M11 M12
2016
2017

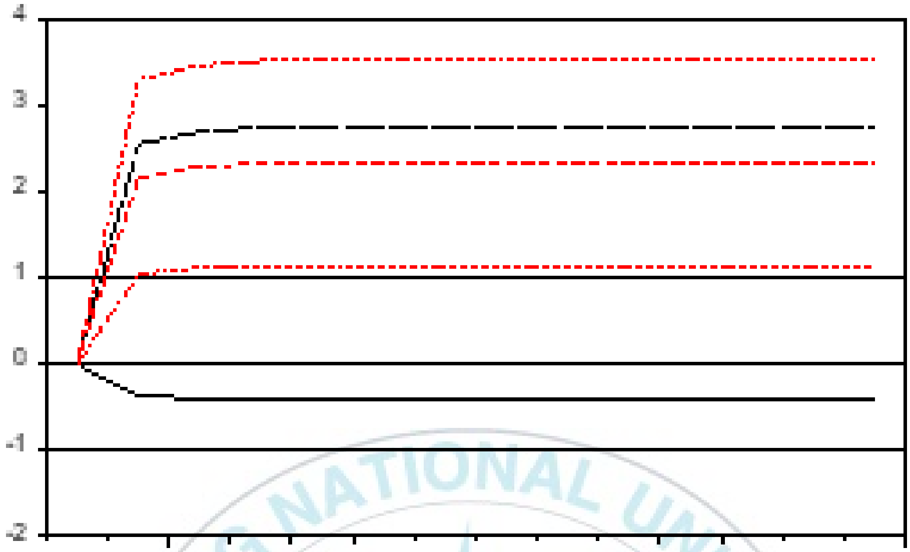
**HS 18**



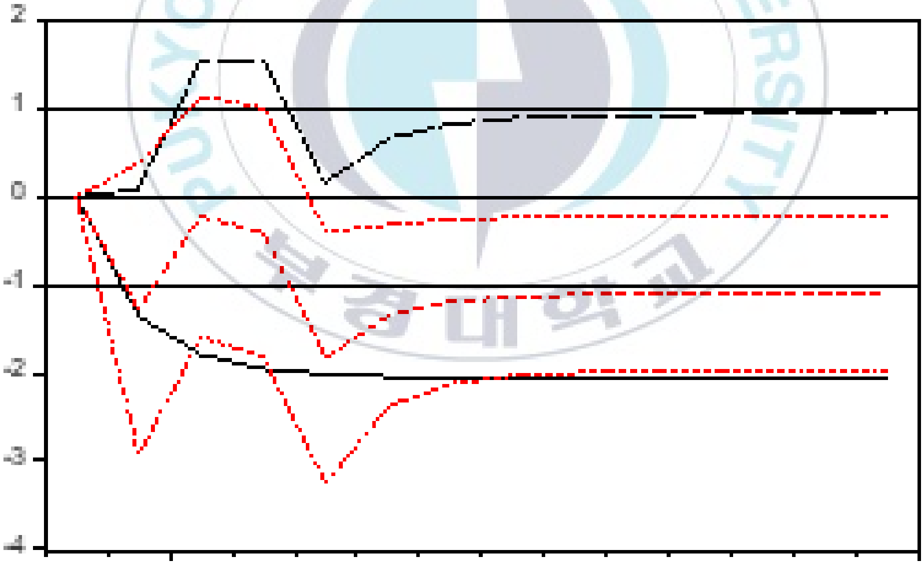

**HS 19**



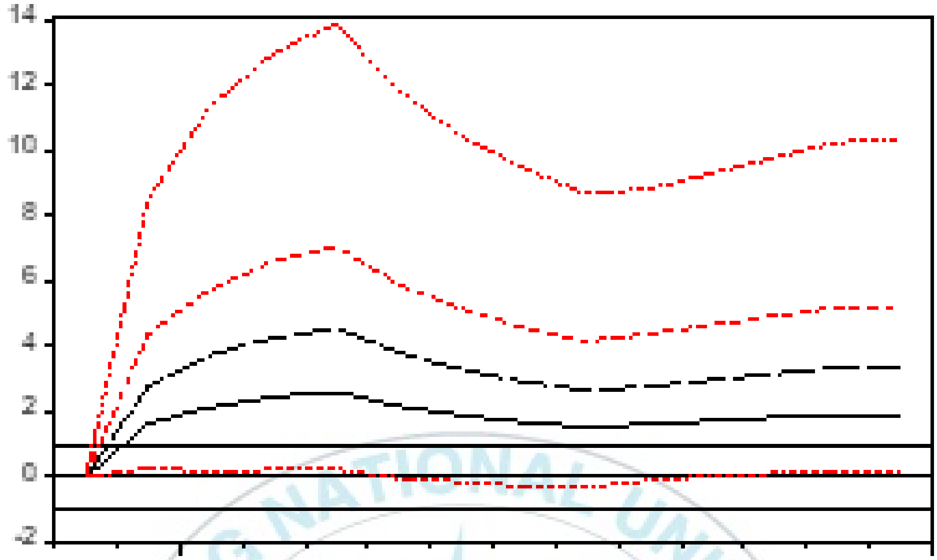
**HS 20**



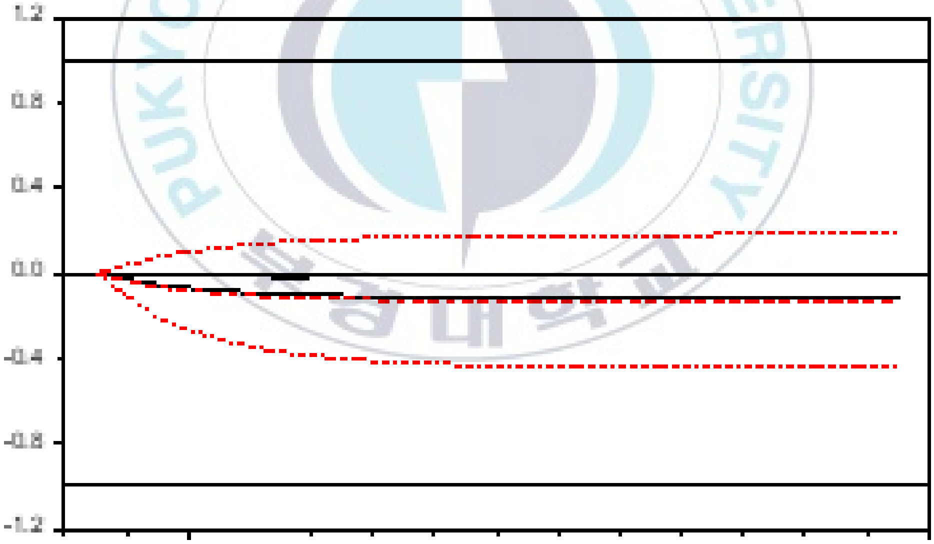

**HS 21**



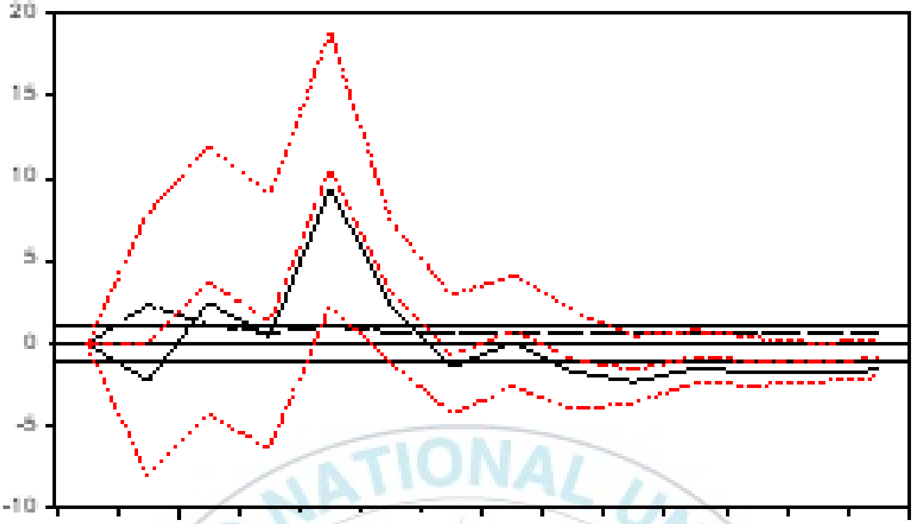
HS 22



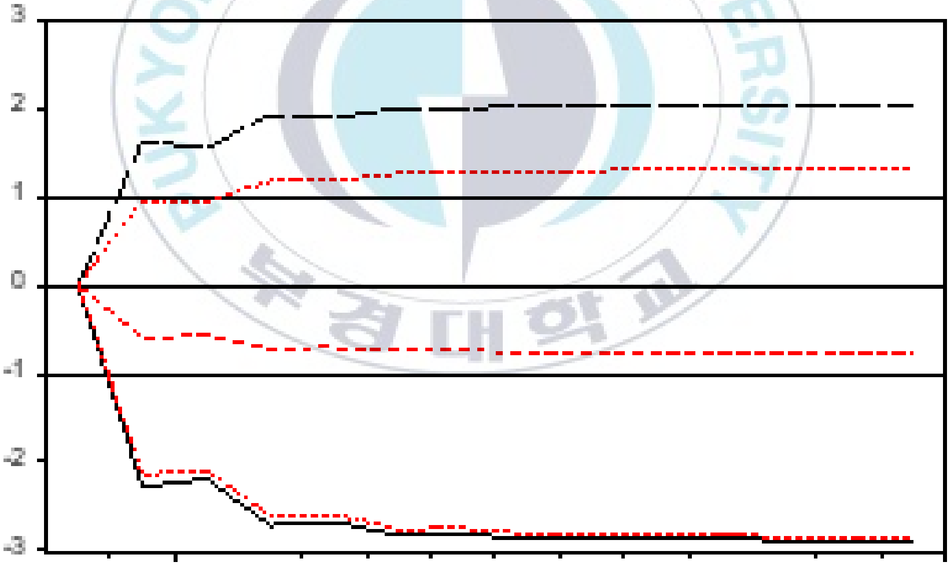

HS 23



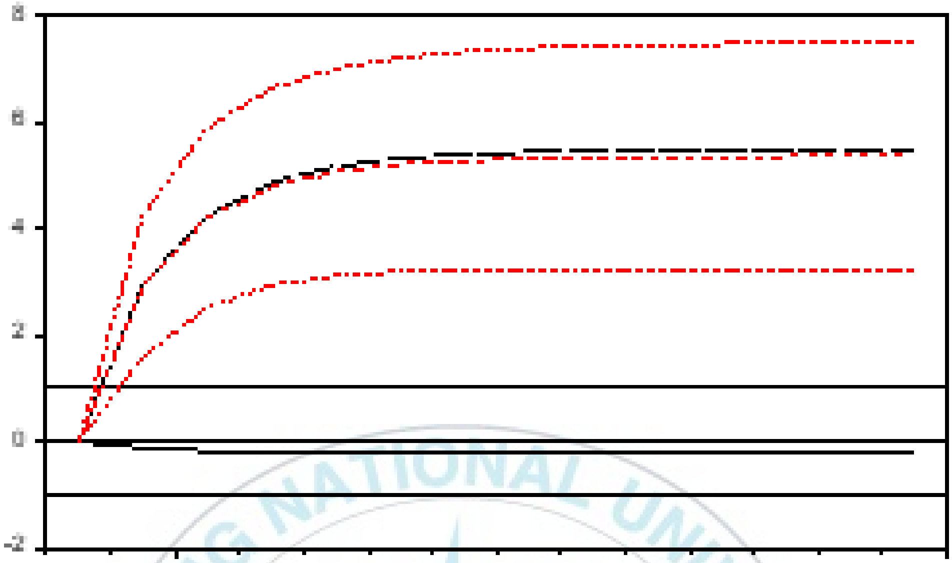
HS 25



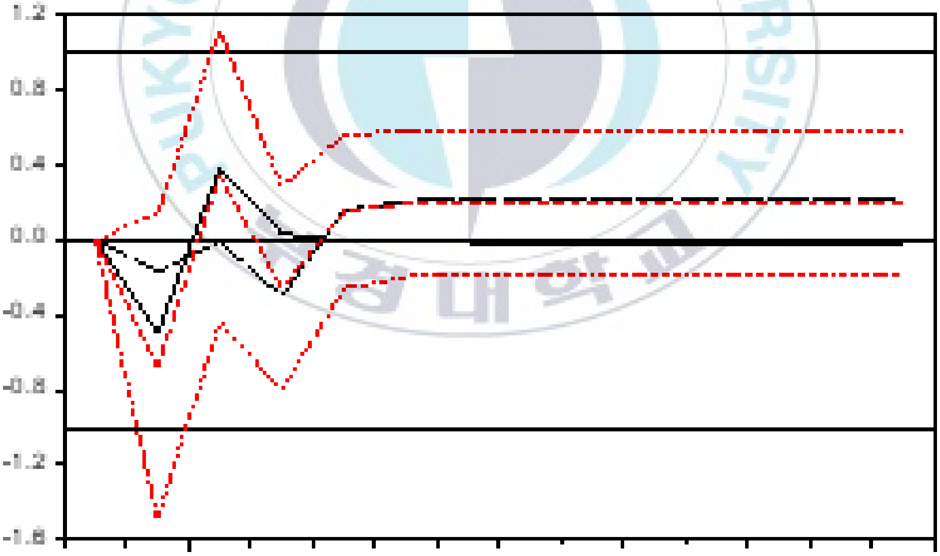

HS 26



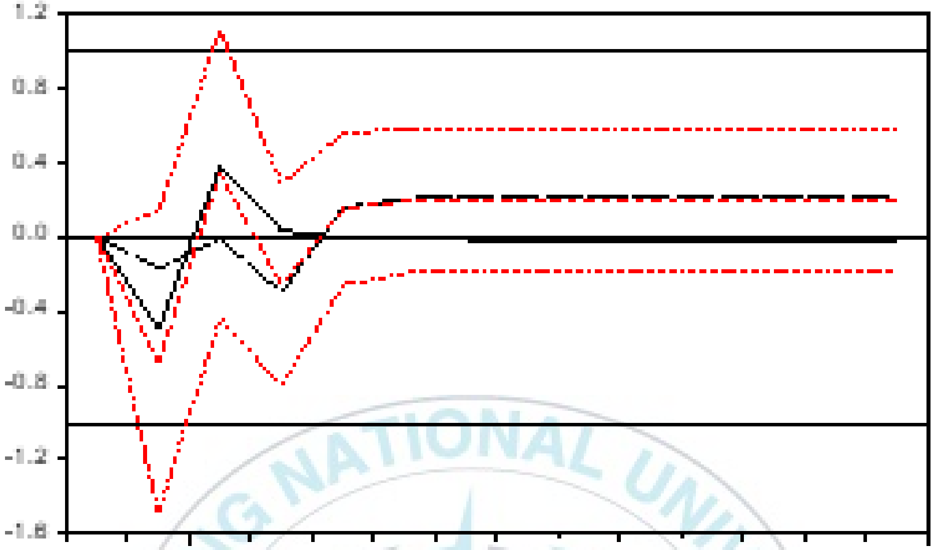
HS 27



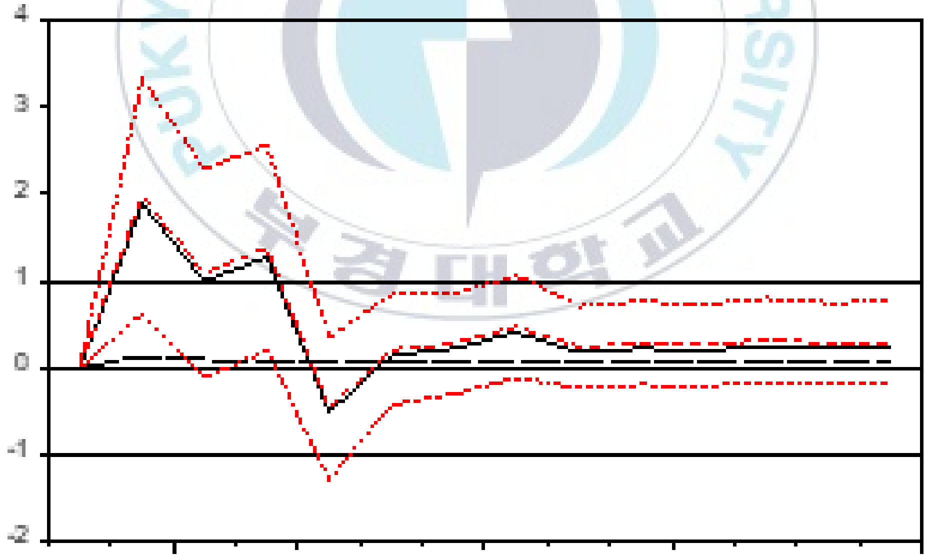

HS 28



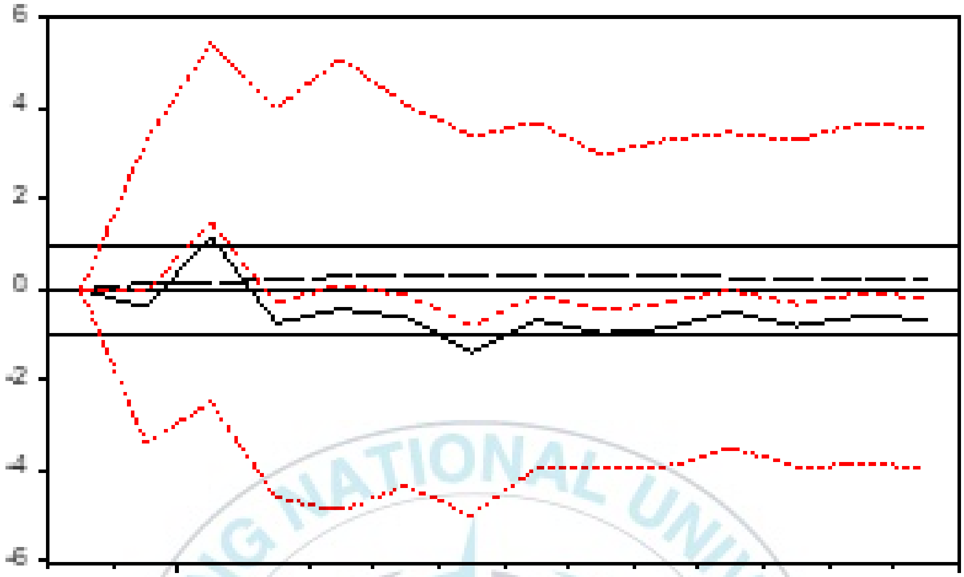
**HS 31**



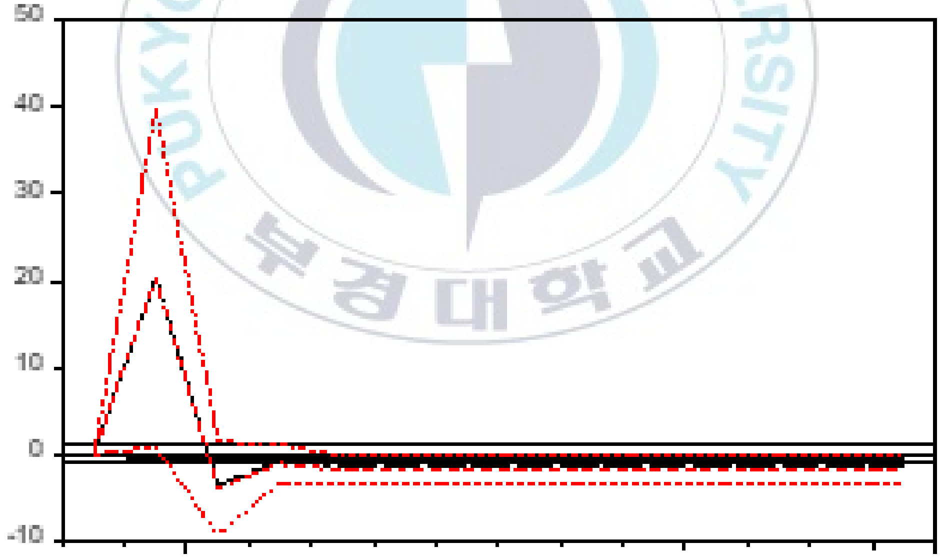

**HS 33**



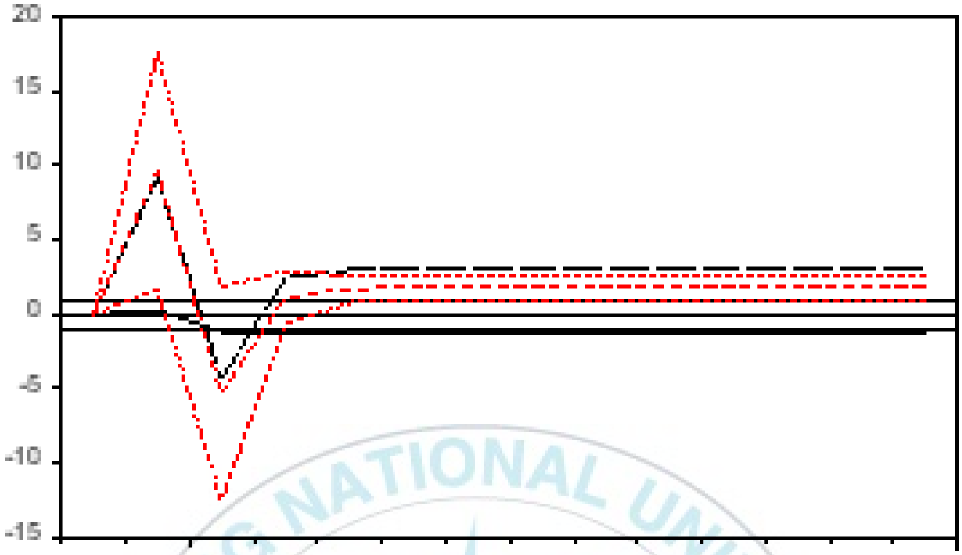
**HS 34**



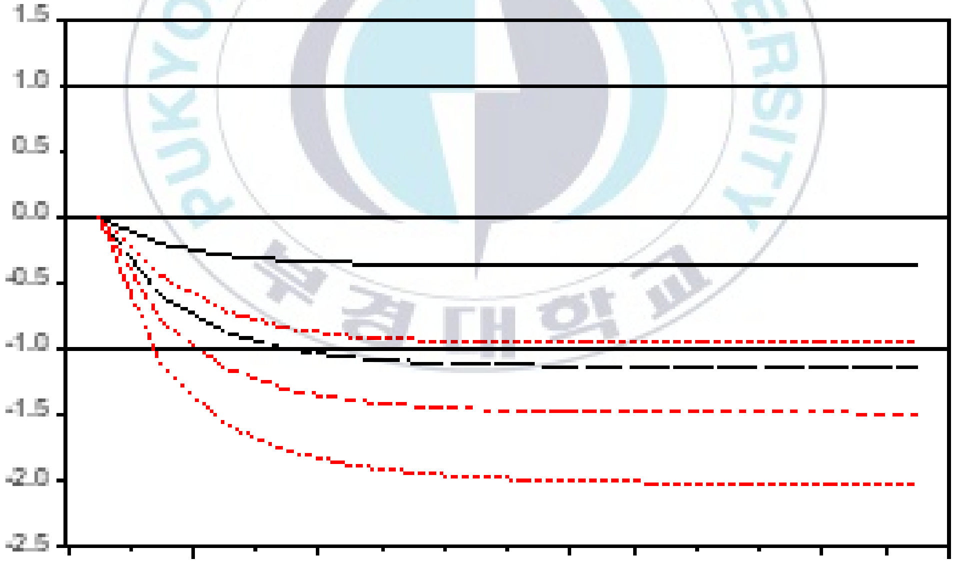

**HS 35**



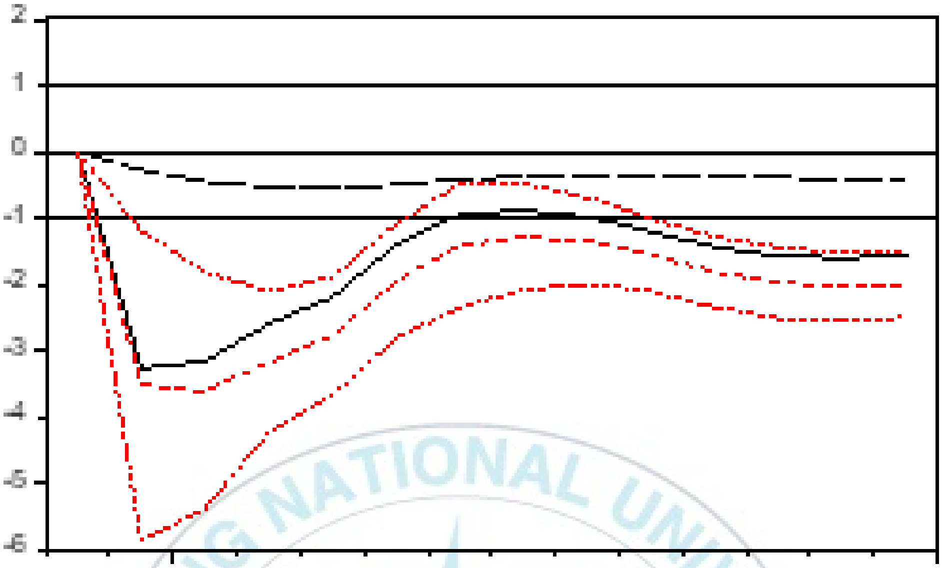
**HS 38**



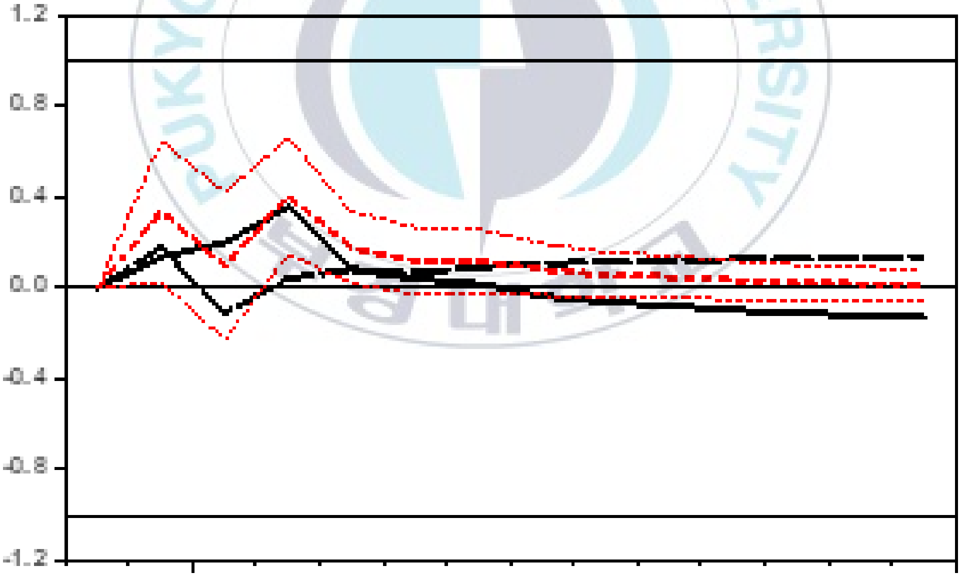

**HS 39**



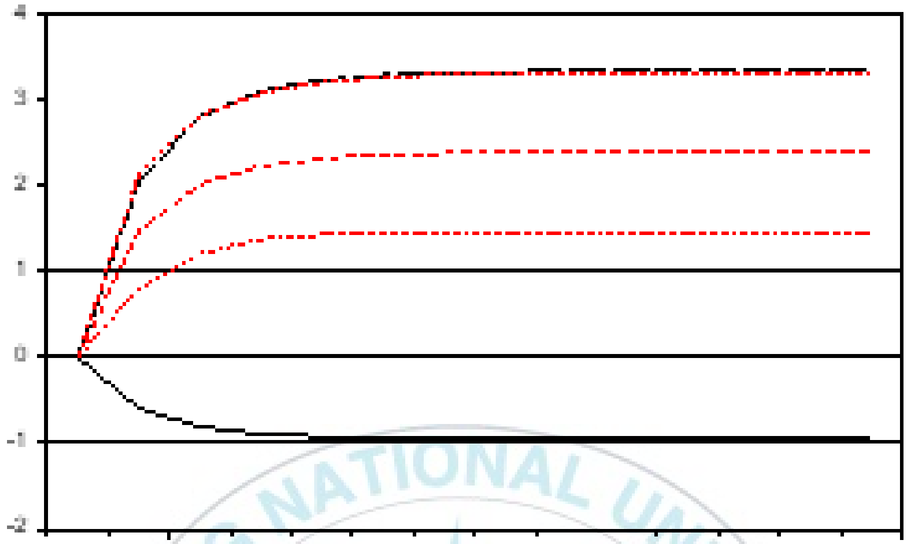
## HS 40



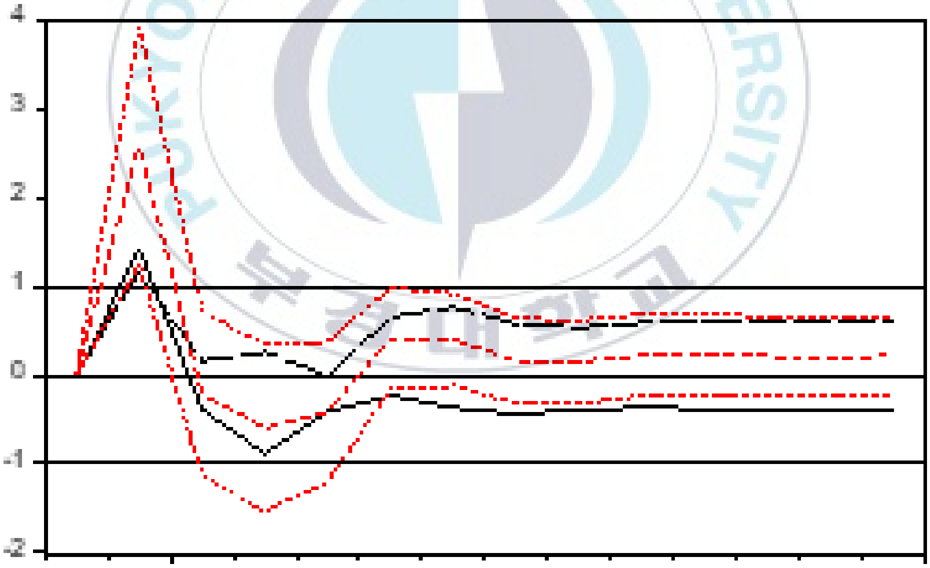

## HS 41



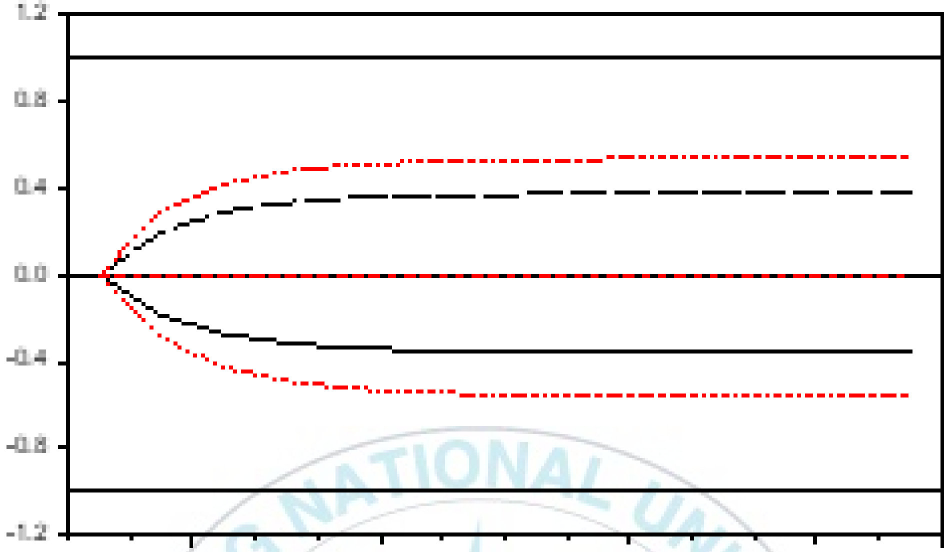
**HS 42**



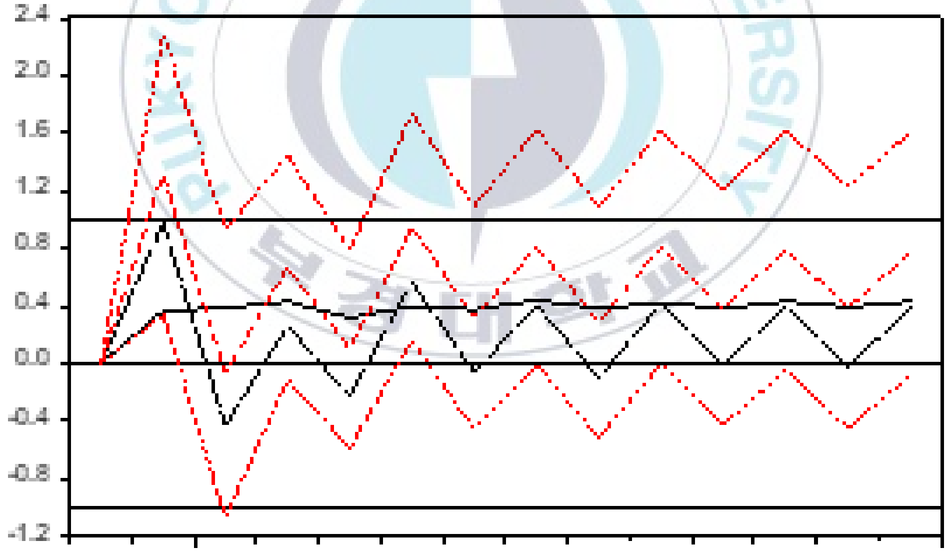

**HS 46**



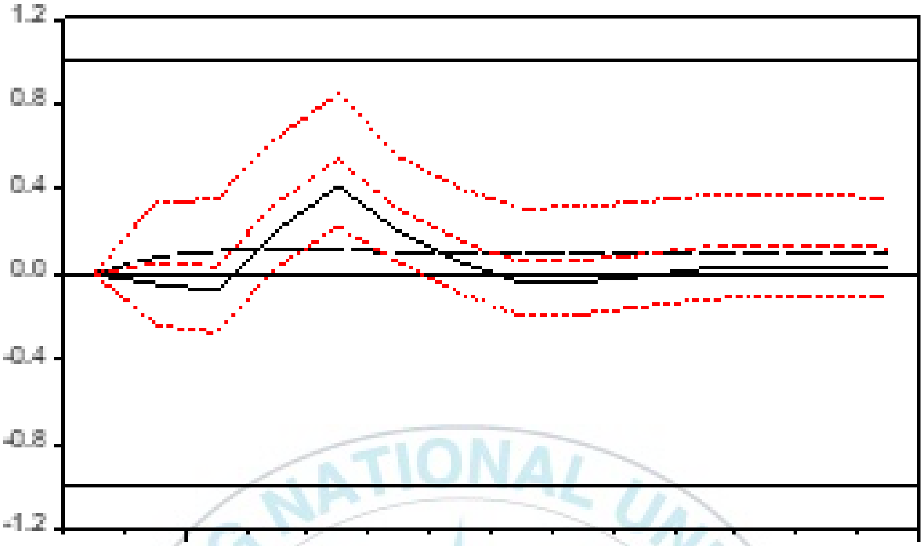
**HS 48**



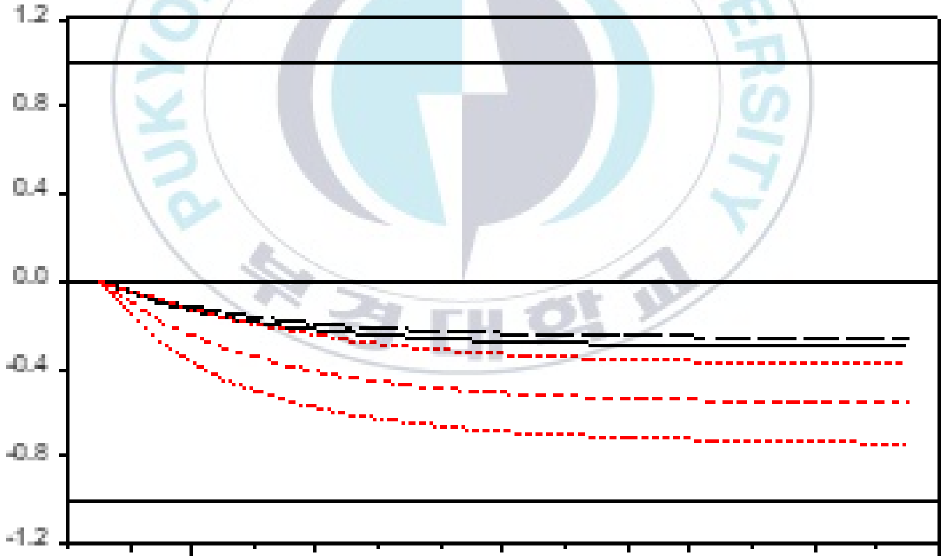

**HS 49**



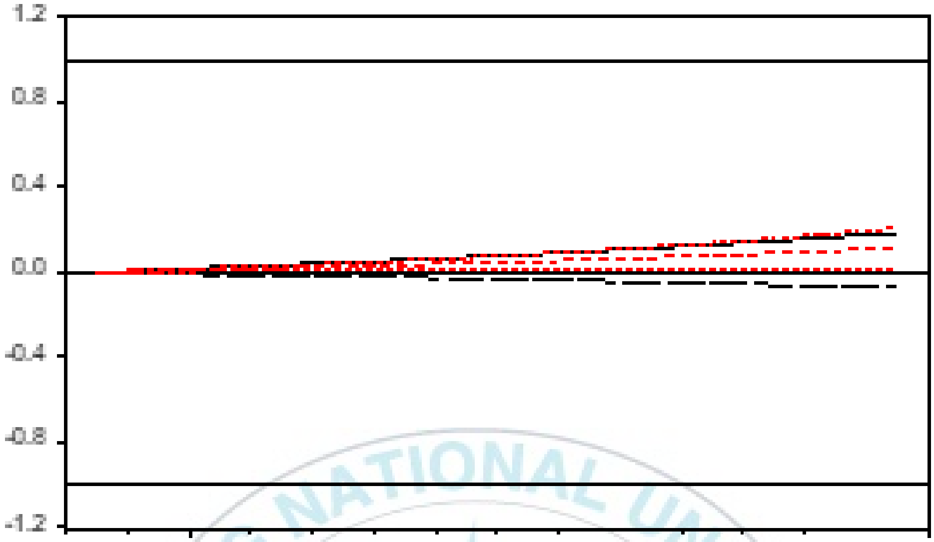
**HS 50**



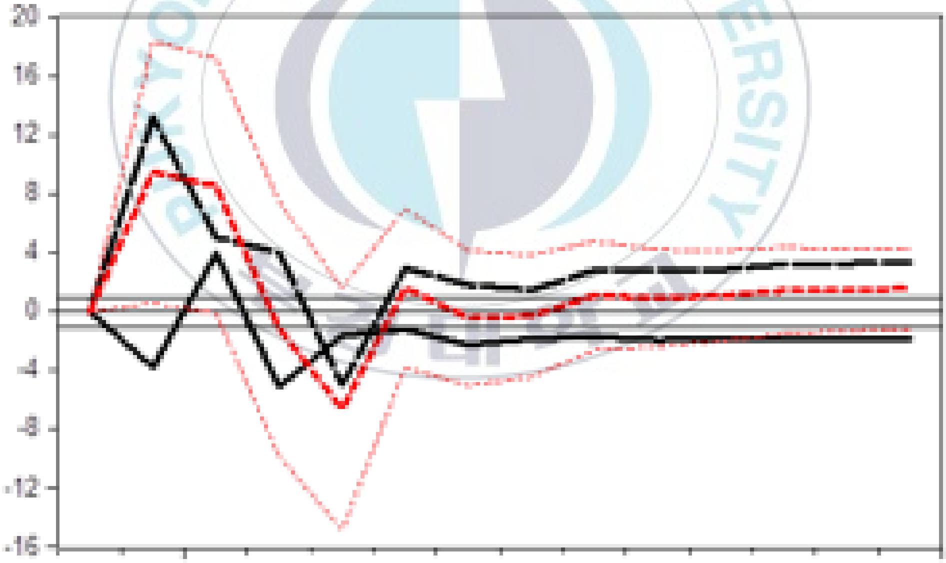

**HS 52**



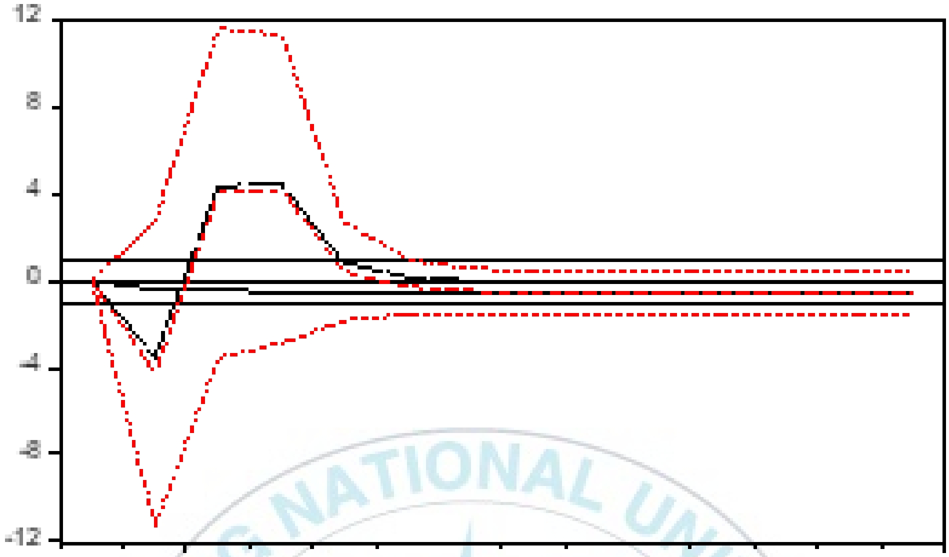
**HS 53**



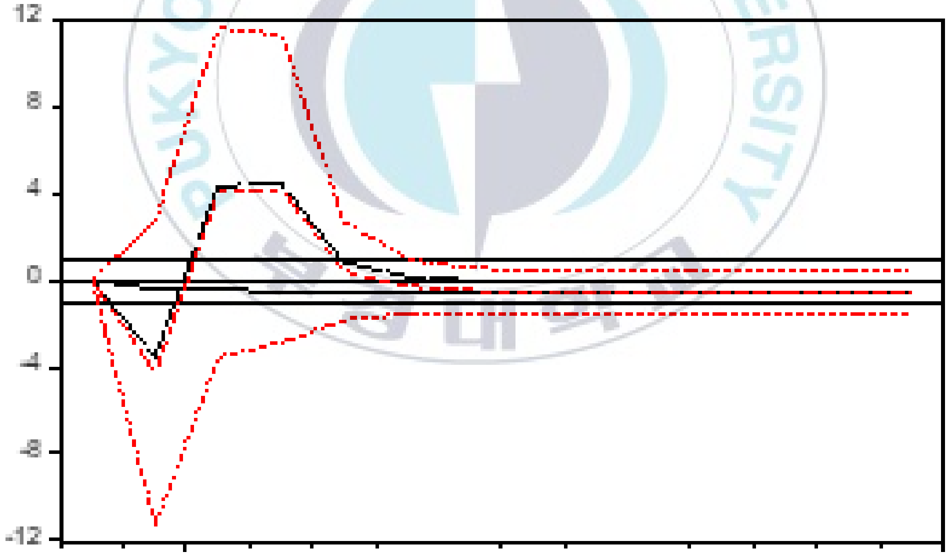

**HS 54**



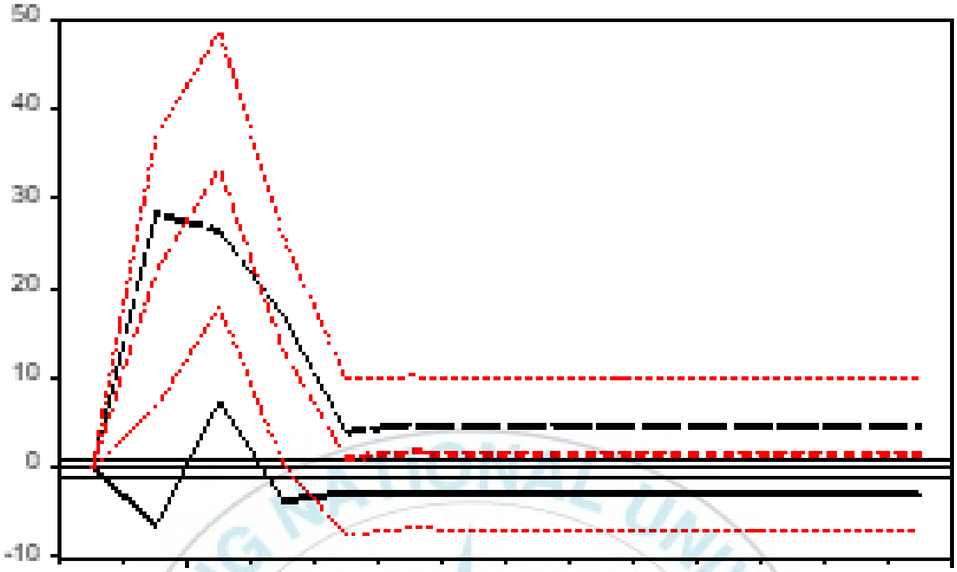
**HS 55**



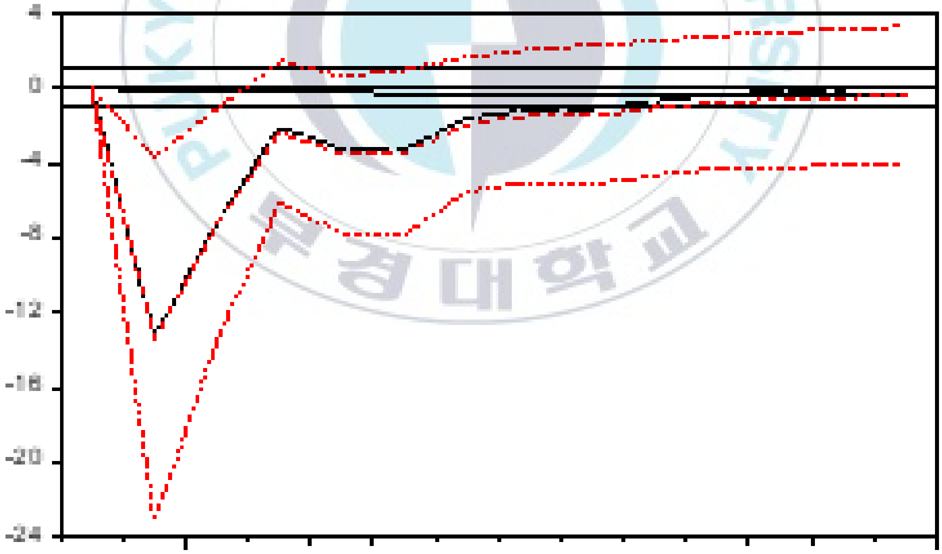

**HS 56**



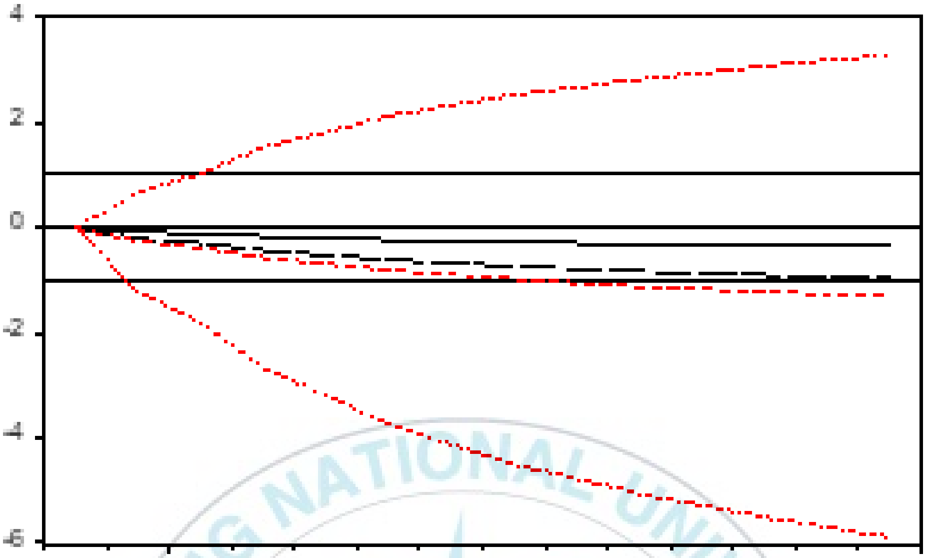
**HS 58**



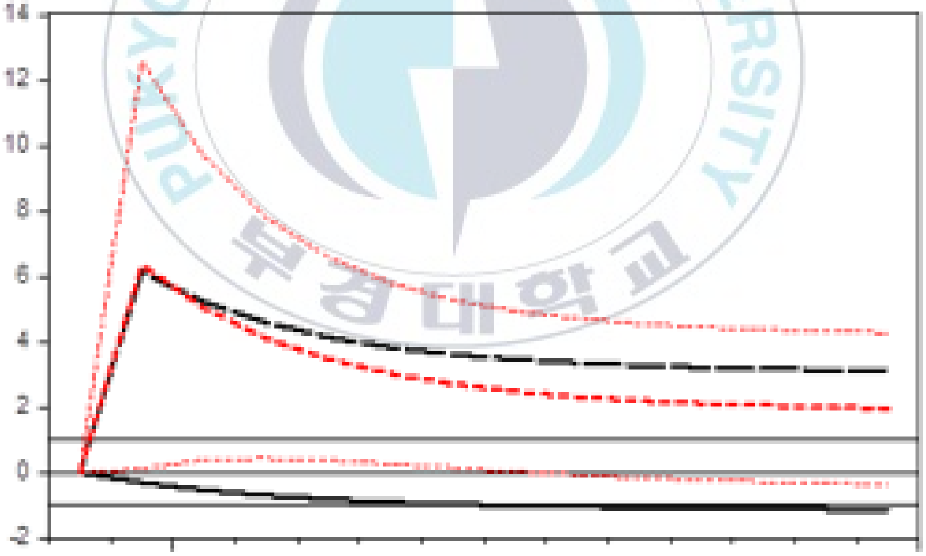

**HS 59**



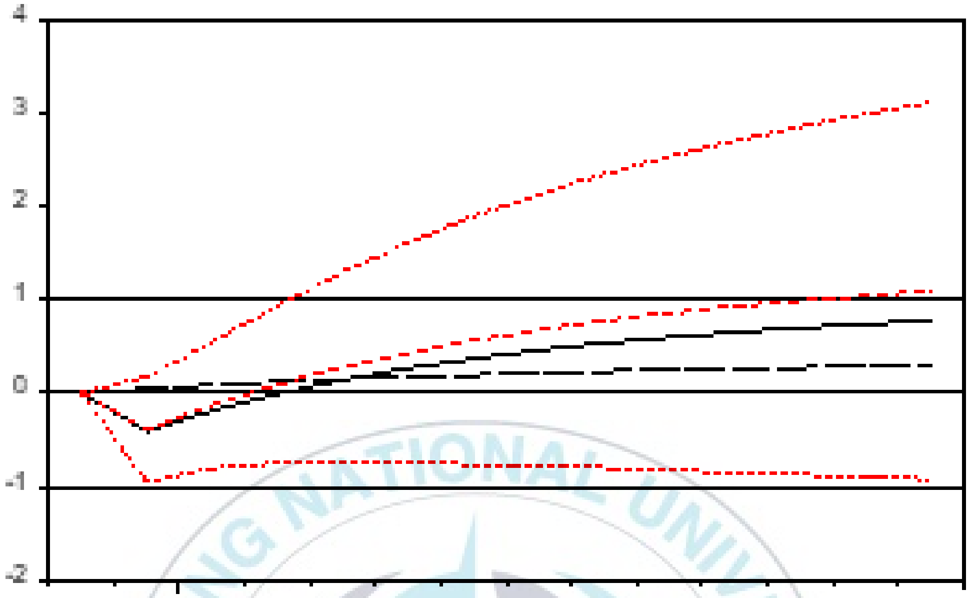
**HS 60**



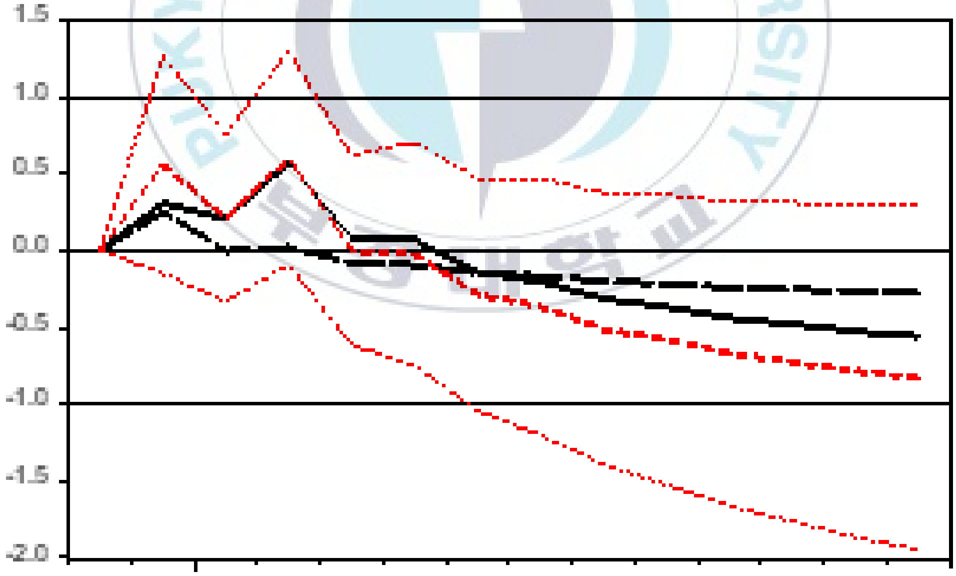

**HS 61**



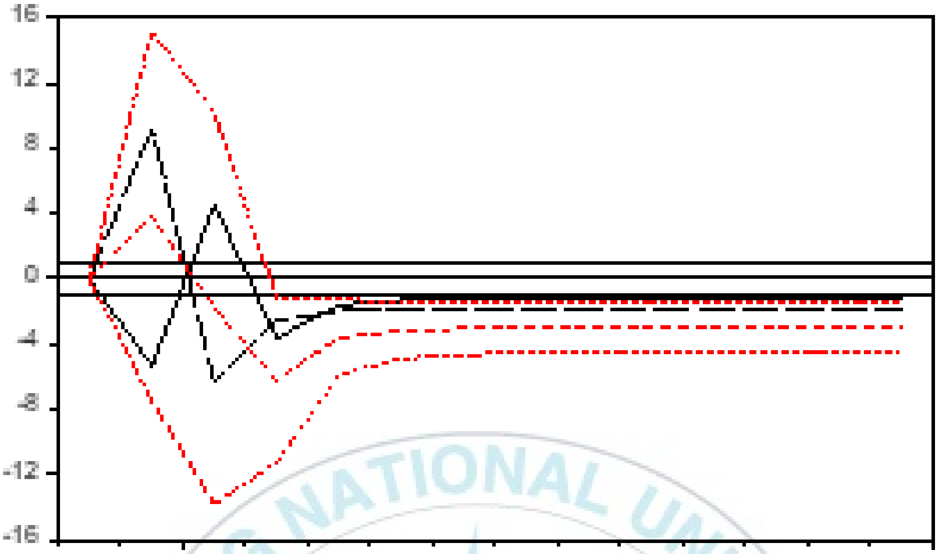
**HS 63**



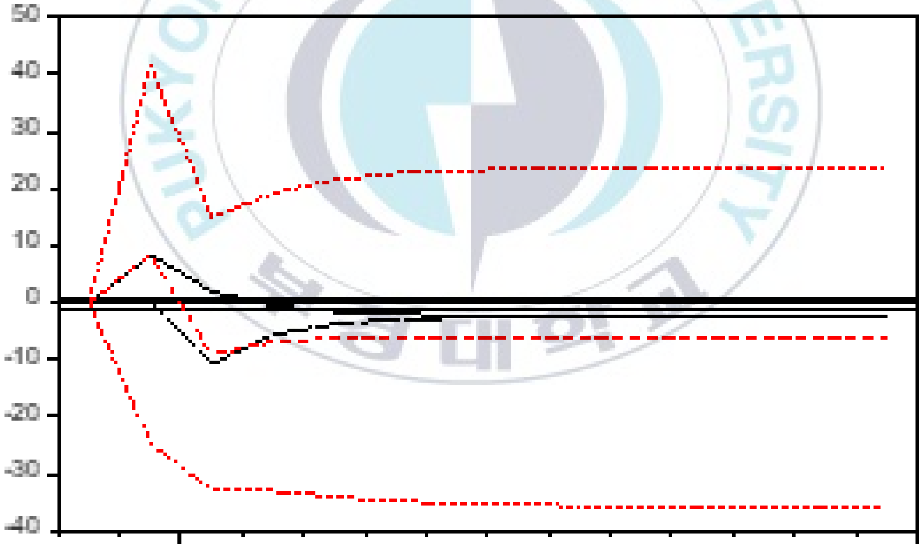

**HS 64**



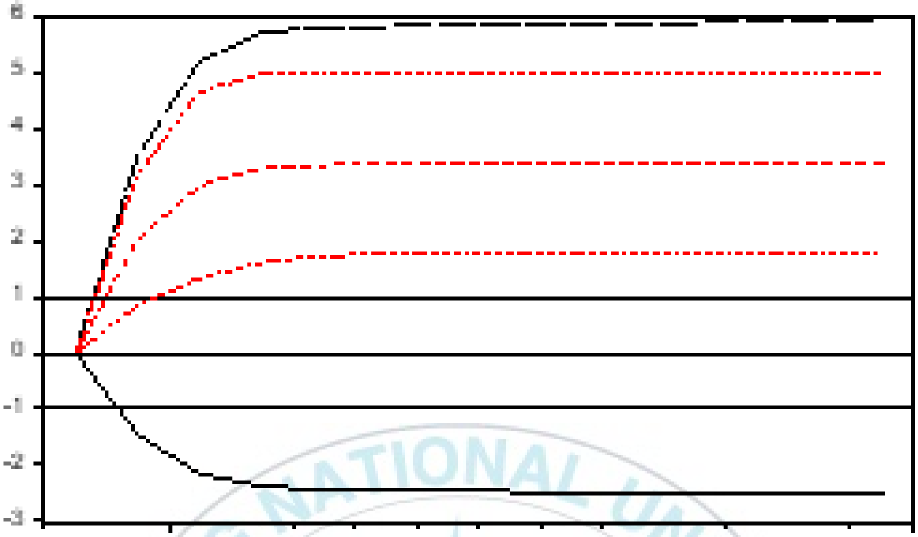
**HS 65**



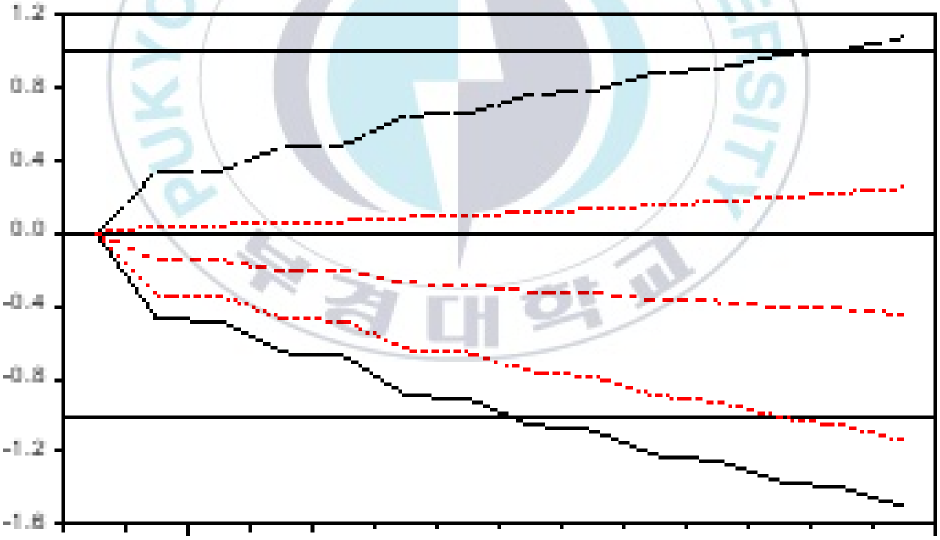

**HS 68**



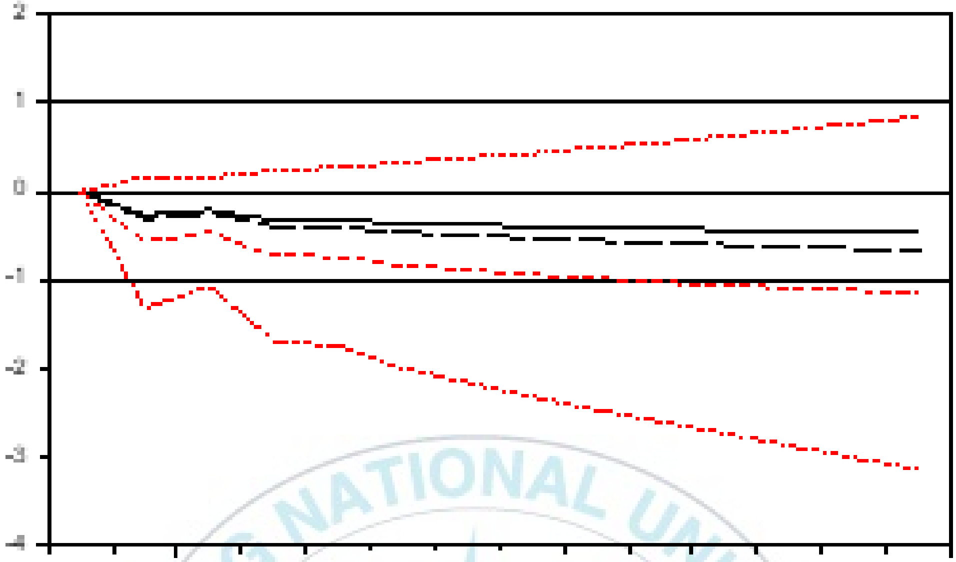
**HS 69**



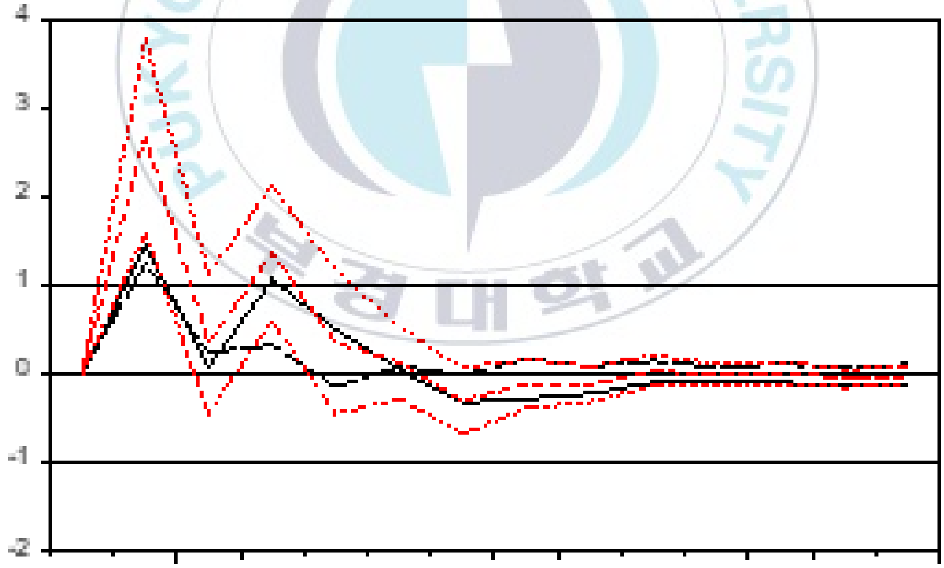

**HS 70**



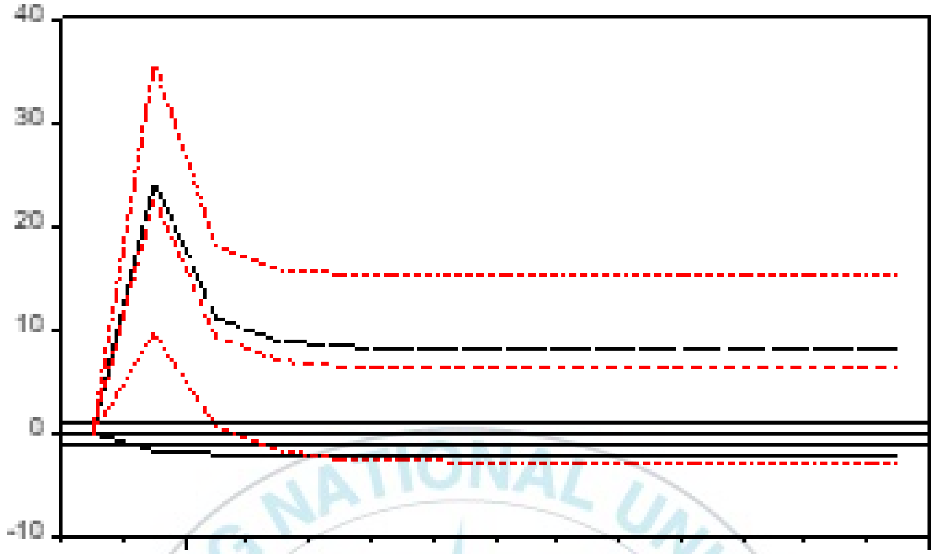
**HS 71**



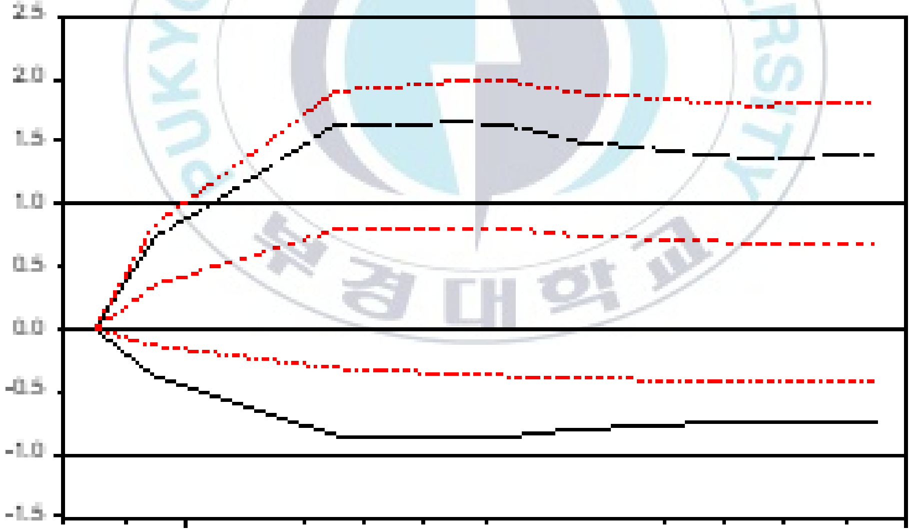

**HS 72**



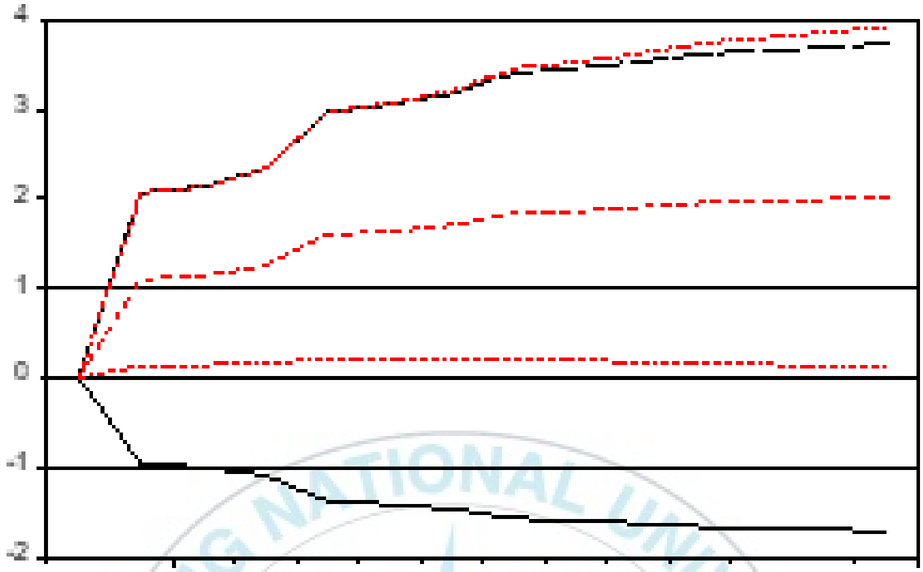
HS 73



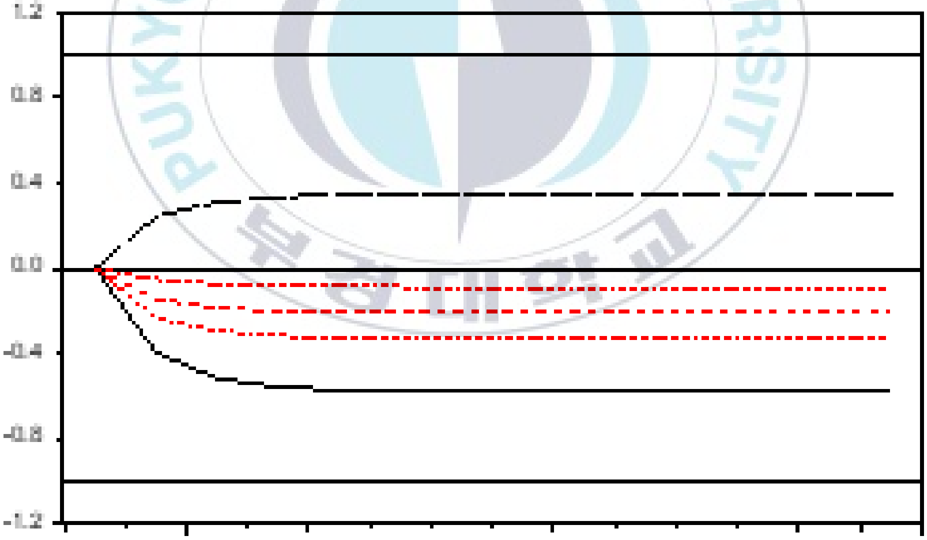

HS 78



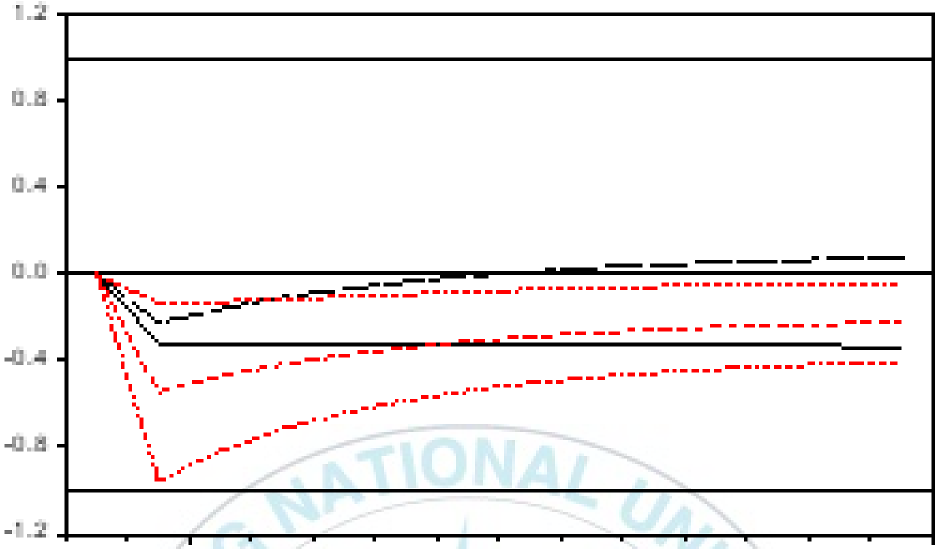
HS 82



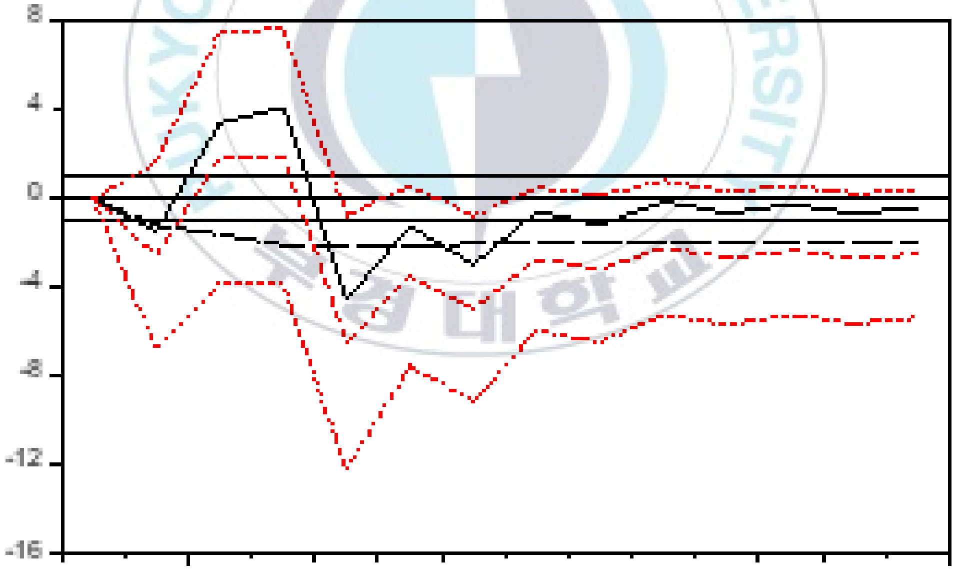

HS 83



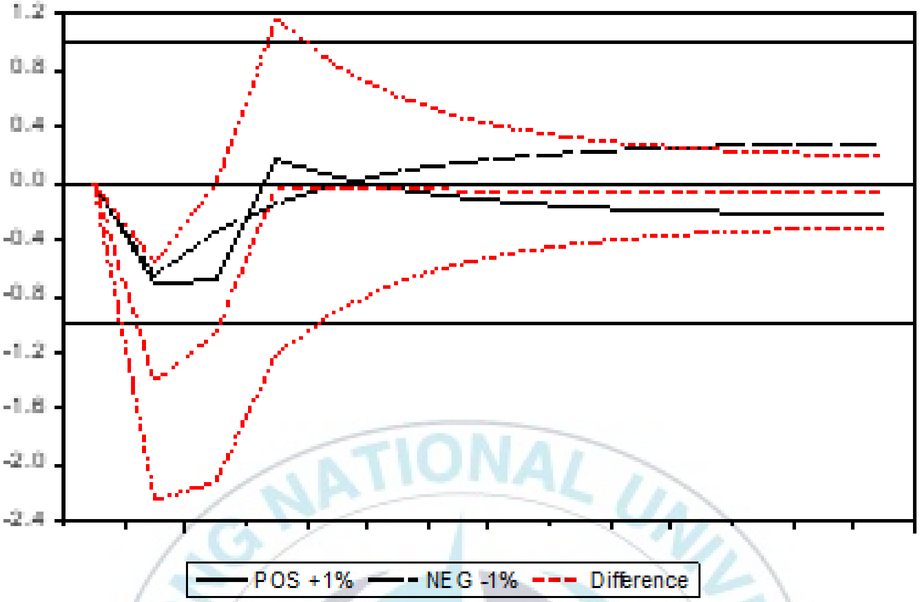
**HS 84**




**HS 94**

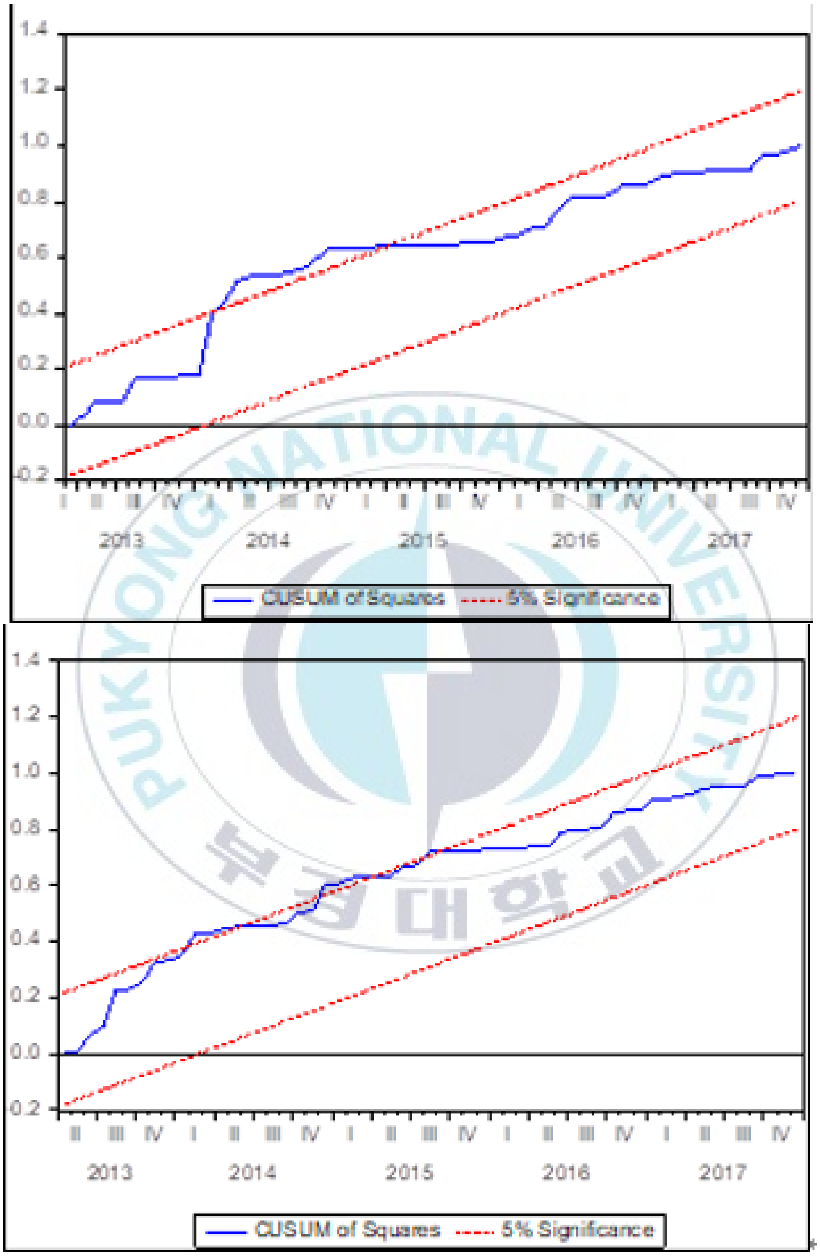


**HS 95**

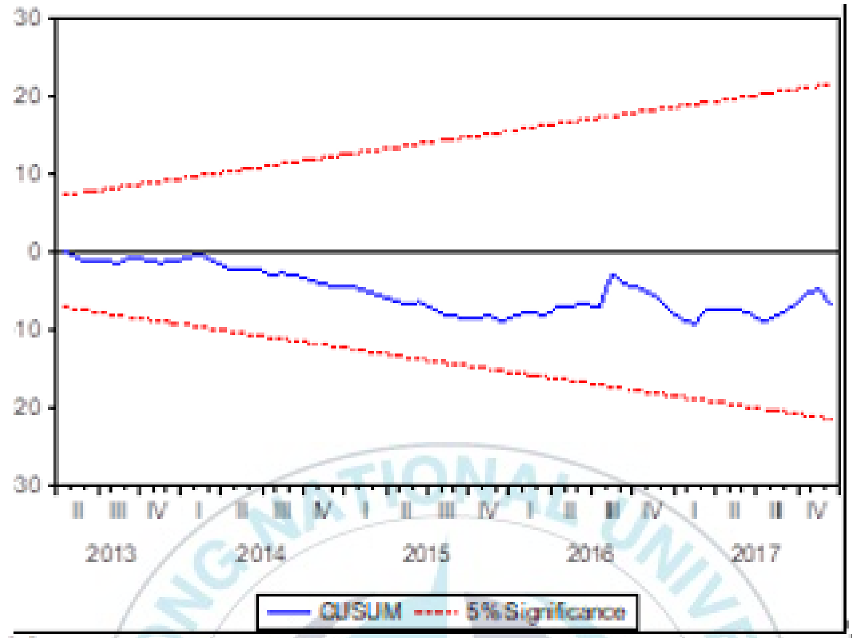


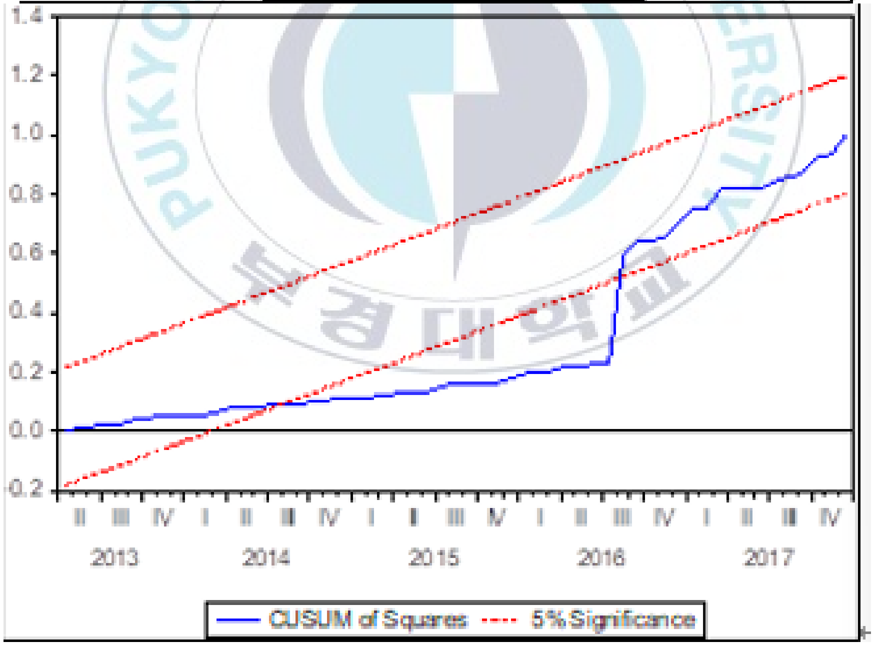
## Figure 5-2: CUSUM and CUSUM Square

**HS 03**

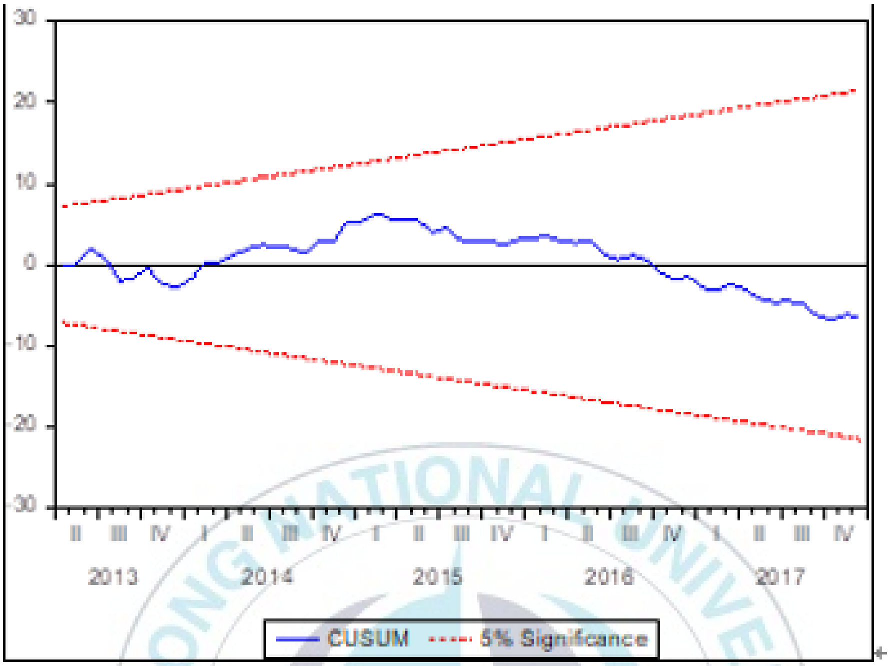


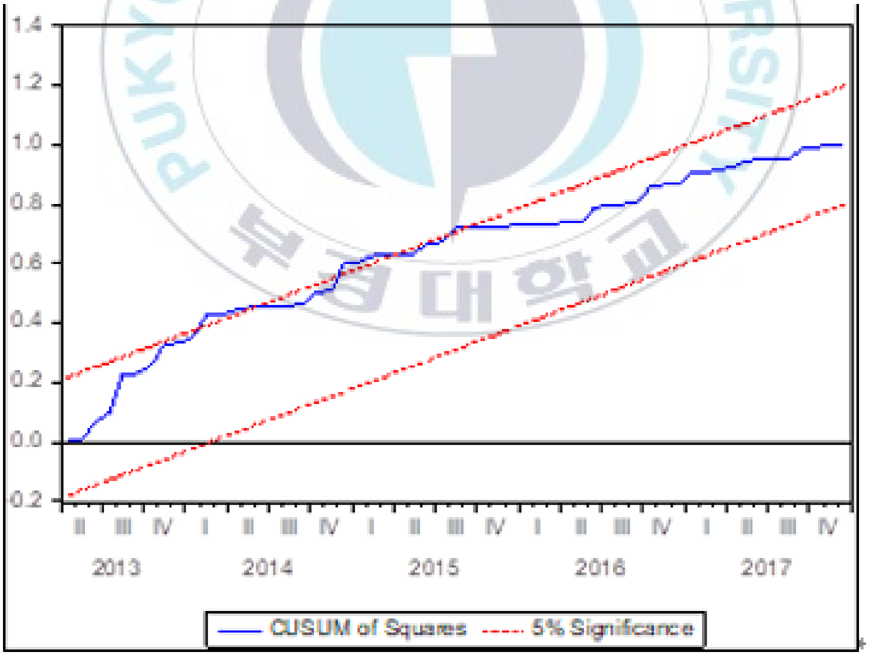
**HS 05**


30
20
10
0
10
20
30
2013
2014
2015
2016
2017
CUSUM
5% Significance

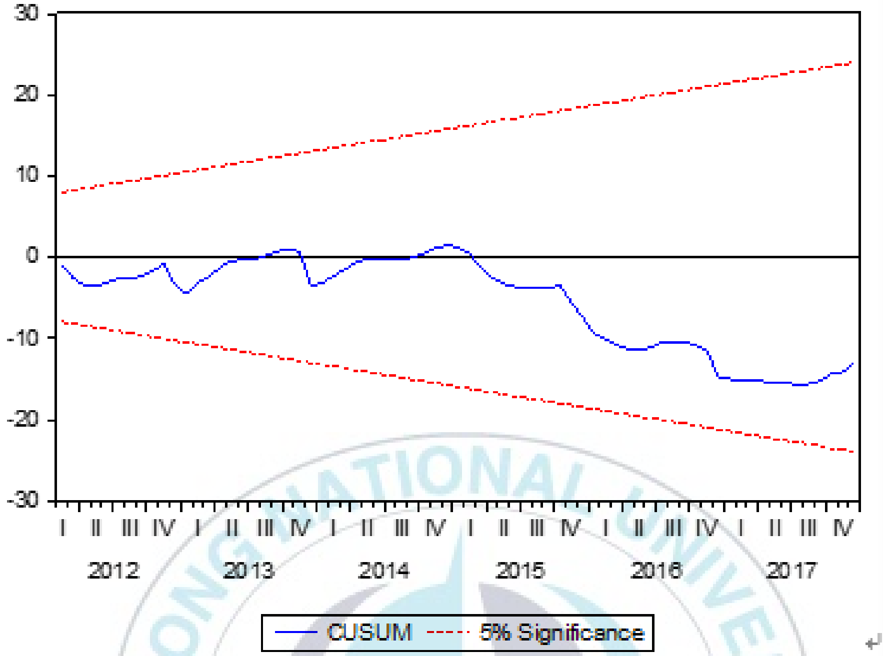

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.2
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

**HS 06**

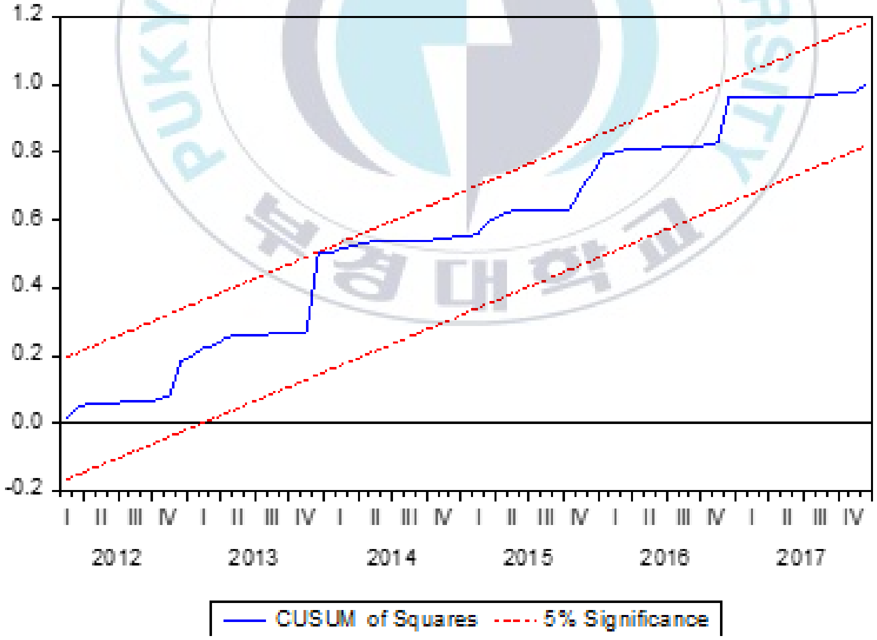

30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM 5% Significance


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

## HS 07

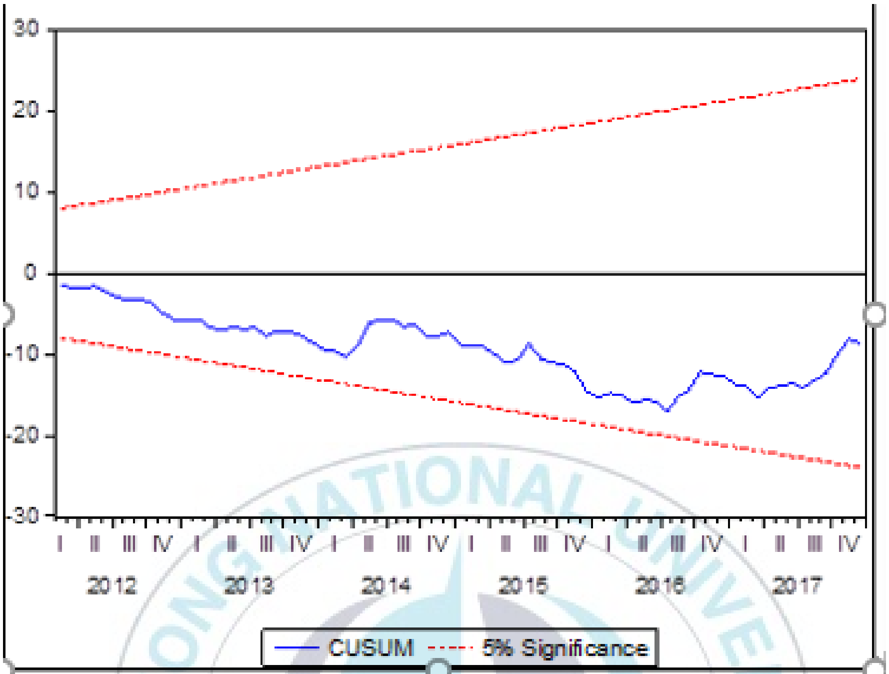


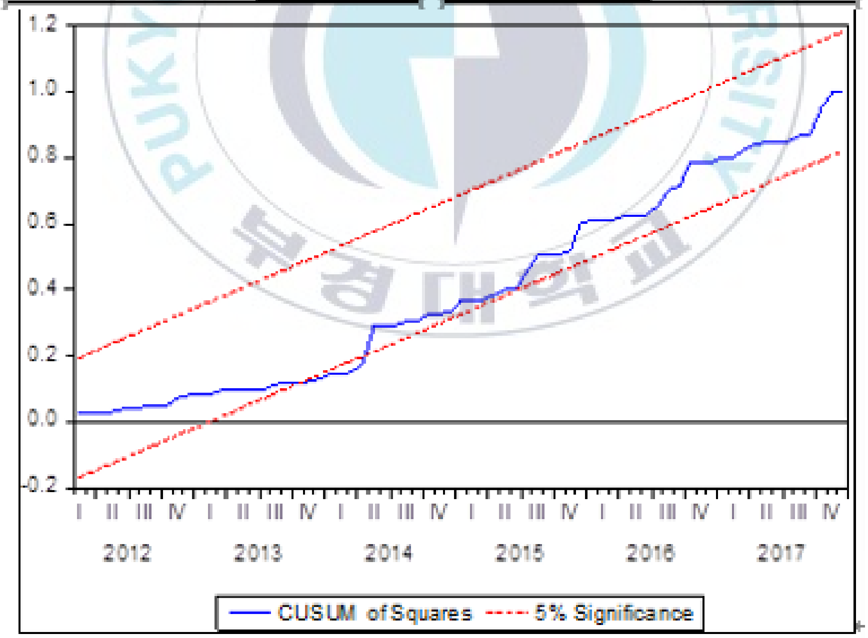
30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

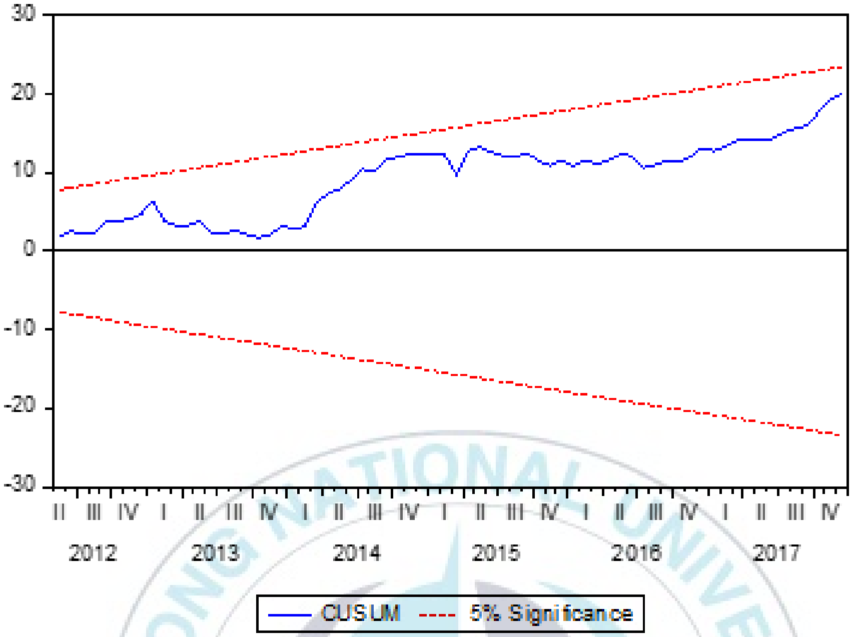
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

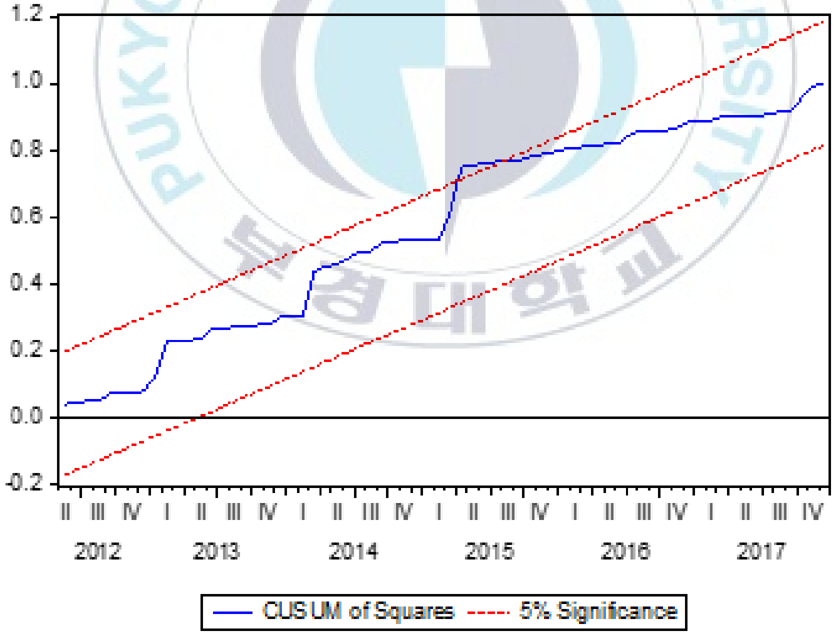
**HS 08**


30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

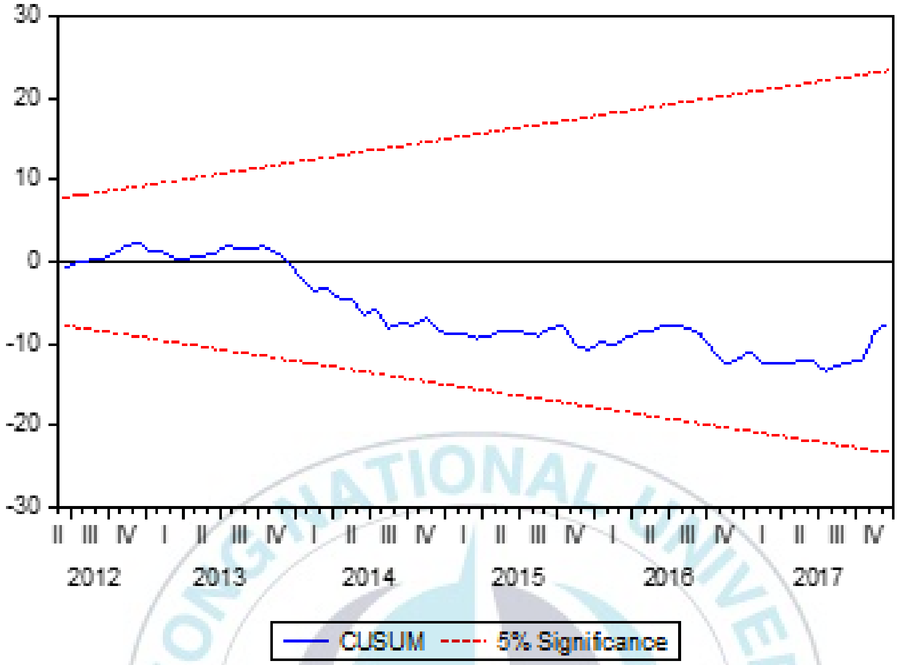

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

HS 10

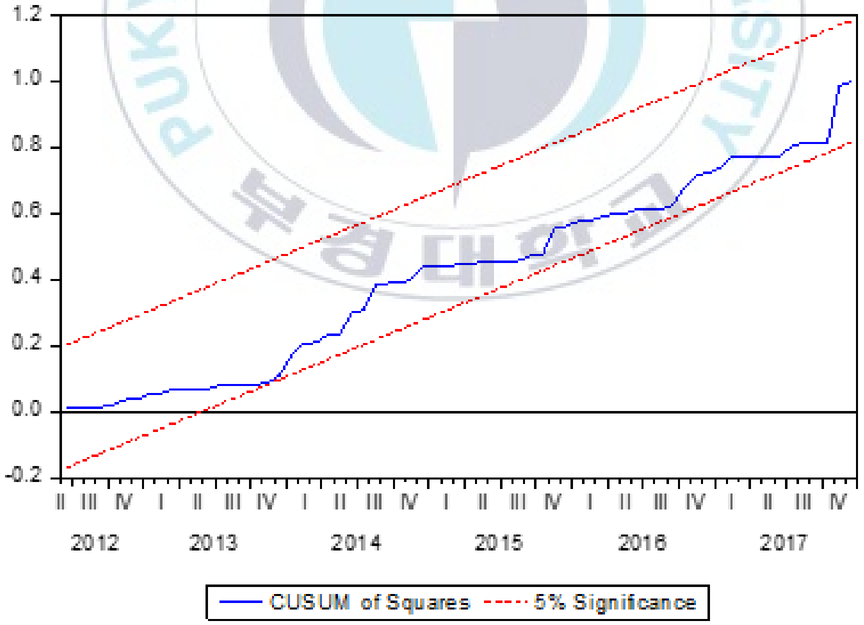

30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 11**

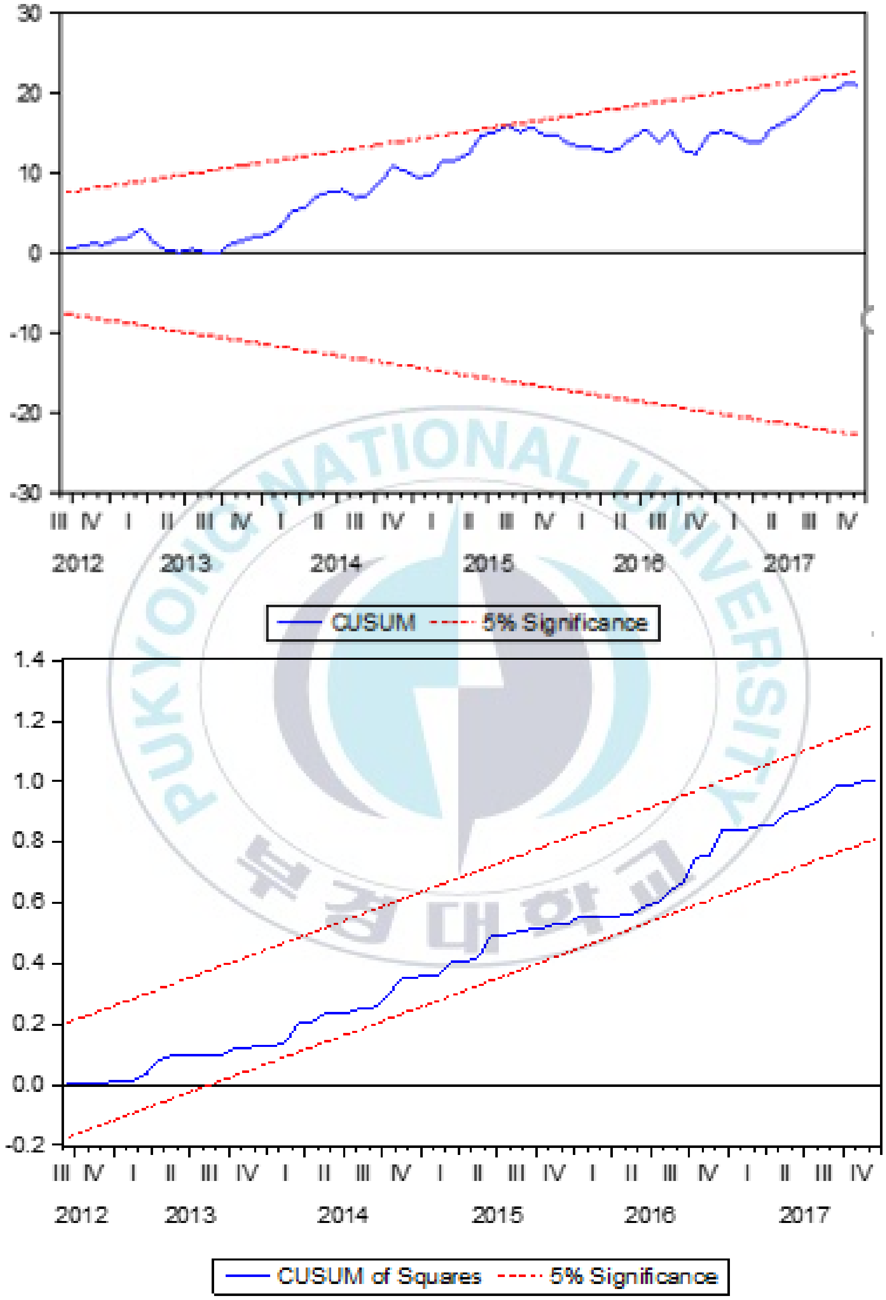


30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

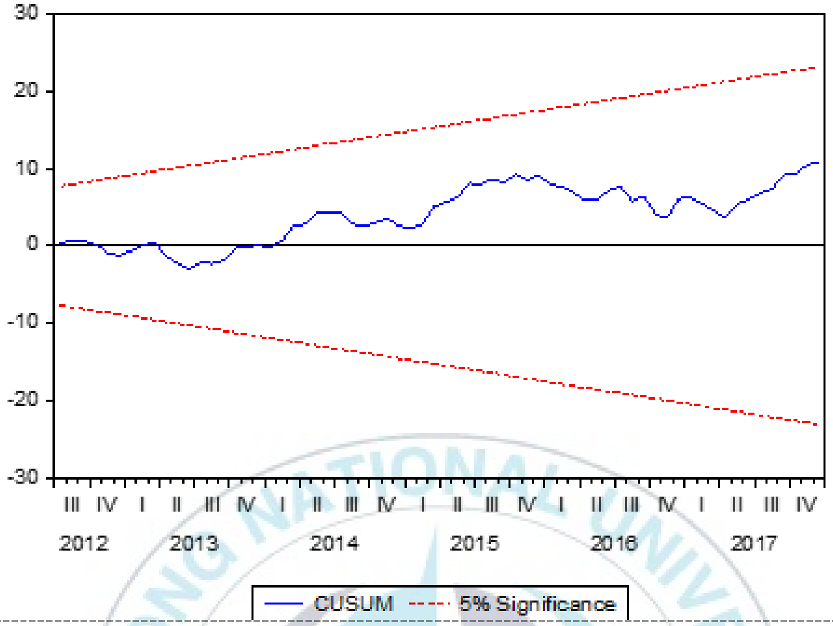



1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

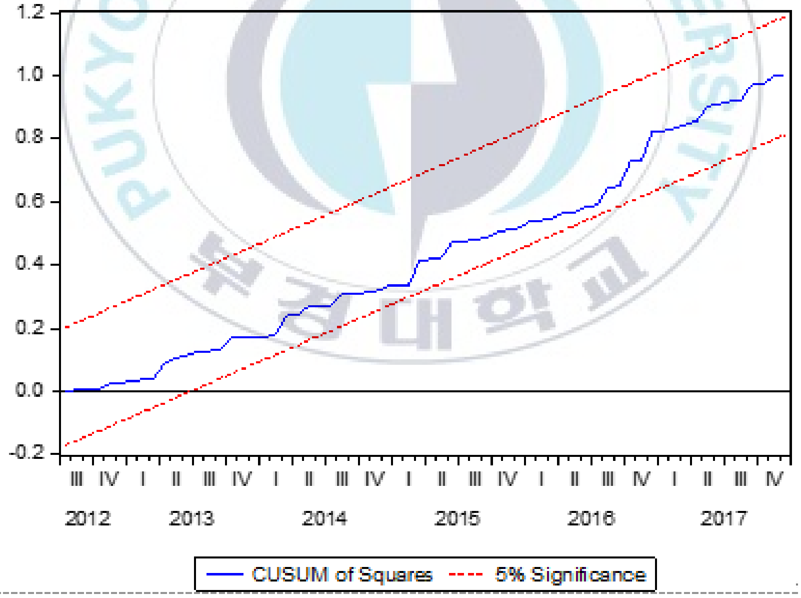
**HS 12**


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

## HS 14

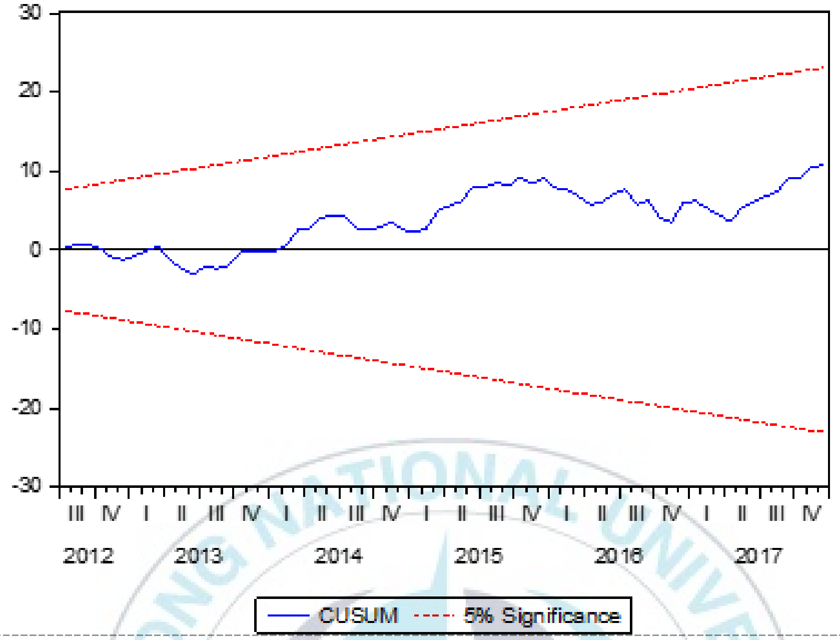


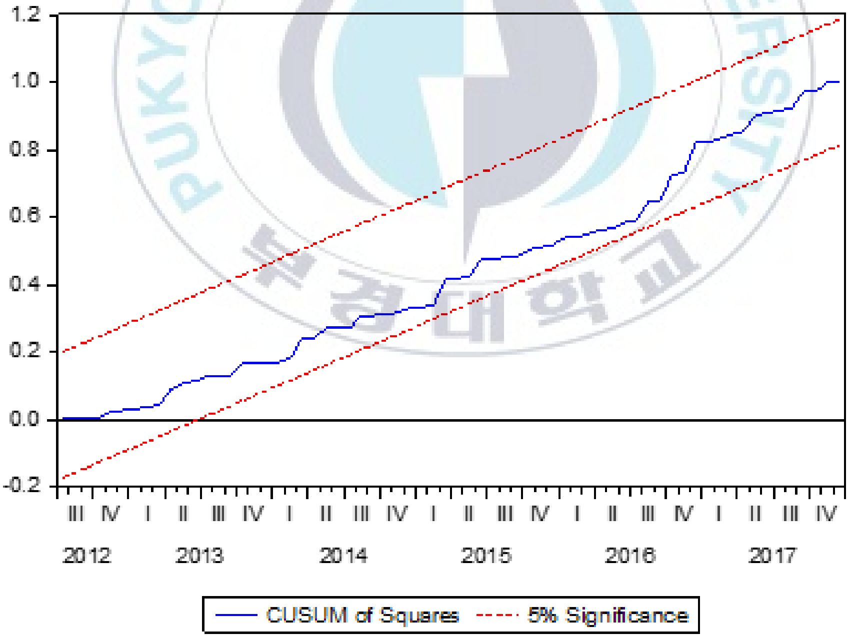
30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

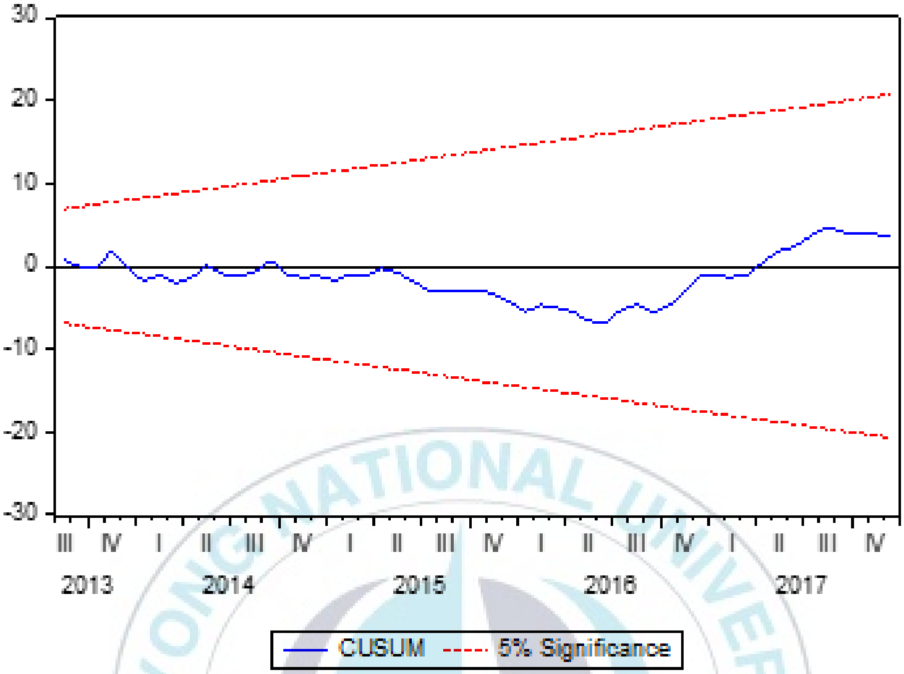
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

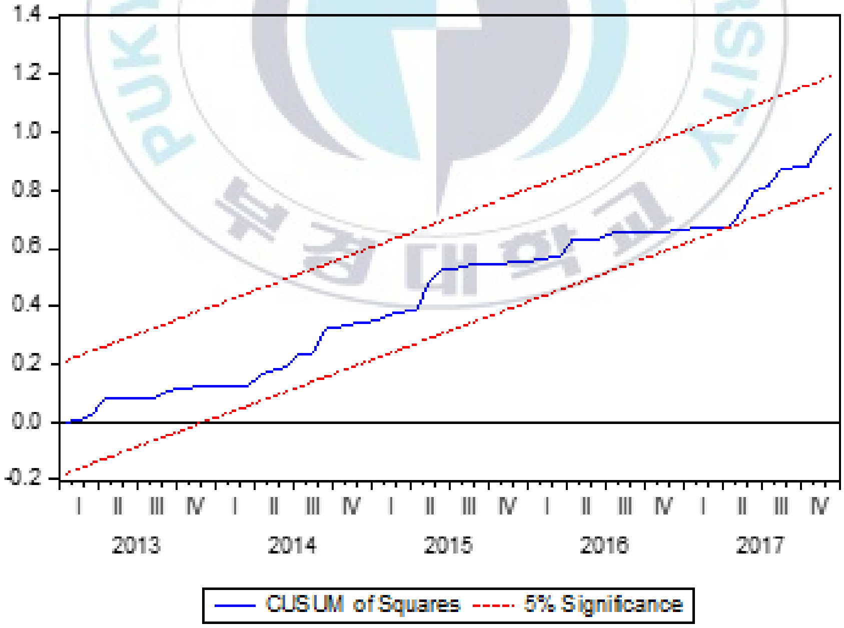
**HS 15**


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

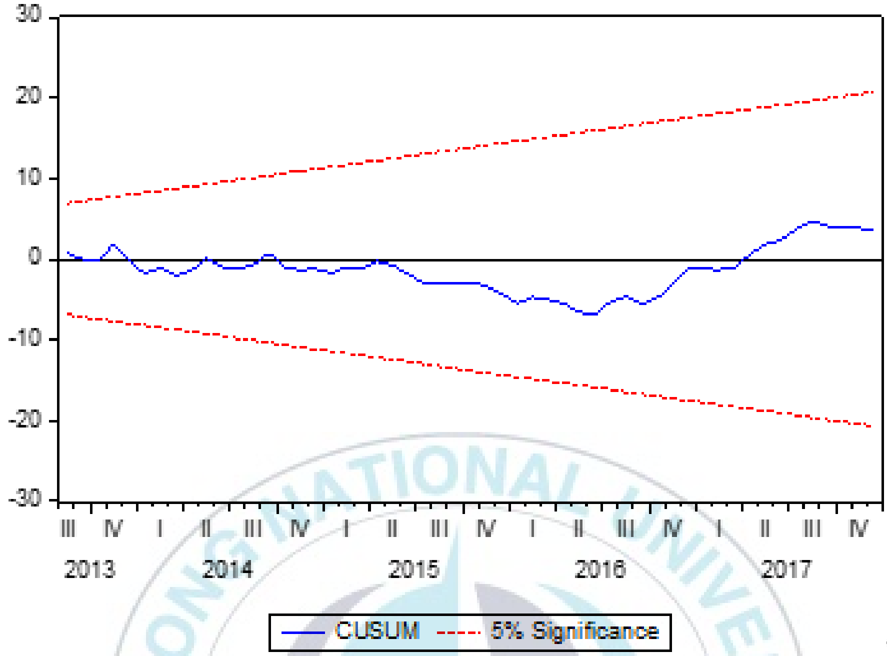

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

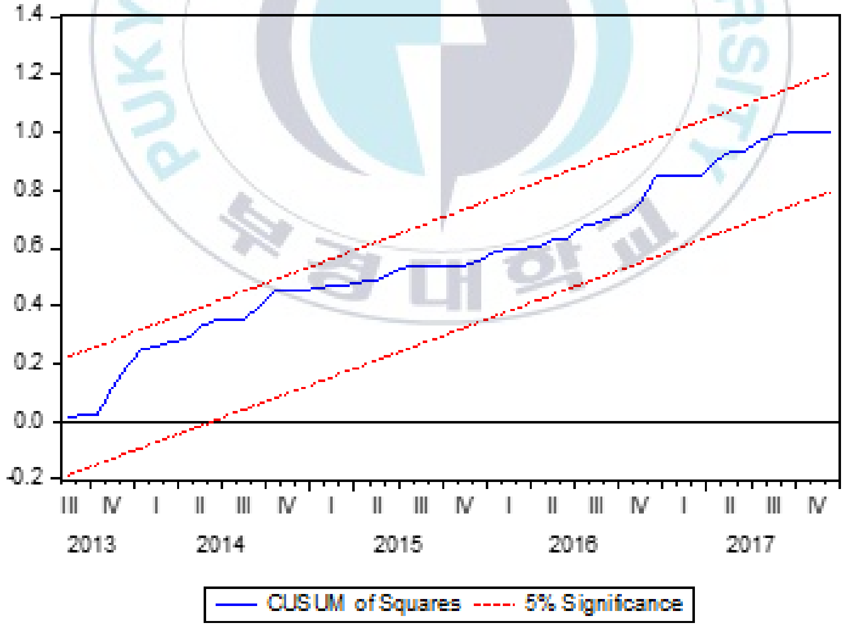
**HS 17**


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

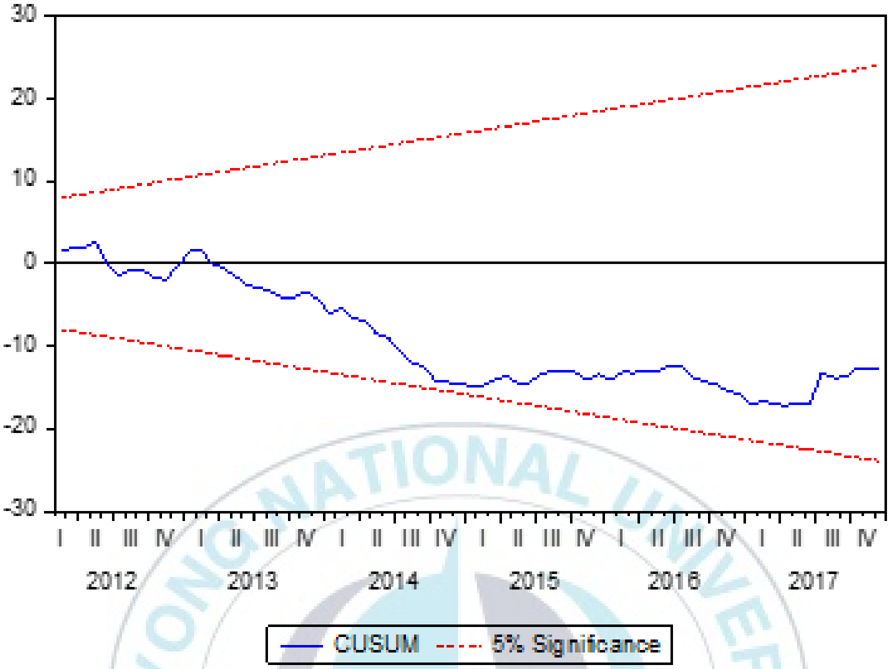

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

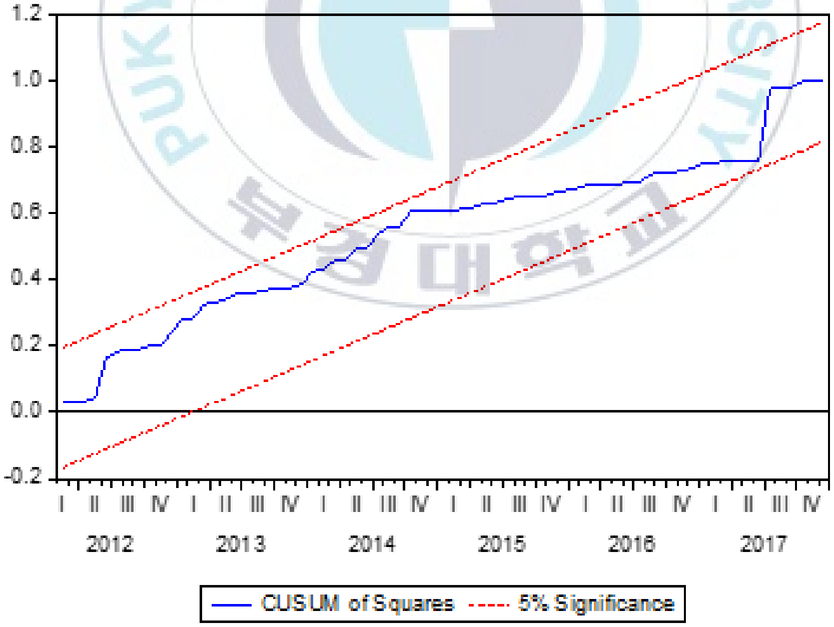
**HS 18**


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

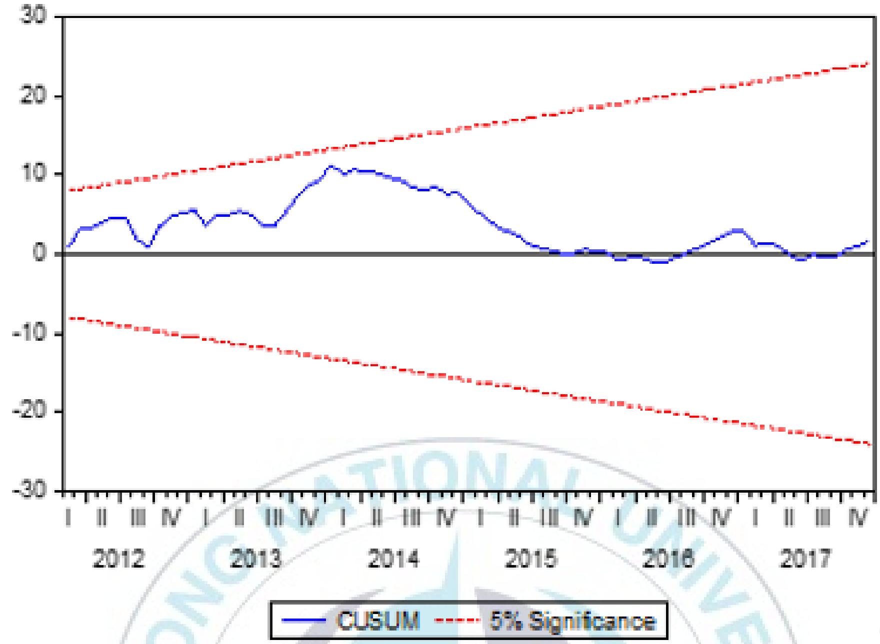

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

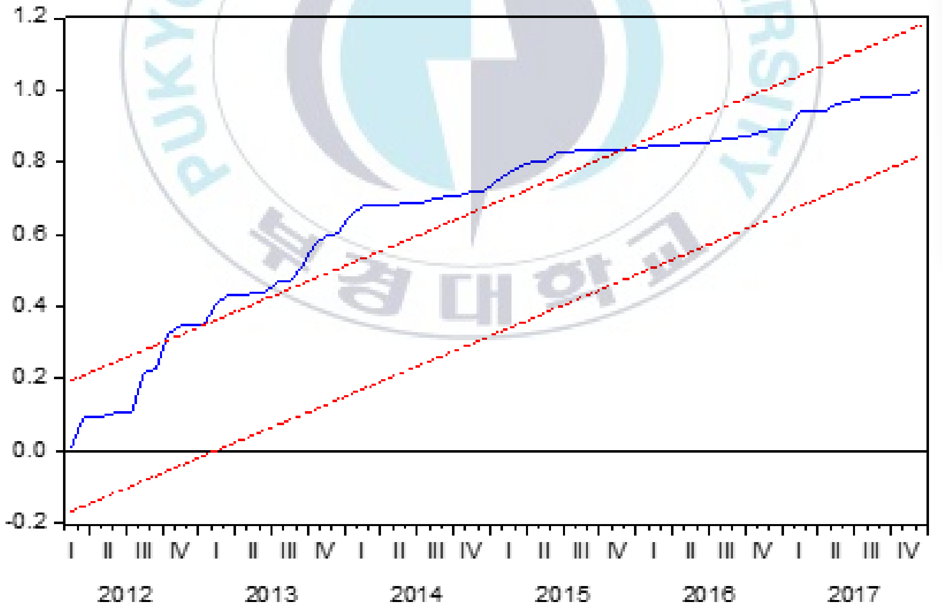
**HS 19**


30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

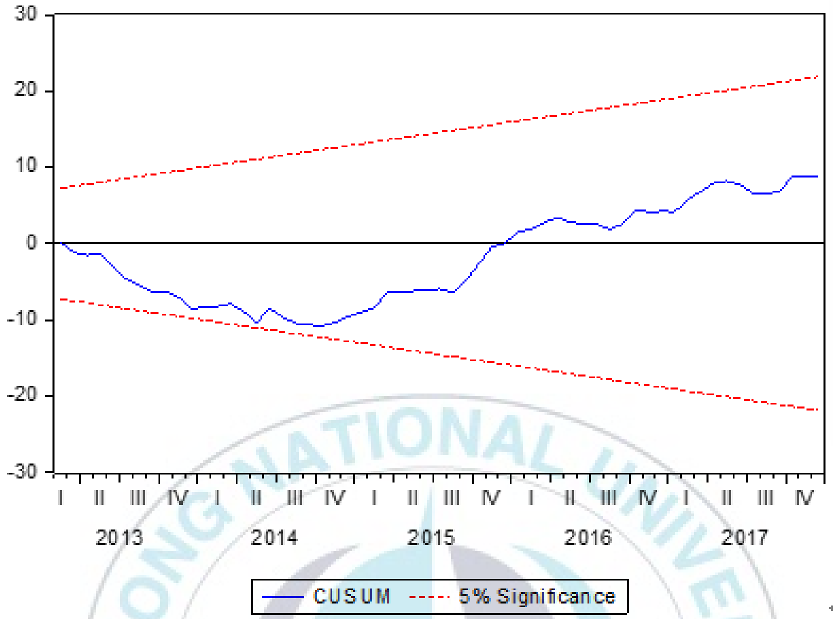

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 20**

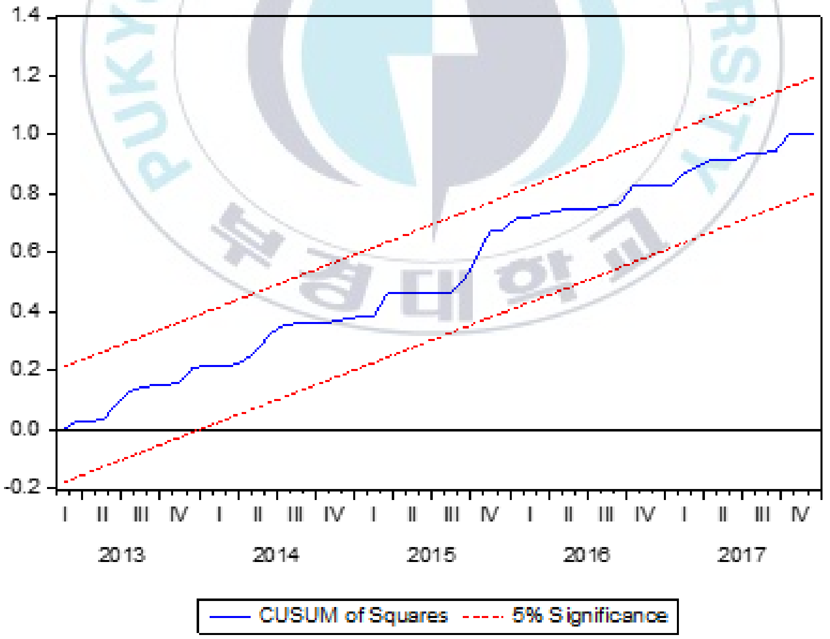

30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM 5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017

## HS 21

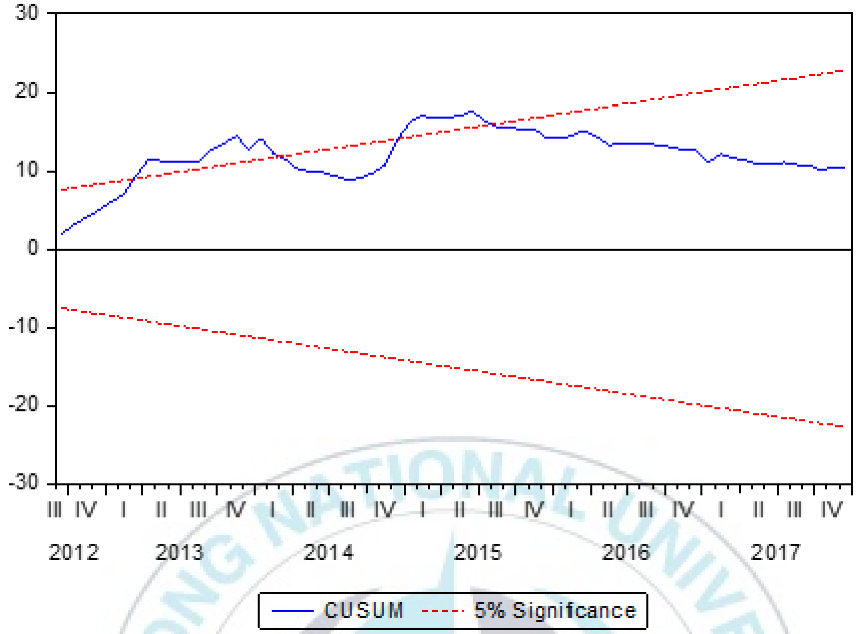


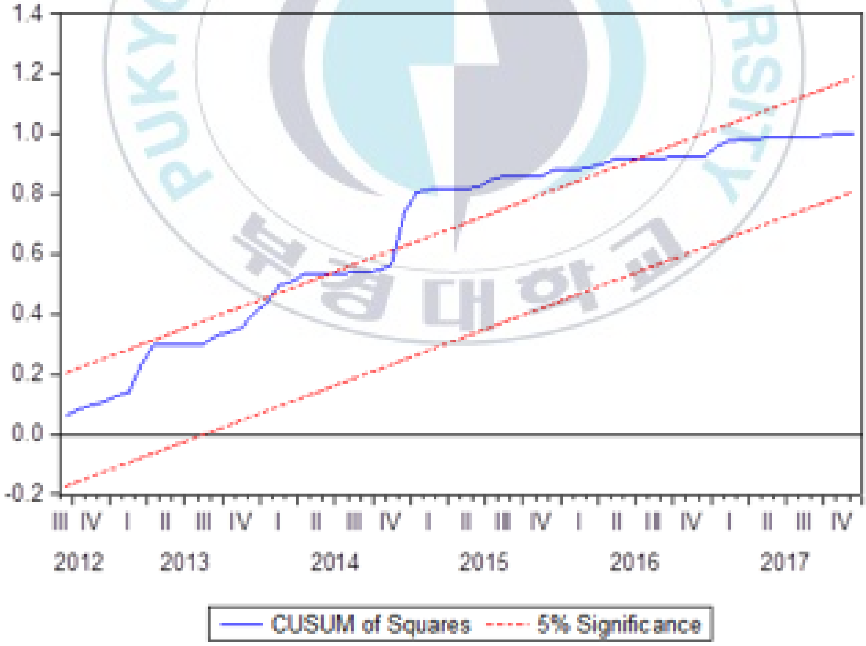
30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM 5% Significance

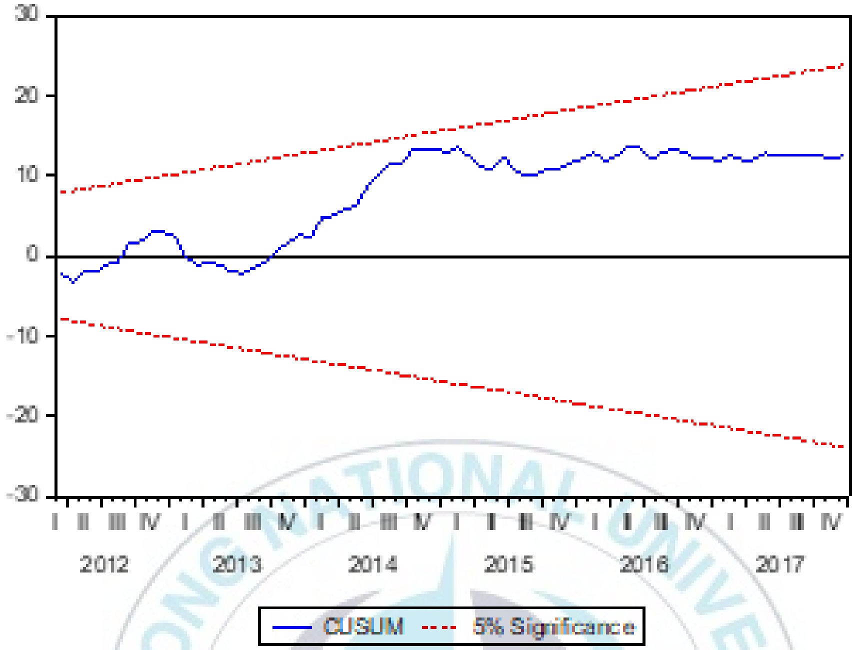
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

**HS 22**

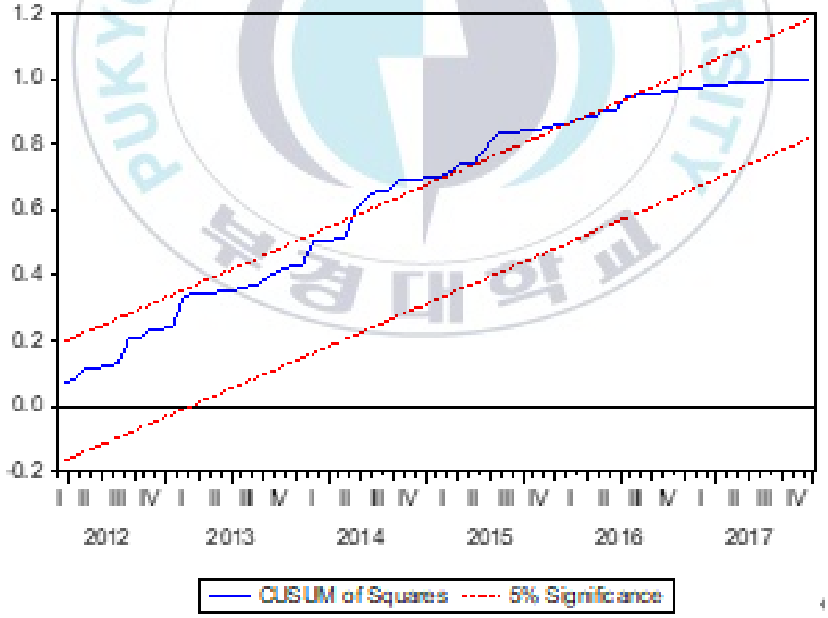

30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 23**

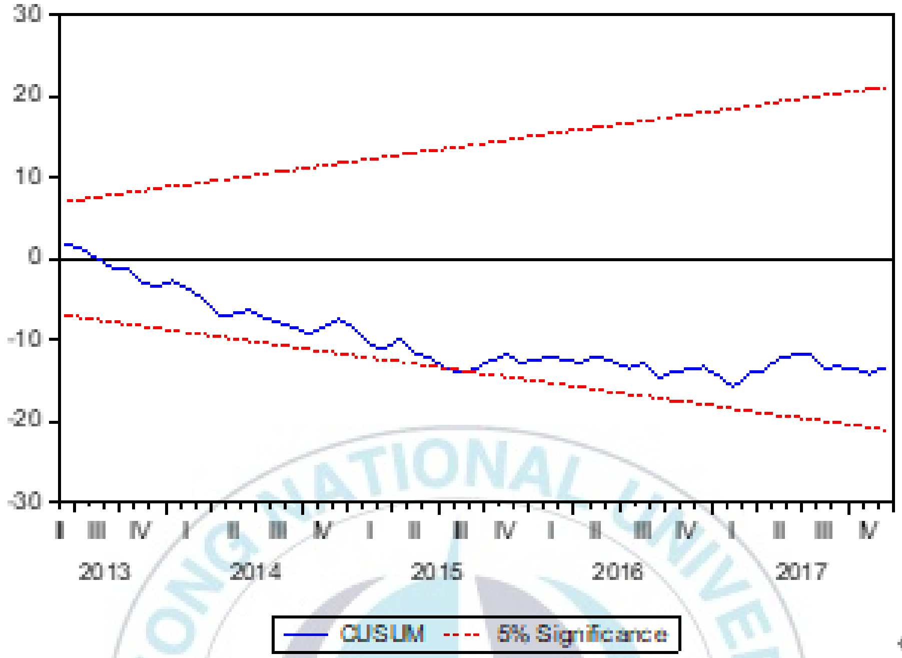


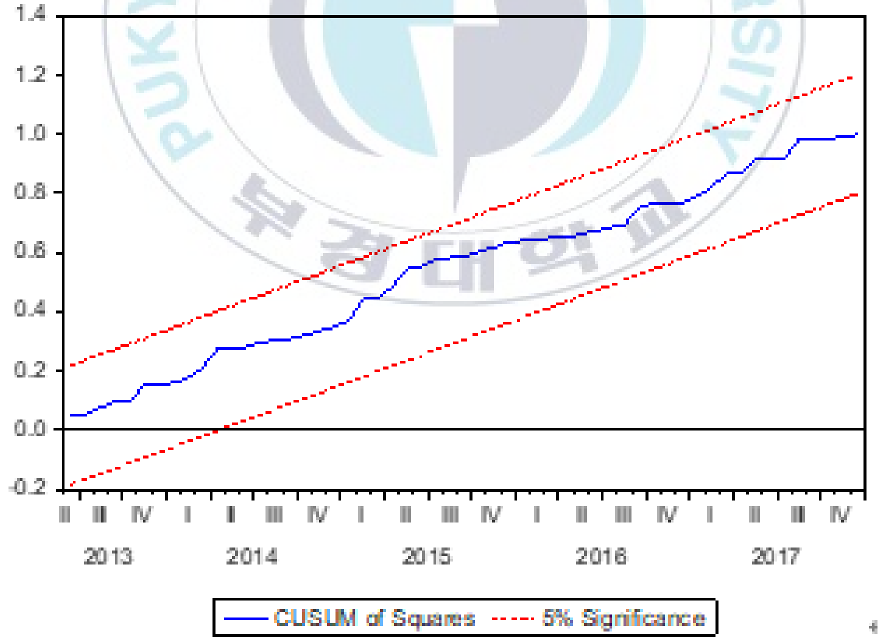
30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

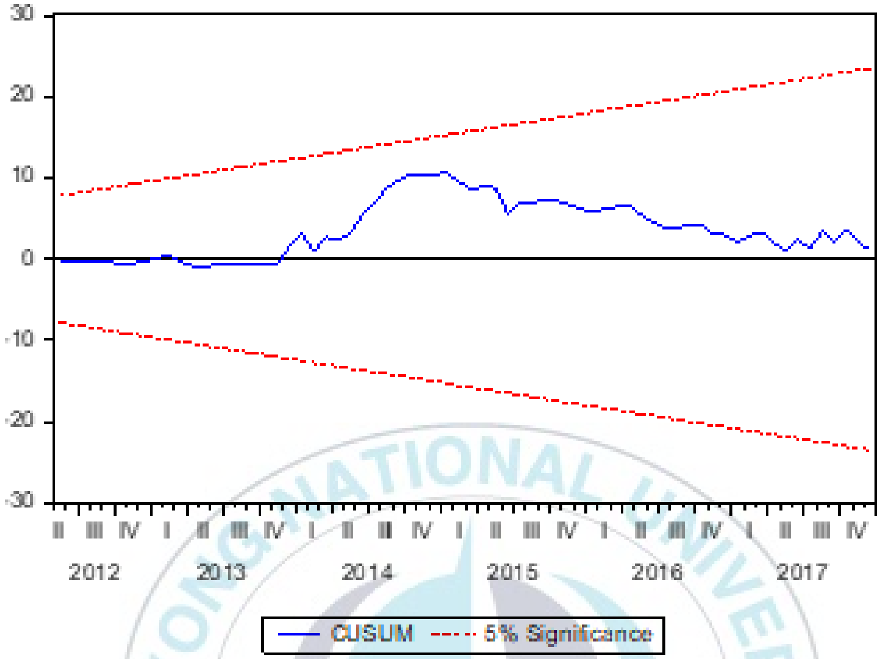
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

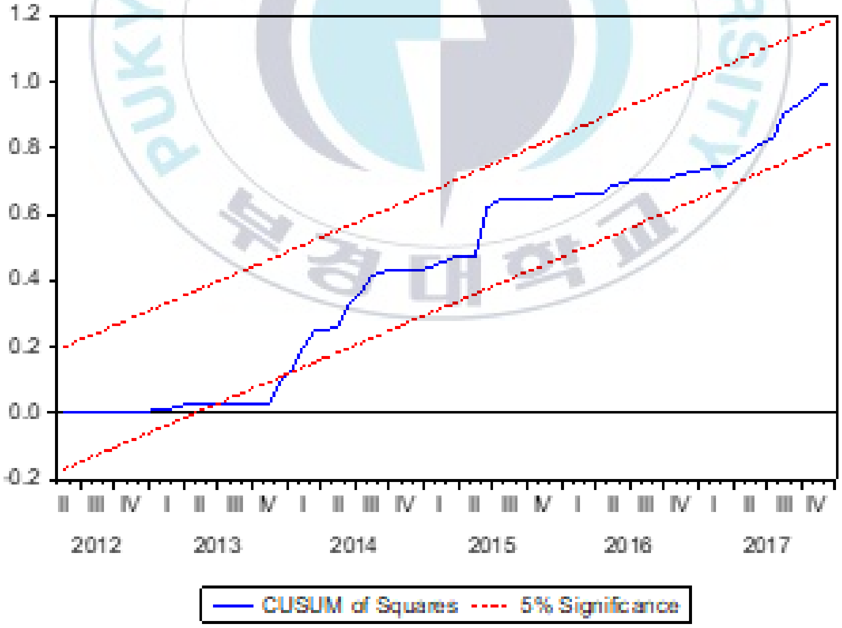
**HS 25**


30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM 5% Significance

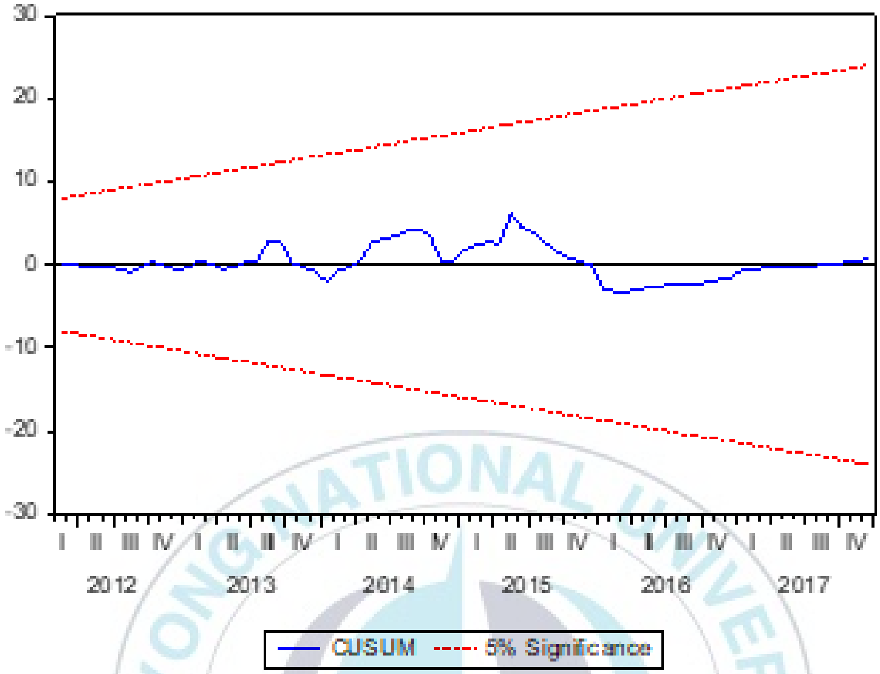

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

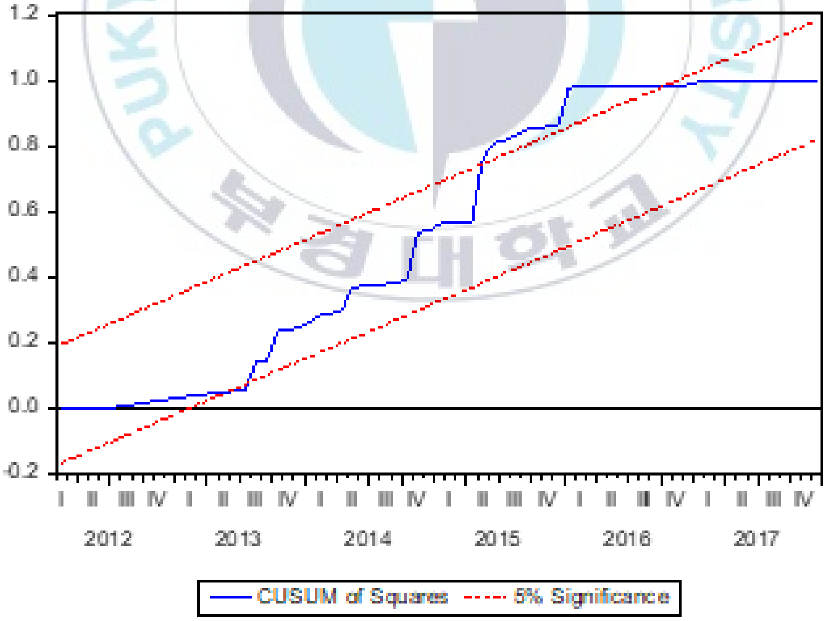
**HS 26**


30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

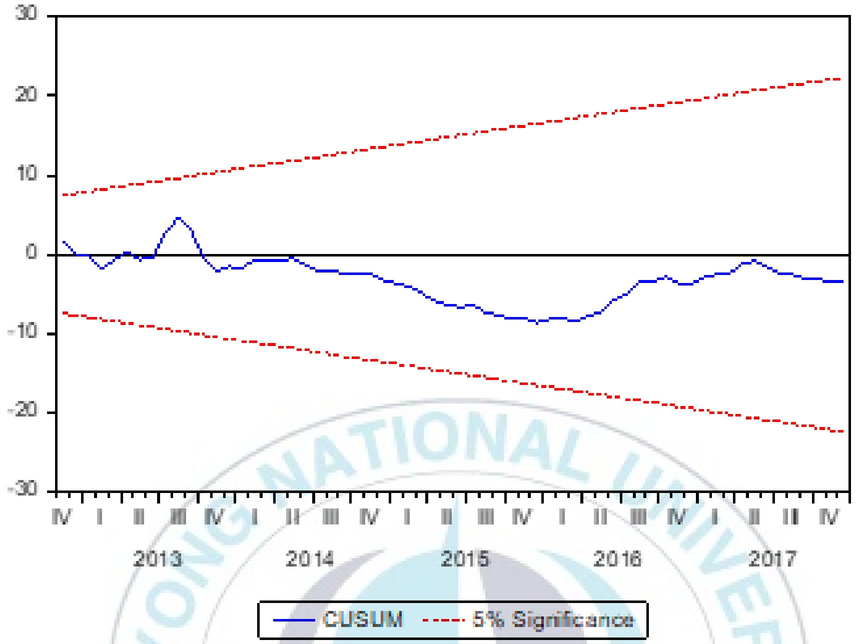

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 27**

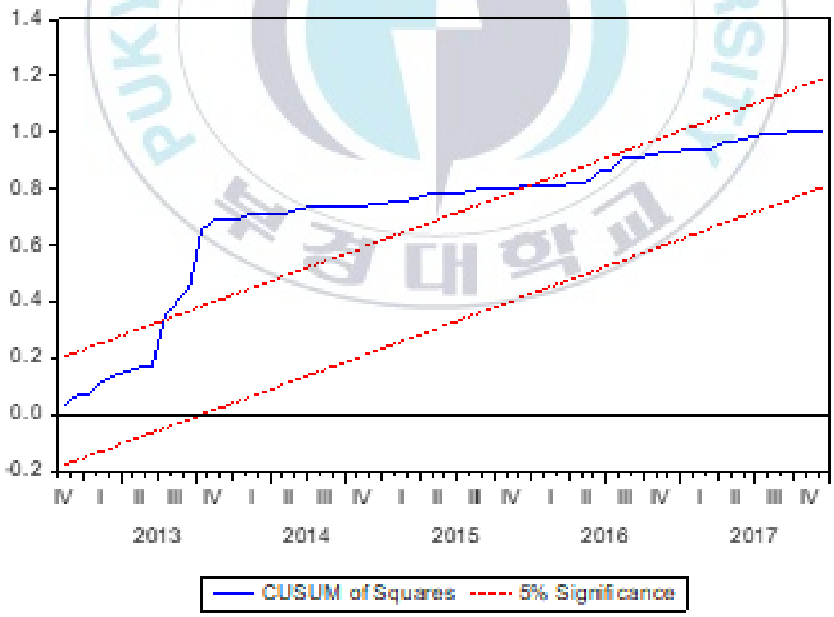

30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 28**

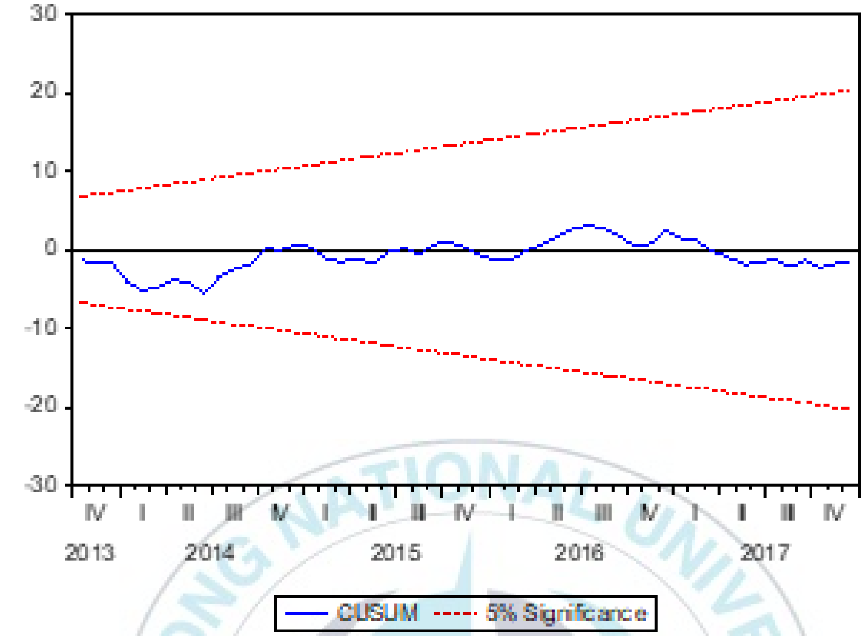


30
20
10
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 31**



30
20
10
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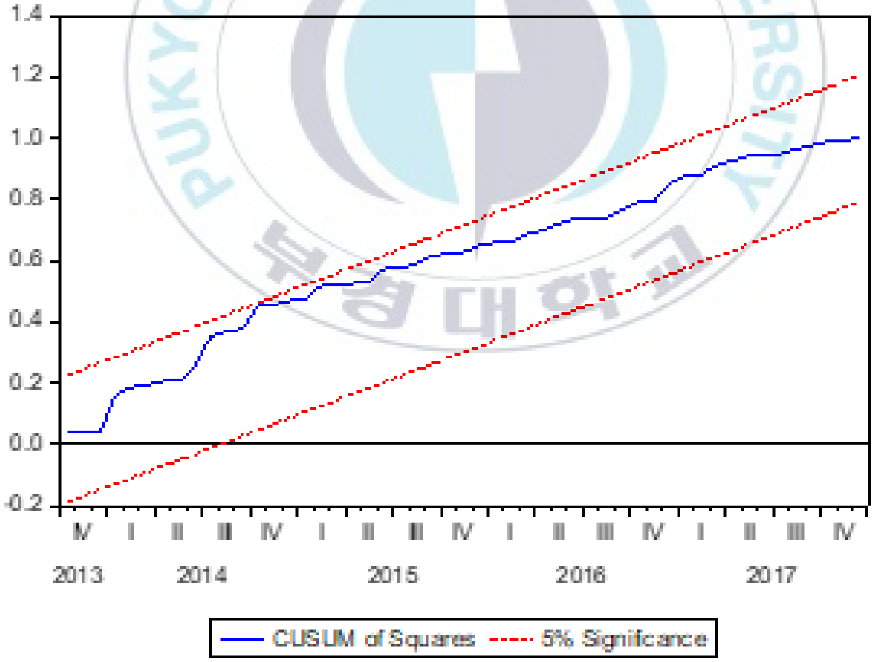
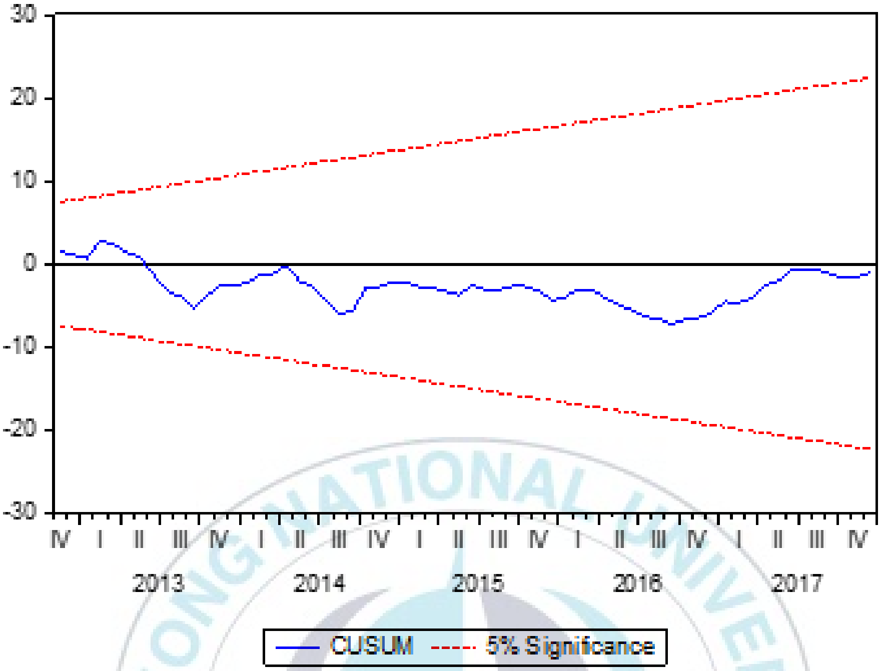
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

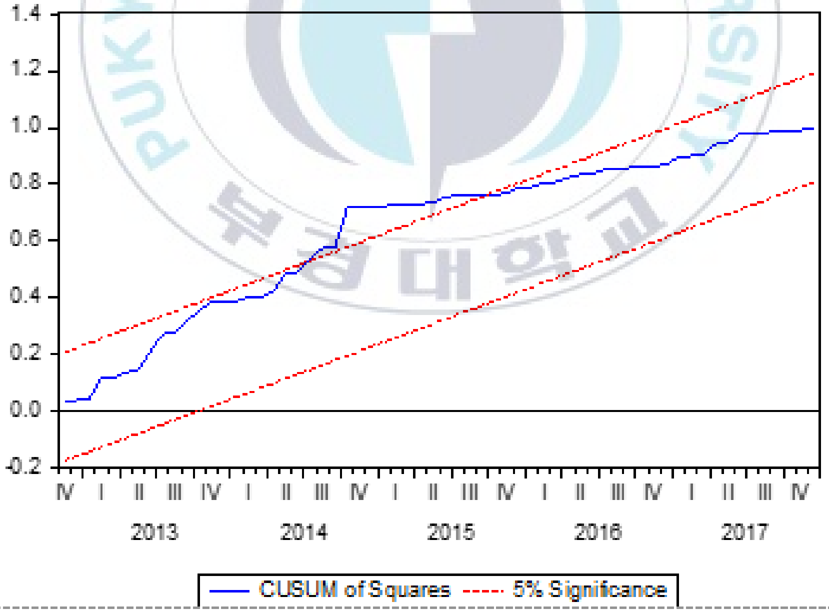



1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 33**

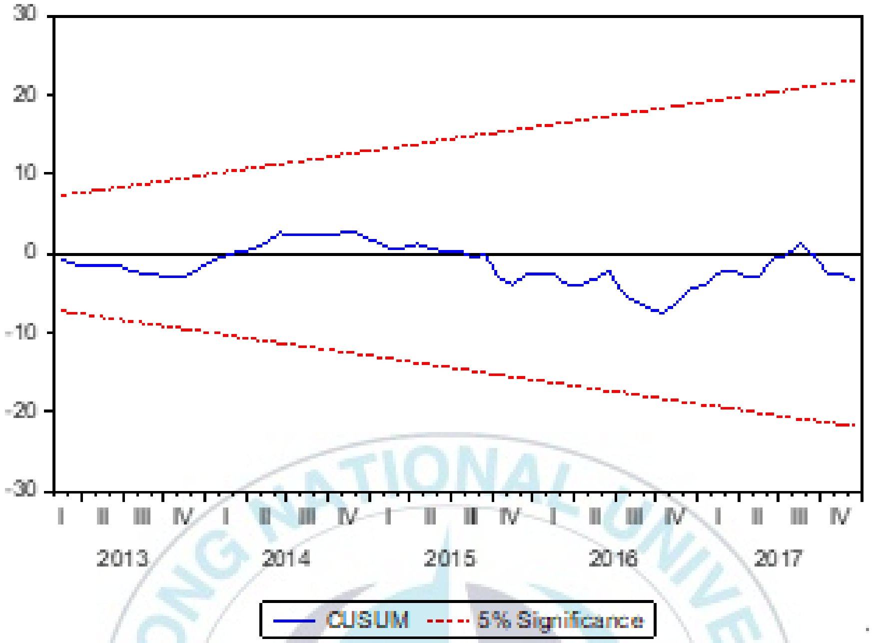


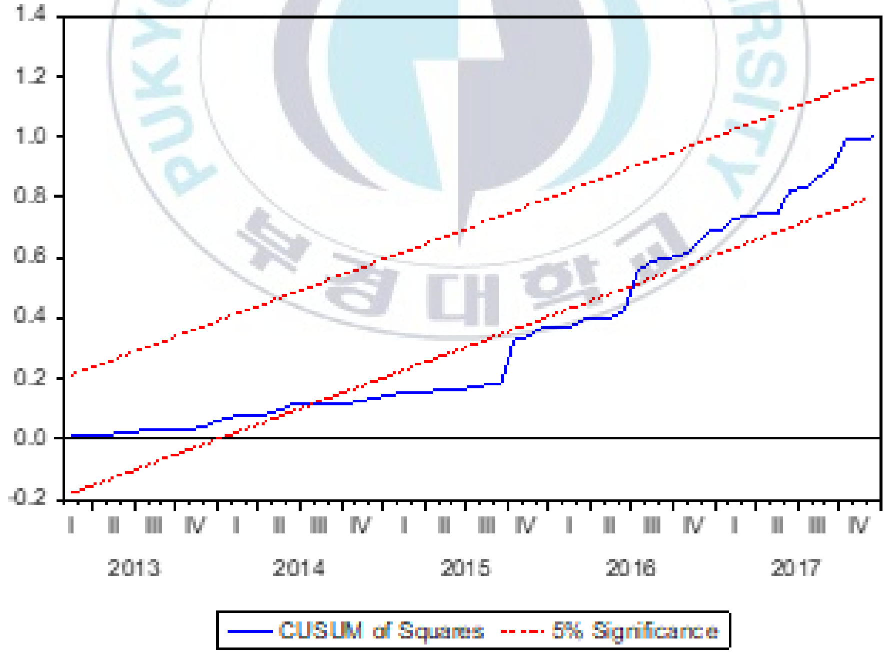
30
20
10
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM
5% Significance

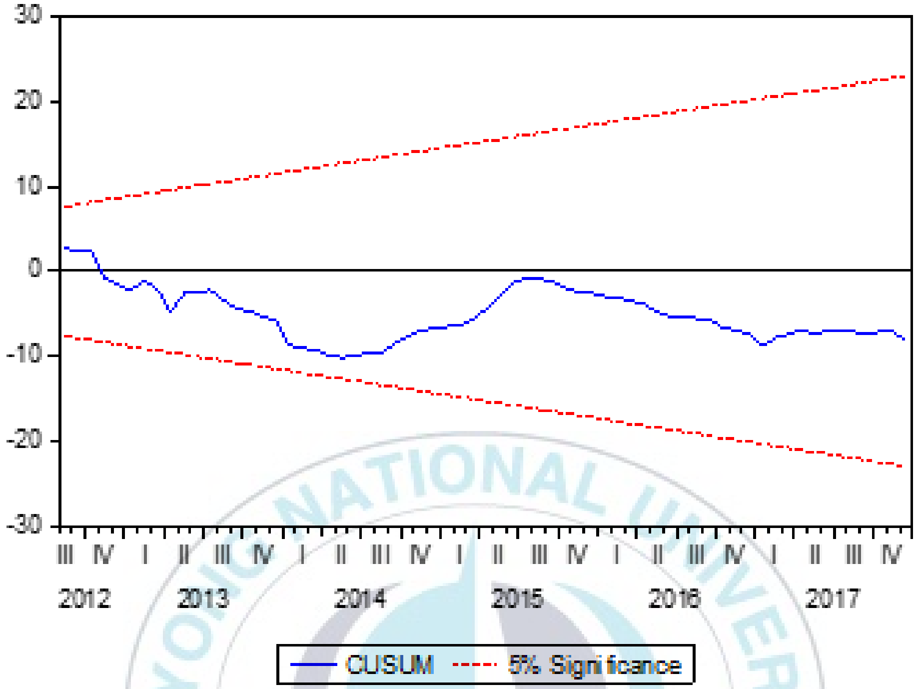
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

**HS 34**

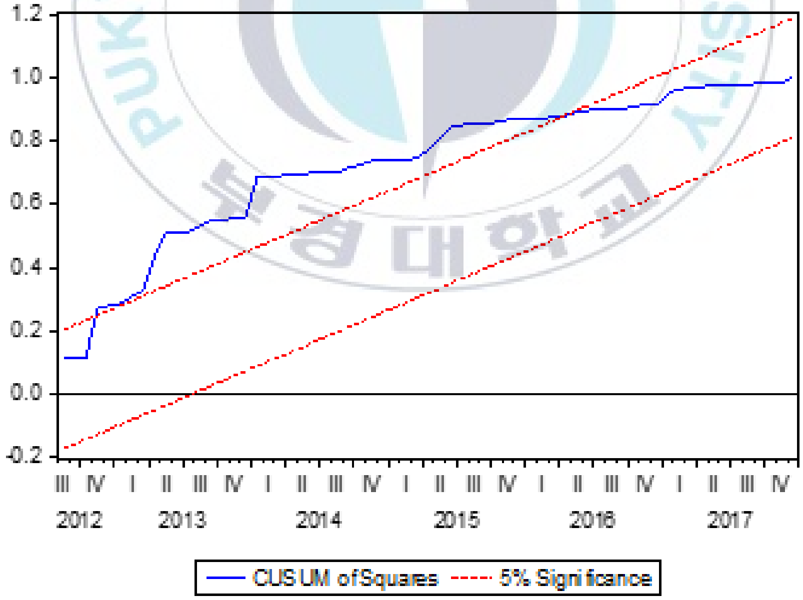

30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 35**

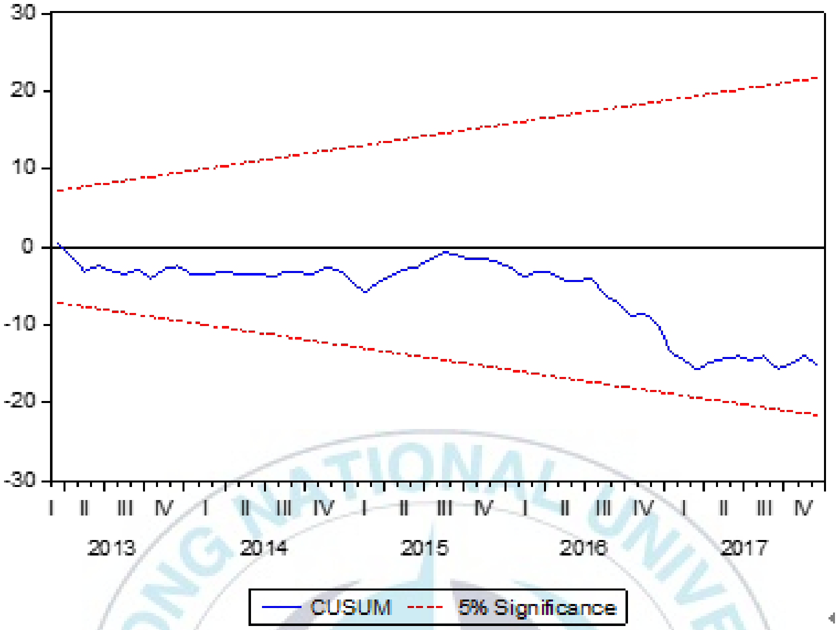


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM 5% Significance

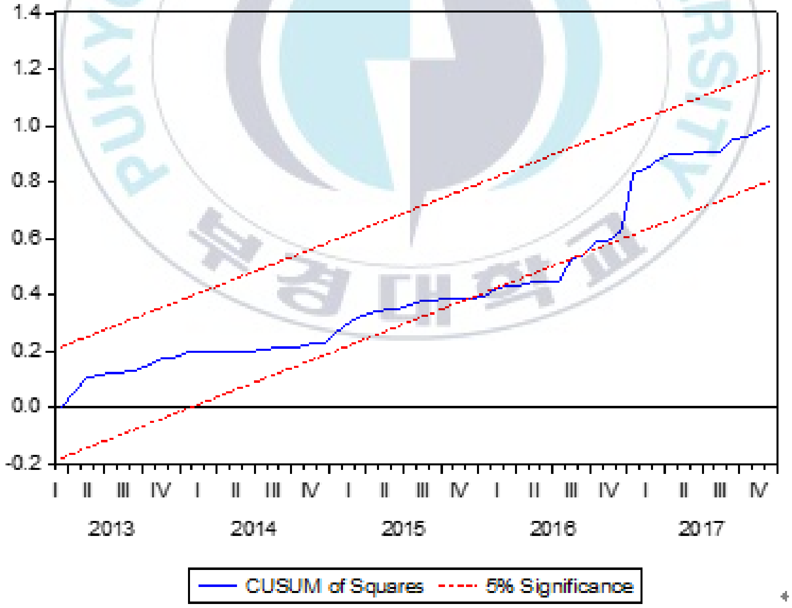



1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

## HS 38

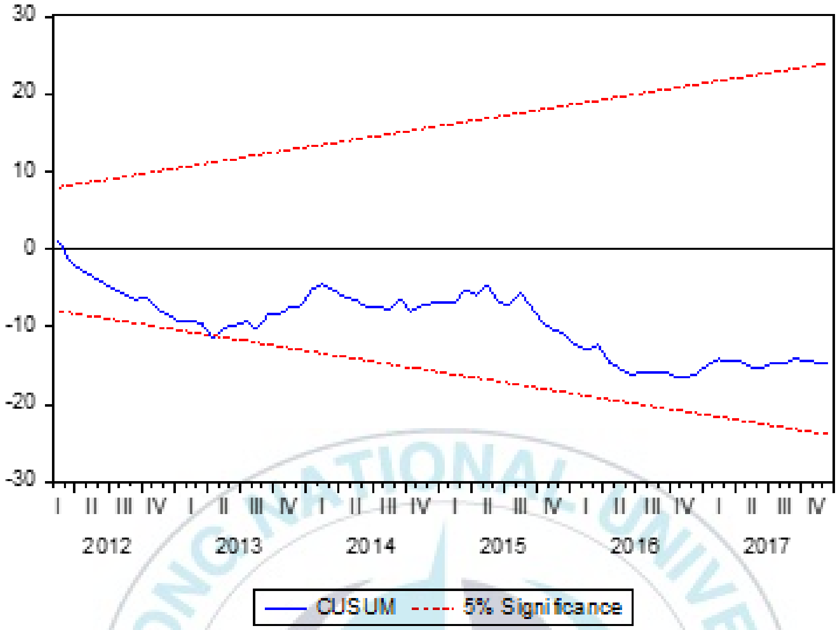


30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

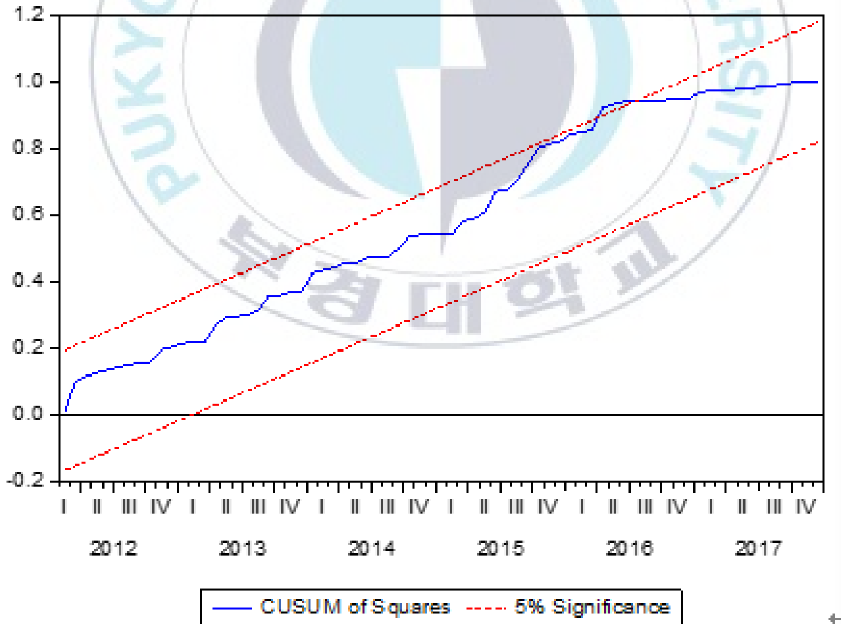



1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 39**

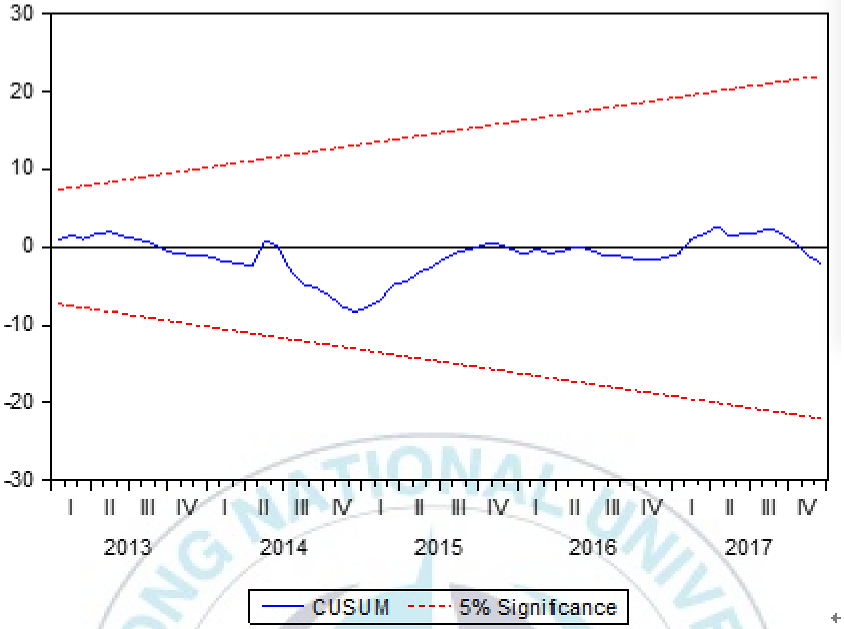


30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

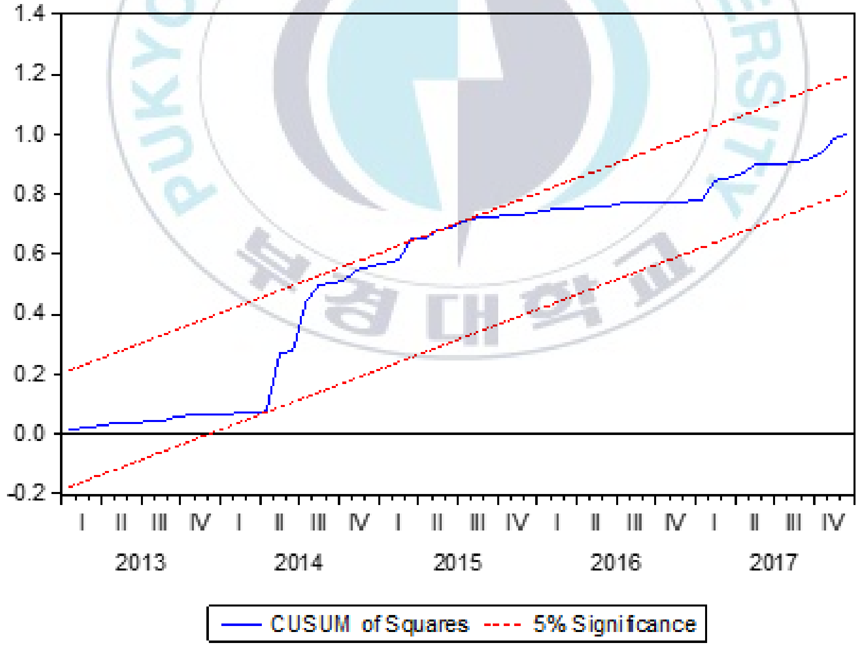



1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 40**

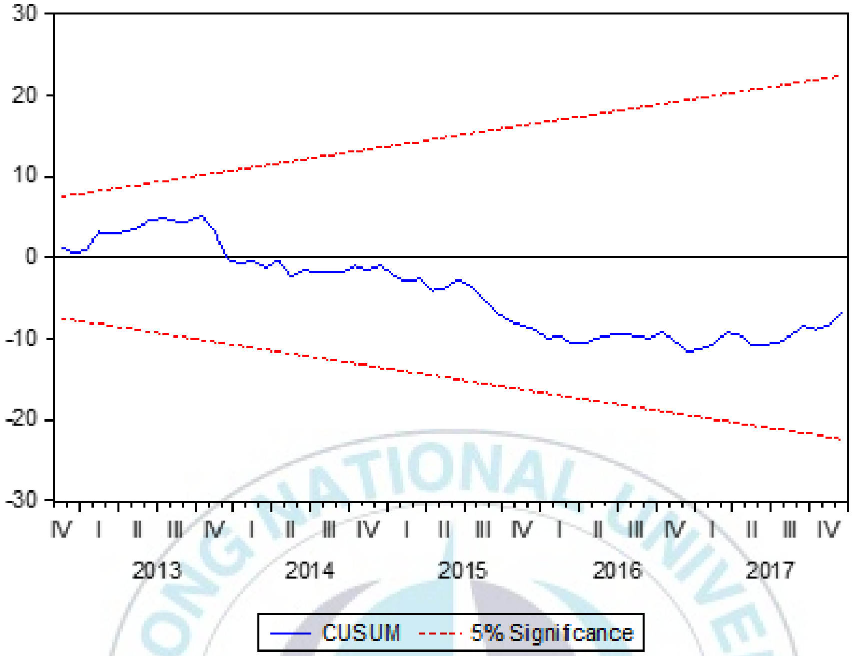


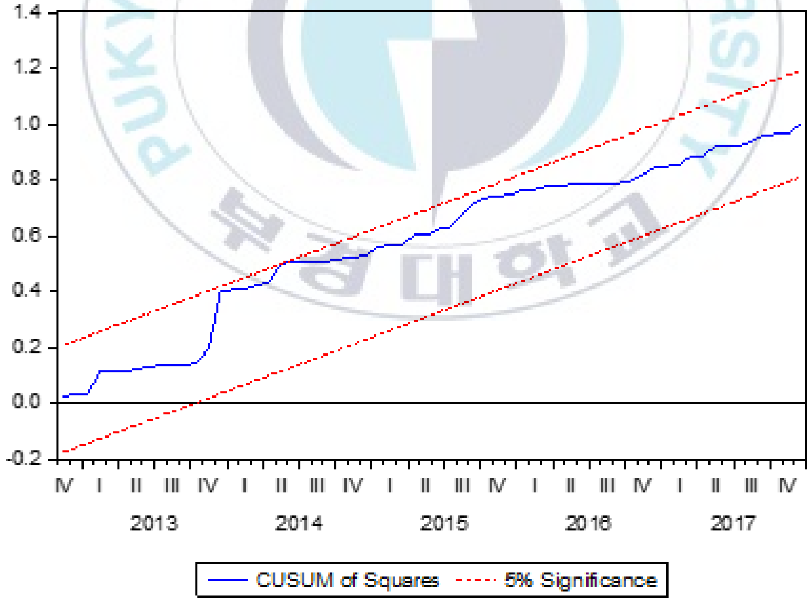
30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM 5% Significance

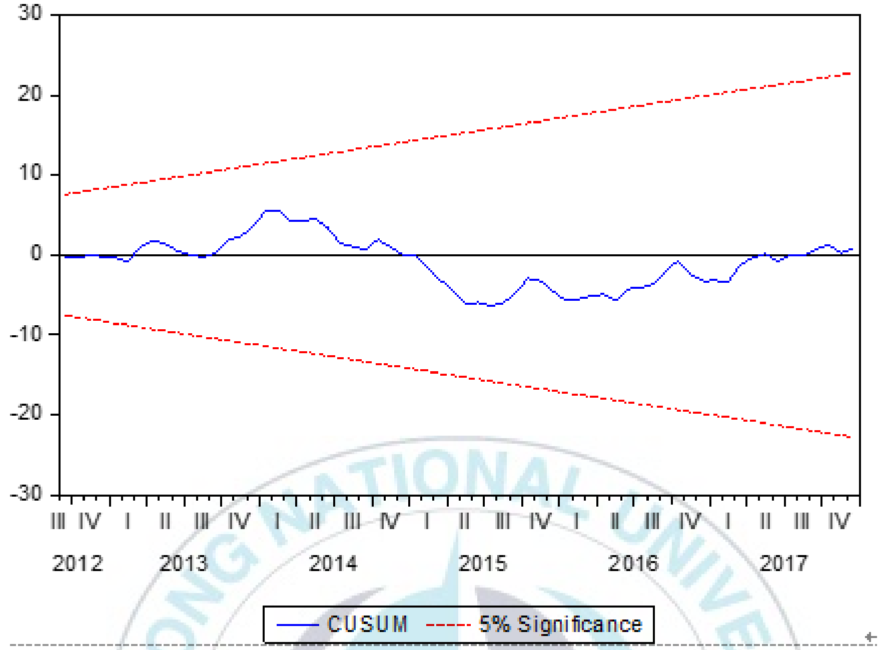
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

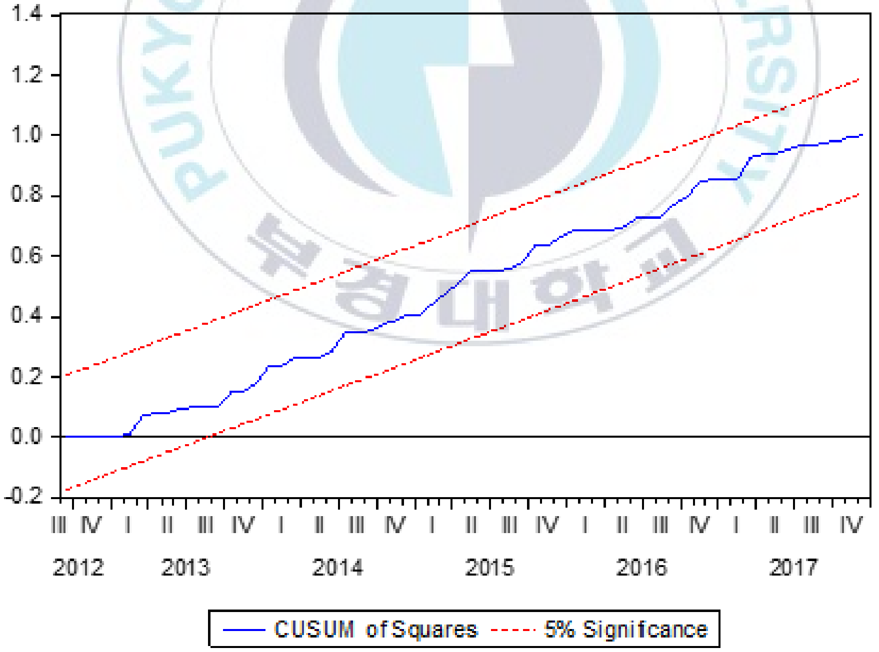
**HS 41**


30
20
10
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM 5% Significance

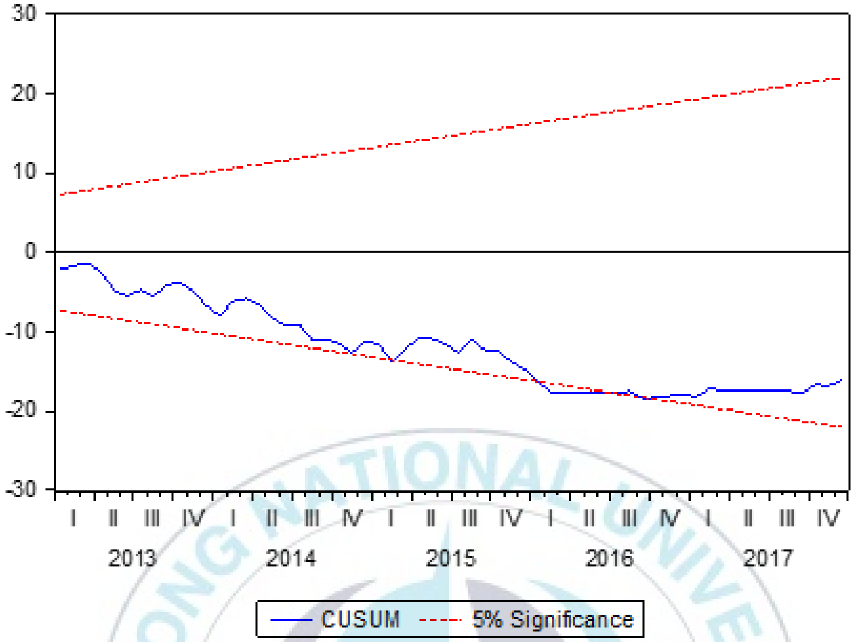

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

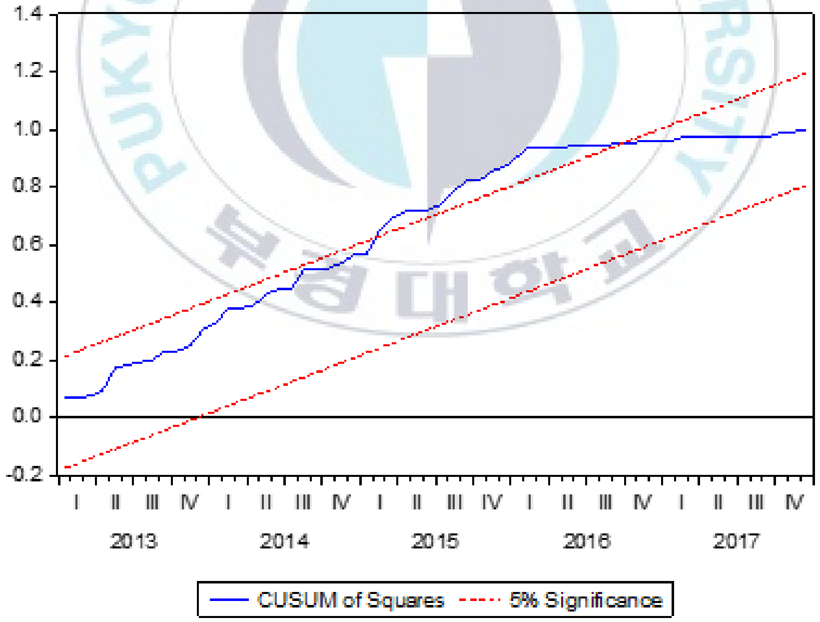
**HS 42**


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

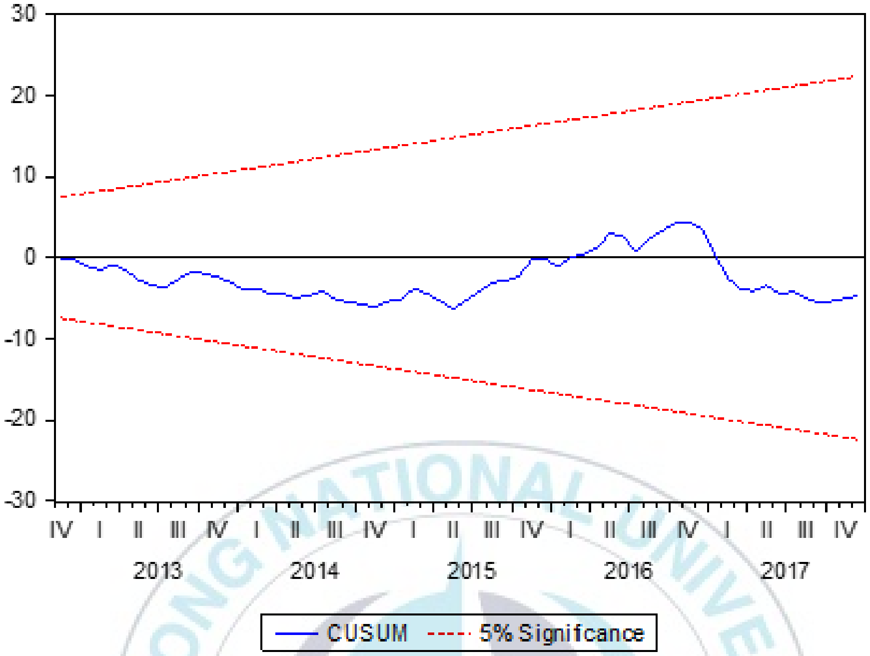

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

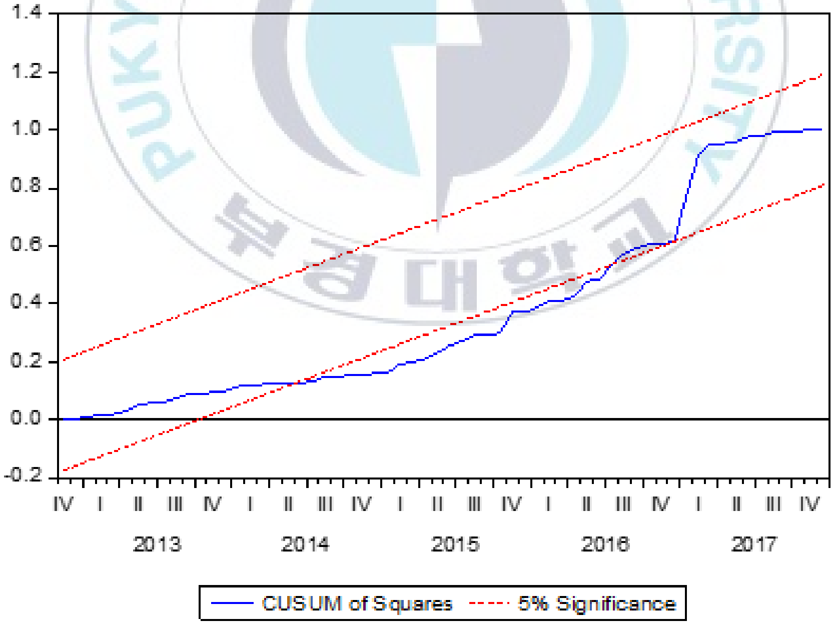
## HS 46


30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM 5% Significance

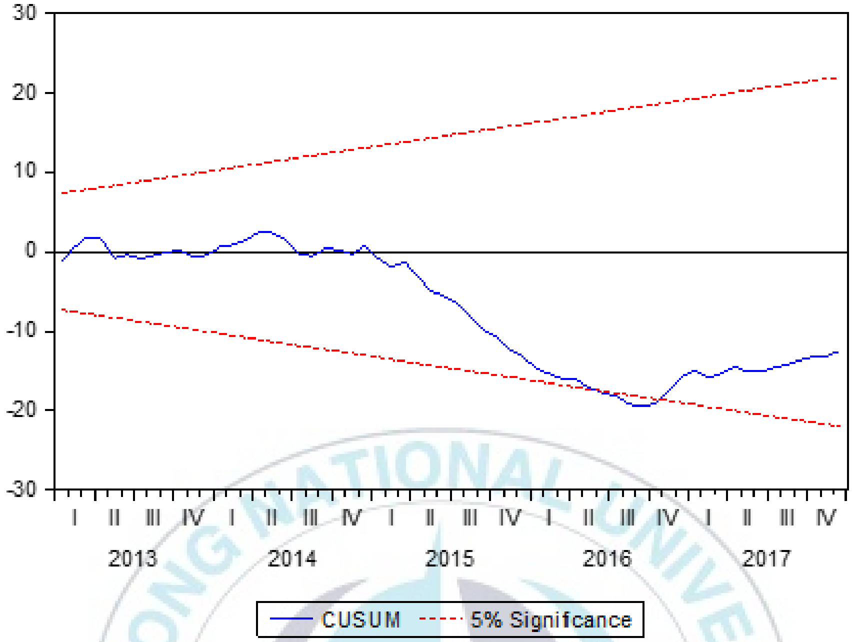

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

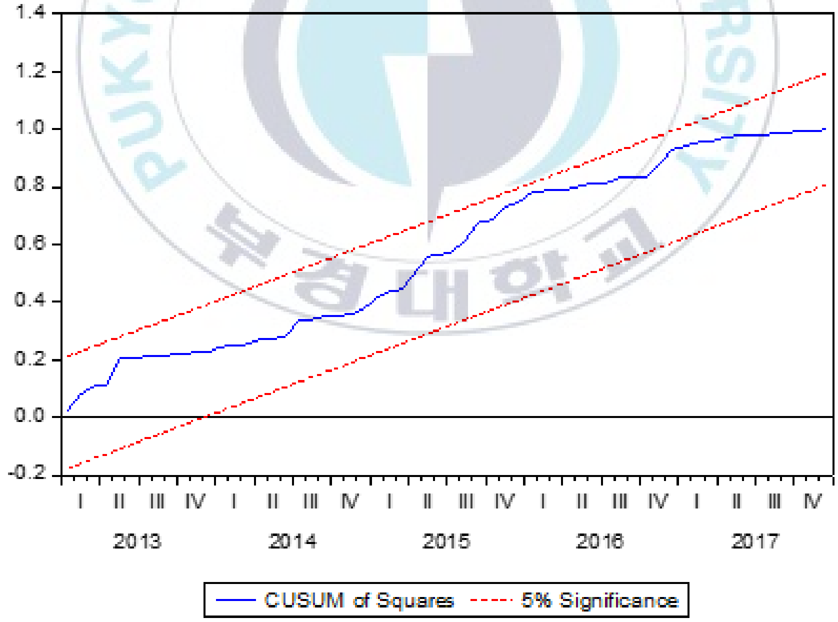
**HS 48**


30
20
10
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

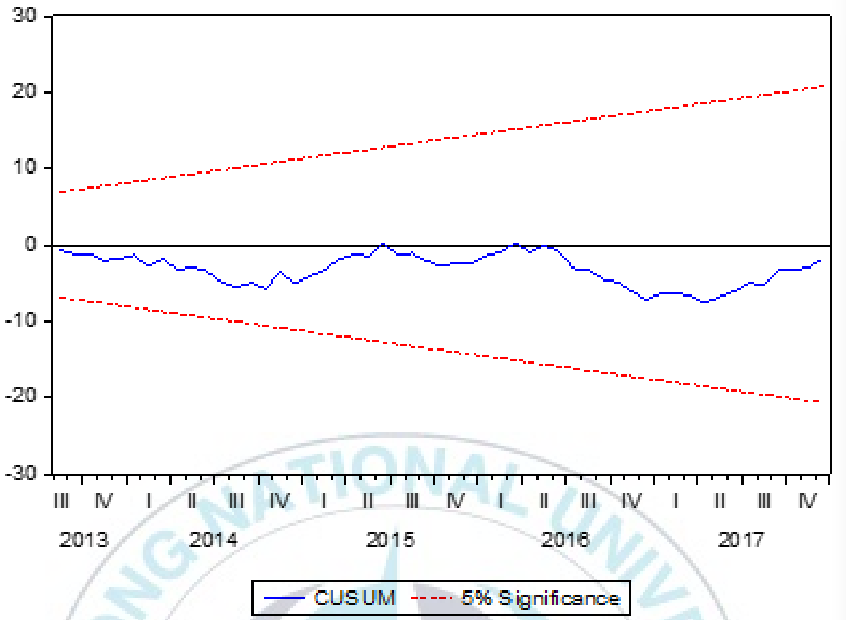

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 49**

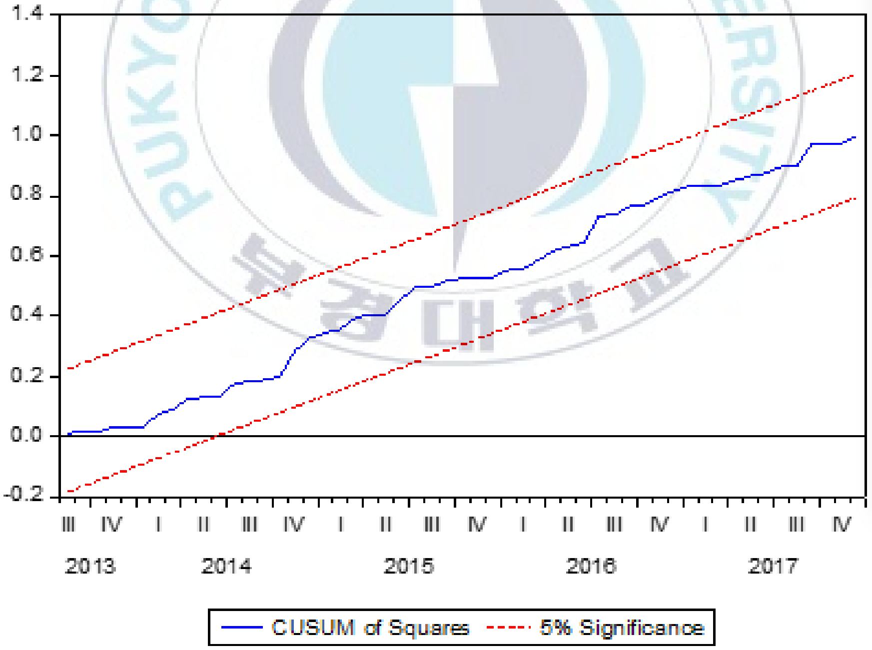

30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 50**

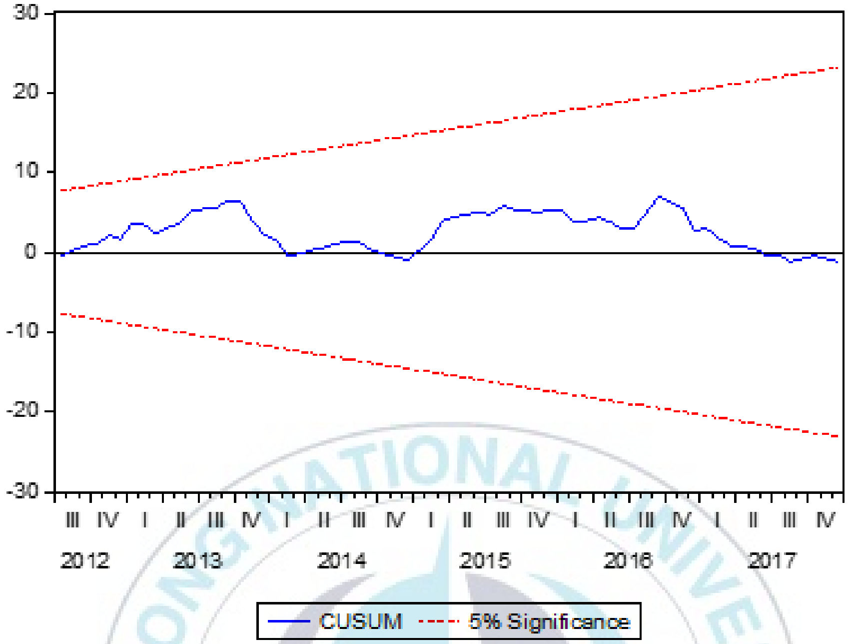


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

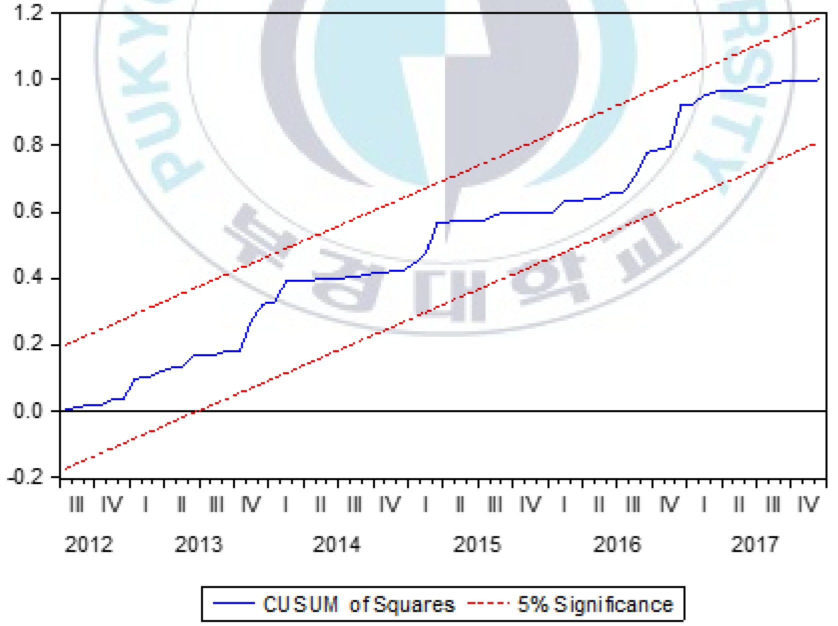



1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 52**

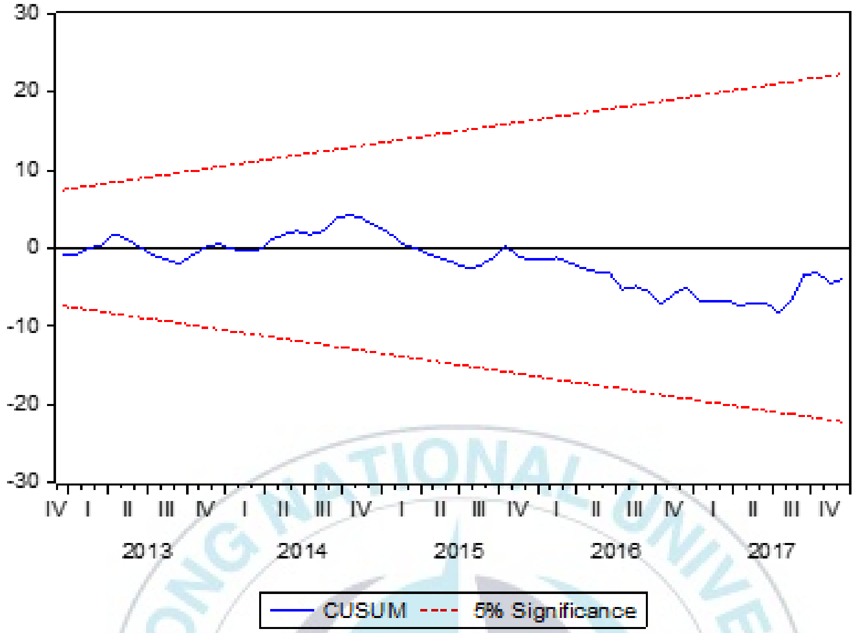


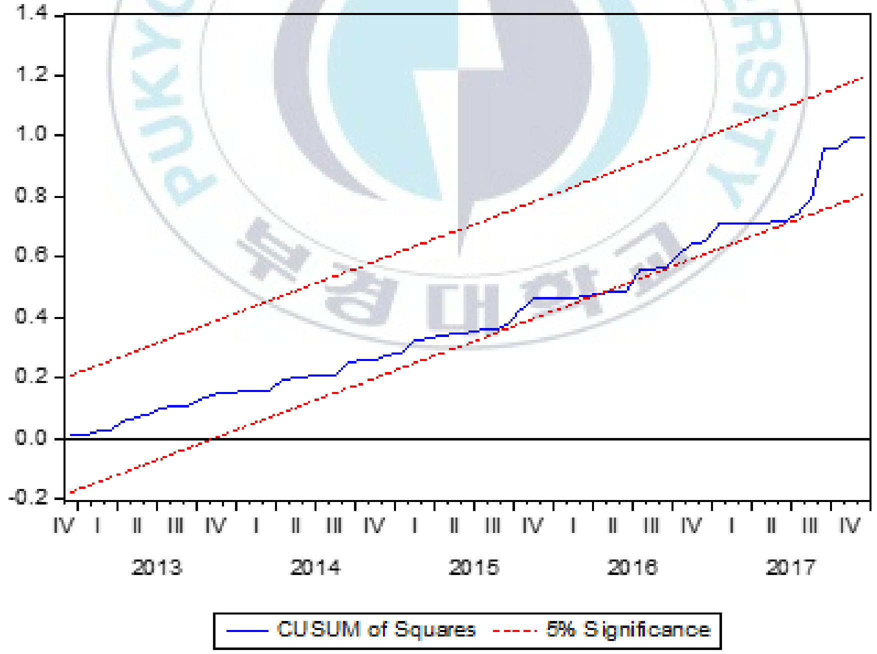
30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

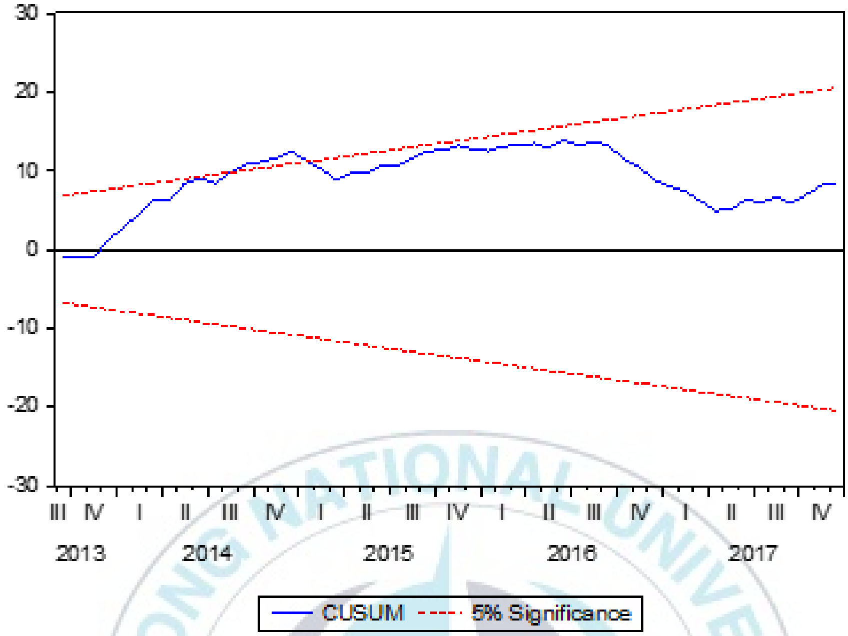
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 53**

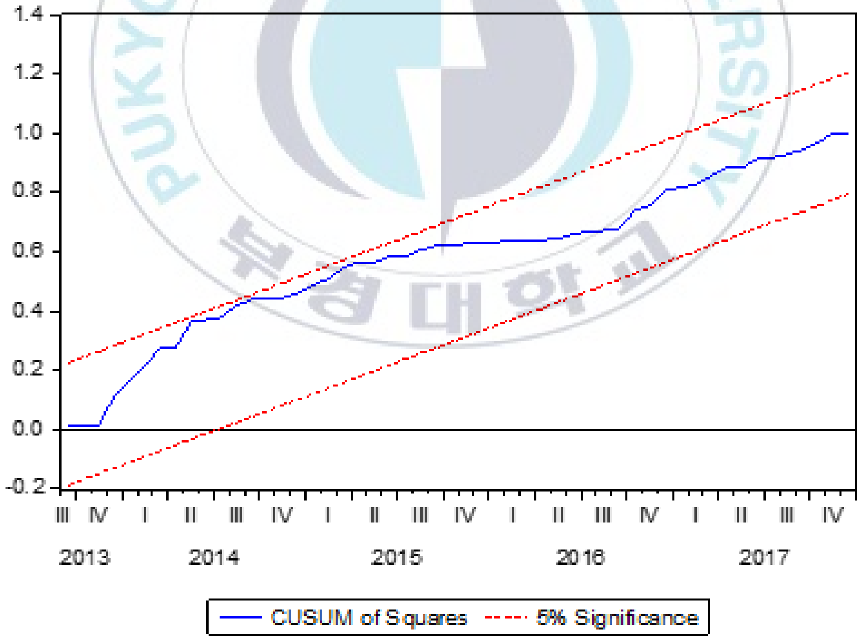

30
20
10
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 54**

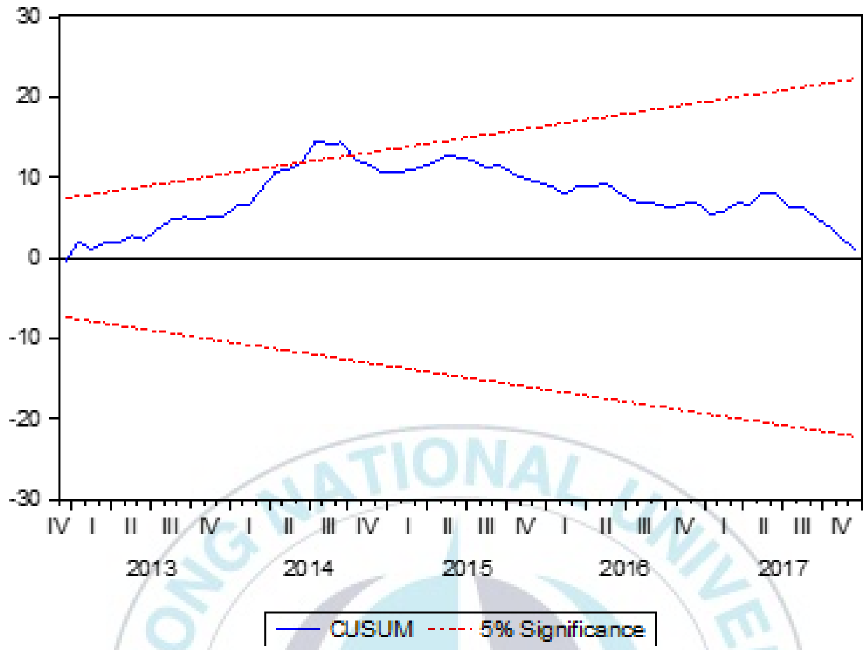


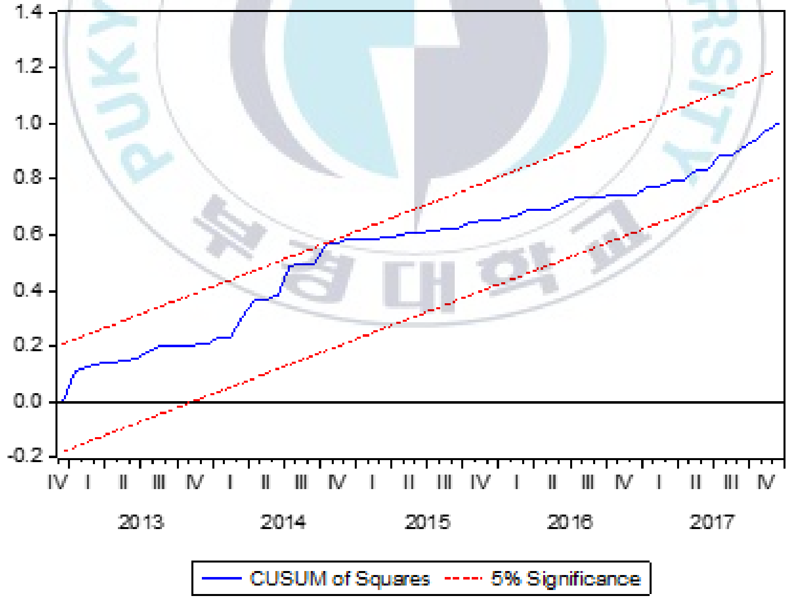
30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM
5% Significance

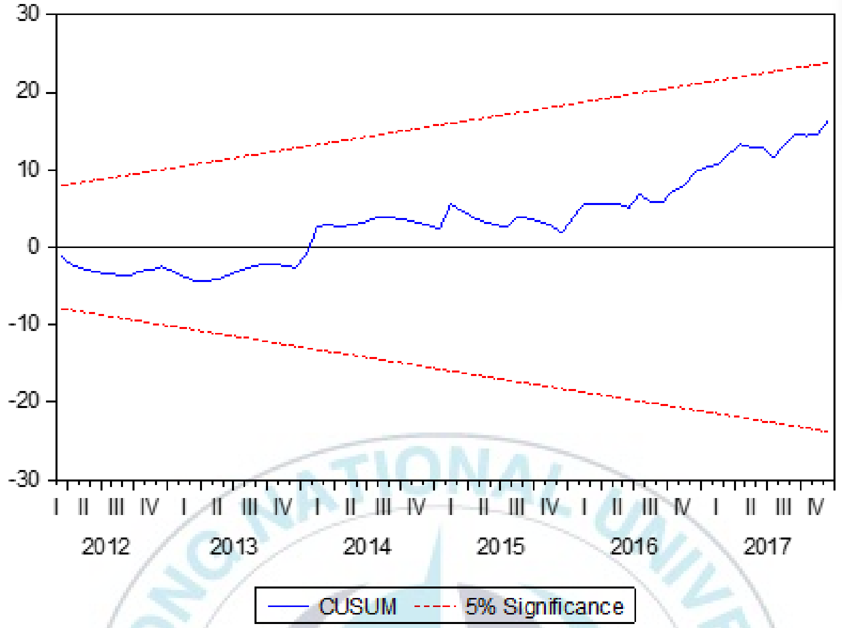
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

**HS 56**

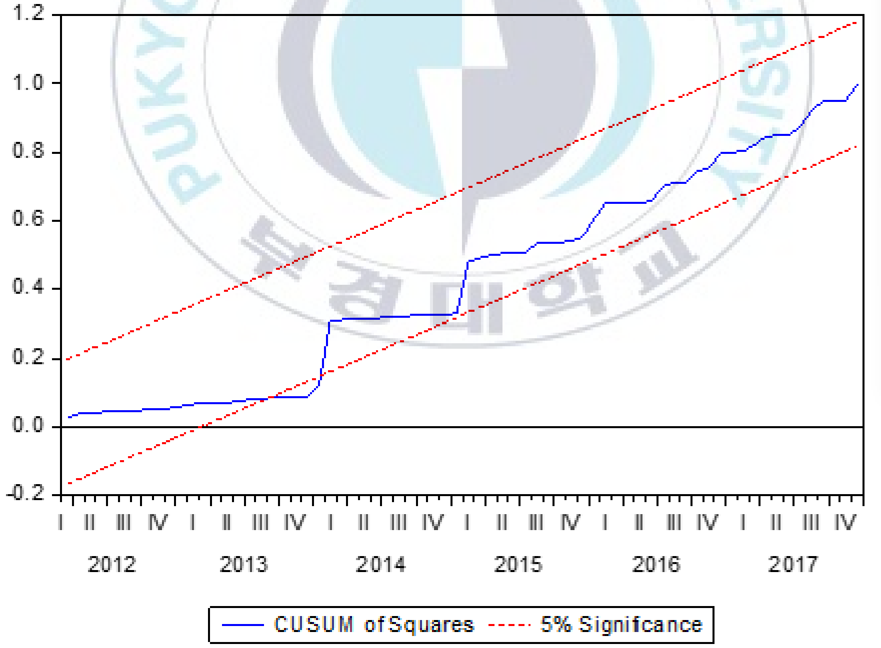

30
20
10
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 58**

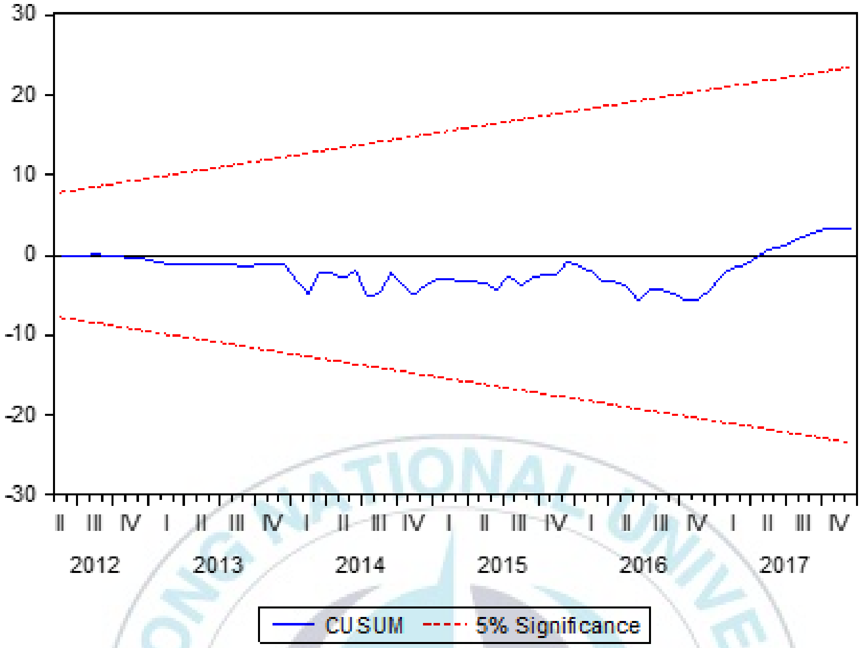


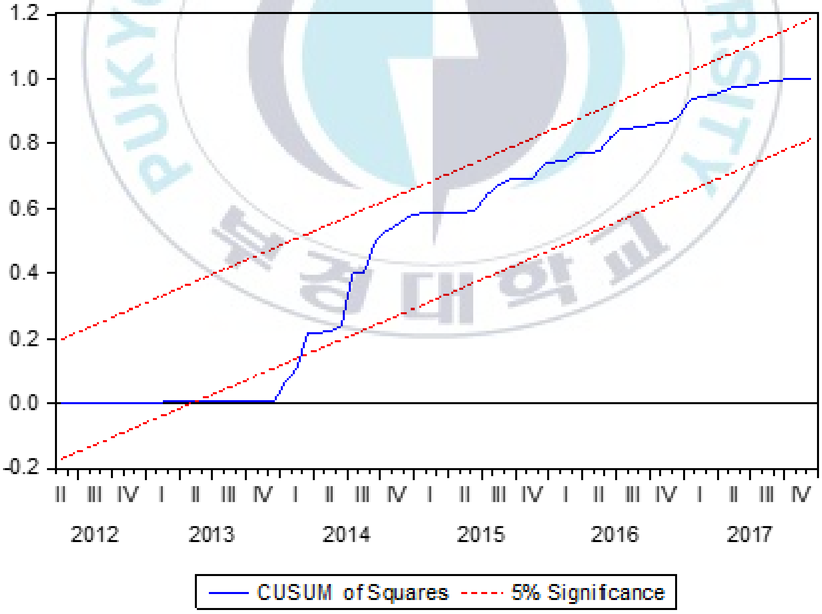
30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM
5% Significance

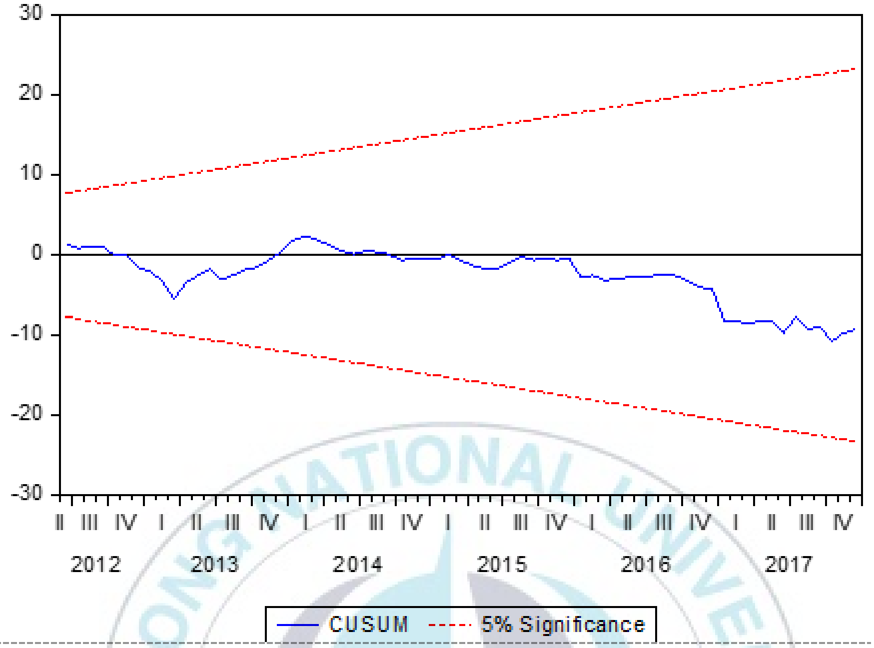
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

**HS 59**


30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Signifcance

**HS 60**



30
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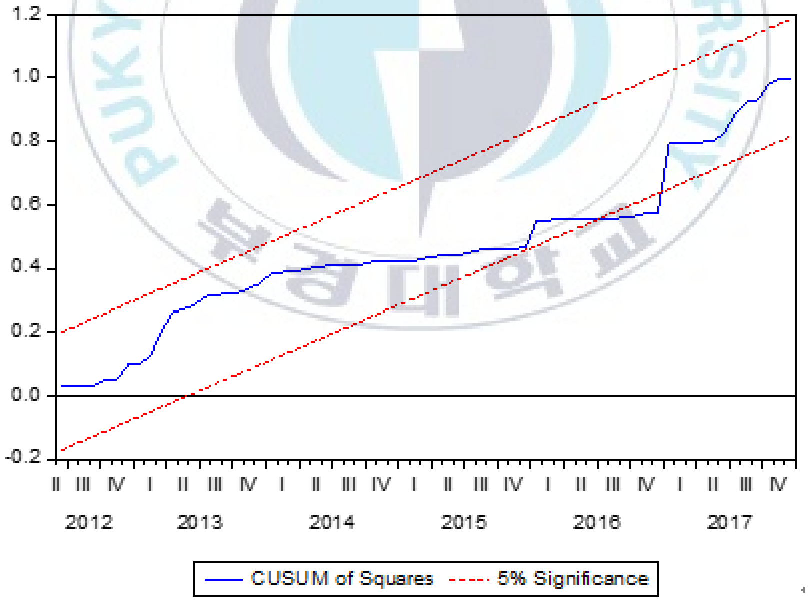
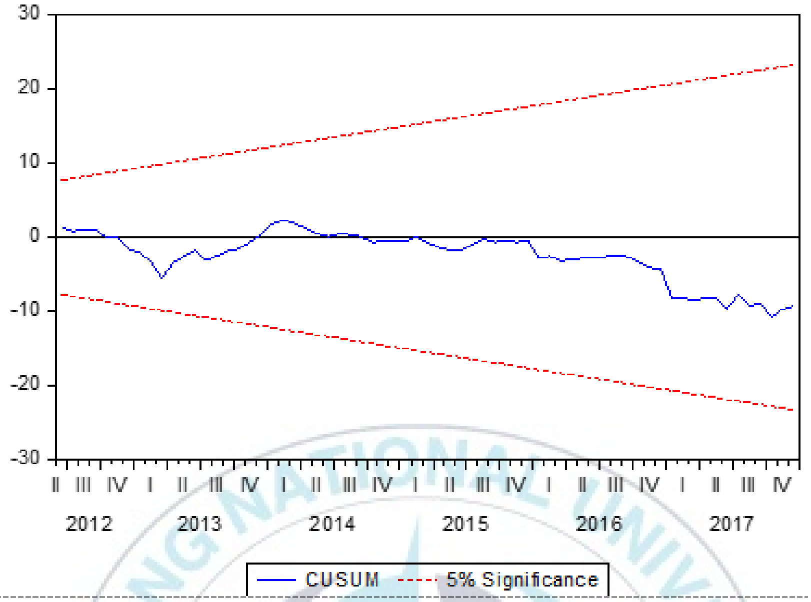
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM 5% Significance

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares 5% Significance

## HS 61


30
20
10
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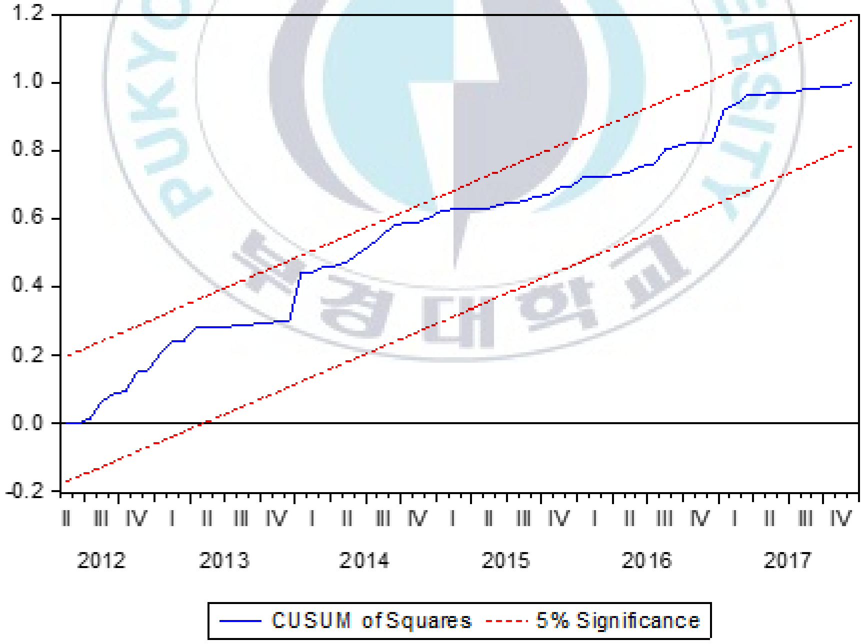
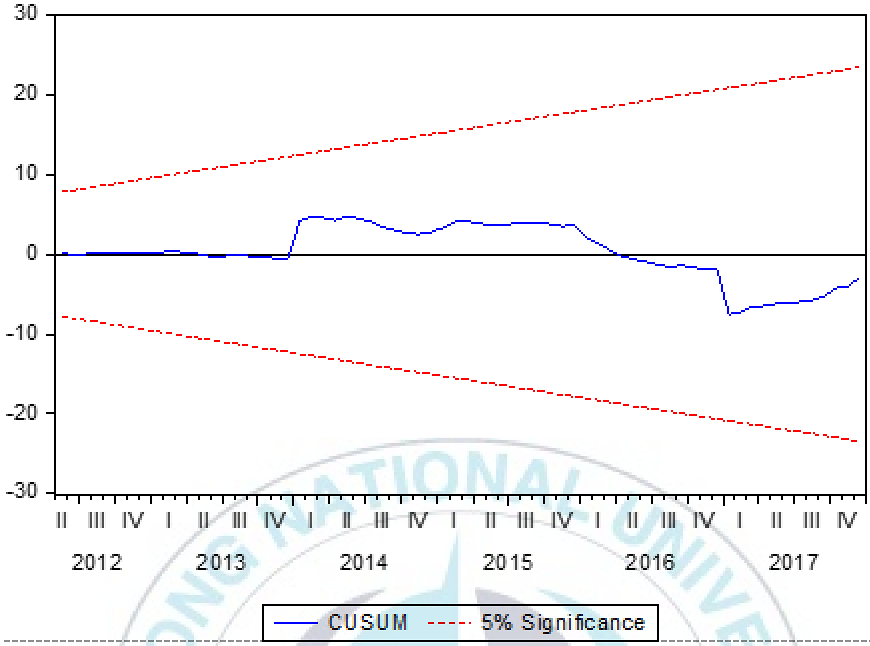
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

## HS 63


30
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10
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-10
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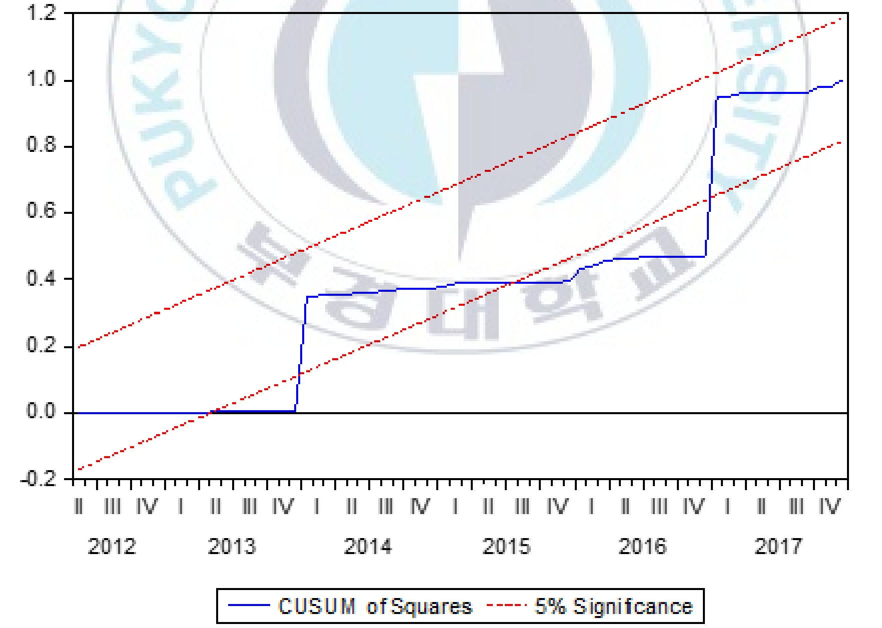
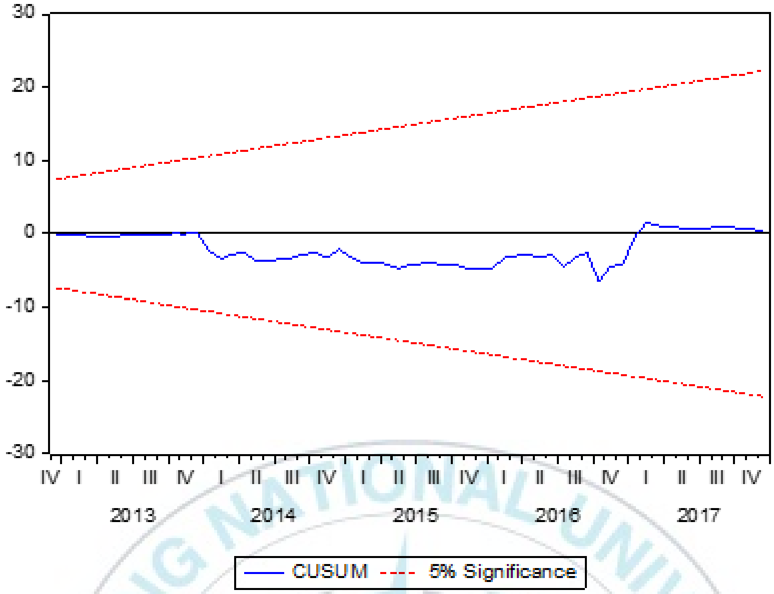
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Signifcance

**HS 64**


30
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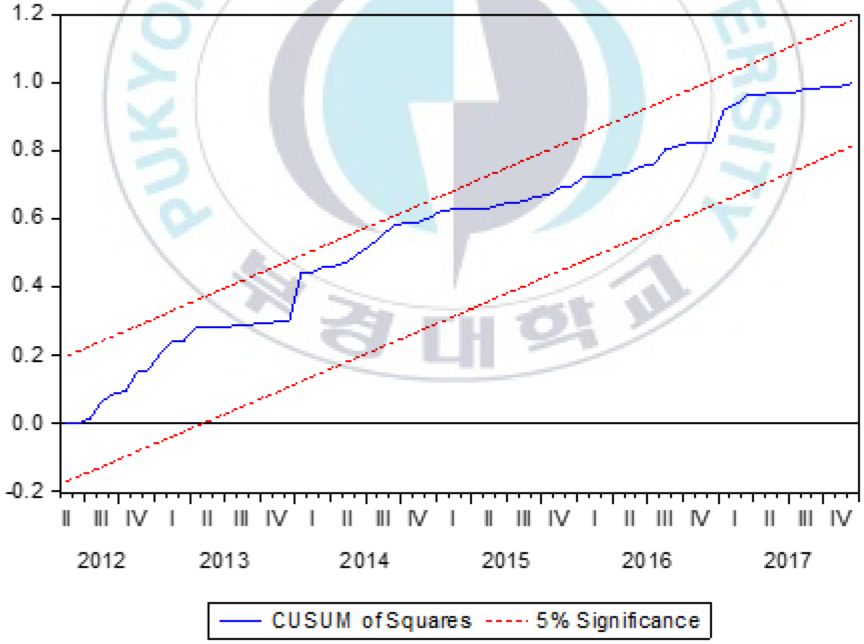
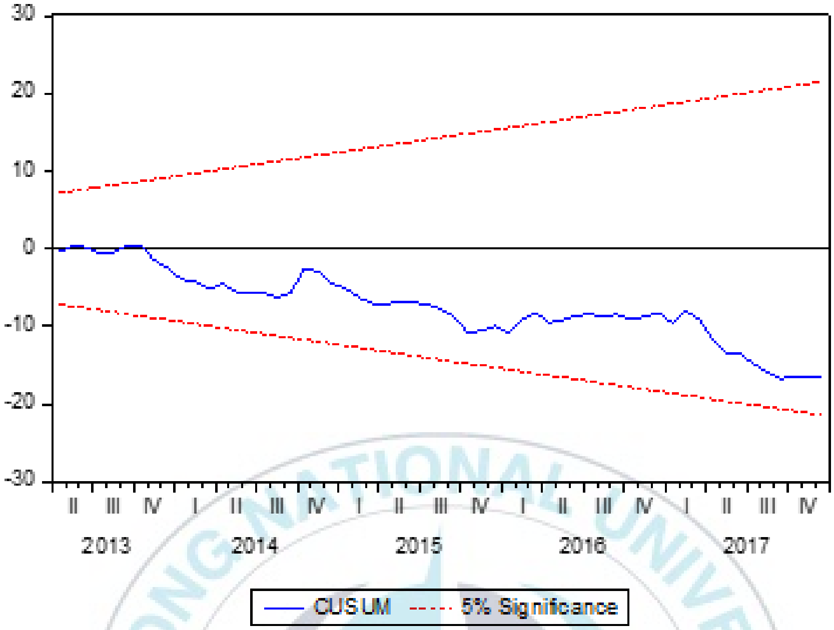
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

## HS 65



30
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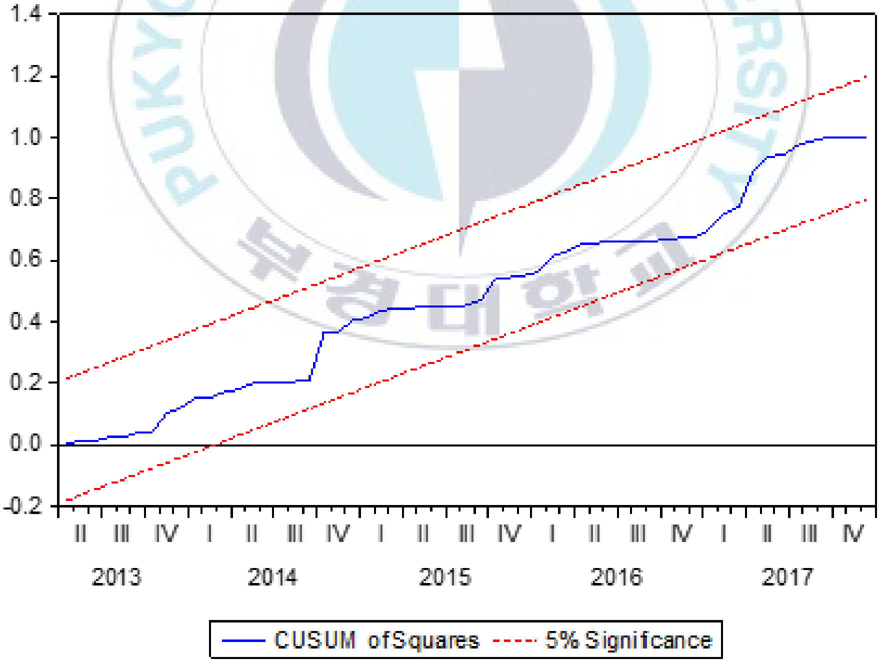
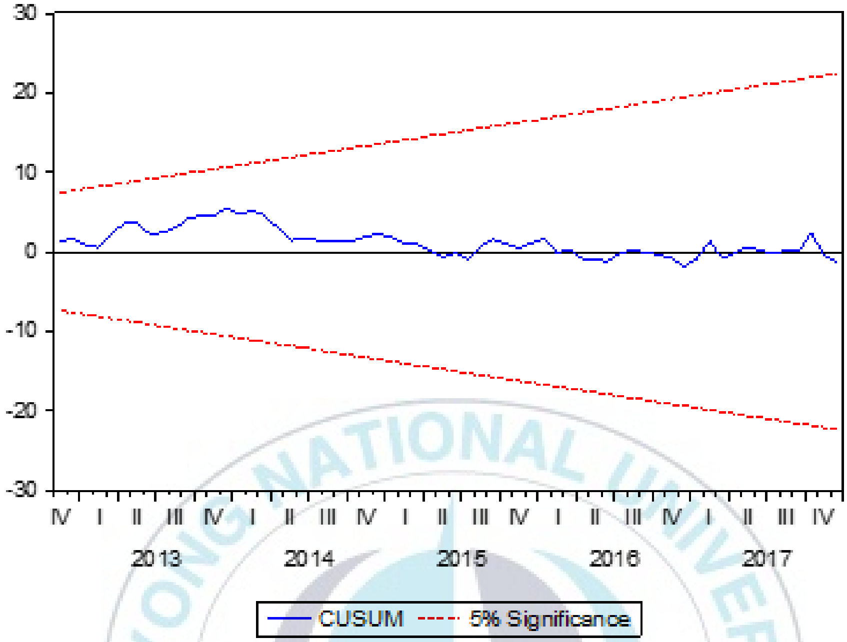
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 68**



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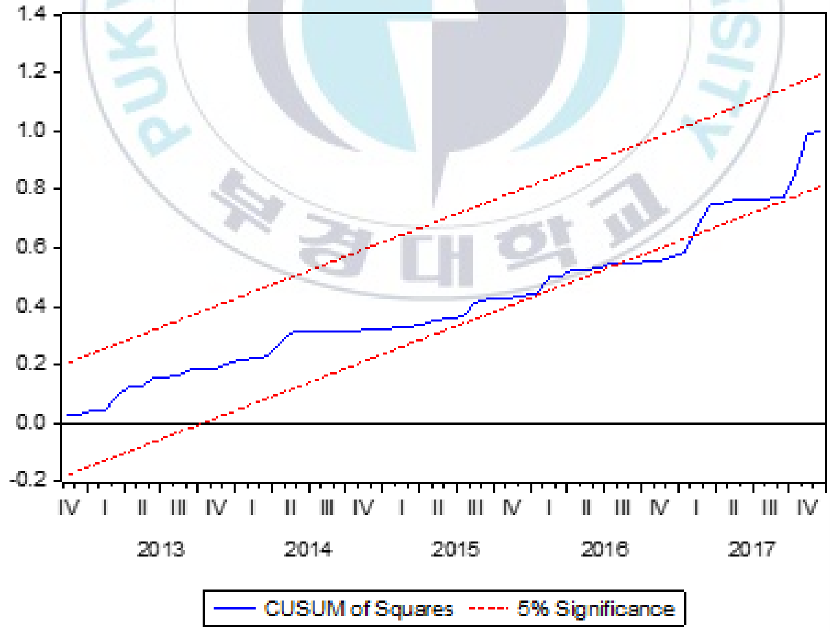
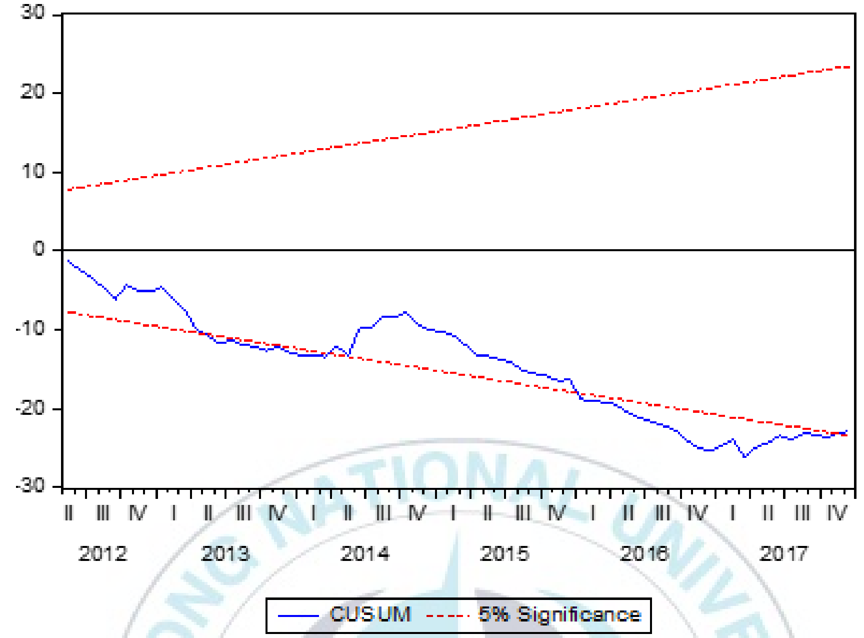
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM
5% Significance

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

**HS 69**



30
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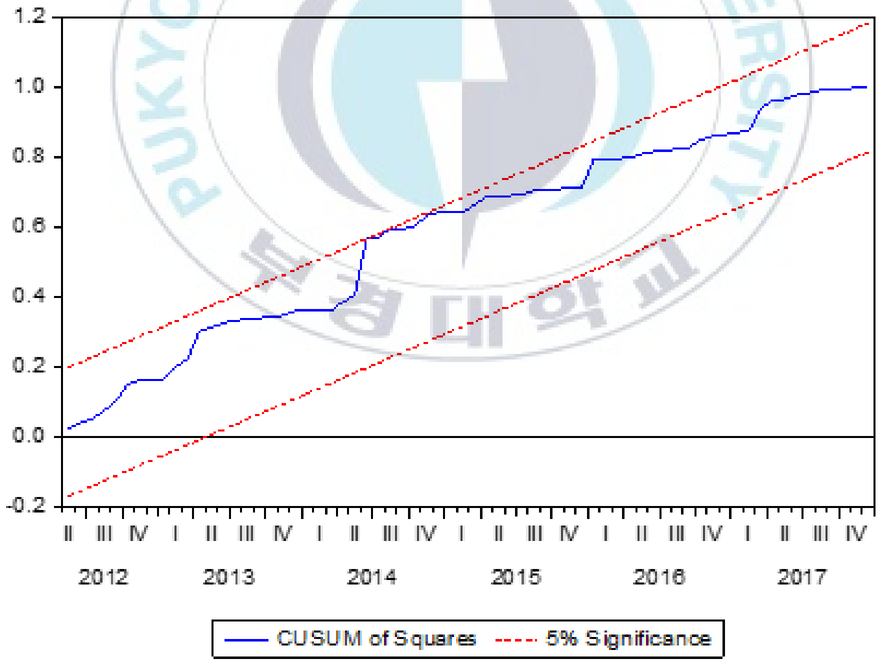
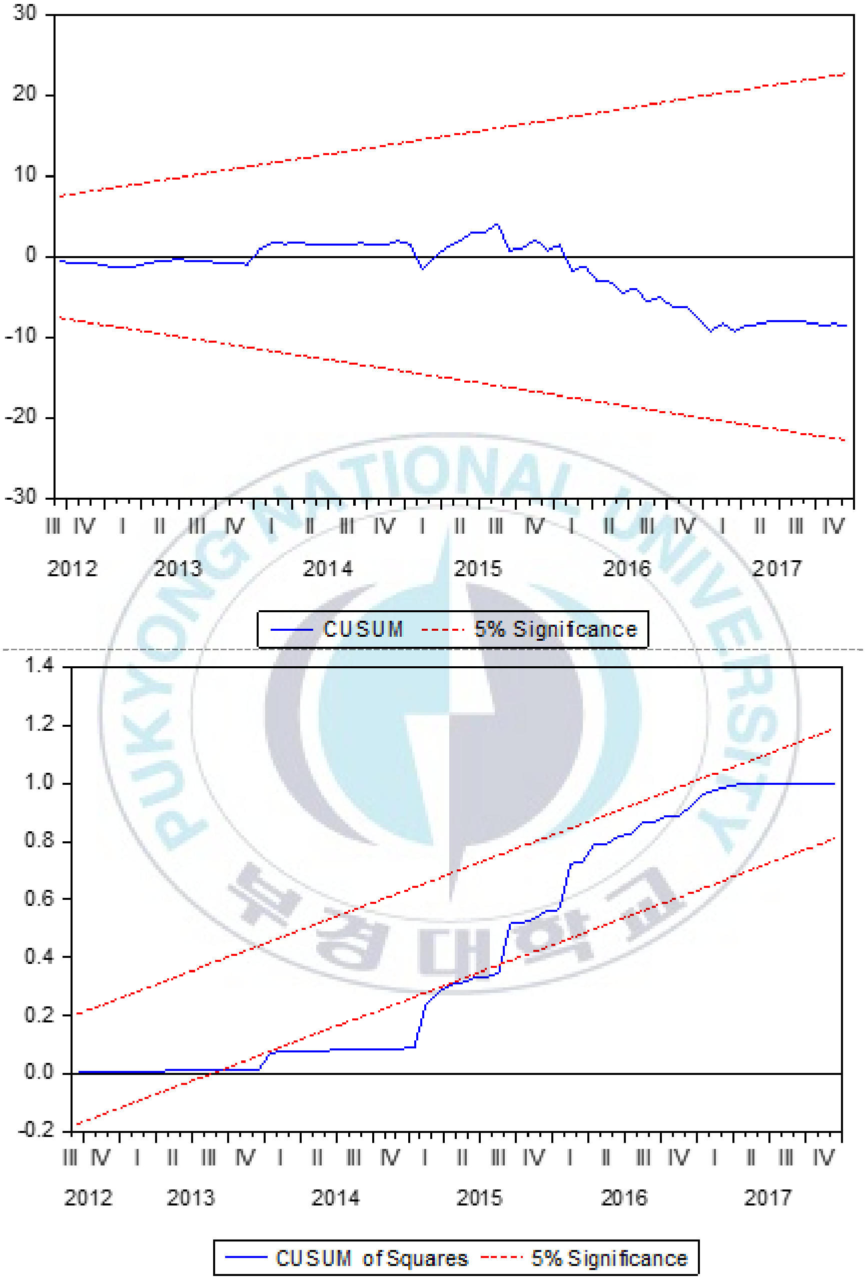
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

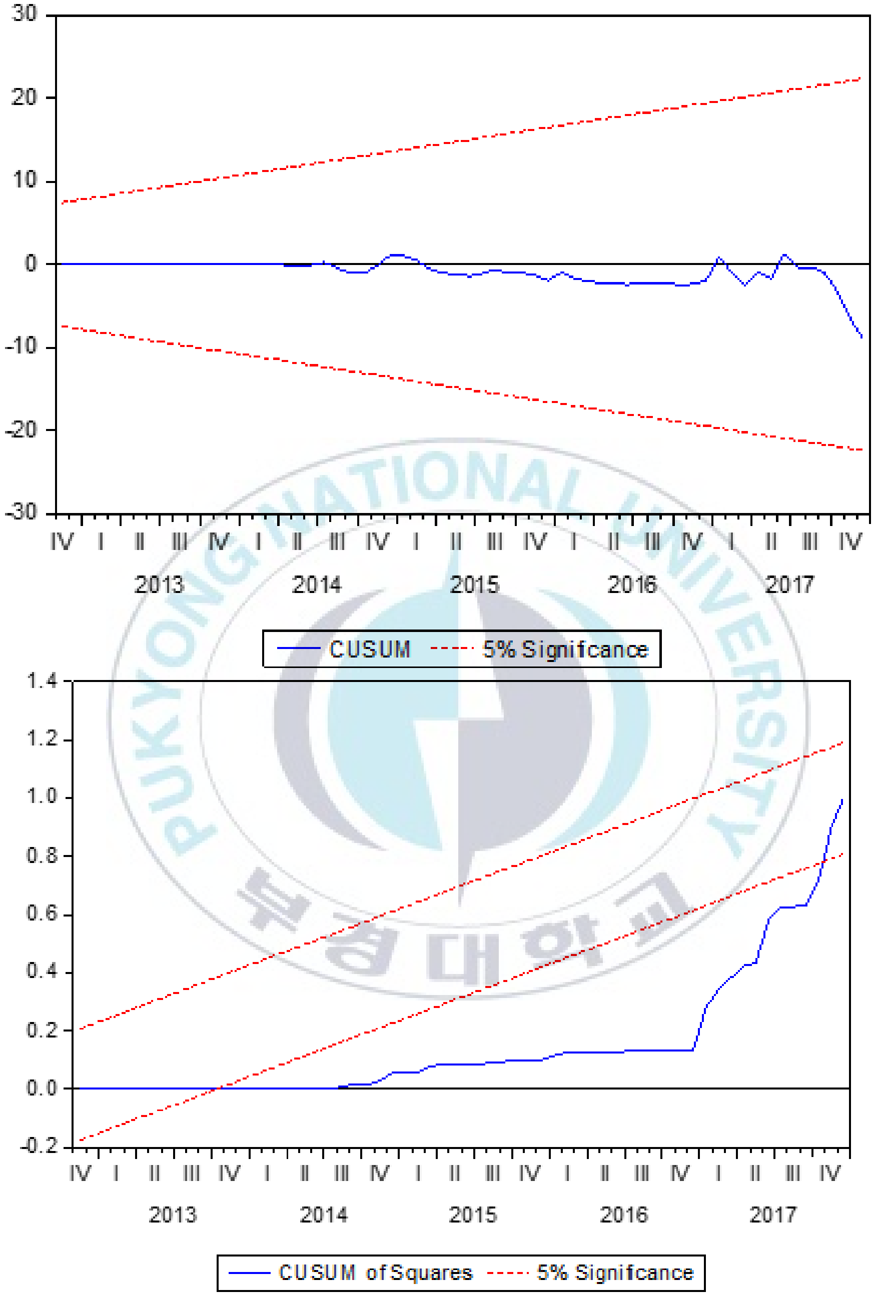



1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

## HS 70


30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Signifcance
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 71**



30
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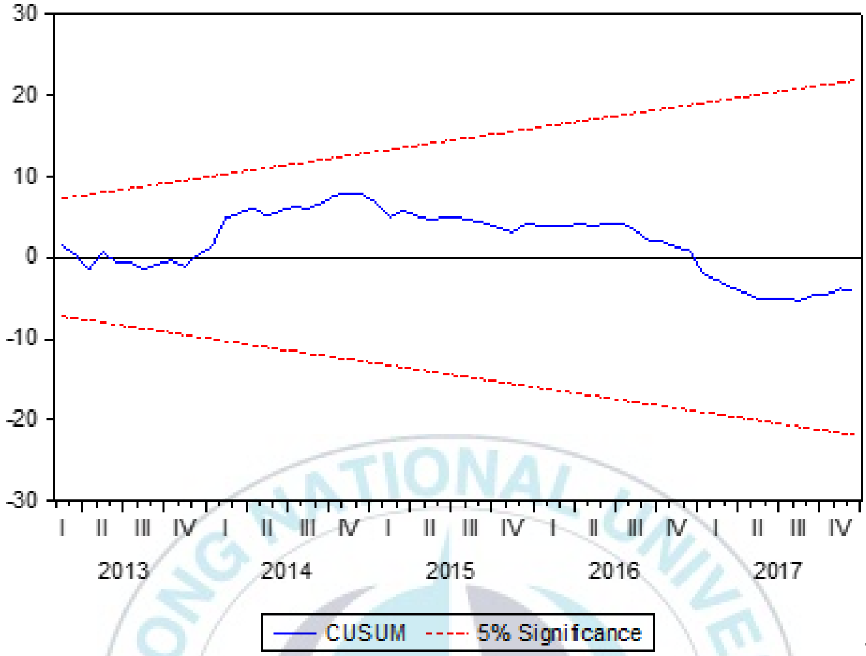
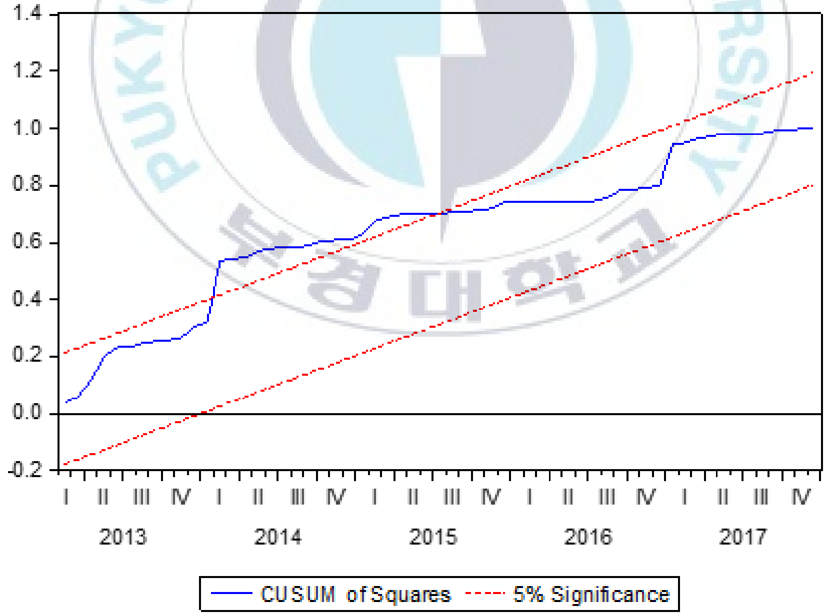
0
-10
-20
-30
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
IV I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Signifcance

**HS 72**

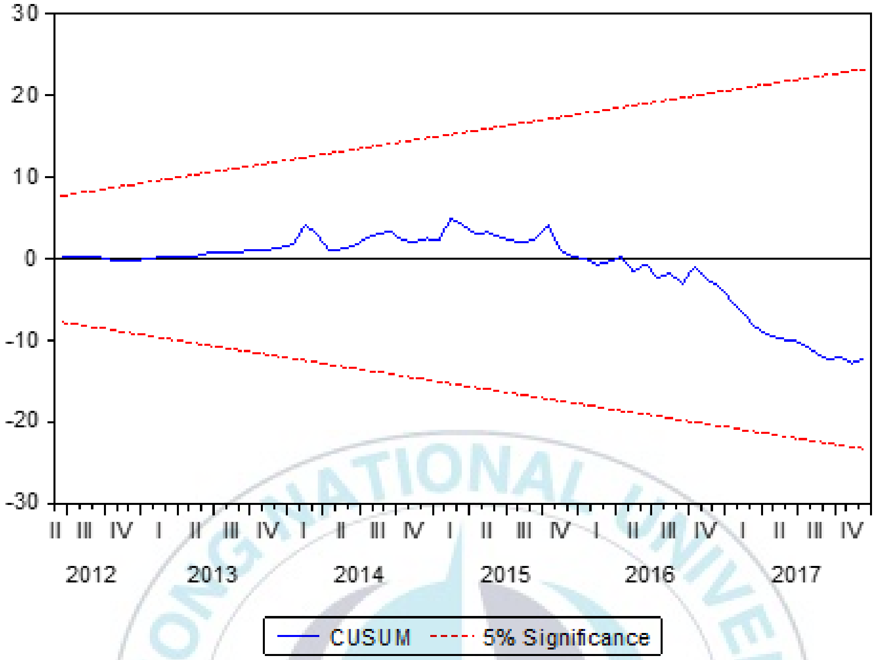


30
20
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM
5% Significance

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV
2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

**HS 73**



30
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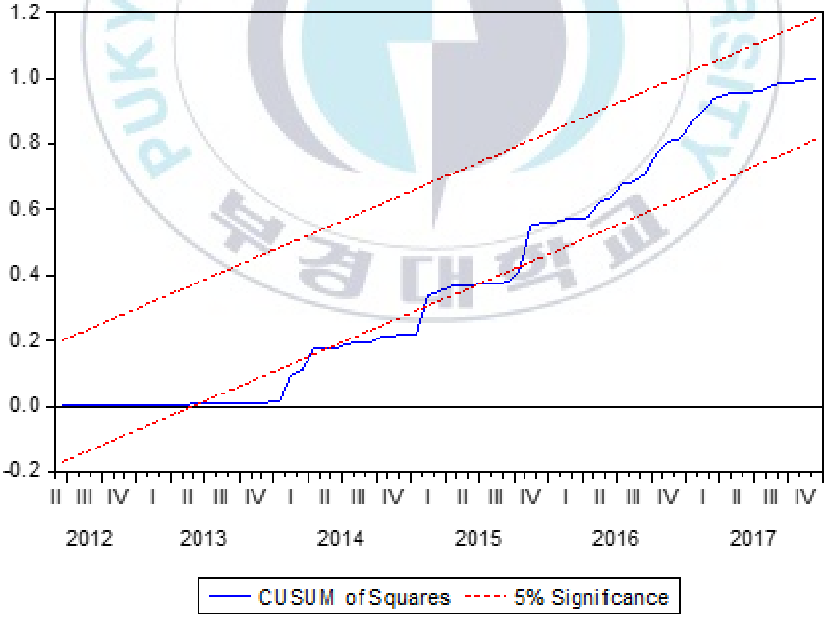
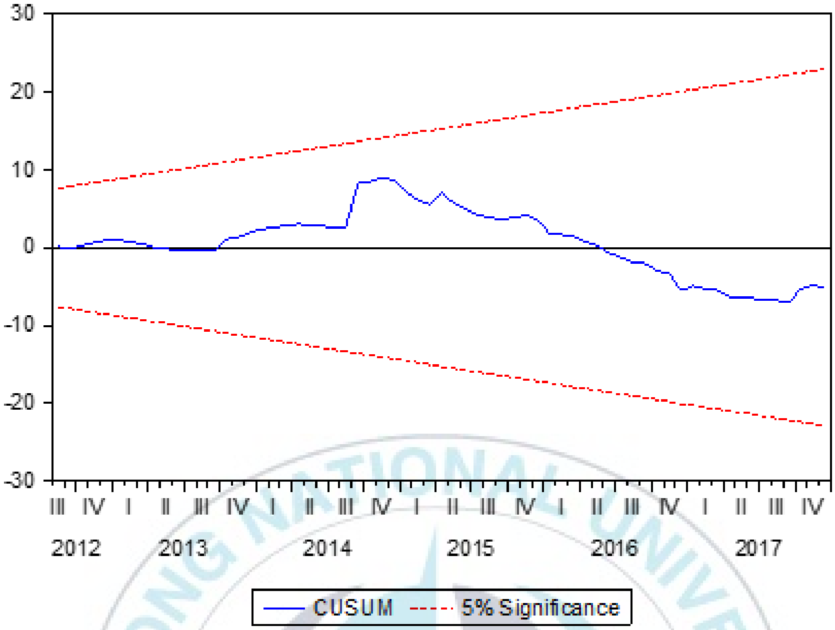
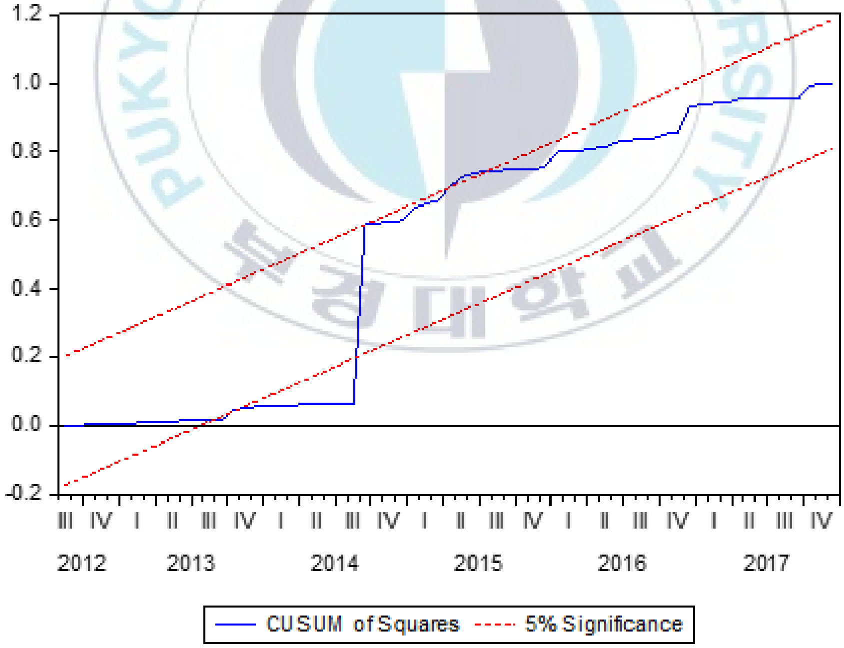
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM
5% Significance

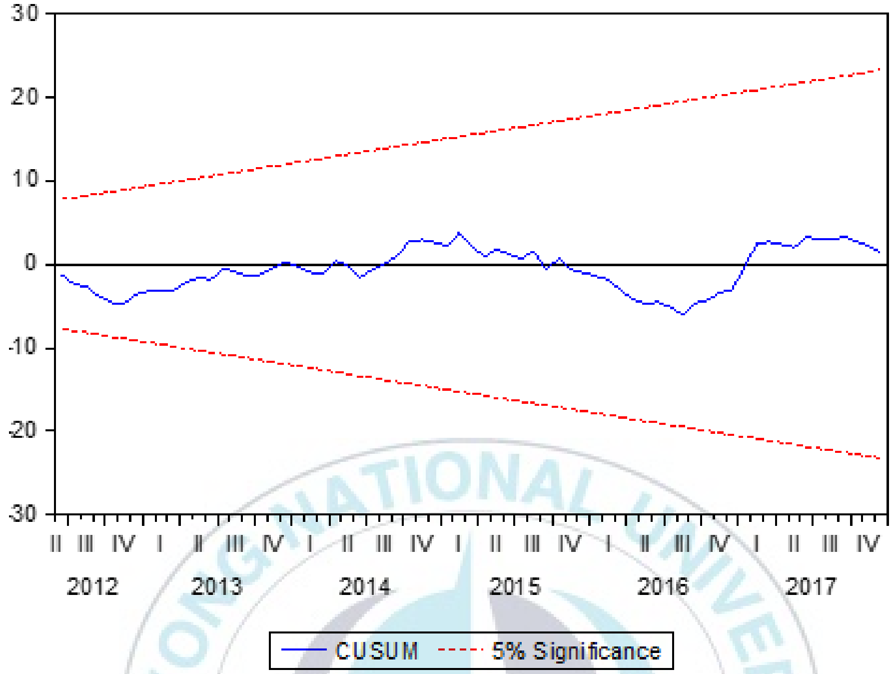
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM of Squares
5% Signifcance

**HS 78**

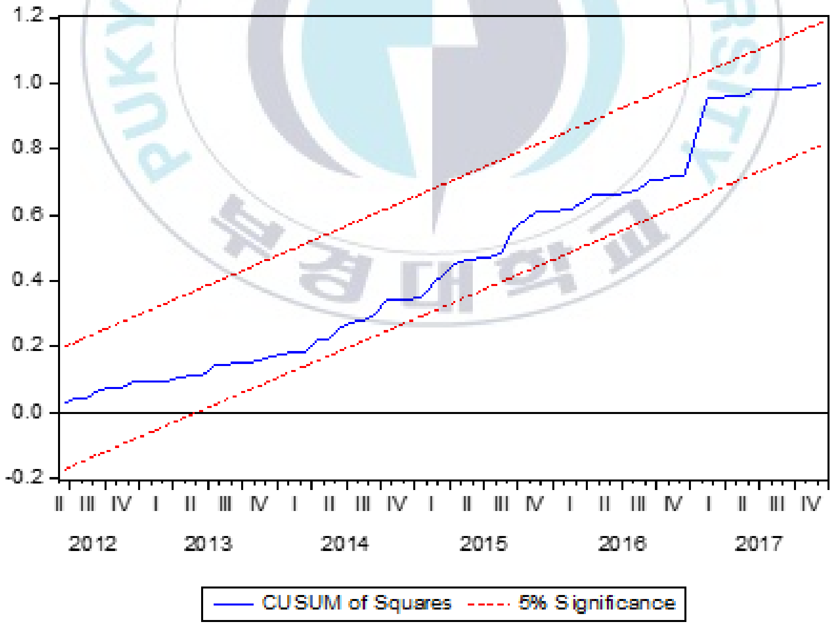

30
20
10
0
-10
-20
-30
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

HS 82

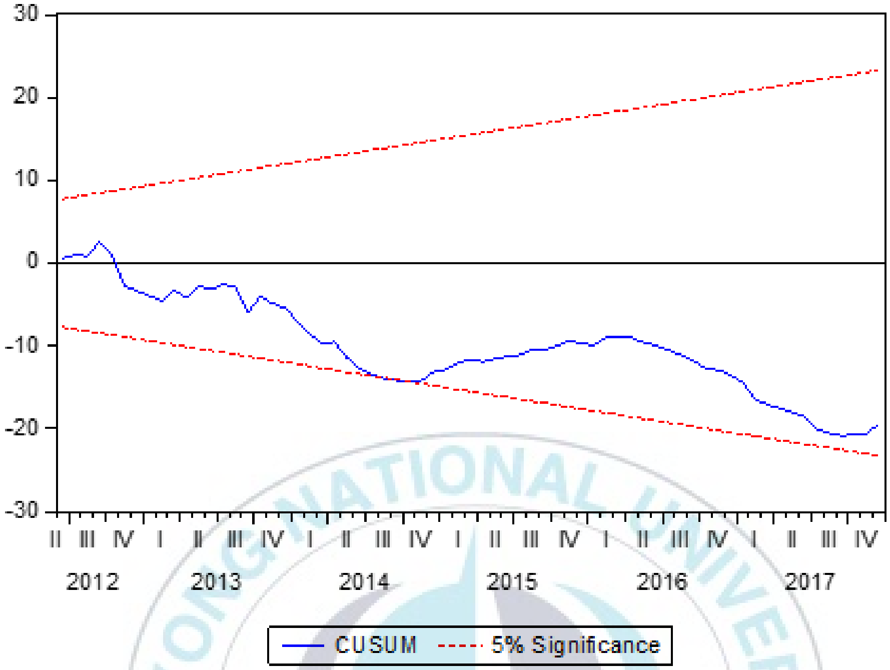


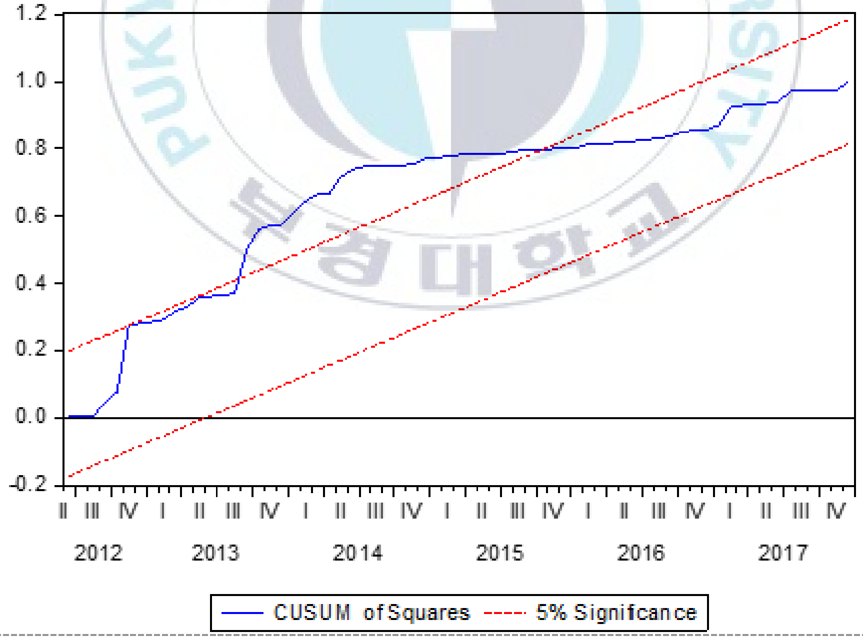
30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

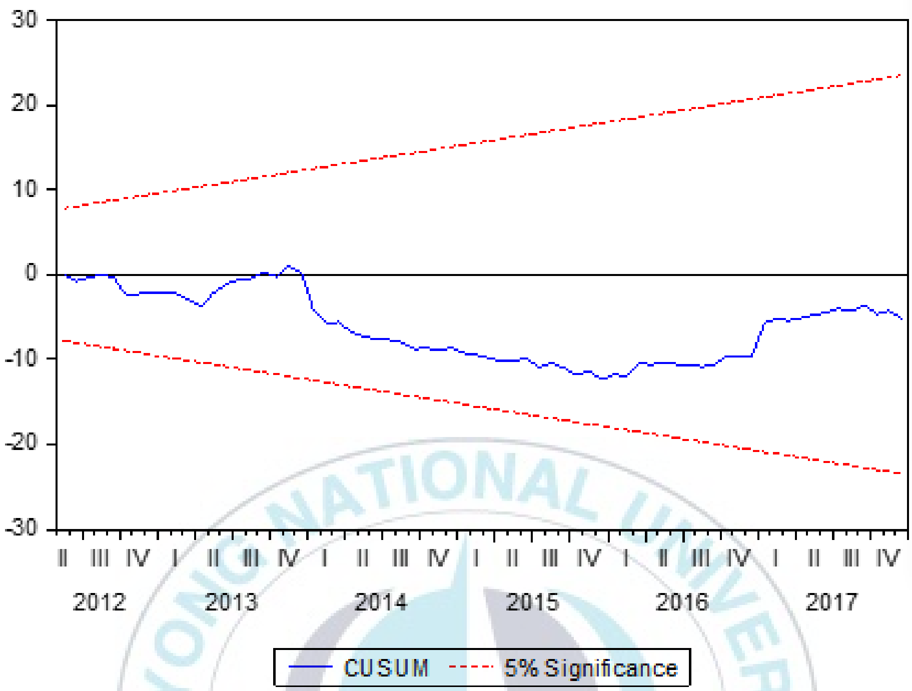
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

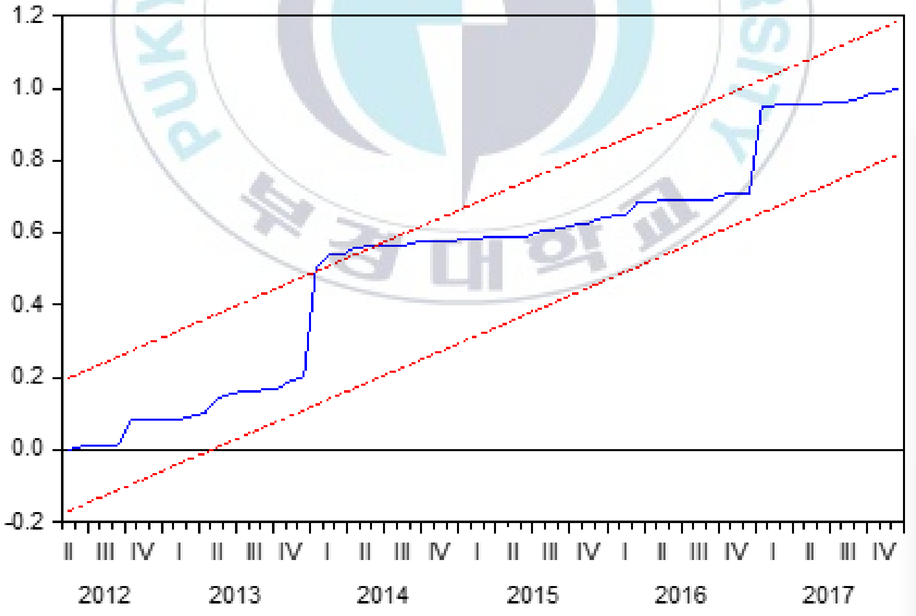
**HS 83**


30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM
5% Significance

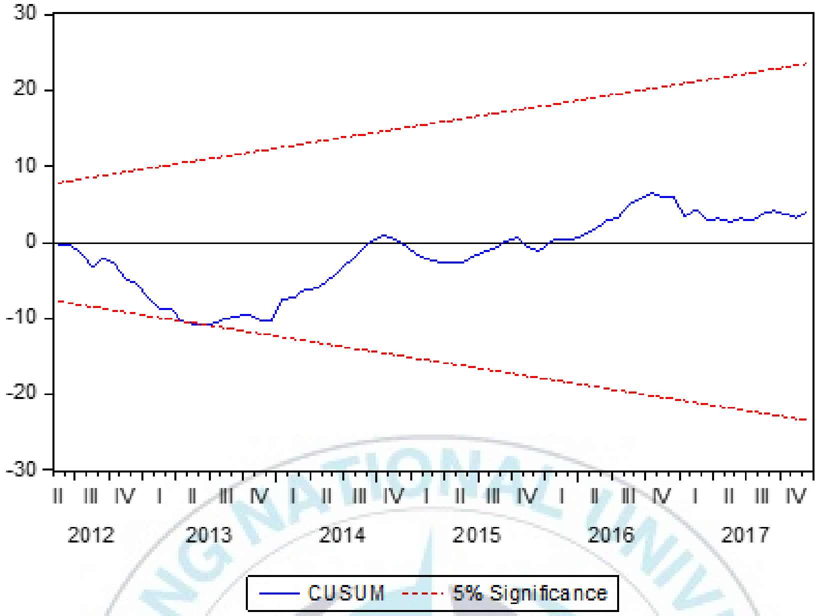

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM of Squares
5% Significance

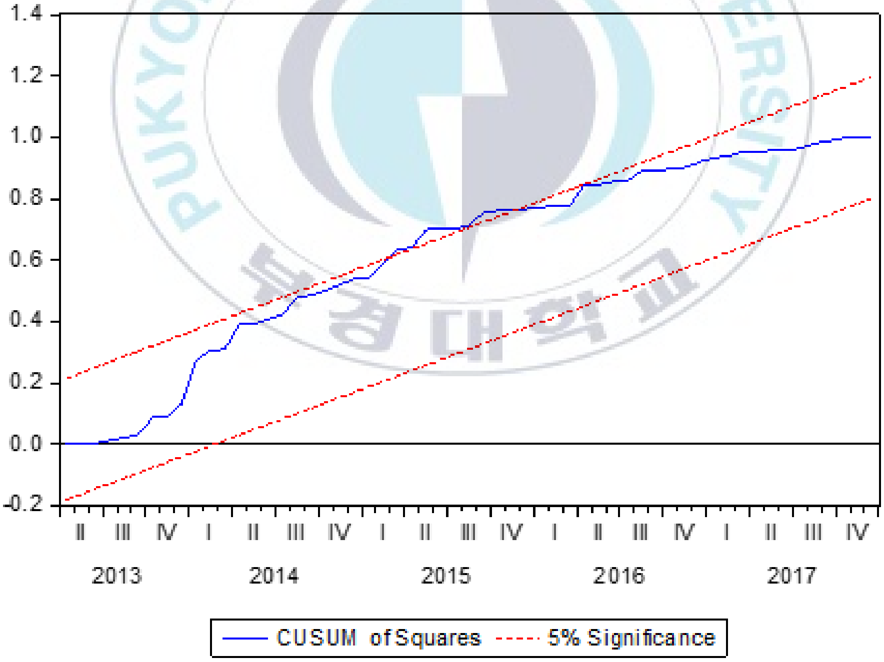
**HS 84**


30
20
10
0
-10
-20
-30
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017
CUSUM 5% Significance

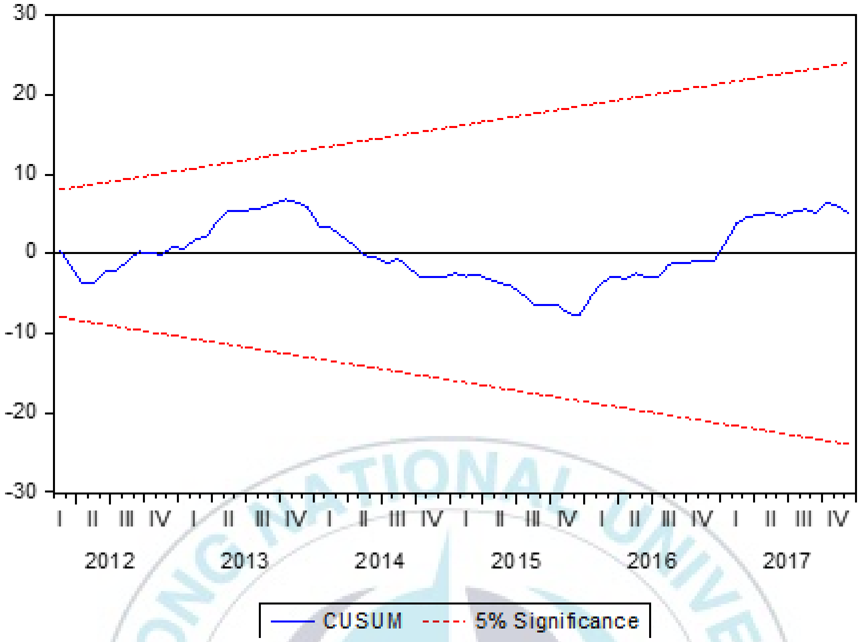

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012 2013 2014 2015 2016 2017

**HS 94**



**HS 95**



30
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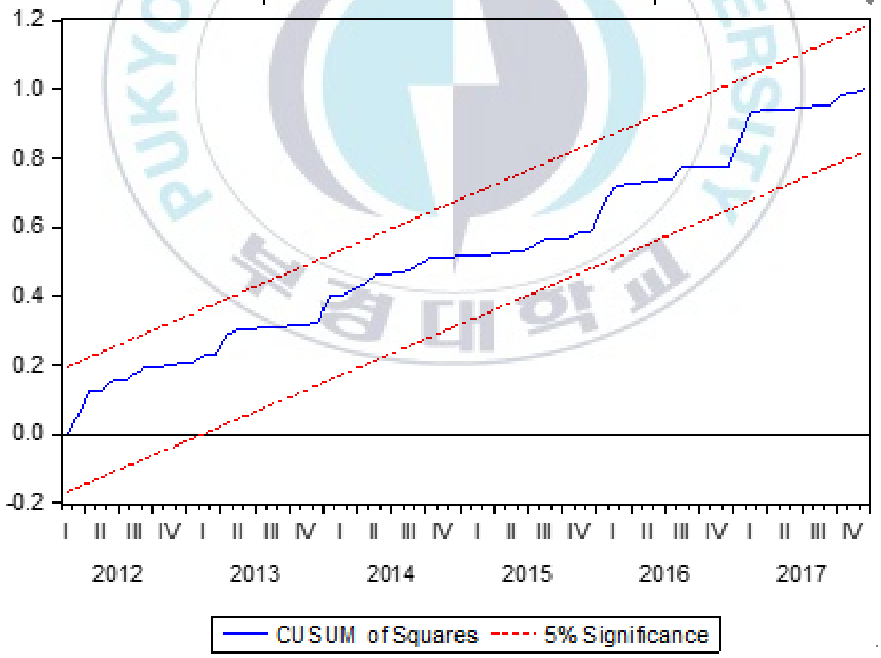
10
0
-10
-20
-30
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM
5% Significance

1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV
2012
2013
2014
2015
2016
2017
CUSUM of Squares
5% Significance

## 5.5 Conclusion

China is the greatest import market for Vietnam, but the empirical research papers on the ERPT into Vietnam's trading prices with China are relatively rare. This part conducts an industry level estimation between Vietnam and China, based on the assumption that the ERPT is asymmetric. Two contributions of this part are worth mentioning. Firstly, it is the first work estimating the asymmetric ERPT into import prices of Vietnam from China, at an industry level. Secondly, the non-linear ARDL model provides more direct and comparable results. To the best of our knowledge, our linear ARDL is also for the first time implemented in estimating the ERPT into import prices of Vietnam from China, at an industry level.

A main finding of the long-run asymmetric pass-though is that for 35 industries, once the VND appreciates against RMB, the import prices of these products from China to Vietnam will decline when the import prices will stay relatively stable when VND depreciates against RMB. In other words, for these industries, once RMB depreciates, the Chinese products will have more advantages in price in the Vietnam market. It may somehow deteriorate the trade imbalance between these countries. When RMB appreciates, Chinese exporters tend to adjust the profit-markup and stabilize the prices in Vietnam, in order to maintain the market share.

Another crucial finding is that in 22 industries, the import prices of Vietnam from China response more sensitively to the real depreciation than appreciation of VND. It indicates when VND depreciates against RMB, the import products of these industries will be more expensive, while the appreciation of VND could slightly or could not make these products cheaper in the Vietnam domestic market. Alternately, exporters may encounter quantity constraints or high adjustment cost

To summary, exporters of China adopt the asymmetric pricing strategy in Vietnam, based on our estimation results. Most of Vietnam's estimated industries are more sensitive to the appreciation of VND against RMB (or depreciation of RMB). Once RMB depreciates, the import prices of 36 industries in Vietnam will go down, which covers more than 60 per cent of Vietnam-China trade. It is beneficial for Chinese exporters to gain market share in Vietnam. However, it might have a negative impact on the Vietnamese domestic producers.

Our empirical results are important for policy implications. At the macro level point of view, the exchange rate policies are still important tools to adjust bilateral trading prices between Vietnam and China. The monetary policies are still crucial tools to adjust bilateral trade balance and prices.

At the medium level point of view, t exporters of China adopt the asymmetric pricing strategy in Vietnam, based on our estimation results. Most of Vietnam's estimated industries are more sensitive to the appreciation of VND against RMB (or depreciation of RMB). Once RMB depreciates, the import prices of 36 industries in Vietnam will go down, which covers more than 60 per cent of Vietnam-China trade. It is beneficial for Chinese exporters to gain market share in Vietnam. However, it might have a negative impact on the Vietnamese domestic producers. Vietnamese authorities should get prepared for the bilateral exchange rate fluctuation so as to avoid the risks, especially when RMB depreciates.

At the micro level point of view, considering the heterogenous ERPT across industries during VND deprecation and appreciation episodes, Vietnamese importers need to consider the impact of the exchange rate fluctuations on the prices of their industries. This research is beneficial for them to obtain appropriate pricing strategies.

# Chapter 6 Conclusion

## 6.1 Findings and Policy Implications

The major findings of chapter 3 are as follows.

Firstly, exchange rate plays a very limited role on Vietnam's trade balance. Depreciation of the VND will deteriorate the trade balance of high-skill labor-produced and medium-skill white-collar labor-produced goods. The underlying reason is that Vietnam does not have competitiveness in these two groups. The exports of these two groups depend heavily on the imported intermediate goods. Secondly, in recent years, Vietnam's exports to most of her main trading partners are moving up the labor skill ladder, which is proved by the increasing export shares of high-skill labor-produced and medium-skill white-collar labor-produced goods. The RCAs of these two groups vis-a`-vis most of her trading partners witness improving patterns, as well. Thirdly, our empirical findings support that optimizing the trade structure and improving the none-price competitiveness of high-skill labor-produced and medium-skill white-collar labor-produced goods are crucial to improve Vietnam's trade balance. Lastly, the other results of the gravity model also indicate that the relative GDP and the import weighted distance have negative impact on Vietnam's trade balance, whereas the relative income has a positive impact on Vietnam's trade balance.

Consequently, policy implications can be drawn based on our empirical findings. Firstly, Vietnam should be very cautious to implement the exchange rate policy to adjust the trade balance. Secondly, concentrating on medium-skill blue-collar labor-produced and low-skill labor-produced goods is not a sustainable developing plan for Vietnam's trade. Thirdly, the alternative policy proposal for promoting Vietnam's trade balance can be moving up the labor skill ladder. Fourthly, promoting the none-price competitiveness of high-skill labor-produced and medium-skill white-collar labor-produced goods can be also beneficial for Vietnam's trade balance, rather than boosting the competitiveness of medium-skill blue-collar labor-produced and low-skill labor-produced goods. Fifthly, the capacity of producing imported substitutions of high-skill labor-produced commodities and medium-skill white-collar labor-produced commodities should be enhanced. Lastly, the coefficient of relative GDP suggests that Vietnam should enhance her own production capacity. The negative impact of import weighted distance indicates that Vietnam should pay more efforts on upgrading her logistics system to reduce transportation cost. The result of relative GNI per capita states that Vietnam's trade balance improves between countries with different income levels. As a result, Vietnam should diversify her trading markets with higher income countries to felicitate her trade balance.

The finding of chapter 4 are as follows.

Based on the results of the weighted GL index, the degree of intra-industry trade between Vietnam and China is increasing, from 2001 to 2016. The vertical intra-industry trade accounts for more than 80 percent of the intra-industry trade between Vietnam and China. However, the percentage of high quality vertical intra-industry trade is still quite low between in Vietnam-China trade. In general, the goods quality Vietnam export to China is lower than the goods quality China export to Vietnam, according to the Kernel density estimations.

According to the results of the estimated equations, firstly we find out that the deepening of intra-industry trade between Vietnam and China weakens the impact of exchange rate on Vietnam’s import prices from China. Secondly, the goods quality plays a significant role on the ERPT in Vietnam’s import prices from China. More specially, the lower quality commodities of Vietnam in relative to China have higher ERPT effects into the import prices than the higher quality commodities. Thirdly, we cannot detect any impact of the horizontal intra-industry trade on the ERPT.

Based on our findings, the policy implications are proposed as follows. At the macro level, exchange rate policy is still a crucial tool to adjust Vietnam's import prices from China. However, the deepening of intra-industry trade between the two countries might make the exchange rate policy less effective. The heterogenous ERPT based on quality also suggests that implementing the exchange rate policy alone might lead to the deterioration of the trade imbalance of some industries.

Therefore, more specific polices should be considered. For example, improving the goods quality can be one practical tool. Especially, we detect that Vietnam's commodities are with lower quality in the industries of hides and skins, textiles and clothing, footwear, stones and glass, metals, machinery and electronics, and transportation equipment, compared to China. As a result, Vietnam should strive to accelerate product upgrades and improve product quality of these industries, to promote the positions of enterprises in international trade and strengthen the pricing power in the Chinese market.

Lastly, from the perspective of import enterprises of Vietnam, our work is vital to show them their positions in the Vietnam-China trade, regarding to the products quality, as well as how much degree exchange rate will affect their trading prices. This information can be instructive for the Vietnamese trading enterprises to make appropriate pricing strategies, when trading with Chinese companies.

The findings of chapter 5 are as follows.

Firstly, the long-run non-linear pass-though is that for 35 industries, once the VND appreciates against RMB, the import prices of these products from China to Vietnam will decline when the import prices will stay relatively stable when VND depreciates against RMB. In other words, for these industries, once RMB depreciates, the Chinese products will have more advantages in price in the Vietnam market. It may somehow deteriorate the trade imbalance between these countries. When RMB appreciates, Chinese exporters tend to adjust the profit-markup and stabilize the prices in Vietnam, in order to maintain the market share.

Secondly, another crucial finding is that in 22 industries, the import prices of Vietnam from China response more sensitively to the real depreciation than appreciation of VND. It indicates when VND depreciates against RMB, the import products of these industries will be more expensive, while the appreciation of VND could slightly or could not make these products cheaper in the Vietnam domestic market. Alternately, exporters may encounter quantity constraints or high adjustment cost

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Our empirical results are important for policy implications. At the macro level point of view, the exchange rate policies are still crucial tools to adjust bilateral trading prices between Vietnam and China. The monetary policies are still crucial tools to adjust bilateral trade balance and prices.

At the medium level point of view, exporters of China adopt the asymmetric pricing strategy in Vietnam, based on our estimation results. Most of Vietnam's estimated industries are more sensitive to the appreciation of VND against RMB (or depreciation of RMB). Once RMB depreciates, the import prices of 36 industries in Vietnam will go down, which covers more than 60 per cent of Vietnam-China trade. It is beneficial for Chinese exporters to gain market share in Vietnam. However, it might have a negative impact on the Vietnamese domestic producers. Vietnamese authorities should get prepared for the bilateral exchange rate fluctuation so as to avoid the risks, especially when RMB depreciates.

At the micro level point of view, considering the heterogenous ERPT across industries during VND deprecation and appreciation episodes, Vietnamese importers need to consider the impact of the exchange rate fluctuations on the prices of their industries. This research is beneficial for them to obtain appropriate pricing strategies.

## 6.2 Limitations and Further Research

Regarding the limitations of each chapter, in chapter 3, we only include the top 20 trade partners of Vietnam, the sample data might be relatively small. Furthermore, according to the previous research, the reaction of trading prices to the movement of exchange rate potentially determines the role of exchange rate on adjusting the trade balance. In other words, it seems more crucial to test the ERPT in to trading prices between Vietnam and her main trading partners. This motivates us to move to chapter 4.

In chapter 4, we only explore the import prices of Vietnam from China at a macro level, by ignoring the heterogeneities between industries. To fill in this gap, we move on to chapter 5. In chapter 5, we conduct an industry level analysis. However, we do not calculate the weighted exchange rate for each industry, which may slightly reduce the accuracy of our estimation results.

Therefore, the future direction of this study can be as follows. Firstly, the trading prices between Vietnam and her main trading partners can be explored. Secondly, the trading prices of Vietnam and her main trading partners can be explored at a more disaggregated level, for example 4-digit HS and 6-digit HS level. Thirdly, for more precise results, the weighted exchange rate for each industry can be calculated.

# References

Auer R A., Chaney, T. and Sauré P. (2018) "Quality Pricing-to-Market.", *Journal of International Economics*. Vol. 110, pp. 87-102.

Abd-el-Rahman, K. (1991). "Firms' competitive and national comparative advantages as joint determinants of trade composition." , *Review of World Economics*. Vol.127. No. 1, pp.83-97.

Adolfson, M. (2001). "Export Price Responses to Exogenous Exchange Rate Movements.", *Economics Letters.* Vol.71, No. 1, pp.91–96.

Anderson, J. E. and Wincoop, E. V. (2003) "Gravity with Gravitas: A Solution to the Border Puzzle?" *American Economic Review*. Vol. 93, No. 1, pp. 170-192.

Antoniades, A and Zaniboni, N. (2016) "Exchange rate pass‐through into retail prices.", *International Economic Review.* Vol. 57, No. 4, pp. 1425-1447.

Aron, J., Farrell, G., Muellbauer, J., and Sinclair, P. (2014) "Exchange Rate Pass-through to Import Prices, and Monetary Policy in South Africa.", *Journal of Development Studies.* Vol. 50, No. 1, pp. 144–64.

Athukorala, P. and Menon, J. (1994). "Pricing to market behaviour and exchange rate pass-through in Japanese exports.", *The Economic Journal*. Vol. 104, No. 423, pp. 271-281.

Aturupane, C., Djankov, S and Hoekman, B. (1999) “Horizontal and vertical intra-industry trade between Eastern Europe and the European Union.”, *Weltwirtschaftliches Archiv*, Vol.135, No.1, pp. 62-81.

Auer, R. and Chaney, T. (2009) “Exchange Rate Pass-through in a Competitive Model of Pricing-to-market.”, *Journal of Money, Credit and Banking*. Vol. 41, pp. 151-175.

Azhar, A. K. and Elliott, R. J. (2008) “On the measurement of changes in product quality in marginal intra-industry trade.”, *Review of World Economics*. Vol. 144, No. 2, pp. 225-247.

Bacchetta, P. and Van, W. E. (2005) “A theory of the currency denomination of international trade.”, *Journal of international Economics*. Vol. 67, No.2, pp. 295-319.

Bahmani-Oskooee, M. (1991) “Is there a long-run relation between the trade balance and the real effective exchange rate of LDCs?”, *Economics Letters*. Vol. 36, No. 4, pp. 403–407.

Bahmani-Oskooee, M. (2001) “Nominal and Real Effective Exchange Rates of Middle Eastern Countries and their Trade Performance”, *Applied Economics*. Vol. 33, No. 1, pp. 103-111.

Bahmani-Oskooee, M. and Ratha, A. (2007) “The bilateral J-curve: Sweden Versus her 17 Major trading partners.”, *International Journal of Applied Economics*. Vol, 4. No. 1, pp. 1-13.

Bahmani-Oskooee, M. and Cheema, J. (2009) “Short-Run and Long-Run Effects of Currency Depreciation on the Bilateral Trade Balance Between Pakistan and Her Major Trading Partners.”, *Journal of Economic Development*. Vol. 34, No. 1, pp. 19-45.

Bahmani-Oskooee, M. and Bahmani, S. (2015) “Nonlinear ARDL approach and the demand for money in Iran.”, *Economics Bulletin*, Vol. 35, No. 1, pp. 381-391.

Balassa, B. (1965) “Trade liberalization and ‘revealed’ comparative advantage.”, *The Manchester School*. Vol.33, No. 2, pp. 92–123.

Bernini, M. and Tomasi, C. (2015) “Exchange rate pass-through and product heterogeneity: does quality matter on the import side?”, *European Economic Review*, Vol. 77, pp. 117-138.

Bhat, T. P., Paul, M. and Guha, A. (2008) “India and China: trade complementarities and competitiveness.” Institute for Studies in Industrial Development.

Branson, W. H. (1972). “The trade effects of the 1971 currency realignments.”, Brookings Papers on Economic Activity, Vol. 1, pp. 15-69.

Boughton, J. M. (2003). “On the origins of the Fleming-Mundell model.”, IMF Staff Papers, Vol. 50, No. 1, pp. 1-9.

Bugamelli, M. and Tedeschi, R. (2008) “Pricing-to-market and market structure.", *Oxford Bulletin of Economics and Statistics*, Vol. 70, No. 2, pp. 155-180.

Chen, N. and Juvenal, L. (2016) "Quality, trade, and exchange rate pass-through.", *Journal of International Economics*, Vol. 100, pp. 61-80.

Cheung, Y. W. and Sengupta, R. (2013), "Impact of Exchange Rate Movements on Exports: An Analysis of Indian Nonfinancial Sector Firms.", *Stronicsrn Electronic Journal*. Vol. 39, No. 4, pp. 231–245.

Choi, Y. J. (2013) "The Estimation of Exchange Rate Pass-through on Korean Export Price Using Panel.", *Journal of International Trade and Commerce.* Vol. 3, pp. 05–29.

Cimoli, M., Fleitas S. and Porcile, G. (2013) "Technological intensity of the export structure and the real exchange rate." *Economics of Innovation and New Technology*. Vol. 22, No. 4, pp. 353–372.

Delatte, A. L. and López-Villavicencio, A. (2012) "Asymmetric exchange rate pass-through: Evidence from major countries.", *Journal of Macroeconomics*, Vol. 34, No. 3, pp. 833-844.

Dettmer, B., Erixon F., Freytag, A. and Legault Tremblay, P. O. (2009) "The dynamics of structural change: the European Union's trade with China" (No. 2009, 053). Jena economic research papers.

Dornbush, R. (1987) "Exchange rate and prices.", *The American Economic Review*. Vol. 77, pp. 93-106.

Dwyer, J. and Lam, R. (1994), "Explaining Import Price Inflation: A Recent History of Second Stage Pass-Through", Research Discussion Paper 9407, Reserve Bank of Australia.

Feinberg R. M. (1989) "The Effects of Foreign Exchange Movements on U.S. Domestic Prices". *Review of Economics & Statistics*, Vol. 71, No. 3, pp. 505-511.

Flam, H. and Helpman, E. (1987) "Vertical product differentiation and North-South trade.", *The American Economic Review*, Vol. 77, Issue 5, pp. 810-822.

Ghosh, A. and Rajan, R. S. (2007) "A Survey of Exchange Rate Pass-Through in Asia: What Does the Literature Tell Us?" *Asia Pacific Economic Literature,* Vol. 21, Issue 2, pp. 13-28.

Gil-Pareja, S. (2003) "Pricing to market behaviour in European car markets.", *European Economic Review*. Vol. 47, No. 6, pp. 945-962.

Gaulier, G., Lahrèche - Révil, A. and Méjean, I. (2008) "Exchange rate pass-through at the product level.", *Canadian Journal of Economics/Revue canadienne d'économique*, Vol. 41, No. 2, pp. 425-449.

Greenaway, D., Hine, R. and Milner, C. (1995) "Vertical and horizontal intra-industry trade: a cross industry analysis for the United Kingdom.", *The Economic Journal*, Vol. 105, No. 433, pp. 1505-1518.

Greenaway, D., Hine, R. and Milner, C. (1994) "Country-specific factors and the pattern of horizontal and vertical intra-industry trade in the UK." *Weltwirtschaftliches archive*. Vol. 130, No. 1, pp. 77-100.

Grubel, H. G. and Lloyd, P. J. (1971) "The empirical measurement of intra‑industry trade.", *Economic record*, Vol. 47, No. 4, pp. 494-517.

Han, J. and Shen, Y. (2016) "Exchange Rate Pass-through to China's Export Price: A Product-level Investigation. China & World Economy", Vol. 24 No. 2, pp. 48-67.

Hang, N. T. T. and Thanh, N. D. (2010) "Macroeconomic determinants of Vietnam Inflation 2000-2010: Evidence and analysis.", Vietnam Centre for Economic and Policy Research, Vietnam National University, Hanoi, Vietnam.

Hoang, K. V. (2013) "The effects of the real exchange rate on the trade balance: Is there a J-curve for Vietnam? A VAR approach.", *Asian Journal of Empirical Research*, Vol. 3, No. 1, pp. 1020–1034.

Hoang, L. H. (2016) "The role of exchange rate in supporting trade balance in Vietnam?", Graduate Institute of International and Development Studies Working Paper No. 16-2016.

Hong, P. and Zhang., F. (2016) "Exchange Rate Pass-Through into China's Import Prices: An Empirical Analysis Based on ARDL Model.", *Open Journal of Social Sciences.* Vol. 04, No. 04, pp. 13–22.

Hong, S. G. and Park, W. S. (2017) "An Empirical Study on the Pricing

Behavior of Korean Exports by Destinations.", *Journal of Korean Economic Studies.* No. 35, Vol. 2, pp. 5–40.

Hooy, C. W., Baharumshah, A. Z. and Brooks, R. D. (2016) "The Effect of Exchange Rate Volatility on the Nexus of Technology Sophistication and Trade Fragmentation of ASEAN5 Exports to China." *Journal of Asia-Pacific Business*, Vol. 17, No. 3, pp. 206–228.

Hooy, C. W., Siong, H. L. and Haw, C. T. (2015) "The impact of the Renminbi real exchange rate on ASEAN disaggregated exports to China", *Economic Modelling*, Vol. 47, pp. 253–259.

Lee. J. H. (2014) "Exchange Rate Pass-Through into Export and Import Prices: Bounds Testing Analysis of the Case of Korea." *Japan of International Trade and Commerce*. Vol. 10, No. 2, pp. 97–219.

Jammazi, R., Lahiani A. and Nguyen, D. K. (2014) "A Wavelet-Based Nonlinear ARDL Model for Assessing the Exchange Rate Pass-Through to Crude Oil Prices.", *Journal of International Financial Markets Institutions & Money*, Vol. 34, pp. 173-187.

Karoro, T. D., Aziakpono, M. J. and Cattaneo, N. (2009) "Exchange rate pass‐through to import prices in South Africa: is there asymmetry?" *South African Journal of Economics*, Vol. 77, No. 3, pp. 380-398.

Khan, M. Z. S. and Hossain, M. I. (2010) "A Model of Bilateral Trade Balance: Extensions and Empirical Tests?" *Economic Analysis and*

*Policy*, Vol. 40, No. 3, pp. 377-391.

Kim, W. J. (2007) “Exchange Rate Pass-through on Disaggregated Korean Export Prices : A Structural VAR Approach.”, *The Journal of the Korean Economy.* Vol. 8, No. 2, pp. 357–76.

Knetter, M. M. (1994) “Is Export Price Adjustment Asymmetric? Evaluating the Market Share and Marketing Bottlenecks Hypotheses.”, *Journal of International Money and Finance.* Vol. 13, No. 1, pp. 55–70.

Knetter, M. M. (1989) “Price Discrimination by US and German Exporters.” *American Economic Review*. Vol. 79, No. 1, pp. 198–210.

Kowalski, P. and Dihe, N. (2009) “India’s trade integration, Realizing the potential”, OECD Trade Policy Working Paper No. 88.

Krugman, P. (1991) “Increasing returns and economic geography”, *Journal of Political Economy*, Vol. 99, No. 3, pp. 483-499.

Krugman, Paul R. 1986. “Pricing to Market When the Exchange Rate Changes.” NBER Working Paper Series No.1926, National Bureau of Economic Research.

Kundu, N. (2015) “Bilateral Trade Balance of Bangladesh with BRICS Countries: A Static Panel Data Analysis.”, *Journal of Economics and Development*, Vol. 17, No. 2, pp. 53-68.

Le, T. D. and Ishida, M. (2016) “The Effects of Exchange Rate on Trade Balance in Vietnam: Evidence from Cointegration Analysis.”, *Regional* *economic research*, Vol. 29, pp. 63-71

Lutz, M.G. and Reilly, B. (1997), "Incomplete Exchange Rate Pass-Through in the European Car Market: Evidence from Hedonic Price Regressions", Discussion Paper 9715, Department of Economics, University of St. Gallen

Mann, C. L. (1986) " Prices, profit margins, and exchange rates.", *Fed. Res. Bull.* Vol. 72, pp. 366.

Marston, R. C. (1990) "Pricing to Market in Japanese Manufacturing.", *Journal of International Economics.* Vol. 29, No. (3–4), pp. 217–36.

Menon, J. (1996) "Exchange Rates and Prices: The Case of Australian Manufactured Imports", Lecture Notes in Economics and Management Systems, 433, Berlin: Springer.

Menon, J. (1993) "Exchange rate pass-through: Australian imports of motor vehicles.", *International Economic Journal*, Vol. 7, No. 3, pp. 93-109.

Minh, V. V. (2009) "Exchange Rate Pass-Through and Its Implications for Inflation in Vietnam.", Vietnam Development Forum, Hanoi, Vietnam.

Moon,C. K. (2015) "Differentiation Value and Exchange Rate Pass-through to Export Prices." *Journal of International Trade and Commerce*. Vol. 11, No. 5, pp. 339–56.

Musila, J. W. and Newark, J. (2003) "Does Currency Devaluation Improve the Trade Balance in the Long run? Evidence from Malawi.", *African*

*Development Review*, Vol. 15, No. 2, pp. 339-352.

My, N. Q., Sayim, M. and Rahman, H. (2017) "The Impact of Exchange Rate on Market Fundamentals: A Case Study of J-curve Effect in Vietnam" *The Research in Applied Economics*, Vol. 9, No. 1, pp. 45-68.

Narayan, P.K. (2004) "New Zealand's trade balance: evidence of the J-curve and Granger causality.", *Applied Economics Letters.* Vol. 11, No. 6, pp. 351–354.

Nguyen, C. N. and Tran T. T. H. (2017) "Exchange Rate Pass-Through into Vietnamese Import Prices by Industries and by Countries", *International Business Management*, Vol. 11, pp.1834-1843.

Nguyen, H. A. (2015) "Exchange Rate Management in Vietnam for Sustaining Stable and Long-Term Economic Growth.", *Review of Business and Economics Studies*, Vol. 3, No. 2, pp. 58–66.

Nhung, N. C. (2014) "Exchange Rate Pass-Through into Import Prices in Vietnam.", *Journal of Development Integration*. Vol. 7, pp. 7-13.

Ohn, K. (2016) "Export Price Strategy of Japanese Firms in Response to Fluctuations in Yen Exchange Rate.", *Japan and the World Economy.* Vol. 12, No. 5, pp. 227–47.

Ohn, K. U. (2014) "Comparison of Exchange Rate Pass-through Rates among Major Countries." *Journal of International Trade and Commerce.* Vol. 10 No. 2, pp. 501–29.

Peneder, Michael. (1999) “Intangible Investment and Human Resources. The New WIFO Taxonomy of Manufacturing Industries”, WIFO Working Papers No. 114, Österreichisches Institut für Wirtschaftsforschung.

Phan, T. H. and Jeong, J. Y. (2015) “Vietnam Trade Balance and Exchange Rate: Evidence from Panel Data Analysis.”, *Journal of Applied Economics & Business Research*, Vol. 5, No. 4, pp. 220-232.

Coughlin, C. C. and Pollard, P. S. (2004) “Size matters: asymmetric exchange rate pass-through at the industry level,” Working Papers 2003-029, Federal Reserve Bank of St. Louis.

Rode S. (2012) Advanced Macroeconomics, Bookboon.

Rose, A.K. and Yellen, J. L. (1989) “Is there a J-curve?” *Journal of Monetary Economics*, Vol. 24, No. 1, pp. 53–68.

Sasaki, Y. N. (2002) “Pricing-to-Market Behavior: Japanese Exports to the US, Asia, and the EU.”, *Review of International Economics.* Vol. 10, No. 1, pp. 140–150.

Shin, Y., Yu, B. and Greenwood-Nimmo, M. (2014) Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In Festschrift in honor of Peter Schmidt (pp. 281-314). Springer, New York, NY.

Singh, T. (2002) “India's trade balance: the role of income and exchange rates.” *Journal of Policy Modeling*, Vol. 24, No. 5, pp. 437–452.

Stiglitz, J. E. (1987) “The Causes and Consequences of the Dependence of Quality on Price.” *Journal of Economic Literature*, Vol. 25, No. 1 (Mar., 1987), pp. 1-48.

Thapa, N. B. (2002) “An Econometric Analysis of the Impact of Real Effective Exchange Rate of Economic Activities in Nepal?”, *Economic Review: Occasional Paper*, Vol. 14, pp. 17-36.

Tho, T. N. and Trang, N. T. N. (2016) “Exchange Rate Pass-Through in Vietnam under the Impact of Inflationary environment.” *Journal of Economic Development*, Vol. 23, pp. 89-109.

Trang. N. T. N and Cuong V. L. (2012) “Exchange Rate Pass-Through into Import Prices in Vietnam”, J*ournal of Development Integration*, Vol. 7, pp. 7-13.

Trinh, P. T. T. (2014) “The impact of exchange rate fluctuation on trade balance in the short and long run: the case of Vietnam.” *Journal of Southeast Asian Economies*, Vol. 31, No. 3, pp. 432-452.

Vo, T. A. and Vo. H. D. (2015) “Trade Balance and Exchange Rate in Thailand & the Implications for Vietnam? An Application using Instrumental Variable and the Heterogeneous Panel Co-Integration Methods”, *Journal of Economic Development*. Vol. 23, No. 1, pp. 137–160.

Wickremasinghe, G. and Silvapulle, P. (2004) “Exchange rate pass-through to manufactured import prices: The case of Japan.", *International Trade*" 406006, University Library of Munich, Germany.

Yi, S. (2004) "Estimation of the Exchange Rate Pass-Through: Evidence from Korean Domestic Prices." *East Asian Economic Review*, Vol. 8, No. 2, pp. 195-221.

# Appendix

## Table A-1: Skill Composition of Goods by SITC at Two Digit Level

| Low-skill labor-produced goods | Medium-skill blue-collar labor-produced goods |
|---|---|
| 00 Live animals | 24 Cork and wood |
| 01 Meat and meat preparations | 35 Electric current |
| 02 Dairy products and birds 'eggs | 63 Cork and wood manufactures (excluding furniture) |
| 03 Fish, crustacean, Mollusca | 78 Road vehicles |
| 04 Cereals and cereal preparations | 79 Other transport equipment |
| 05 Vegetables and fruit | 82 Furniture and parts thereof; bedding, mattresses, cushions |
| 06 Sugars, sugar preparations, and honey | 89 Miscellaneous manufactured articles |
| 07 Coffee, ea, cocoa, spices and manufactures thereof | **Medium-skill white-collar labor-produced goods** |
| 08 Feeding stuff for animals | 23 Crude rubber |
| 09 Miscellaneous edible products and preparations | 25 Pulp and waste paper |
| 11 Beverages and tobacco | 27 Crude fertilizers and crude minerals |
| 12 Tobacco and tobacco manufactures | 51 Organic chemicals |
| 21 Hides, skins and fur skins, raw | 52 Inorganic chemicals |
| 22 Oil seeds and oleaginous fruits | 53 Dyeing, tanning, and colorings materials |
| 26 Textile fibers | 55 Essential oils, perfume materials; toilet, polishing, and cleansing preparations |
| 28 Metalliferous ores and metal scrap | 56 Fertilizers (other than in Div 27) |
| 29 Crude animal and vegetable materials | 57 Plastics in primary forms |
| 32 Coal, coke, and briquettes | 59 Chemical materials and products |
| 42 Fixed vegetable fats and oils | 64 Paper, paperboard, and articles made thereof |

| | |
|---|---|
| 43 Animal or vegetable fats and oils processed | 71 Power-generating machinery and equipment |
| 58 Plastics in non-primary forms | 76 Telecommunications and sound recording and reproducing equipment |
| 61 Leather, leather manufactures | 77 Electrical machinery, apparatus, and appliances |
| 62 Rubber manufactures | 87 Professional, scientific, and controlling instruments and apparatus |
| 65 Textile yarns, fabrics, made-up articles | 88 Photographic apparatus and optical goods; watches and clocks |
| 66 Non-metallic mineral manufactures | High-skill labor-produced goods |
| 67 Iron and steel | 54 Medicinal and pharmaceutical products |
| 68 Non-ferrous metals | 72 Machinery specialized for particular industries |
| 69 Manufactures of metals | 73 Metalworking machinery |
| 81 Sanitary, plumbing, heating, and lighting fixtures and fittings | 74 General industry machinery and equipment, and machine parts. |
| 83 Travel goods, handbags | 75 Office machines and automatic data processing machines |
| 84 Articles of apparel and clothing accessories | |
| 85 Footwear | |

Source: Peneder (1999)

## Table A-2: Vietnam's Main Trading Partners, Classified by Region and Income Level

| | |
|---|---|
| **Asia** | Hong Kong, Israel, Japan, Korea Republic, Saudi Arabia, Singapore, United Arab Emirates, China, Iran, Malaysia, Thailand, Turkey, India, Indonesia, Lao PDR, Pakistan, Philippines |
| **Europe** | Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, United Kingdom |
| **Africa** | Algeria, Egypt Arab Republic, Nigeria, South Africa |
| **America and Oceania** | Argentina, Australia, Brazil, Canada, Chile, Cuba, Mexico, New Zealand, Panama, US |
| **Vietnam's Main Trading Partners, Classified by Income Level** | |
| **High income** | Australia, Austria, Belgium, Canada, Hong Kong, Denmark, Finland, France, Germany, Ireland, Israel, Japan, Netherlands, Norway, Singapore, Sweden, Switzerland, United Kingdom, USA |
| **Upper middle income** | Czech Republic, Greece, Hungary, Italy, Korea Republic, New Zealand, Poland, Portugal, Saudi Arabia, Spain, United Arab Emirates, Algeria, Argentina, Brazil, Bulgaria, Chile, China, Cuba, Iran, Malaysia, Mexico, Panama, Romania, Russian Federation, South Africa, Thailand, Turkey |
| **Low income and lower middle income** | Cambodia, Egypt Arab Republic, India, Indonesia, Nigeria, Pakistan, Philippines, Laos PD |

Note: 1. High income countries: GDP per capital $\geq$ 12,476 USD

2. Upper middle-income countries: 4036 USD $<$GDP per capital$<$ 12,475 USD

3. Low income and lower middle-income countries: GDP per capital $<$ 4000 USD

4.Classification are based on the classifications of United Nation.