

2017 BOK Knowledge Partnership Program Cambodia



*Empirical Analysis on the Relationship between
Exchange Rate and Inflation in the Cambodian Economy*



**2017 BOK Knowledge Partnership Program
with **Cambodia****

*Empirical Analysis on the Relationship between
Exchange Rate and Inflation in the Cambodian
Economy*

2017 BOK Knowledge Partnership Program with Cambodia

Research Participants

Senior Advisor	Chung, Soon Won (Former Monetary Policy Board member, Bank of Korea)
Research Team	Jang, Hong Bum (The University of Suwon, PM) Park, Hail (Kyung Hee University) Son, Jong Chil (Hankuk University of Foreign Studies) Oh, Hwa-Seok (Global Management Research Institute) Kim, Jaeryun (Hankuk University of Foreign Studies) Le, Thanh Dieu (Kyung Hee University) You, Yoonjeong (Global Management Research Institute)
Local Research Team	Khou, Vouthy (National Bank of Cambodia) Long, Vibunrith (National Bank of Cambodia) Duong, Sophak (National Bank of Cambodia) So, Sophornvichet (National Bank of Cambodia) Chey, Sovanney (National Bank of Cambodia) San, Sopheawattey (National Bank of Cambodia)
Local Cooperative Institution	National Bank of Cambodia

2017 BOK Knowledge Partnership Program with Cambodia

*Empirical Analysis on the Relationship between
Exchange Rate and Inflation in the Cambodian
Economy*

Contents

I. Introduction	1
II Current Issues and Challenges in the Cambodian Economy	4
1. Economic Growth and Key Industries.....	4
2. Balance of Payments and FDI.....	12
3. Fiscal Development.....	14
4. Inflation, Exchange Rate, and Money Supply.....	18
III. Inflation and Foreign Exchange Fluctuations under Dollarization ·	24
1. Dollarization: Benefits and Costs.....	24
2. Empirical Analyses on Determinants for Dollarization.....	28
3. Analysis on the Relationship between Inflation and Foreign Exchange Rate	45
4. Studies on Country Cases.....	49
5. Summary.....	56
IV. Impact of Exchange Rate on Inflation	60
1. Overview.....	60
2. Data and Model Specifications.....	64
3. Results of Empirical Analyses.....	67
4. Summary.....	88
V. Conclusions	90
Appendix 1	95
Appendix 2	101
References	107

List of Tables

Table 2-1. Revenue by Sectors	17
Table 2-2. Broad Money (M2)	21
Table 3-1. Country Panel Differences between Previous Literature and This Paper	30
Table 3-2. Countries Included in the Empirical Analyses	32
Table 3-3. Explanations of Variables	33
Table 3-4. Basic Statistics	34
Table 3-5. Panel Estimations	40
Table 3-6. Groups of Countries According to Exchange Rate Regimes and Degrees of Dollarization	41
Table 3-7. Main Features of Country Group	42
Table 3-8. Panel Estimation: Floating vs. Pegging	43
Table 3-9. Panel Estimation: De-Dollarization vs. Dollarization	44
Table 3-10. Panel Estimation: Inflation and Exchange Rate	46
Table 3-11. Inflation and Foreign Exchange Rate: Floating vs. Pegging	47
Table 3-12. Inflation and Exchange Rate: De-Dollarization vs. Dollarization	49
Table 3-13. Causing Factors of Dollarization by Region	51
Table 3-14. Mitigating Factors of Dollarization by Region	53
Table 4-1. Unit Root Tests	66
Table 4-2. Descriptive Statistics	66
Table 4-3. Threshold Estimation: Baseline Model	67
Table 4-4. Threshold Estimation: Extended Model	68
Table 4-5. Generalized Forecast Error Variance Decomposition of Inflation (1)	81
Table 4-6. Generalized Forecast Error Variance Decomposition of Inflation (2)	81
Table 4-7. Generalized Forecast Error Variance Decomposition of Inflation (3)	82
Table 4-8. Generalized Forecast Error Variance Decomposition of Inflation (4)	83
Table 4-9. Generalized Forecast Error Variance Decomposition of Inflation (5)	84
Table 4-10. Generalized Forecast Error Variance Decomposition of Inflation (6)	84
Table 4-11. Generalized Forecast Error Variance Decomposition of Inflation (7)	85

List of Figures

Figure 2-1. Economic Growth Trend of Cambodia	5
Figure 2-2. Growth of Major Cambodian Sectors	5
Figure 2-3. Share of Major Sectors	6
Figure 2-4. Tourist Arrival	10
Figure 2-5. Balance of Trade	12
Figure 2-6. Balance of Payments	13
Figure 2-7. Balance of Payments	13
Figure 2-8. Foreign Direct Investment	14
Figure 2-9. Fiscal Balance	15
Figure 2-10. Total Revenue	16
Figure 2-11. Inflation	19
Figure 2-12. CPI Increase Rate by Sector	19
Figure 2-13. Exchange Rate Movements	20
Figure 2-14. Composition of M2 and Percentage Change in M2	22
Figure 3-1. Impossible Trinity	27
Figure 3-2. Time-Series Trends for the Variables	36
Figure 3-3. Distributions of Variables	38
Figure 4-1. Riel/USD Exchange Rate and Cambodian Inflation Rate	60
Figure 4-2. Cambodia's Foreign Currency Deposits	62
Figure 4-3. Cambodia's Foreign Currency Deposits Growth Rate and Inflation Rate	62
Figure 4-4. Global Oil Price and Cambodian Inflation	64
Figure 4-5. Shadow Funds Rate and Federal Funds Rate	65
Figure 4-6. Generalized Impulse Responses of Inflation to Exchange Rate Shocks (1)	71
Figure 4-7. Generalized Impulse Responses of Inflation to Exchange Rate Shocks (2)	72
Figure 4-8. Generalized Impulse Responses of Inflation to Exchange Rate Shocks (3)	73
Figure 4-9. Generalized Impulse Responses of Inflation to Exchange	

Rate Shocks (4).....	75
Figure 4-10. Generalized Impulse Responses of Inflation to Exchange Rate Shocks (5).....	76
Figure 4-11. Generalized Impulse Responses of Inflation to Exchange Rate Shocks (6).....	77
Figure 4-12. Generalized Impulse Responses of Inflation to Exchange Rate Shocks (7).....	78
Figure 4-13. Relative Contribution of Exchange Rate to the Forecast Error Variance Decomposition of Inflation (1).....	87
Figure 4-14. Relative Contribution of Exchange Rate to the Forecast Error Variance Decomposition of Inflation (2).....	88

Executive Summary

The Cambodian economy has been growing rapidly at an average rate of 7% per annum over the past two decades. As a result, it has brought the country's per capita income in 2016 above the US\$ 1,400 level which qualifies as the mid-level among low-income countries. Such relatively high economic growth, however, has also exposed a number of fundamental vulnerabilities, notably an under-developed financial system. The Cambodian economy is heavily dollarized and thus constrained in adopting appropriate macroeconomic policies, being characterized by the difficulty in implementing independent monetary policies, propping up weak financial institutions, and enhancing financial market functions and structures. Such structural weaknesses caused the Cambodian economy to experience a great deal of difficulty during the global crisis, which made the Cambodian government to undertake a more intensive search for strategic policy directions to address this issue with a view to achieving sustained growth over the medium to long run. The analysis of the relationship between exchange rate and inflation under dollarization and the deriving of implications from it promises to provide a great number of insights into such directions.

Against this background, this study sets out to analyze the relationship between the exchange rate and inflation in Cambodia from multiple perspectives: (i) analysis of determinants of dollarization, including the benefits and costs of dollarization; (ii) the construction of panel data, including countries that are currently adopting dollarization; (iii) inflation and economic growth rate - exchange rate empirical analysis; and (iv) a review of countries with experience of historically gradual de-dollarization in comparison with the case of Cambodia. At the same time, the effects of the exchange volatility on inflation in the Cambodian economy are analyzed step by step: (i) analysis using the Threshold VAR-X models; (ii) a comparative analysis of the impact of other variables on inflation by phase (low regime and high regime) through Generalized Forecast Error Variance Decomposition. This study presents several key observations and suggestions.

First, both benefits and costs of dollarization exist. A certain degree of dollarization, as a sign of integration with the world economy, can have some benefits, such as promoting the development of domestic financial markets and spurring foreign investment. In the case of the Cambodian economy, the economy and the financial market have continued to grow steadily while the dollarization has proceeded, implying the substantiation of benefits from dollarization. If dollarization continues to deepen, however, there may be significant costs materialized over time. Importantly, the policy effectiveness in the monetary and foreign exchange market could deteriorate continuously and the domestic economy would become more vulnerable to external shocks. There is no question that the Cambodian economy should adopt a strategy and policies to increase the circulation ratio of domestic currency in order to ensure sustained growth in the future.

Under this study, panel data for the countries that have undergone dollarization are constructed and analyzed in order to investigate the relationship between exchange rate and inflation under dollarization. One key finding is that the factors that intensify the dollarization are high inflation, less flexible exchange rate movements, deterioration of the real economy, and the inadequacy of the institutional environments in terms, for example, of social and market systems. On the other hand, additional analysis of the de-dollarization country group suggests that real appreciation of the domestic currency is an important factor in mitigating the degree of dollarization.

In addition, the results of investigation on the effects of foreign exchange fluctuation on inflation depending on the exchange rate system and the degree of dollarization using the same panel data indicate that high dollarization or a high depreciation rate of the domestic currency tends to increase inflation, while real depreciation is a factor contributing to lowering inflation. Empirically, the quantitative effects of exchange rate changes on inflation are as follows: a 1%p depreciation in the country group of floating exchange regime increases inflation by 0.6-0.7%p, while the effects in the country group of fixed exchange regime are greater such as increasing inflation by 0.7-1.1%p. Meanwhile, in the case of the dollarization country group, a 1%

appreciation (depreciation) of the domestic currency decreases (increases) inflation by 0.8-1.1%p. However, the magnitude of such a transmission effect is significantly reduced or disappears in the de-dollarization country group. The influence of external factors on inflation is relatively larger in the case of dollarization countries.

It should be noted that applying the stylized facts confirmed by the panel data study directly to the economic and financial system of Cambodia may not be appropriate. The dollarization factors of the Cambodian economy are rooted in political upheaval and administrative measures in the course of the United Nations Transitional Authority in Cambodia (UNTAC) intervention. In addition, the Cambodian factors are somewhat different from other countries' economic factors such as (hyper) inflation and frequent depreciation of domestic currencies. The fact that Cambodia's economy has exhibited continuing economic growth and stable inflation for the past decade, supports this observation. Further development of the Cambodian economy beyond the country's still somewhat initial stage, however, requires a good policy mix that enables the government authorities to introduce a conducive policy framework and system. The majority of industrialized countries have adopted aggressive policy combinations in line with discretionary monetary policy along with gradually shifting to a floating exchange rate system from a fixed exchange rate system.

The study investigates the impact of the exchange rate on inflation in Cambodia using Threshold VAR-X models, in which each endogenous variable, including exchange rate growth rate, the change in average interest rate, inflation rate and foreign currency deposits growth rate, is set as the threshold. As Cambodia's inflation is affected by oil prices and US interest rate, these two global factors are included in the models as exogenous variables. The data sample is monthly data from 1996M1 to 2015M11.

According to the results of generalized impulse response functions, when the threshold variable exceeds a certain threshold value, the impact of the

exchange rate change on inflation will be different, yet in general, the positive exchange rate shock will lead to a rise in inflation. However, in the model using the change in interest rate as threshold variable, the inflation rate declines in response to the increase in the regime of declining interest rate. On the other hand, the responses of inflation to different types of shocks are fairly symmetric in most of the cases, but asymmetry is found in the model where the foreign currency deposits growth rate is used as the threshold variable.

Additionally, this study has calculated the Generalized Forecast Error Variance Decomposition of Inflation in each case in order to examine the relative contribution of each endogenous variable on inflation. The relative contribution of exchange rate to inflation variance decomposition is seen to be bigger in the high regime of exchange rate growth rate, the low inflation regime and the regime of increasing interest rate, while it is almost equal in the case of different foreign currency deposits growth regime.

Finally, it is recommended that Cambodian economy needs to gradually promote policies in the following direction for the development of financial and foreign exchange markets. First, it is necessary to enhance a system of posting dual prices in US dollar and Cambodian riel together for all goods and services. If the credibility of the riel is improved, its use will be automatically enlarged. More concrete and gradual implementations to widen the current bands for the exchange rate of the riel should be considered while maintaining the stability of prices and the economy. According to the empirical estimation results, the effect of such exchange rate fluctuations on the inflation rate would be reduced when the degree of dollarization is eased or when adopting a floating exchange rate system. In addition, it is desirable to consider policies to increase the incentives for holding the Khmer Riel such as decreasing the financial income tax and reserve requirement ratio on riel deposits.

I. Introduction

The Cambodian economy has been growing at an average rate of 7% over the past two decades, except during the global crisis. As a result, Cambodia's economic level is entering the medium group of low-income countries, and this rapid growth trend is expected to continue for the time being. The stable growth of the Cambodian economy is based on stabilization of the US dollar exchange rate, inflation management, and competitiveness in keeping with its dollarization.

However, the Cambodian economy has basic weaknesses such as under-developed financial system. It is fundamentally a dollarization economy with structural weaknesses such as macroeconomic policy constraints, including difficulties in monetary policy implementation, and vulnerable financial institutions and financial market functions. The dollarization of the Cambodian economy has been continuing since the 1990s, with US dollar deposits now accounting for more than 95% of all bank deposits (over 80% of M2). Cambodia's per capita income has doubled in the past decade, but despite the economic performance, Cambodia's dollarization has become more intense. In addition, the Cambodian economy is heavily dependent on exports of a limited set of items, such as garments and footwear, and has a very fragile structure that is easily affected by changes in foreign prices and demand.

The National Bank of Cambodia recognizes the need to analyze the exchange rate - inflation relationship under dollarization as a structural issue in light of the experience of the Cambodian economy during the global crisis period, and to explore possible policy directions. The Bank of Korea placed the topic of "Empirical Analysis on the Relationship between Exchange Rate and Inflation" on the agenda for a limited set of 2017 BOK-KPP project at the request of the National Bank of Cambodia. This is the final report of the 2017 BOK-KPP Cambodia project, and the main contents are as follows.

In Chapter II, we present the situation of the Cambodian economy and the challenges it faces. We describe the contents of the research through our

researches and local surveys, and the contributions of the staff members of the National Bank of Cambodia who participated in the 2017 BOK-KPP Cambodia.

Chapter III analyzes the exchange rate and inflation under dollarization. First, we review the benefits and costs of dollarization and analyze the determinants of dollarization. To do this, we construct national panel data for countries that have adopted dollarization around the world, and undertake various analyses of exchange rate and inflation. We also analyze the relationship between inflation, economic growth rate and exchange rate in various ways. In addition, countries that have experienced a gradual mitigation of dollarization over time are selected, and the cases of the countries concerned are carefully examined and compared with that of Cambodia.

The results of empirical analysis of determinants of dollarization are similar to those presented in previous discussions. High inflation, rigid or sticky exchange rate fluctuations, sluggish real economic activity, and an under-developed market system are analyzed as the main factors behind the dollarization. As a result of further analysis, we found that the real appreciation of the local currency is an important factor in mitigating the degree of dollarization. In addition, the correlation between inflation and the key variables of the foreign exchange market analyzed using the same country panel data shows that a high dollarization rate and a high depreciation rate of the domestic currency increase the inflation rate as expected, and the real depreciation of domestic currency is a factor in lowering inflation. The results of the analysis on the de-dollarization country group show that neither the pass-through of the exchange rate nor the degree of dollarization have a significant effect on inflation. The effect of the exchange rate fluctuations on inflation was larger in the fixed exchange rate country group than in the floating exchange rate country group. Compared with the de-dollarization country group, the dollarization country group showed a significant effect of exchange rate fluctuation on inflation.

Chapter IV analyzes the impact of the exchange rate on inflation in the Cambodian economy using the Threshold VAR-X models. In addition, we

explain the relative importance of other variables in the explanations of inflation fluctuations by comparing forecasts with low-regime and high-regime. As a result of the analysis, it is observed that when the critical variable exceeds the threshold, the impact of the exchange rate change on inflation is different from that of the generalized impulse response functions. However, in the model where the interest rate change is used as the critical variable, the inflation rate declines under a positive exchange rate shock in the period when the interest rate falls. The response of inflation to the direction and magnitude of the exchange rate shock was largely symmetric, but asymmetry was found in the model where the change in foreign currency deposits was used as the critical variable. In the model using the exchange rate change as a critical variable, the exchange rate impact on the variance decomposition of inflation was higher in the period of high exchange rate fluctuations. The contribution of the exchange rate shock to inflation was analyzed as being larger in a period of rising interest rates and in one of low inflation.

Chapter V assesses the macroeconomic implications of the exchange rate and inflation under the current degree of dollarization of Cambodia based on the analysis of Chapter III and IV, and suggests policy implications for the Cambodian economy to take into account for sustainable growth from a medium to long-term perspective.

II. Current Issues and Challenges in the Cambodian Economy

Cambodia has a small open economy and the country neighbors Thailand, Laos, and Vietnam in Indochina. The Cambodian government has continued to press ahead with market liberalization and structural reform as part of efforts to integrate its economy into the regional economy and the world economy since the late 1980s. Cambodia became a member of the Association of South East Asian Nations (ASEAN) in 1999 and a member of the World Trade Organization (WTO) in 2003, thus speeding up the liberalization of trade in goods and services. With market opening, inward foreign direct investment (FDI) in Cambodia increased ten times from 1993 until 2012.

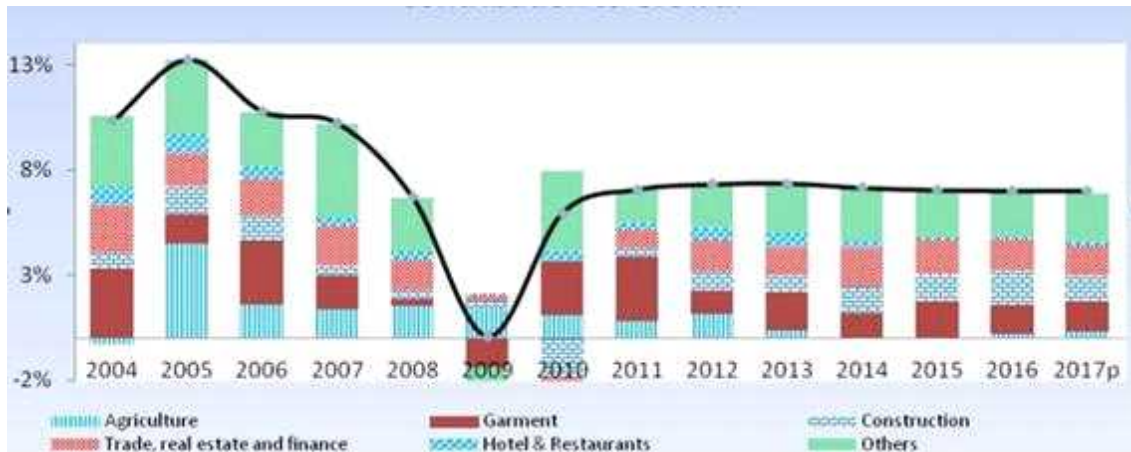
1. Economic Growth and Key Industries

Cambodia's economy has shown high growth of about 7% for the last two decades since the mid-1990s. After registering a remarkable average annual growth rate of 7.8% from 1995 until 2003, it showed a very high growth rate of over 10% for four consecutive years from 2004 till 2007. More recently, the growth rate, which had fallen to 6.7% in 2008 when the global financial crisis broke out, dropped to its lowest figure of 0.1% in 2009.

In the following year of 2010 the Cambodian economy was on a strong recovery track of 6% growth and from 2011 up until 2017, exhibited a robust average annual growth rate of about 7%. As a result, Cambodia recorded 1,434 US dollars in GDP per capita at the end of 2016, which implies that the country has risen to intermediate level among low income countries. <Figure 2-1> represents the trends of economic growth rate of Cambodia over the past decade.

<Figure 2-1>

Economic Growth Trend of Cambodia



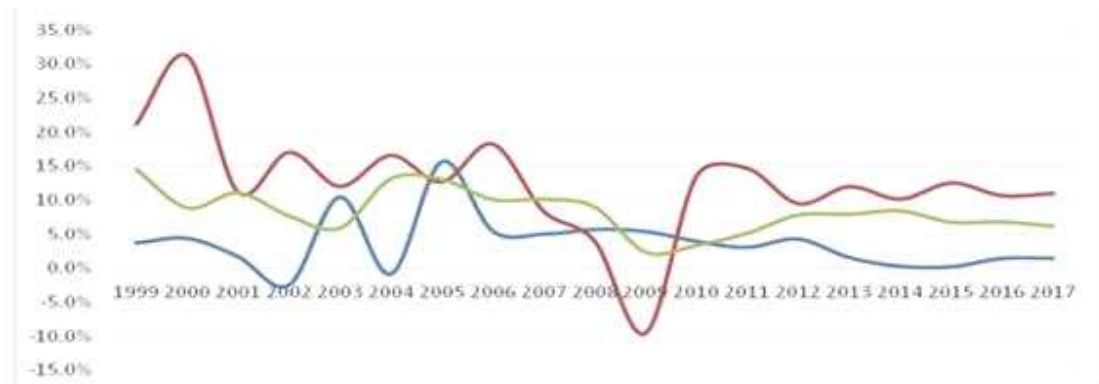
Source: National Institute of Statistics

Cambodia's economic growth relies heavily on a limited group of industries. As can be seen in <Figure 2-1>, three key engines that led the Cambodian economic growth until 2011 were clothing, agriculture, and tourism. But since 2012, construction has emerged as another engine for growth and has come to lead Cambodian economic growth.

Meanwhile, the agricultural sector, which had led the Cambodian economic growth for a long time, has contributed only marginally to the country's economic growth since 2013.

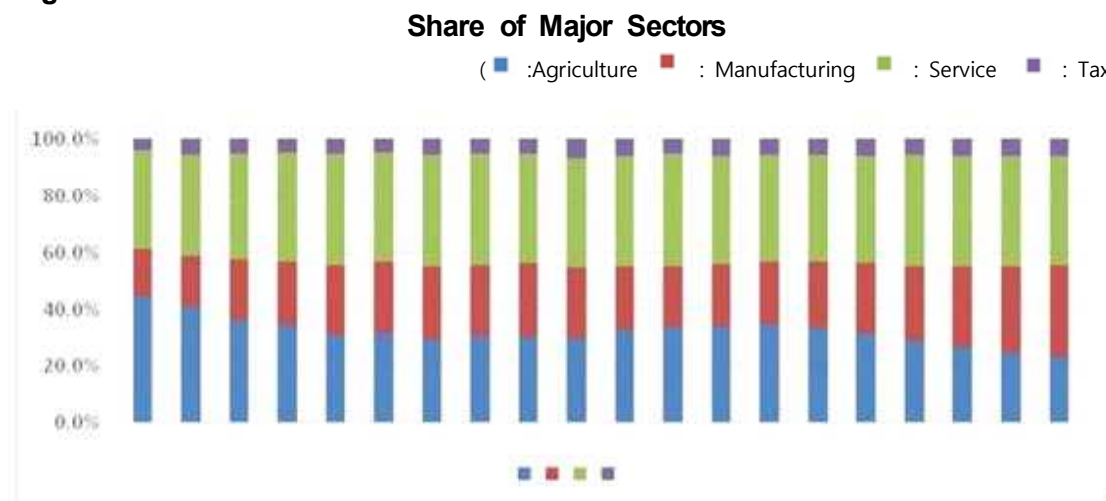
<Figure 2-2>

Growth of Major Cambodian Sectors



Source: National Institute of Statistics

<Figure 2-3>



Source: National Institute of Statistics

A. Manufacturing Industry

The manufacturing sector was a strong front runner that led the Cambodian economic growth at a high growth rate of over 10% until the 2008 global financial crisis. In the aftermath of the global financial crisis, the growth trends of Cambodian garment exports contracted sharply. Manufacturing industry recorded minus 9.5% growth in 2009, which was the worst in Cambodian history, but recovered a high growth rate at 13.5% when garment and footwear exports increased by about 20% after the global financial crisis that started in the U.S. In 2017, the growth rate of the manufacturing sector has been running at 11% or so on an annual average.

Recently, Cambodia's exports of garments have still shown strong growth, but have slowed down since the second quarter of 2016. The rate of increase in garment exports declined to 8.4% in 2016, from 12.3% in 2015. Rising domestic labor costs, appreciation of the U.S. dollar, enhanced competition with other low-income countries including Myanmar, etc. are considered to have acted as a pressure in increasing the export price of Cambodian clothing lines.

Cambodian footwear exports, like those of the garment industry, are facing strong price competition. As a result, the export price of a pair of shoes on

average remained at about 7 dollars in 2016. Nevertheless, Cambodia's exports of footwear in 2016 sustained a high growth rate of 15.6%, amounting to 763 million dollars.

In Cambodia, the garment and footwear sector contributed greatly to Cambodian economic growth as a whole as well as the manufacturing sector. As of 2016, the garment and footwear sector's contribution to overall Cambodian economic growth stood at around 20%. Interestingly, the recent rapid growth of garment and footwear exports arose from the EBA (Everything But Arms) policy in the EU market and the Generalized System of Preferences in the U.S. Market. EBA is a policy whereby the EU will not impose customs duties and quota (allocated amount) on any imported goods manufactured by 48 developing countries including Cambodia other than arms. It is an initiative undertaken since March 2001 to help developing countries gain greater access to the EU market.

The garment and footwear sector could grow as part of the shift of Cambodia's industrial structure from low value-added to relatively higher value-added. The garment and footwear industry in Cambodia is expected to go fluctuate in line with the demands of the global market and individual countries' economic conditions, as footwear garments in Cambodia are manufactured mostly for export.

Foreign direct investment (FDI) into garment and footwear sector in Cambodia tends to show a gradually decreasing trend, declining from 490 million dollars in 2012 to 160 million dollars in 2016. Nevertheless, total exports of the garments and footwear sector are maintaining a continual increase. However, if the FDI declines further in both fields, it is likely to have a negative impact on the growth of the Cambodian garment and footwear sector.

B. Construction Industry and Real Estate

Construction and real estate are new growth sectors that contributed significantly to the Cambodian economy at average growth rate of 16% for the

or last four years in a row. The construction and real estate industry showed a high annual growth rate of over 10% on average before the global financial crisis, but registered negative 25% growth for the first time in 2010 owing to the crisis. However, in 2011, the following year, it recovered quickly to a double-digit growth rate.

Recently, Cambodia's construction sector has concentrated on expensive state-of-the-art construction projects and thus the average construction cost per square meter reached 434 dollars. The recent boom in the real estate and construction industry in Cambodia stems largely from foreign direct investment (FDI) in it and a rise in domestic financing. For the last five years, inward FDI in the construction sector in Cambodia has increased continuously. In 2016, the FDI on an approval basis in the Cambodian construction sector stood at 1.3 billion dollars. Accordingly, the total (stock) of FDI invested in the Cambodian construction sector from 2000 to 2016 reached 4.8 billion dollars in total, which represented 19% of the entire GDP. Domestic Cambodian financing provided to the real estate and construction field amounted to 3 billion dollars as of the end of 2016, which made up 17.4% of GDP.

In Cambodia's construction field, the top foreign investor was Korea. Korean investors accounted for 45% (1.6 billion dollars) of the entire investment in the construction sector for 16 years from 2000 till 2015. Following Korean investors, Chinese investors accounted for 27% (1 billion dollars) of the total construction investment. This suggests that Korean and Chinese investors together had a greater than 70% share of the construction market in Cambodia.

The investment boom in the construction market in Cambodia continued in 2017. The investment into Cambodian real estate and construction sector in the first half of 2017 was 5 billion dollars, which was a six-fold increase compared to 2015 (about 0.8 billion dollars). This growth underlines the rapid increase in the role of the construction industry's contribution to Cambodian economic growth.

C. Service Industry

Service industry is also contributing importantly to the Cambodian economic growth, chalking up about a 7% average annual growth rate. The percentage share of the service sector in Cambodia's GDP increased slightly from 34% in 1998 to 38.6% in 2017. The field that occupies the highest percentage in service sector is tourism, followed by transportation and communications. Lodging and restaurants representing the tourism industry in Cambodia also contribute greatly to the growth of service sector.

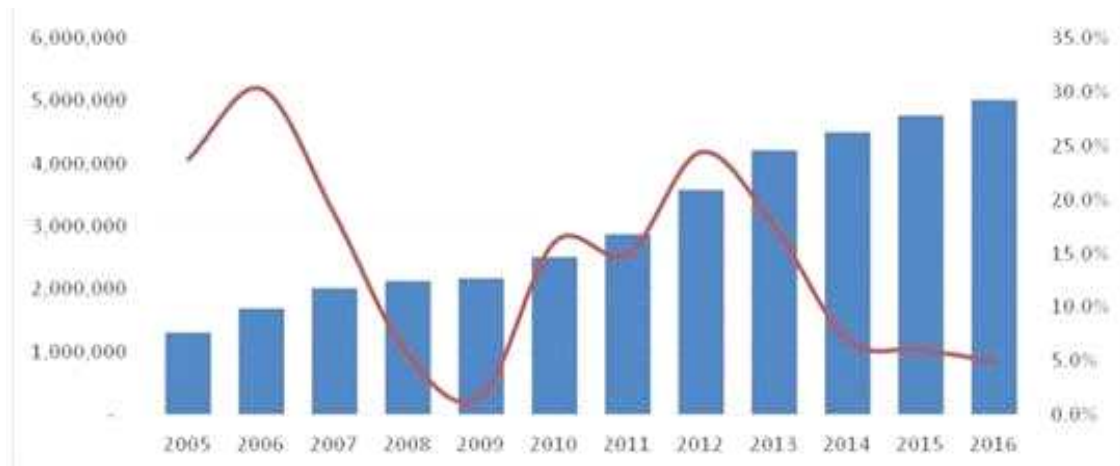
For the growth of the country's service sector in the future, expanding service industry to islands and isolated areas in Cambodia is a pressing necessity. However, Cambodian infrastructure in terms especially of roads and railways is very weak. Therefore, expanding the infrastructure including road to reach islands and isolated areas is urgent. If this can be done, the increased population and active trade in goods and services will activate the Cambodian services market.

Tourism accounts for a large percentage of the Cambodian service industry. The number of foreign tourists in Cambodia increased from 0.7 million people in 2003 to 5 million people in 2016, which was a seven-fold increase in 13 years. The growth of inbound foreign tourist arrivals to Cambodia suffered greatly in the aftermath of global financial crisis, but showed a high growth rate of 24.4% in 2012. But from this peak, it slowed down to 9% annually on average and eventually in 2016, dropped to its lowest figure of 5% since 2009.

The recent slowing of tourism in Cambodia is largely ascribable to the appreciation of the U.S. dollar. The increased exchange-value of U.S. dollar made travel costs to Cambodia expensive for foreigners, in view of its dollarization economy. In 2016, the annual growth rate of the Cambodian tourism sector stood at just 5%, but the sector created over 3 billion dollars. Meanwhile, the majority of foreign tourists coming to Cambodia were Asians. Specifically, Vietnamese and Chinese tourists accounted for 20% and 16%, respectively and accordingly ranked 1st and 2nd, followed by Korean and Thai

tourists.

<Figure 2-4> Tourist Arrival



Source: Ministry of Tourism

Various initiatives are being undertaken by the Cambodian government to attract more foreign tourists. For example, the efforts include a new project dubbed 'China Ready,' devised to develop more direct lines and attract more Chinese tourists, the development of a variety of joint tour packages, and strengthening the organization and role of the Cambodian Ministry of Tourism. According to the statistics of the Ministry of Tourism of Cambodia, tourism recovered gradually in the first half of 2017 in that, the number of tourists from Europe and North America grew rapidly. Still, the tourists who visit Cambodia are mostly Asians.

Diversifying the tourist attractions, in addition to Angkor Wat, the must-see tourist destination in Cambodia is very urgent. Cambodia is a country that holds a countless number of historical, cultural, and wonderful natural tourism resources. To this end, it is necessary to increase the access to a variety of new tourism attractions that are not yet developed and to exploit them, in cooperation with private tourist bodies as well as the public sector.

D. Agriculture

Agriculture, which was the mainstay of the Cambodian economy, with a 50% share of industry as a whole for a long time in the past, has shown a low growth rate for the last ten years and its share now falls short of 25%. Nevertheless, agriculture is still the most important sector that drives Cambodian employment. This industry employs over half of the total labor force. Agriculture is a major source of income for the lower income groups in the provincial areas and so is very important. The bottom decile of the Cambodian population in terms of income is composed of households in the provincial areas, and most of these people make a living by farming. In Cambodia, where a rice-based agricultural system has endured for over 2,000 years, rice still remains the chief item of Cambodian agricultural production.

In Cambodia, as a low-income country, rice is a strategic product for increasing income, eradicating poverty, and securing household and national food security. To increase the productivity of rice-based agriculture, efficient irrigation facilities and resource management systems are urgently needed. However, in Cambodian farming areas, irrigation facilities are inadequate. Still, farmers are bound to the pre-modern agricultural structure that relies heavily on rainfall.

The agricultural sector recorded a high growth rate of 15.7% in 2005, but has slowed down rapidly since then. The worsening of weather conditions has continued to intensify this trend since 2010. In particular, in 2015, the growth rate of the agricultural sector registered 0.2%, the lowest in the last ten years. In 2017, the value of crops made up 60% of the entire agricultural sector and 11% of GDP, but since 2013, agriculture has shown a disappointing 0.2% average annual growth rate. This suggests that agriculture has contributed little to Cambodian economic growth.

The reason for the low contribution to growth is the low prices of most internationally traded agricultural products, except natural rubber. The prices of internationally traded agricultural products are expected to rise by up to 1% in

2017, whereas cereal prices are expected to drop about 3% due to increased supply. In comparison, the price of natural rubber has been on a strong upward trend, as it rose rapidly from 1.57 dollars per kilogram in the third quarter to 1.92 dollars in the fourth quarter in 2016 due to strong Chinese demand.

In 2016, Cambodia’s rice production increased, due to good weather conditions. In Cambodia, the rainy-season rice production making up 80% of the entire rice production was 7.5 million ton in 2016, the biggest since 2013. The reason is that arable land for growing rice expanded by 1.1%, compared to the previous year of 2016. However, in the dry season of 2017, arable land for growing rice decreased, compared to 2016. Thus, in 2017, a smaller annual rice harvest is to be expected. In addition, in 2017, the harvests of corn, legumes, and other vegetables are expected to decrease from the previous year.

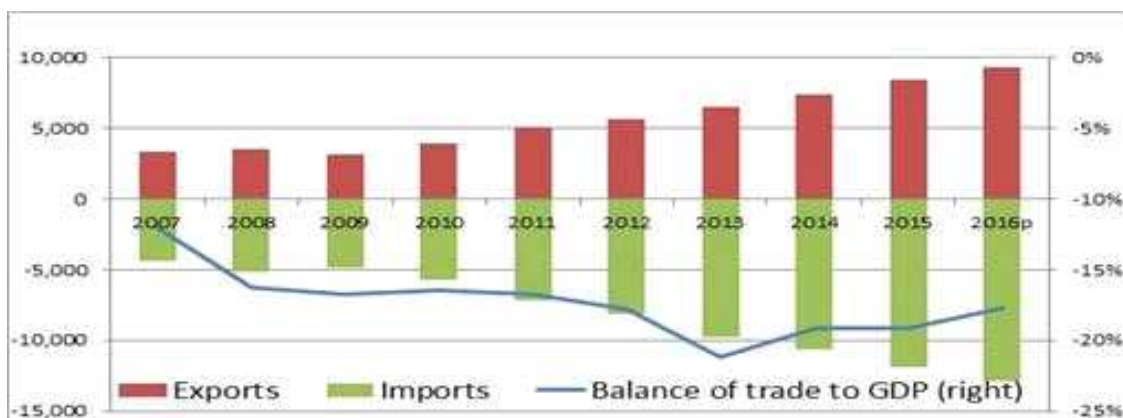
2. Balance of Payments and FDI

Cambodia has traditionally been a country running a balance of trade deficit. In 2013, the country recorded a trade deficit of 22% of GDP, the lowest in recent years. But it decreased slightly to 19% in 2015 and to 17% in 2016 (<Figure 2-5>).

<Figure 2-5>

Balance of Trade

(in percentage of GDP)



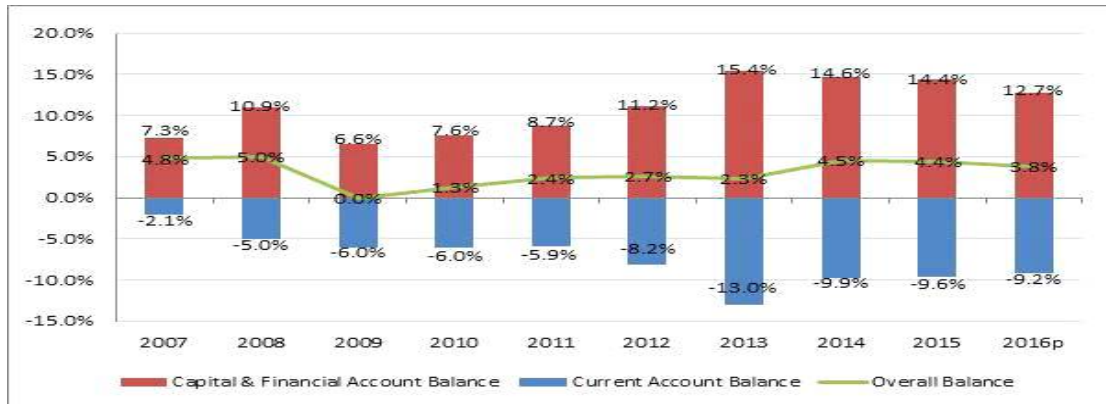
Source: The National Institute of Statistic and the National Bank of Cambodia

Accordingly, the current-account balance also registered a deficit equivalent to 13% of GDP in 2013, but this position has improved gradually since then. Now in 2017, it is running a deficit equivalent to 9% of GDP on an annual average. However, the capital account surplus offsets the current account deficit and thus the overall balance registered a surplus of 3.1% of GDP in the first half of 2017 (<Figure 2-7>). Due to the overall surplus, the foreign exchange reserves reached 7.7 billion dollars in the first half of 2017 and are sufficient to cover imports for the next six months.

<Figure 2-6>

Balance of Payments

(as a percentage of GDP)



Source: The National Institute of Statistic and the National Bank of Cambodia

<Figure 2-7>

Balance of Payments

(in millions of US dollars)



Source: The National Bank of Cambodia

The capital account surplus is due to the large scale of inward FDI in Cambodia. The capital account surplus increased seven-fold in total, at an average annual increase of 15% for the past decade, and so recorded a 2.5 billion dollar surplus in 2016. Notably in the first half of 2017, the foreign investment into financial institutions and real estate increased rapidly, recording a 33.4% FDI rate of increase.

Cambodia was relatively successful in attracting FDI. About 90% of the FDI invested into the country until 2014 came from Asia; among which that from China was 8.4 billion dollars in total, 44% of the entire FDI. Following this, Korea ranked second at 15% of the entire FDI and Vietnam ranked third.

<Figure 2-8>

Foreign Direct Investment

(in millions of US dollars)



Source: The National Bank of Cambodia

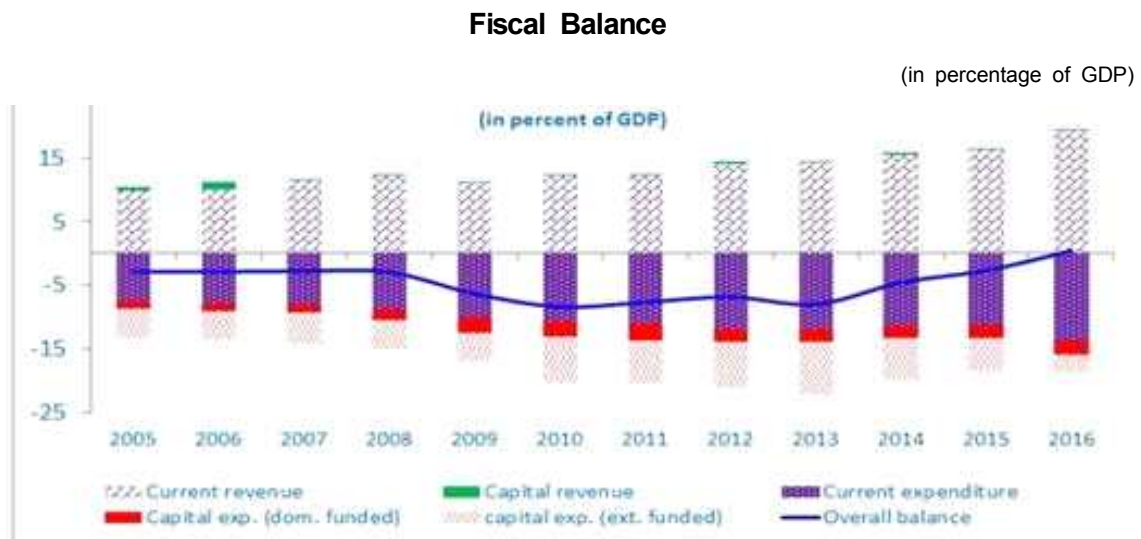
3. Fiscal Development

The Cambodian fiscal balance has shown a chronic deficit for the past decade. As can be seen in <Figure 2-9>, Cambodia ran an average annual fiscal deficit of 4.4% of GDP from 2005 to 2010 and a 4.9% deficit from 2011 to 2016. To break free from this chronic fiscal deficit, the Cambodian government introduced the Revenue Mobilization Strategy for the 2014-2018 fiscal year and pressed ahead with it very strongly. Accordingly, in 2016, the fiscal balance returned to

a 0.4% GDP surplus.

To increase revenue, the Cambodian government has pushed forward various policies, actively implementing the Revenue Mobilization Strategy, strengthening tax administration, promoting awareness among taxpayers, and providing incentives to tax collection managers. As a result, domestic tax revenue increased by 17% of GDP in 2014 and 18% of GDP in 2015.

<Figure 2-9>



To look at it by period, the revenue that was just 11.5% of GDP for the five years from 2005 to 2010 increased greatly to 15.9% of GDP from 2011 to 2016 (<Figure 2-9>). Such a rising trend of revenue is a positive sign that Cambodia’s long-standing structural unsound fiscal position has improved.

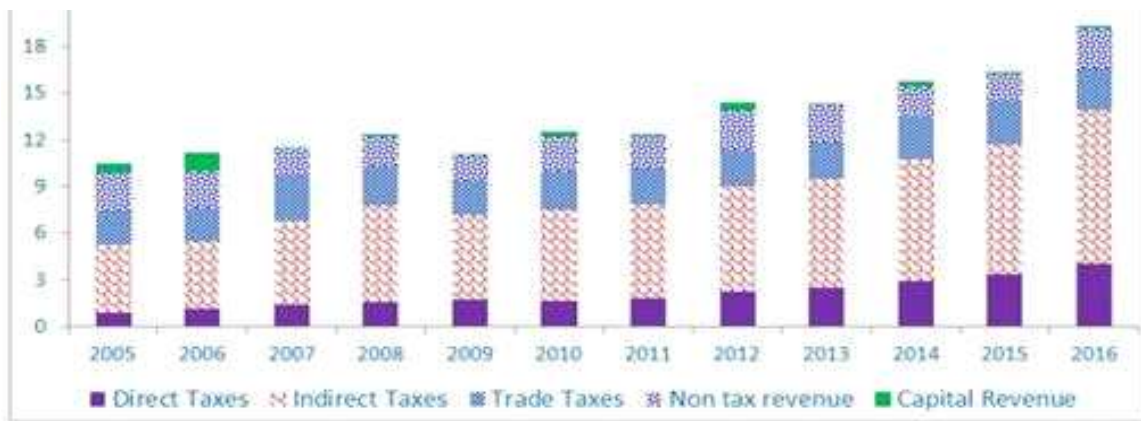
With respect to government expenditure, the Cambodian government has concentrated on reinforcing national security and infrastructure so far. However, this has led it to neglect relatively spending on education, healthcare, and salaries for officials. This parsimonious spending on public services has hindered improvements in the quality of public services provided to Cambodian people overall.

In this respect, the Cambodian government is making efforts to use government spending in such a way as to improve the public services. Part of this effort includes reducing expenditure on national security and increasing the expenditure on education, medical care, agriculture, and low-income earners in rural areas.

<Figure 2-10>

Total Revenue

(in percentage of GDP)



Source: Ministry of Economic and Finance

As a result, overall government expenditure increased greatly from 15.5% of GDP between 2005 and 2010 to 20% of GDP between 2011 and 2016. The government spending largely focused on education, medical care, agriculture, but the existing expenditure on national defense and infrastructure increased slightly from 2.1% of GDP to 2.8% of GDP during the same period.

<Table 2-1>

Revenue by Sectors

(in percentage of GDP)

Percentage of GDP	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total revenue	10.5	11.2	11.5	12.4	11.1	12.5	12.4	14.4	14.3	15.7	17.8	21.1
Current Revenue	9.9	9.9	11.4	12.2	11.0	12.2	12.2	13.9	14.2	15.5	16.2	19.2
Tax Revenue	7.4	7.6	9.7	10.3	9.4	10.0	10.2	11.4	11.9	13.5	14.5	16.6
Direct Taxes	0.9	1.1	1.4	1.6	1.7	1.7	1.8	2.3	2.5	2.9	3.4	4.0
Payroll Tax	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.8
Profit tax	0.7	0.9	1.1	1.2	1.3	1.3	1.4	1.7	1.9	2.1	2.5	3.0
Land and Property	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3
Indirect Taxes	4.3	4.3	5.4	6.2	5.5	5.8	6.0	6.8	6.9	7.9	8.3	9.9
Turnover tax	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
VAT	2.8	2.9	3.3	3.7	3.4	3.5	3.7	4.2	4.4	4.8	4.8	5.7
o/w VAT from Imports	0.0	0.0	2.0	2.2	2.0	1.9	2.2	2.4	2.4	2.8	3.0	3.6
Excise Tax	1.5	1.4	2.1	2.4	2.0	2.2	2.2	2.5	2.4	2.9	3.2	4.0
Domestic	0.2	0.3	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.7	0.9
Imports	1.2	1.1	1.9	2.1	1.7	1.8	1.8	1.9	1.9	2.3	2.4	3.1
Others	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.3	0.1
Trade Taxes	2.2	2.1	2.9	2.6	2.2	2.5	2.3	2.4	2.4	2.7	2.7	2.7
Imports	2.1	2.1	2.5	2.5	2.2	2.2	2.0	2.1	2.1	2.4	2.4	2.7
Petroleum	0.5	0.4	1.0	0.8	1.0	1.1	0.8	0.8	0.7	0.7	0.7	0.8
Other goods	1.7	1.6	1.5	1.7	1.2	1.1	1.2	1.3	1.3	1.6	1.7	1.9
Non tax revenue	2.5	2.3	1.8	1.9	1.6	2.2	2.0	2.6	2.3	2.0	1.7	2.6
Fishery	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestry	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0
Public Enterprises	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Profit												
Civil Aviation	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Tourism	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3
PTC	0.5	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.2
Visa and Related fees	1.5	1.6	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.6
Quality and Standard												
inspection fees	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rental Incomes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other non-tax revenue	0.0	0.0	0.6	0.8	0.7	1.3	0.9	1.4	1.1	0.8	0.5	1.1
Capital Revenue	0.6	1.3	0.0	0.2	0.1	0.3	0.1	0.4	0.1	0.3	0.2	0.2

Source: Ministry of Economics and Finance

4. Inflation, Exchange Rate, and Money Supply

A. Inflation

Cambodia is a rapidly developing country, growing at a rate of over 7%. Nevertheless, its inflation has been maintained at a relatively low level. Such price stability is expected to have positive effects on consumption and investment by creating a favorable macroeconomic environment to accelerate Cambodian economic growth. From 2002 till 2016, Cambodia recorded an average annual rise in the consumer price index (CPI) of less than 5%. This is a remarkable outcome in that high economic growth is generally accompanied by high-level inflation. Exceptionally in 2007 and 2008 Cambodian prices increased at a relatively high rate due to the world price phenomenon that food and oil price increased.

As can be seen in <Figure 2-11>, the national CPI (Consumer Price Index) held stable on average at about 4% from 2002 till 2006. However, in the second half of 2006, it rose to 4.2% and recorded a double-digit rate of increase due to external factors such as soaring global food and energy prices in 2007 and 2008.

However, Cambodian prices stabilized quickly in 2009 and dropped to an increase of 1% in 2014. For seven years from 2009 till 2016, the average rise in the Cambodian CPI recorded 3.4%.

<Figure 2-11>

Inflation

(%)



Source: The National Institute of Statistics and the National Bank of Cambodia

<Figure 2-12>

CPI Increase Rate by Sector

(YoY)



Source: The National Institute of Statistics and the National Bank of Cambodia

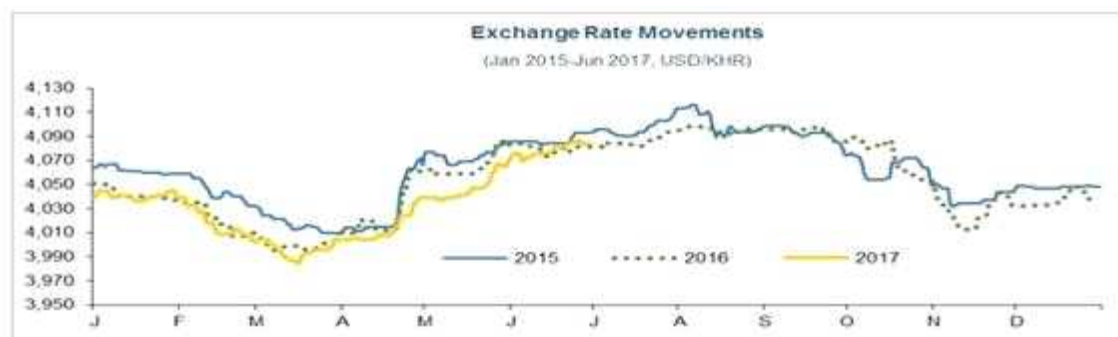
B. Exchange Rates

Dollarization of the economy has made it difficult for the Cambodian financial authorities to execute monetary policy effectively. The main purpose objective of the monetary policy implemented by the Cambodian central bank (NBC) has been to maintain price stability with the ultimate aim of facilitating economic development within the framework of Cambodian economic and financial policies. Cambodian inflation has been largely influenced by exchange rates, international oil prices, different seasonal factors, import price and so on.

In Cambodia, exchange rates are influenced by tax payments and the purchase of agricultural products. The exchange rate between the U.S. dollar and Cambodian Khmer Riel is determined at the market. In the Cambodian economy, the exchange fluctuations are due to excess supply or shortage of riel, compared to the demand for riel. Generally, the demand for riel increases around the new year by the Khmer calendar, i.e. period of tax payment and the season of crop harvests. Thus, the value of the riel tends to increase. In other periods, on the other hand, its value tends to decrease. In other words, the exchange-value of the riel tends to increase in the first quarter and then gradually decreases over the 2nd to the 3rd quarter, and then from the 4th quarter, tends to increase again. To smooth out such exchange fluctuations, the NBC either buys or sells U.S. dollars.

<Figure 2-13>

Exchange Rate Movements



Source: The National Bank of Cambodia

However, NBC has not bought or sold the U.S. dollar since 2011. Instead, it has acted as an intermediary when EDC (Electricite Du Cambodge) bought the U.S. dollar. Under this arrangement, the Cambodian exchange rate has shown stability at 4,000 Riel on average per U.S. dollar. In the first half of 2017, the Cambodian exchange rate showed a slight upward trend of 0.2% or so per annum. This is considered attributable to the government expenditure, payment of taxes and increased foreign direct investment.

C. Movement of Money Supply

In Cambodia, M1 is composed of riel circulating in the market and demand deposits in riel. In a larger sense, M2 includes M1, savings deposits, and foreign currency deposit. The movement of M2 can be observed by changes in foreign currency deposit. The reason is that in M2, the percentage of foreign currency deposits is considerably high at about 80%. In 1993, the foreign currency deposits made up around 64% of the money in circulating in the market. However, this has changed greatly since 1994. A vast amount of foreign currency invested in Cambodia by the UNTAC was absorbed to the banks from private hoardings. The number of banks increased rapidly to 29 banks in 1994, from 13 in 1993. The foreign currency deposits doubled during the same period. The reason was that the bank system became much more widespread and Cambodian people gained faith in it thanks to the political stability after the first election in 1993.

<Table 2-2>

Broad Money(M2)

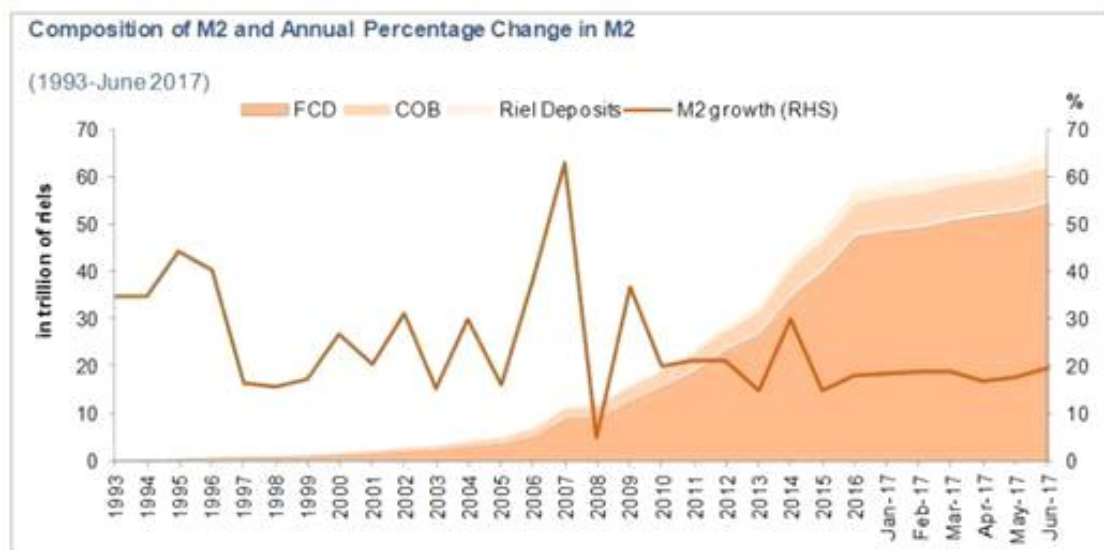
In trillion of riels	1993	1998	2003	2008	2013	Jun-17
Broad Money (M2)	0.3	1.2	3.3	11.9	32.8	65.3
Money	0.2	0.5	0.9	2.4	4.9	8.2
Currency Outside Banks (KHR)	0.2	0.5	0.9	2.3	4.5	7.3
Demand Deposits (KHR)	0.0	0.0	0.0	0.1	0.4	0.9
Quasi-Money	0.1	0.7	2.4	9.5	27.9	57.1
Time and Saving Deposits (KHR)	0.0	0.0	0.1	0.2	0.9	2.2
Foreign Currency Deposits	0.1	0.7	2.3	9.3	26.9	54.8

Source: The National Bank of Cambodia

When the second election campaign began in mid-1997, however, Cambodian people wanted to hold foreign currency deposits in fear that political instability would appear again. As a result, the growth of foreign currency deposits rose to 32% from 1999 to 2002. In 2003, the rate of increase of foreign currency deposits began to decline slightly. Foreign currency deposits rose quickly from Jun. 2007 to Sept. 2008, due to real estate and other asset bubbles. Foreign currency deposits began to soar from Dec. 2009, because people then came to gradually gain trust in the banking system.

<Figure 2-14>

Composition of M2 and Percentage Change in M2



Source: The National Bank of Cambodia

In 2013, the Cambodian general election was held. The opposition party declared that they would not accept the result of the general election. Accordingly, the calls for a new election became stronger. This situation caused some bank users to withdraw their bank deposits. In other words, whenever political instability builds up strongly in Cambodia, people's trust in the bank system deteriorates quickly.

As of the first half of 2017, the percentage of M2 in foreign currency deposits stands at 84%. This reflects the reality that dollarization is high despite

financial authorities' continuous efforts to facilitate the use of the riel. The riel currency in circulation in the market and riel-denominated deposits in Riel have increased continuously for the past twenty years, and currently in the first half of 2017, are represent 11% and 5% of the respective totals.

III. Inflation and Foreign Exchange Fluctuations under Dollarization

Dollarization has been a worldwide phenomenon and Cambodia is well reported example of it. In Cambodia, during the highly volatile political and economic period in 1970s and 80s, the credibility of local currency (riel) was greatly undermined. In early 1990s, the progress in dollarization accelerated as United Nations Transitional Authority in Cambodia (UNTAC) had provided public funds in US dollars. More specific recent developments in Cambodian dollarization by the National Bank of Cambodia can be referred in <Appendix 1>.

During the past decade even though Cambodia's income per capita has doubled and political and social instability have greatly decreased, dollarization has intensified. In what follows, we first consider the general benefits and costs of dollarization. Secondly, the country-level panel data are constructed based upon the counties which experienced or are still experiencing dollarization or currency substitution. Then we conduct empirical estimation to analyze the common determinants for dollarization across dollarized economies. Also by using the panel data, we undertake empirical investigation on whether the impact of foreign exchange rate on inflation can differ across foreign exchange rate regimes or degrees of dollarization. Finally, a case study on de-dollarized countries is carried out and we draw some policy implications on the issue of gradual de-dollarization in Cambodia based upon the empirical and case studies analysis.

1. Dollarization: Benefits and Costs

A. Benefits of Dollarization

Dollarization can be defined as a situation where the ratio of foreign currency (or dollar) deposits in commercial banks exceeds 20%. Once dollarization is in progress, its benefits and costs can exist at the same time. According to Balino

et al. (1999) and Kokenyen et al. (2010), heightened dollarization can be a sign of increasing integration of a country's economy into the world market and this can generate the following benefits to it. First, closer integration into the world economy could enhance the development of domestic financial markets. Second, dollarization can mitigate foreign investors' exchange rate risk for domestic investment. Lastly, lending in foreign currency with low credit cost can have a positive impact on domestic consumption and investment. Accordingly there may well be an optimal degree of dollarization depending on structural factors.

As reviewed in Section II, the Cambodian economy can currently be evaluated as having achieved stable economic growth over the last 10 years based upon the economic benefits generated in dollarized economies. First, tourism, one of the main industries in Cambodia, takes advantage of dollarization in that tourists' means of payment can be a lot easier in a dollarized economy. Also, it makes easier for international payments in trade with the US, one of Cambodia's main partners. In a fixed exchange regime or soft-pegging regime only allowing restricted bands around an official rate, dollarization can be more helpful in maintaining such regimes. This is because, in order to maintain the foreign exchange rate within a certain range, a government needs a huge amount of foreign reserve, but dollarization can reduce the need to hold large foreign exchange reserves.

B. Costs of Dollarization

Dollarization can not only yield some benefits but involve significant disadvantages for an economy. According to Ize and Yeyati (2005), dollarization limits the effectiveness of monetary policy. In other words, if control of the local currency is weakened, it will constrain the independence of monetary or foreign exchange market policy. Secondly, as the analysis of Rennhack and Nozaki (2006) indicates, a high degree of dollarization has been closely correlated with unstable and high inflation, exchange rate volatility and lack of monetary policy discipline. Thirdly, according to De Nicole et al. (2005), Fischer et al. (2013) and Yeyati (2006), a high degree of dollarization can leave an

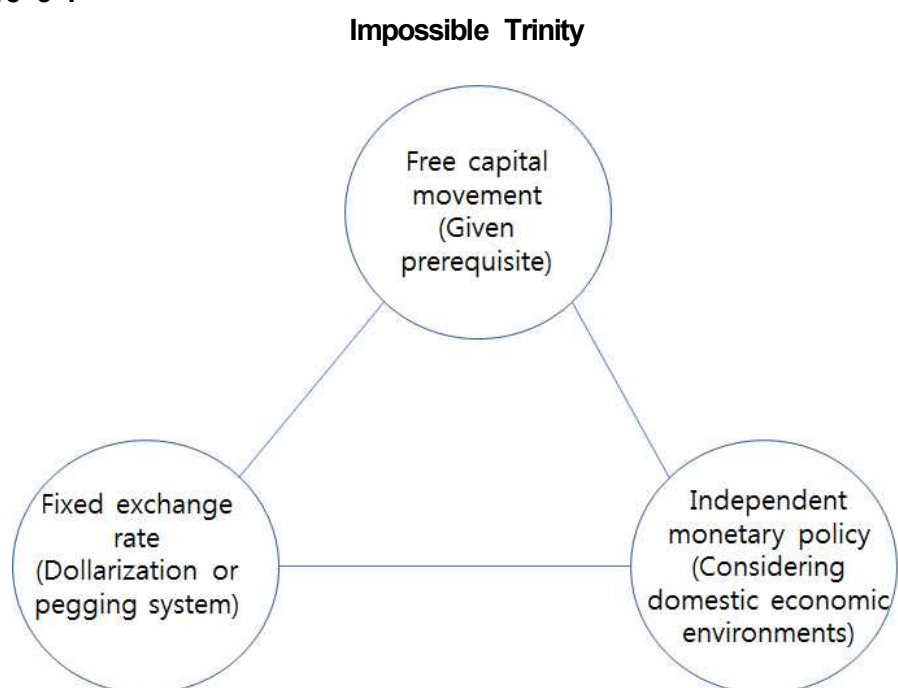
economy more vulnerable to economic crises. Fourth, Ize and Yeyati (2005) and Leiderman et al. (2006) argue that dollarization can deepen the transmission channels running from the foreign exchange rate to inflation. In other words, the fluctuations of inflation can be more readily brought about by external factors than by internal factors. In addition to the previous literature, as seen in various country-specific studies, deepening dollarization can deter natural development of the financial and foreign exchange markets and make it more less sustainable and more uncertain. Also, the delay of their endogenous growth can bring about a high probability of disturbing sustainable economic growth. This is because sustainable economic growth can only be achieved when a country's various policy factors which are based on domestic-currency are effectively combined.

In short, the benefits and costs of dollarization can be abstracted as forming an impossible trinity in the foreign exchange market. As can be seen in <Figure 3-1>, the trinity implies a fixed exchange rate, free capital movements and independent monetary policy in an economy. This concept refers to the inability to achieve the following three goals at the same time: exchange rate stability, financial integration and monetary independence. According to the Bank of Korea (2005), free capital movements were allowed in line with the fixed exchange rate regimes implied by the gold standard before the 1930s, consequently countries forfeited the right to pursue independent monetary policy. Another fixed exchange rate regime was imposed under the mantle of the Bretton Woods system after the Second World War whereby the value of the US dollar, directly and firmly linked with the value of gold, was accepted as the international currency. In this system, monetary policy was discretionary for a means of stabilizing the macroeconomy and hence, cross-border capital flows were restricted.

If the capital liberalization factor is regarded as a given prerequisite because of the progress of global capital liberalization since the 1980s, policy makers face the problem of choosing between a fixed exchange rate regime and independent monetary policy. If the choice is dollarization, this is one of the extreme forms of the fixed exchange rate regime. In other words, while there

are some benefits in terms of significantly lowering the volatility risk of the foreign exchange market and promoting the inflow of foreign investment funds under the international trend of capital liberalization, the costs must be paid in the form of giving up the independent monetary and exchange rate policies with which to respond to domestic business fluctuations.

<Figure 3-1>



As discussed above, in order to achieve sustainable growth of the economic and financial sectors in Cambodia, it would be desirable to develop relevant strategies for independent monetary policy attuned to domestic economic conditions of the country, gradually reducing the degree of dollarization. In other words, in pursuing foreign exchange market stability, it is necessary to develop a step-by-step strategy to enhance the circulation ratio of Cambodia's local currency, the riel. In this context, this paper constructs country-level panel data incorporating countries that have experienced dollarization and conducts empirical analysis on the causes of deepening dollarization and the relationship between exchange rate and inflation across foreign exchange regimes and degrees of dollarization in countries. Finally, policy implications will be drawn for the de-dollarization of the Cambodian economy based upon country case studies and

empirical estimations.

2. Empirical Analyses on Determinants for Dollarization

A. Previous Literature

Researches on dollarization and currency substitution have been steadily continuing since the 2000s. After the 1980s, dollarization spread out because of the occurrence of the outbreak of frequent currency or financial crises around the world. Garcia-Escribano and Sosa (2010) analyse de-dollarization in four Latin America countries; namely Bolivia, Paraguay, Peru and Uruguay. The study shows that the deposit dollarization ratio on average dropped from 82.1% in 2001 Q1 to 55.3% in 2010 Q3. The reasons for the decline in the degree of dollarization are analyzed from the aspect of financial institutions' loans and deposits. The main reason for deposit de-dollarization was the appreciation of the domestic currency. In addition, driving factors for credit de-dollarization were attributed to prudential measures such as reserve requirement differentials across local and foreign deposits, development of domestic local-currency capital markets in local currency, and de-dollarization of deposits.

Catao and Terrones (2016), on the other hand, analyze the case of Peru's dollarization mitigation more specifically. In the case of Peru, the ratios of dollar deposits and loans, which had both been around 80% in 1993, showed a steady decline to around 30-40% in 2015. They present the external and domestic factors respectively for the weakening of dollarization. In terms of external factors, weaker trends in preference for safe assets, low international interest rates and rising prices for international commodities are suggested. Domestic factors include prudential regulation such as enforcing higher interest rates on dollar loans, and overall stabilization in inflation after the introduction of inflation targeting.

Naceur et al. (2015) analyze the dollarization factors for Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan Tajikistan, Turkmenistan and Uzbekistan

countries belonging to the Caucasus and Central Asia country group. As of the fourth quarter of 2013, dollar-denominated deposits account for 46% of total deposits in these countries. This paper regards the volatilities in inflation and exchange rate, the undeveloped financial markets, and the domestic-currency depreciation policies as factors reinforcing dollarization. Thus, to mitigate the degree of dollarization, it is necessary to raise the credibility of monetary and foreign exchange policy, attain stable and low inflation and foster the development of the domestic financial market.

Kokenyne et al. (2010) construct monthly-frequency country-level panel data from January 1999 to March 2009 for 32 countries undergoing dollarization, rather than a small group of countries limited to individual countries and regions. Factors strengthening dollarization are analyzed using the panel data. According to this analysis, high inflation, highly volatility exchange rate and real depreciation of the local currency are presented as the main factors at work.

B. Construction of Country Panel and Estimation Model

Reinhart et al. (2003) measure the degree of dollarization by using three indicators such as foreign currency deposits, foreign currency denominated domestic debt and foreign debt for 90 countries in the world. And then Reinhart et al. (2003) reviewed how the degree of dollarization can affect the effectiveness of monetary and foreign exchange policies. In this paper, we have constructed country-level panel data including countries having a more than 20% ratio in foreign currency deposits among the 90 nations in Reinhart et al. (2003), because according to Duma (2011), the criterion for successful de-dollarization is less than 20% of foreign currency deposits. Meanwhile this paper adds Israel, Poland, Mexico and Liberia to the panel data based upon the related literature. In addition, in Reinhart et al. (2003), the some countries classified as dollarized ones with a higher than 20% foreign currency deposit ratio were not included in this paper's country panel dataset due to limited availability of the key data.

The reason for establishing the country panel data based on Reinhart et al.

(2003) is that the countries with high dollarization ratios around 2000, can be separated into two group; those with a continuing high degree of dollarization and those now having a de-dollarized economy. In this chapter, we analyze whether the factors of dollarization are differentiated across degrees of dollarization and foreign exchange regimes. There are some differences between the country group selected on the basis of Reinhart et al. (2003) and the country group of Kokenyne et al. (2010). As can be seen in <Table 3-1>, only nine of the 29 countries used in this paper overlap with the country group of Kokenyne et al. (2010). In other words, Kokenyne et al. (2010)'s estimation technique, involving monthly frequency data framework, is applied to a different country group with a yearly frequency data framework.

<Table 3-1>

Country Panel Differences between Previous Literature and This Paper

	This paper (28 countries)	Kokenyne et al. (2010) (32 countries)
Common countries	Indonesia, Costa Rica, Honduras, Jamaica, Nicaragua, Saint Kitts, Uruguay, Belarus, Ukraine	
Different countries	Armenia, Cambodia, Laos, Mongolia, Pakistan, Argentina, Mexico, Belarus, Poland, Russia, Slovenia, Egypt, Israel, Jordan, Turkey, Angola, Liberia, Sao Tome and Principe, Tanzania, Zambia	Azerbaijan, Babados, Bolivia, Burundi, Canada, Cape Verde, Chile, Dominica, Grenada, Guatemala, Haiti, Kenya, Kuwait, Lithuania, Saint Lucia, Moldova, Paraguay, Qatar, Romania, Seychelles, South Africa, St. Vincent

Following Kokenyne et al. (2010), the empirical specification on driving factors for dollarization is presented as in Equation (1).

$$\Delta Dollarization_{it} = \alpha_i + \beta_1 \Delta Dollarization_{it-1} + \beta_2 FXflex_{it-1} + \beta_3 \Delta Rer_{it-1} + \beta_4 \pi_{it-1} + \beta_5 Others_{it-1} + \epsilon_{it} \quad (1)$$

Dollarization indicates the degree of dollarization in a form of annual differences as the triangle, Δ , implies. *FXflex* is a proxy for flexibility of foreign exchange

rate, *Rer* indicates the real exchange rate between local currency and the US dollar, and π implies inflation. Finally, *Others* indicates other control variables such that real GDP growth, openness and a proxy for the quality of market institution. Descriptions of the variables used in the analysis will be discussed in more detail in the next section.

On the other hand, since the number of individual variables that determine the size of the cross section of the panel is no greater than 28, the time series characteristic can be dominant. Thus, the level variables are strongly assumed to have unit roots in general, and subsequently all level variables are transformed into stationary time-series by a form of growth rate or difference. In addition, we try to alleviate the endogenous problem between independent and dependent variables by using the one-year lags. This lagged dependent variable model could be well matched with dynamic panel estimations such as system GMM. This estimation, however, is usually applied to panel structure having short time-dimension and long individual variables which is not the case for this paper.

C. Data and Basic Statistics

<Table 3-2> shows sample countries for panel data. Many countries from Latin America are included. However, countries that have undergone dollarization or continued to date, are distributed all over the world whether in Asia, Europe or Africa.

<Table 3-2>

Region¹⁾	Country
Asia	Armenia, Cambodia, Indonesia, Laos, Mongolia, Pakistan
South America	Argentina, Costa Rica, Honduras, Jamaica, Mexico, Nicaragua, St. Kitts and Nevis, Uruguay
Europe	Belarus, Poland, Russia, Slovenia, Ukraine
Middle East and Northern Africa	Egypt, Israel, Jordan, Turkey
Central and Southern Africa	Angola, Liberia, Sao Tome and Principe, Tanzania, Zambia

Note: 1) It follows the IMF's regional classification criteria.

The variables included in the empirical analyses are as follows. Unfortunately, we are not able to track the statistics of foreign currency deposits in publicly accessible databases such as the IMF IFS. Inevitably, the ratio of foreign debt to savings deposits is used as an alternative for foreign currency deposits. The differences in yearly ratios ($D.flia_sav$) are used, not the level itself, due to both mitigating the unit root characteristics of the time series and minimizing the distortions from the two-level variables between foreign liabilities and foreign deposit ratios. As shown in <Table 3-4>, the ratio of foreign liabilities is 28.4%, which is somewhat lower than Reinhart et al. (2003)'s 43% foreign deposit ratios on average between 1996 and 2001. However, as can be seen from comparison of the statistics between the de-dollarization countries and the on-going dollarization countries shown in <Table 3-7>, the foreign liabilities ratio in de-dollarized countries is significantly lower than that in on-going dollarization countries. In other words, although there are basic limitations to the statistics, it can be said that the foreign liabilities ratios can approximate more or less the trend of foreign deposit ratios.

<Table 3-3>**Explanations of Variables**

Variables	Explanations
Foreign liabilities over saving deposits (flia_sav)	Proxy for degree of dollarization or foreign currency deposits; deposit money banks; local currency basis
Inflation (inf)	Annual rates of increase in consumer price index; %
Growth in foreign exchange rate (fxr_g)	Proxy for exchange rate's flexibility; yearly growth rates in local currency unit/US\$; rising values implying depreciation of local currency against the US\$
Real exchange rate (rer)	Proxy for real exchange rate's flexibility; (local currency unit/US\$)*(US price index/local price index); price index's base 2010; growing values implying real depreciation of the local currency
Real GDP growth (y_g)	Yearly growth rates in GDP; constant 2010 US\$
Openness (open)	(Exports plus imports)/GDP; %
Government effectiveness (govt_eff)	Proxy for the quality of (market) institutions; index ranging from -2.5 to +2.5

Note: () means abbreviation for variable

Sources: except government effectiveness, all the data are from IMF's International Financial Statistics; government effectiveness is from World Bank Worldwide Governance Indicators

As seen in <Table 3-3>, Inflation implies yearly rates of increase in the consumer price index. Nominal exchange rate is defined as local currency per one US dollar (local currency/US\$), which definition is applied for every country. Thus, an increase in the nominal exchange rate indicates depreciation of the local currency against the US dollar. In addition to the nominal exchange rate, the real exchange rate, including the price index ratio of the developing country over the US, is also considered as an independent variable. In addition, we used real GDP growth rate, trade openness, and government efficiency index as other control variables reflecting the characteristics of each country.

The basic statistics of the variables used in panel estimation are listed in <Table 3-4>. Here, the variables D.flia_sav, D.rer and D.govt_eff represent the annual differentials. A number of heterogeneous developing countries around the world are included in the national panel data, indicating that standard deviations, minimums and maximums have very huge bounds.

<Table 3-4>**Basic Statistics**

Variables	Mean	S.D	Min	Max
flia_sav (%)	28.4	25.8	0.3	153
D.flia_sav (%p)	0.3	12.2	-77.3	81.6
inf (%)	27.6	204.9	-2.3	4145.1
fxr_g (%)	10.6	32.9	-220.8	384.1
rer	125.8	49.2	9.8	431
D.rer	-1.6	21	-125	173.7
y_g (%)	4.3	5.4	-35.9	72.4
open (%)	69.1	35.1	6	152
govt_eff	-0.3	0.7	-2	1.4
D.govt_eff	0.01	0.1	-1	0.9

Note: () means abbreviation for variable

Sources: except government effectiveness, all the data are from IMF's International Financial Statistics; government effectiveness is from World Bank Worldwide Governance Indicators

A brief overview of the variables included in the estimations is as follows. Inflation turns out to be 27.6%, on average for annual rates of increase of the CPI, which is significantly higher than that of other major countries. In particular, the highest inflation rate was recorded at 4,145.1% per annum, since hyper-inflation occurred in Angola from 1991 to 1999. In addition, it showed an average depreciation of about 10% per year against the US dollar. On the other hand, as of 2010, the real exchange rate, reflecting changes both from the nominal exchange rate and the relative price level of the developing country over the US, has increased to 125.8. This implies a real depreciation of the domestic currency against the US dollar. The average annual economic growth rate is 4.3% and the trade openness on average is 69.1% of GDP. In the case of the government efficiency index, it can be considered that the overall market and social system quality of the panel countries that underwent dollarization are somewhat below the world average in that the index is assumed to be of normal distribution with zero mean set as the world average.

The time series of major variables are shown in <Figure 3-2>. This time-series trend implies the average value of the corresponding variable for all countries for each year. First, the ratio of foreign liabilities (flia_sav) shows that the proportion of foreign liabilities fell steadily until 2004, then it rose

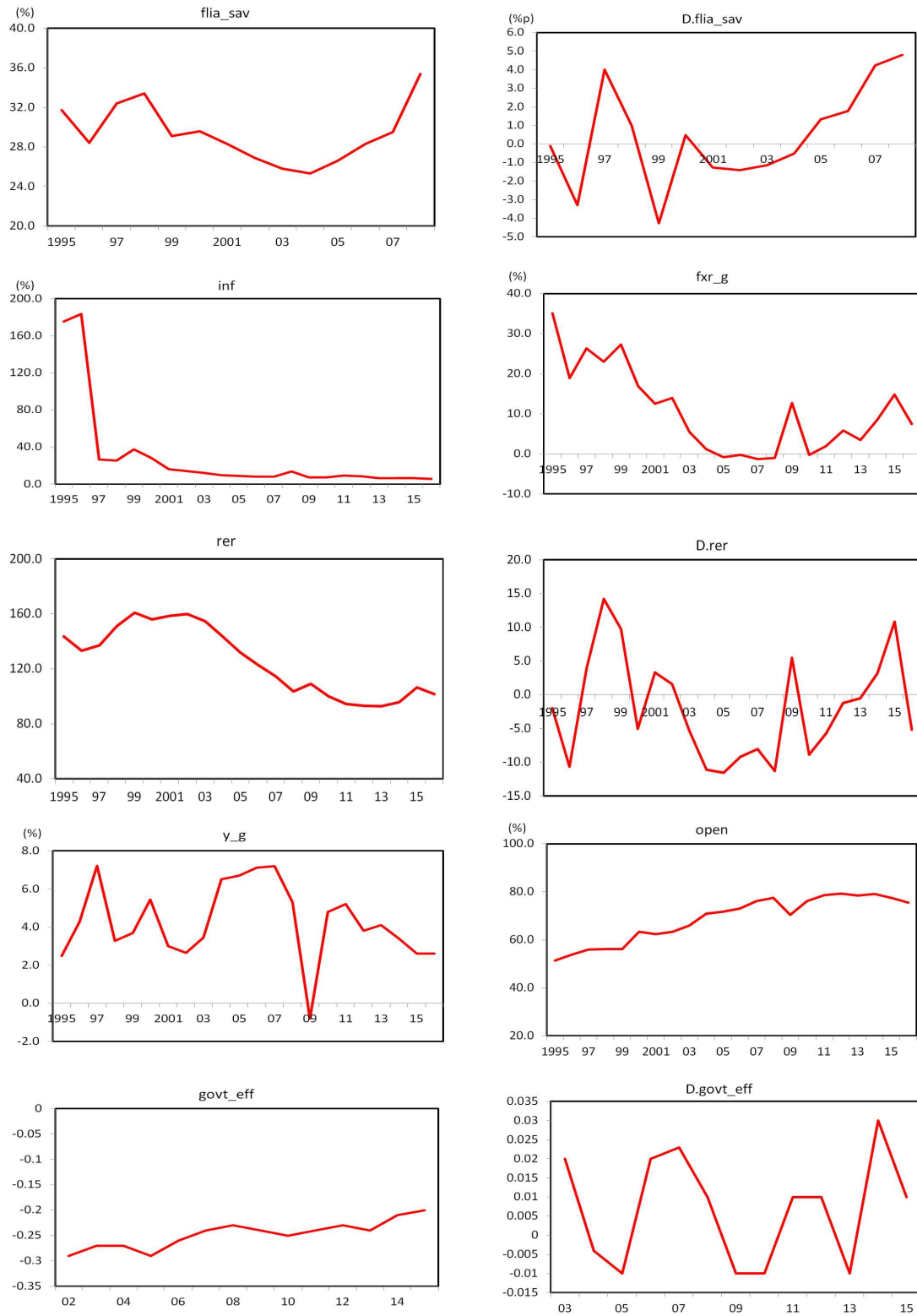
consistently until the 2008 global financial crisis. Since the data for foreign liabilities ratio from 2009 are limited, the time series trends are exhibited until 2008 due to series-break concerns. After the 1997 Asian Crisis had subsided, from the 2000s the foreign liabilities steadily increased due to an increase in capital inflows into emerging market and developing countries before the 2008 global financial crisis. This increase in foreign liabilities is estimated to be correlated with increase in the proportion of dollar denominated foreign currency deposits. The difference (D.flia_sav) of the ratio of foreign liability by year also shows a steady increase from 2004 to 2008 after fluctuating up to the mid-2000s.

Inflation (inf) was very high in 1995-97 due to the effect of hyperinflation in Angola, but has steadily declined since then. In this paper, the transition over time of inflation within one country figures is more important, than the between variations across countries, on the ground that the empirical approach using the fixed effect model can sufficiently control the characteristics of each country. Therefore, the huge variations in inflation as an overall average of the country panel do not pose a crucial problem.

The annual rate change in the exchange rate (fxr_g) showed a steady appreciation against the US dollar until the global financial crisis in 2008, once the Asian Crisis in the late 1990s subsided. However, as the flight to safe assets has strengthened since the 2008 crisis, the depreciation of domestic currencies against the US dollar has continued steadily.

<Figure 3-2>

Time-Series Trends for the Variables (yearly averages on countries)



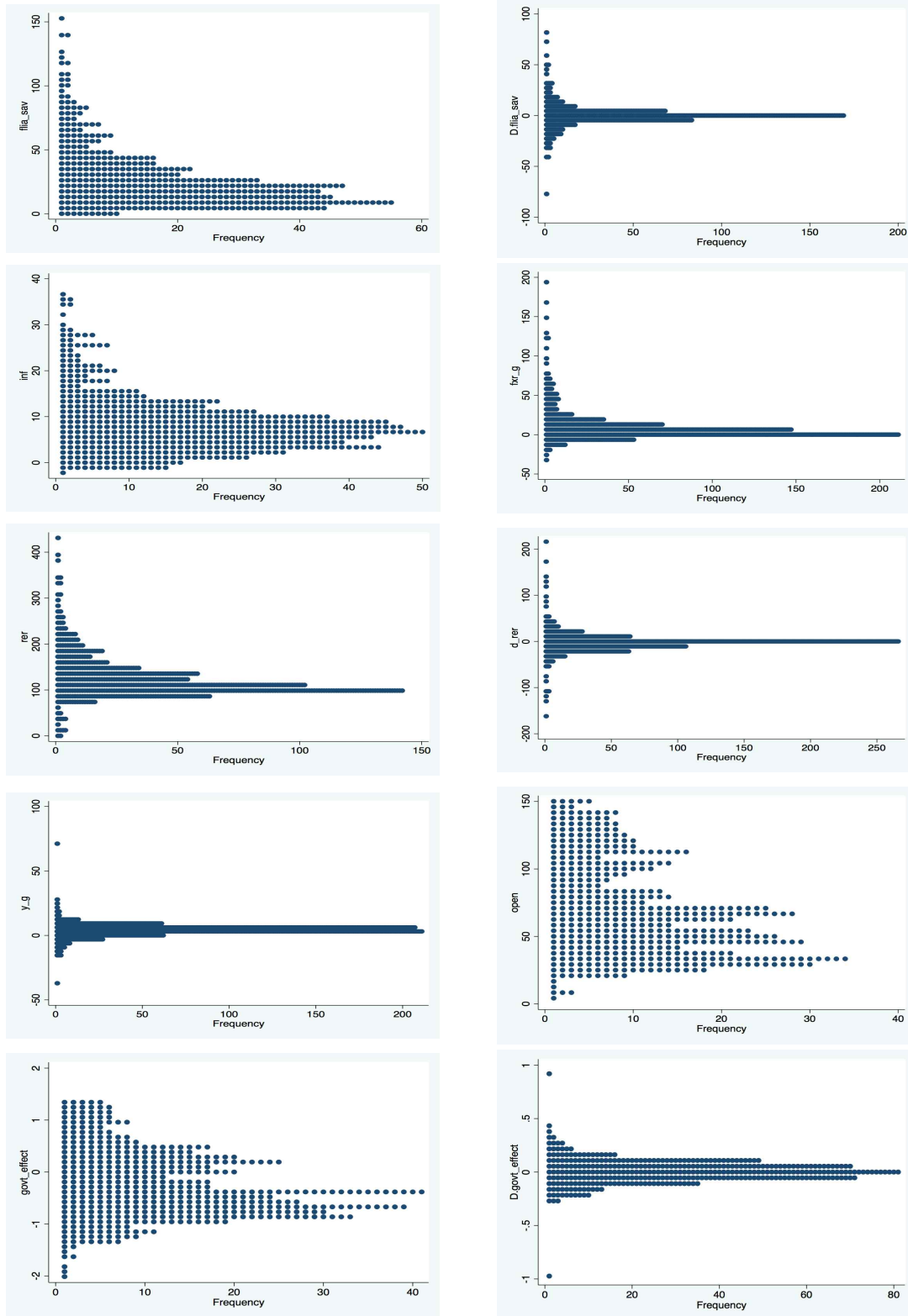
The trend of the real exchange rate (rer) involving inflation rates at first continued to decline substantially compared to the US dollar, implying real appreciation of domestic currencies. The trend, however, has stopped since the global financial crisis. Meanwhile, unlike the reduction of the nominal exchange rate against the US dollar, there has been real appreciation in local currencies as inflation in each country rose faster than the US. The yearly difference (D.rer) of the real exchange rate continues to fluctuate.

The real GDP growth rate (y_g) fluctuated from around 5%, but fell sharply after the global financial crisis in 2008. The average growth rate has generally fallen below 4% after rebounding from the crisis. With the progress of international trade and capital flows, the openness of the country has been risen from 50% in 1995 to 80% in 2016. Looking at the government efficiency (govt_eff) index, the absolute level of the country does not reach the global average, i.e. zero, but the efficiency index has been gradually improving as time goes by. The yearly differential variable (D.govt_eff) of the variable has been fluctuating without any trends.

The overall distribution for each variable is shown in <Figure 3-3>. Some extreme values are excluded in the distributions. The variables applied to the empirical analysis are generally close to the normal distribution. In other words, although the foreign liabilities over saving deposits (flia_sav) is larger than 0, the distribution of the yearly differential variable for foreign liabilities ratio (D.flia_sav) applied to the actual panel estimation is close to a symmetric distribution. The differential variables in real exchange rate and government efficiency index are also close to symmetry centered on the average. In this paper the distribution of the variables is not a huge problem because the empirical analysis is performed mainly using the fixed effects model involving the unobserved heterogeneity in each country. We also report the estimation results of the random effect model together with those of the fixed effect model.

<Figure 3-3>

Distributions of Variables¹⁾



Note: 1) Extreme values are excluded for some variables.

D. Panel Estimation Results

In this section, the fixed effect model is mainly used, and panel estimation results are shown in <Table 3-5>. The random effects model can capture cross-country variations of the relationship between independent and dependent variables over time. On the other hand, the fixed effect model is more suitable for capturing changes over time in within-country. In this paper, we will mainly use the fixed effects model taking into account the individual characteristics of each country on the grounds that the financial and economic systems or institutions are quite different across the panel countries.

As discussed above, the dependent variable replacing foreign currency deposits (or dollar deposits), a proxy for the degree of dollarization, is the ratio of foreign liabilities to savings deposits. In <Table 3-5>, the English capital letter L refers to the first lagged variable. The capital letter D is an abbreviation of the difference, which indicates that the differential variable is used to transform the variable suspected of having a unit root, into a stationary time series.

The use of first-order lagged variables is to alleviate the problem of endogeneity between dependent and independent variables by enhancing the degree of the exogeneity of independent variables. Since the data frequency is one year, the fixed effect model, which assumes correlation between the individual effect (α_i) and the explanatory variables, can alleviate the endogeneity problem to a greater or lesser degree. However, it can be said that if contemporary variables are used as independent variables at the individual country level, it is difficult to prevent the possibility of reverse causation in that dependent variables may have effects on independent variables. Therefore, the independent variable is constructed as a one-year lagged form. In addition, various models are estimated by different combinations of independent variables in order to verify whether there is a difference in statistical significance for influences on the dependent variables due to multi-collinearity among the independent variables.

Estimation results are overall consistent with the stylized facts presented in previous studies. In other words, high inflation, low flexibility in exchange rate, depression of the real economy, and a decline in trade openness have contributed to deepening dollarization. Meanwhile, the dollarization can be eased when the quality of the market and social system improves despite the statistical significance being somewhat low.

<Table 3-5>

Panel Estimations¹⁾²⁾

Variable	Random effect	Fixed effect	Fixed effect	Fixed effect
L.D.flia_sav	0.1147* (0.0584)	0.0382 (0.0604)	0.0652 (0.0592)	0.3305*** (0.0879)
L.inf	0.1853* (0.0720)	0.2118*** (0.0738)	0.1805*** (0.0499)	
L.fxr_g	-0.2505** (0.1121)	-0.3569*** (0.1216)	-0.2829*** (0.0555)	
L.D.rer	-0.0002 (0.0606)	0.0519 (0.0665)		-0.1301* (0.0718)
L.y_g	-0.2037 (0.1498)	-0.2636 (0.1625)	-0.2789* (0.1632)	-0.1395 (0.1514)
L.open	-0.0161 (0.0187)	-0.1190 (0.0747)	-0.0650 (0.0729)	-0.2621*** (0.0807)
L.D.govt_eff				-5.0899 (7.3627)
# of obs.	263	263	273	131
# of countries	23	23	24	23
Adj. R-sq./ Within R-sq.	0.2579	0.0995	0.1025	0.2607

Notes: 1) Detailed explanations for each variable are given in <Table 3-3>

2) *, **, and *** indicate 10%, 5% and 1% statistical significance levels, respectively

Sources: All the data are from IMF's International Financial Statistics except government effectiveness; government effectiveness is from World Bank Worldwide Governance Indicators

However, the flexibility of the nominal and real exchange rate among the estimation results needs to be interpreted with some caution. This variable represents the nominal and real depreciation rate of the local currency against the US dollar. Here, depreciation of domestic currencies is a factor that strengthens dollarization because local currency depreciation directly indicates

relative appreciation of the US dollar. However, panel estimation results show that overall depreciation of the local currency in previous year moderates the degree of dollarization in the following year. We conjecture that this result seems to depend on economic agents' expectations on the value of US dollar. In other words, if appreciation of US dollar has already been fully realized in the previous year, the expectation of its further appreciation will weaken, which can be interpreted as the incentive for economic agents to hold more US dollars having declined. Or it could reflect the data limitations of the foreign liabilities ratio replacing the foreign currency deposit ratio. Further research on this issue is needed in the future.

In order to verify whether the factors of deepening dollarization are differentiated according to degree of dollarization and exchange rate regimes, we classify the corresponding country groups and execute the same estimations. First of all, the exchange rate systems are divided into two groups as floating system and (managed) fixed exchange rate regime (pegging system) as of 2016. The floating exchange rate regime includes both fully floating systems and managed floating system. The fixed exchange rate regime includes hard-pegging systems including currency board and soft-pegging allowing movements within a certain band. In addition, as of 2008, when the statistics of foreign liabilities ratio are available for most of the panel countries, we divide the countries into two groups; i.e. de-dollarization countries with a foreign currency deposit ratio of less than 20% and on-going dollarization countries with a foreign currency deposit ratio exceeding 20%. <Table 3-6> shows the countries belonging to each group.

<Table 3-6>

Groups of Countries According to Exchange Rate Regimes¹⁾ and Degree of Dollarization²⁾

	Floating	Pegging
De-dollarized ³⁾	Israel, Indonesia, Mexico, Tanzania	Argentina, Egypt, Honduras, Liberia, Pakistan
Dollarized	Armenia, Mongolia, Poland, Russia, Slovenia, Turkey, Ukraine, Uruguay, Zambia	Angola, Belarus, Cambodia, Costa Rica, Jamaica, Jordan, Laos, Sao Tome, Principe, St. Kitts

Notes: 1) Exchange regimes based on the year of 2016

2) Degree of dollarization based on the year of 2008

3) Foreign deposit ratio is below 20% as of 2008.

<Table 3-7> shows main features of each country group according to the exchange rate system and degree of dollarization. The figures in the table indicate the average of each group for the sample period. First of all, there is no significant differences between floating and pegging countries. The size of the foreign liabilities ratio is similar. Pegging countries show slightly higher GDP growth and openness but there is no huge gap between them. However, floating countries show significantly lower inflation than pegging countries. One interesting fact is that the rate of increase in the exchange rate in pegging countries is higher than in floating countries, which presumably reflects huge temporary devaluations by the foreign exchange authority in pegging regime countries.

<Table 3-7>

Main Features of Country Group

variable	Floating	Pegging	De-dollarization	Dollarization
	average	average	average	average
flia_sav (%)	29.9	27.5	20.3	32.6
inf (%)	14.4	39.5	8.3	36.3
fxr_g (%)	9.1	11.8	6	12.8
rer	137.7	116	113.7	131.9
y_g (%)	3.9	4.6	4.3	4.3
open (%)	61.9	78.8	48.9	80.6

Looking at de-dollarization and dollarization country groups, we can see that there are some differences in several key economic indicators. First, the foreign liabilities ratio, representing the degree of dollarization, is lower in de-dollarized economies than in the dollarization countries as expected. In addition, the inflation and exchange rate growth or the depreciation of the domestic currency are more stable in the de-dollarization countries. Foreign trade openness also showed a difference. In the case of the de-dollarization countries, 48.9% was recorded, while the degree of openness was nearly double at 80.6% in the

dollarization countries. However, the annual economic growth was 4.3%, indicating no difference between the two groups.

<Table 3-8> shows panel estimation results between floating and pegging foreign exchange regime country groups. Overall estimates show no significant difference between the two groups except for inflation and economic growth. It is worth noting that the exchange rate system applied to the national group classification is based on the present point of view as the past exchange rate system is not reflected due to information constraints. In the case of inflation, it influences the degree of dollarization in the floating exchange rate system more significantly. In the fixed exchange rate system, the increase of economic growth plays a more important role in mitigating the degree of dollarization.

<Table 3-8>

Panel Estimation: Floating vs. Pegging

Variable	Floating fx regime		Pegging fx regime	
	Fixed effect	Fixed effect	Fixed effect	Fixed effect
L.D.flia_sav	0.0485 (0.0815)	0.0971 (0.0785)	0.0134 (0.0980)	0.0118 (0.0977)
L.inf	0.3221*** (0.1217)	0.2797*** (0.0846)	0.1980* (0.1176)	0.1514* (0.0774)
L.fxr_g	-0.3639** (0.1626)	-0.2614*** (0.0686)	-0.3879* (0.2257)	-0.2820*** (0.1031)
L.D.rer	0.0578 (0.0771)		0.0846 (0.1604)	
L.y_g	0.0216 (0.2467)	-0.0226 (0.2475)	-0.4045* (0.2262)	-0.4061* (0.2254)
L.open	-0.0210 (0.1228)	0.1172 (0.1136)	-0.1502 (0.0990)	-0.1501 (0.0987)
# of obs.	138	148	125	125
# of countries	12	13	11	11

Notes: 1) Detailed explanations for each variable are given in <Table 3-3>

2) *, **, and *** indicate 10%, 5% and 1% statistical significance levels, respectively

Sources: All the data are from IMF's International Financial Statistics except government effectiveness; government effectiveness is from World Bank Worldwide Governance Indicators

<Table 3-9> displays the results of the same panel estimations by classifying into de-dollarization and on-going dollarization country groups as of 2008. Unlike

the previous estimates of floating and pegging country groups, marked differences between the estimates of the two country groups can be found. First of all, the effect of inflation on the degree of dollarization is mostly derived from the on-going dollarization country group. In addition, the real economy and the active foreign trade are also important factors in lowering the degree of dollarization, which is also significant in the de-dollarization country group. In addition, real depreciation of the local currency has also shown statistically significant increasing effects on dollarization in the de-dollarization country group. On the other hand, the exchange rate flexibility is shown to lower the degree of dollarization in both country groups with the magnitude of the coefficient being larger in the de-dollarization country group.

<Table 3-9>

Panel Estimation: De-Dollarization vs. Dollarization

Variable	De-dollarization		Dollarization	
	Fixed effect	Fixed effect	Fixed effect	Fixed effect
L.D.flia_sav	-0.0424 (0.0985)	-0.1015 (0.0993)	-0.0113 (0.0802)	0.0290 (0.0774)
L.inf	0.0706 (0.1829)	-0.1899 (0.1607)	0.2129** (0.0985)	0.2701*** (0.0686)
L.fxr_g	-0.5529*** (0.1688)	-0.1325* (0.0681)	-0.2865* (0.1685)	-0.3910*** (0.0916)
L.D.rer	0.2434*** (0.0899)		-0.0620 (0.0882)	
L.y_g	-0.5010*** (0.1612)	-0.5045*** (0.1665)	0.0037 (0.2918)	-0.0724 (0.2891)
L.open	-0.4972*** (0.1088)	-0.4606*** (0.1116)	-0.0358 (0.0991)	0.0167 (0.0953)
# of obs.	106	106	157	167
# of countries	8	8	15	16
Within R sq.	0.3049	0.2496	0.1272	0.1381

Notes: 1) Detailed explanations for each variable are given in <Table 3-3>

2) *, **, and *** indicate 10%, 5% and 1% statistical significance levels, respectively

Sources: All the data are from IMF's International Financial Statistics except government effectiveness; government effectiveness is from World Bank Worldwide Governance Indicators

3. Analysis on the Relationship between Inflation and Foreign Exchange Rate

A. Previous Literature

The relationship between exchange rate fluctuations and inflation is often known as pass-through. This means that if domestic currencies are devalued, the domestic currency denominated price of imported goods initially denominated in the US dollar will be subject to upward pressure on inflation. The penetration effect of exchange rate fluctuations is known to be different depending on the structure of industry and the foreign exchange market in each country. According to Ize and Yeyati (2005) and Leiderman et al. (2006), the transmission effect of exchange rate fluctuations on prices is twice as strong the dollarization countries. In the case of dollarization countries, it is possible to directly affect the inflation rate not only due to the depreciation of domestic currencies but also due to appreciation of foreign currency deposits and market prices denominated in the US dollar. In the case of dollar deposits, if the US dollar appreciates, aggregate demand may increase through a kind of wealth effect from the dollar deposits, which may cause pressure for inflation over the medium to long term.

Unlike the above theoretical approaches, empirical analysis of correlation between exchange rates and prices in dollarization countries is not easy to find. Moreover, there are many questions about whether the effectiveness of the transmission of the foreign exchange rate to inflation can be differentiated according to various exchange rate regimes and the degree of dollarization. In this section, hence, we analyze the effect of the foreign exchange rate on inflation using panel data of various country groups.

B. Model and Panel Estimation Results

The analytical model was modified from the previous estimation model to perform a country panel analysis on inflation determinants as shown in Equation (2). As discussed earlier, all the independent variables are first-order lagged

forms to mitigate the endogeneity problem. The fixed effect model was used mainly to control unobserved heterogeneous factors of the countries. Based on the estimated coefficients of Equation (2), we can gauge the average causality of the dollarization country group to see how policy makers' exchange market policy changes, such as easing exchange rate flexibility, could have an impact on inflation.

$$\pi_{it} = \alpha_i + \beta_1 \Delta Dollarization_{it-1} + \beta_2 FXflex_{it-1} + \beta_3 \Delta Rer_{it-1} + \beta_4 \pi_{it-1} + \beta_5 y-g_{it-1} + \epsilon_{it} \quad (2)$$

<Table 3-10>

Panel Estimation: Inflation and Exchange Rate

Variable	Pooled OLS	Fixed effect	Fixed effect	Fixed effect
L.inf	-0.0592*** (0.0086)	-0.0498 (0.0092)		-0.0524*** (0.0076)
L.D.flia_sav	0.2455** (0.1029)	0.2151* (0.1093)	0.2993*** (0.1104)	
L.fxr_g	1.2138*** (0.0619)	1.0511*** (0.0755)	0.7280*** (0.0486)	1.0390*** (0.0608)
L.D.rer	-0.3067*** (0.0554)	-0.2193*** (0.0606)	-0.0604 (0.0551)	-0.2584*** (0.0492)
L.y_g	0.8983*** (0.2603)	0.6060** (0.2925)	0.2589 (0.2971)	0.7493*** (0.2127)
# of obs.	365	365	366	521
# of countries	..	27	27	27
Adj. R sq./ within R sq.	0.6114	0.4863	0.4403	0.4764

Notes: 1) Detailed explanations for each variable are given in <Table 3-3>

2) *, **, and *** indicate 10%, 5% and 1% statistical significance levels, respectively

Sources: All the data are from IMF's International Financial Statistics except government effectiveness; government effectiveness is from World Bank Worldwide Governance Indicators

First, the estimation results for the whole country sample are shown in <Table 3-10>. The coefficient estimates of all explanatory variables are found to be largely consistent with the theoretical expectations. The higher the degree of dollarization, the stronger the penetration effect of exchange rate fluctuations accelerated inflation. In addition, depreciation of the domestic currency has a significantly positive (+) effect on inflation through the rise in import prices.

The quantitative effects can be measured based upon the estimated coefficients

as follows. A 1%p increase in the foreign liabilities ratio representing the foreign currency deposit ratio, can raise inflation by 0.2-0.3%p on average for dollarization countries. In addition, a 1%p depreciation (appreciation) of domestic currencies can lead to a 0.7% to 1.2%p increase (decrease) in inflation throughout the dollarization countries. The stabilization of domestic prices (D.rer) relative to US prices in terms of goods, real exchange rate, shows that the effect on inflation in the next year differs from the nominal exchange rate. Real depreciation, involving the changes in nominal exchange rate, indicates that the domestic price level is lower than the US. According to the estimation results, a real depreciation of 1%p reduces the average inflation by 0.2-0.3%p. In addition, a 1% increase in real GDP has an increasing effect on inflation of 0.6-0.9%p on average for dollarization countries

<Table 3-11>

Inflation and Foreign Exchange Rate: Floating vs. Pegging

Variable	Floating fx regime		Pegging fx regime	
	Fixed effect	Fixed effect	Fixed effect	Fixed effect
L.inf	0.0935 (0.1020)		-0.0579*** (0.0120)	
L.D.flia_sav	0.2680*** (0.0750)	0.2791*** (0.0740)	-0.0583 (0.1842)	0.0986 (0.1851)
L.fxr_g	0.6003*** (0.1330)	0.7014*** (0.0742)	1.1094*** (0.1013)	0.7203*** (0.0649)
L.D.rer	-0.1633*** (0.0643)	-0.2031*** (0.0473)	0.0158 (0.1060)	0.1949 (0.1047)
L.y_g	0.3785* (0.2262)	0.3792* (0.2261)	0.4116 (0.4405)	-0.0457 (0.4539)
# of obs.	159	159	286	207
# of countries	12	12	15	15
Within R sq.	0.4669	0.4637	0.5291	0.4403

Notes: 1) Detailed explanations for each variable are given in <Table 3-3>

2) *, **, and *** indicate 10%, 5% and 1% statistical significance levels, respectively

Sources: All the data are from IMF's International Financial Statistics except government effectiveness; government effectiveness is from World Bank Worldwide Governance Indicators

Next, the same estimation was carried out by dividing the country group by exchange rate regime and the degree of dollarization as in the previous analysis. First, the estimation results for each exchange rate regime are shown in <Table 3-11>. There are some differentiated effects on inflation determination across the

country groups by exchange rate regime. The degree of dollarization shows a significant increase in inflation under a floating exchange rate regime, but under a pegging exchange rate regime, it is not statistically significant presumably because of the rigid exchange rate movements.

On the other hand, as shown in the previous analysis, the effect of the depreciation of the domestic currency on inflation was greater in the fixed exchange rate countries than in the floating exchange rate. In other words, a 1%p depreciation in the country group of floating exchange rate increases inflation by 0.6-0.7%p, while it increases it by 0.7-1.1%p in the fixed exchange rate country group. In addition, a 1%p real depreciation implying relative price stabilization of domestic goods as against US' goods lowers inflation by 0.2%p with more significant effects in the floating group. Finally, a 1% increase in real GDP leads to 0.4%p increase in inflation, which indicates that the spillover effect of the real economy on inflation is more dynamic under a floating exchange rate than a fixed exchange rate.

<Table 3-12> shows the results of dividing countries by dollarization level. First, in the case of the de-dollarization country group, the foreign exchange market variables do not have statistically significant effects on domestic inflation unlike the case of the dollarization country group. That is, a 1%p depreciation of the domestic currency does not have any effects on inflation or increases it by just 0.2%p in the de-dollarization country group, while it increases the inflation by 0.8-1.1%p with statistical significance in the dollarization country group. In addition, the degree of dollarization does not appear to have a significant effect on inflation in de-dollarization country group. In other words, in the case of dollarization countries, external variables through the foreign exchange market have a significant influence on inflation, while in the case of de-dollarization countries, domestic factors are more influential.

According to the above estimation results, mitigation of the degree of dollarization, appreciation of the domestic currency, and gradual implementation

of the floating exchange rate are necessary in order to stabilize the impact of exchange rate fluctuations on inflation.

<Table 3-12>

Inflation and Exchange Rate: De-Dollarization vs. Dollarization

Variable	De-dollarization		Dollarization	
	Fixed effect	Fixed effect	Fixed effect	Fixed effect
L.inf	0.2321* (0.1288)		-0.0553*** (0.0108)	
L.D.flia_sav	0.0221 (0.0753)	-0.0083 (0.0650)	0.4253*** (0.1427)	0.5406*** (0.1480)
L.fxr_g	0.0855 (0.1138)	0.2223* (0.0831)	1.1490*** (0.0907)	0.7962*** (0.0585)
L.D.rer	-0.0202 (0.0606)	-0.0711 (0.0529)	-0.0598 (0.0799)	0.1120 (0.0756)
L.y_g	0.1177 (0.1243)	0.1162 (0.1245)	0.5221 (0.4720)	-0.1537 (0.4748)
# of obs.	123	124	242	242
# of countries	9	9	18	18
Within R sq.	0.1261	0.0999	0.5576	0.5086

Notes: 1) Detailed explanations for each variable are given in <Table 3-3>

2) *, **, and *** indicate 10%, 5% and 1% statistical significance levels, respectively

Sources: All the data are from IMF's International Financial Statistics except government effectiveness; government effectiveness is from World Bank Worldwide Governance Indicators

4. Studies on Country Cases

This section will highlight countries that have historically experienced gradual mitigation of dollarization and will focus more on their cases. We will also try to summarize the factors that have a failure in implementing de-dollarization policy. To this end, we will look at cases of Latin American countries such as Peru and those in the Caucasus and Central Asia such as Armenia. And we try to summarize some of the stylized facts related to dollarization mitigation in these countries.

A. Causing and Mitigating Factors of Dollarization

Countries experiencing high dollarization can be broadly classified into three

regions: Middle East and African country group, Latin American country group, and Caucasus and Central Asian country group. In other Asian countries, Cambodia (80% of foreign currency deposits), Laos (50% of foreign currency deposits), and Mongolia (30% of foreign currency deposits) are known as dollarization countries. Recently, the continued high dollarization in Cambodia is a differentiated phenomenon in light of the gradual declines in the ratios of foreign currency deposits in Vietnam and Laos and by and large, in Latin American countries. In this section, the major causative and mitigating factors of dollarization are examined first with greater focus on the Caucasus and Central Asian and South American country groups.

As can be seen in <Table 3-13>, factors that strengthen dollarization are common to the two country groups, but there are also some factors that are differentiated by region. First, the Caucasus and Central Asian countries here comprise Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. As has emerged from many previous discussions, the depreciation of the local currencies has contributed to the strengthening of US dollar holdings as it has lowered the real purchasing power of domestic currencies. The high volatility of the exchange rate also contributes to increase the motivation to hold dollars. High inflation also contributed to increasing foreign-currency denominated domestic loans in Central Asian countries. In addition, the lack of means to avoid the risk of local-currency denominated domestic assets also contributed to strengthening dollar deposits and dollar lending due to the immaturity of the financial markets. Finally, dollarization is a very persistent phenomenon in that once dollarization is underway, it is not easy to enhance the degree of circulation of domestic currency and it is known to take a very long time.

In Latin America, on the other hand, inflation or hyperinflation appeared in most dollarization countries. As a result, currency substitution was undertaken in the process of economic agents' optimal response to arrest the decline in real purchasing power driven by depreciation of the domestic currency. This country group includes Peru, Paraguay, Uruguay and Bolivia.

<Table 3-13>

Causing Factors of Dollarization by Region

	Dollarization Causing Factors	
	Common Factors	Region-Specific Factors
Caucasus and Central Asia ¹⁾	<ul style="list-style-type: none"> - Frequent depreciation of domestic currencies - High volatility of the exchange rate - High inflation strengthens foreign currency loans - Immaturity of the financial market - Dollarization is a persistent phenomenon 	<ul style="list-style-type: none"> - High volatility in inflation boosts foreign currency deposits and foreign currency loans - High inflation only affects foreign currency loans - Asymmetric exchange rate policy (accommodating depreciation/ resisting appreciation) valuation increases foreign currency deposits - Higher proportion of foreign currency deposits leading to higher foreign currency loans for banks to ease their foreign currency risk positions
Latin America ²⁾	<ul style="list-style-type: none"> - High inflation - Hyper-inflation 	<ul style="list-style-type: none"> - It can be understood as the optimal response of economic agents to preserve their real purchasing power in response to the depreciation of the value of the currency.

Notes: 1) Summary based on Naceur et. al. (2015). Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan are included

2) Summarized based on Garcia-Escribano and Sosa (2010) and Catao and Perrones (2016). Peru, Paraguay, Uruguay, and Bolivia are included

As shown in <Table 3-14>, the dollarization mitigation factors vary somewhat, as there are some differences in factors strengthening dollarization between the two regional groups. First, for the Caucasus and Central Asian countries, Naceur et al. (2015) shows that three key principles are important. First, securing public confidence in monetary and exchange rate policy frameworks; second, stable and low inflation are also important; and third, development of financial industry and financial markets in these countries. Under these core principles, a more concrete

implementation program can be summarized as follows. First, a gradual transition to a more flexible exchange rate system is recommended. Second, prudential approaches enhancing incentives for domestic currency holdings, such as applying a higher reserve ratio to foreign currency deposits, turn out to be very effective. Finally, it is also important to try to reduce asymmetric exchange rate interventions such that depreciation of domestic currencies is accommodated whereas their appreciation is resisted.

In addition, when dollarization-mitigation policies are implemented, policy-makers need to be aware of the potential risks such as instability in the financial market, weakening of the financial intermediation function, and temporary capital outflows. It is also important to recognize that transparency and efficient communication with the market is fundamental to building up public confidence in monetary policy.

<Table 3-14>

Mitigating Factors of Dollarization by Region

	Mitigating factors of dollarization or de-dollarization policies
Caucasus and Central Asia ¹⁾	<p>(Core Principles)</p> <ul style="list-style-type: none">- Ensuring the reliability of monetary and exchange rate policy frameworks- Stable and low inflation- Continued development of financial industry and financial market <p>(Action plans)</p> <ul style="list-style-type: none">- Gradual transition to a more flexible exchange rate system- Greater incentives to holding domestic currencies, such as applying relatively higher reserve ratios to foreign currency deposits- Asymmetric exchange rate policy such as allowing depreciation but resisting appreciation, needs to be reduced <p>(Policy maker's mind)</p> <ul style="list-style-type: none">- Need to recognize and prepare for potential risks such as instability in the financial market, weakening of the financial intermediation function and increasing capital outflows temporarily during de-dollarization policy implementation- Transparent and efficient communication is the basis for securing the public credibility of monetary and exchange rate policies
Latin America ²⁾	<p>(Easing of dollarization in 2000s: global factors)</p> <ul style="list-style-type: none">- The appreciation trend of domestic currencies against the US dollar: international abundant liquidity- Rise in commodity prices and alleviating international economic instability <p>(Factors by country)</p> <ul style="list-style-type: none">- Application of differential reserve ratios across currencies- Introduction of inflation targeting system (Peru)

Notes: 1) Summary based on Naceur et. al. (2015). Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan are included

2) Summarized based on Garcia-Escribano and Sosa (2010) and Catao and Perrones (2016). Peru, Paraguay, Uruguay, and Bolivia included

In Peru, Paraguay, Uruguay and Bolivia, the proportion of US dollar deposits continued to decline from 82.1% on average in the first quarter of 2001 to

55.3% in the third quarter of 2010. According to Garcia-Escribano (2011) and Catao and Terrones (2016), this was attributable to common global factors. First, US dollar liquidity was abundantly supplied to emerging markets and developing countries as the Asian financial crisis ended by the early 2000s. Against this backdrop, the appreciation trend of domestic currencies against the US dollar continued. This implies that real purchasing power of the domestic currencies increased and has contributed to reducing the motivation to hold dollar deposits. In addition, the rise of international commodity prices and the easing of international financial and economic instability have also contributed to the steady supply of US dollar liquidity to the world. On the other hand, country-specific factors, for example, introduction of prudential regulation such as application of differential reserve ratios on the deposits and inflation targeting system introduced in Peru, have also contributed to lowering the shares of dollar deposits in the countries.

B. Review on Dollarization in Cambodia

According to the National Bank of Cambodia's assessment report on the dollarization of Cambodia (see <Appendix 2>), Cambodia had experienced the hyperinflation and depreciation in riel during the reintroduction of local currency in the early 1990s. This is more or less similar to the South American and Central Asian countries that underwent dollarization. Looking at Cambodian dollarization, it is interesting to note that there are some differences between the above-mentioned dollarization country groups and Cambodia in terms of the strengthening and mitigating factors. In other words, the degree of dollarization in many countries has eased since the 2000s, under the steady depreciation of the US dollar, that is, the appreciation of domestic currencies. However, according to Duma (2011), the proportion of foreign currency deposits in Cambodia during the same period has risen from 65% to 80%.

Unlike the Latin America and Central Asian countries where economic factors such as high inflation and steady depreciation of the local currencies, have caused dollarization, in Cambodia, according to Menon's (2008) analysis, political

and administrative cases have been more closely related with dollarization such as the collapse of economic and financial systems in the 1970s after political disruption and the introduction of public funds from the United Nations Transitional Authority in Cambodia (UNTAC) led by the United States.

Accordingly, it may not be appropriate to apply the stylized facts confirmed in the cases of the previous literature on the dollarization countries to Cambodia's economic and financial system. Unlike other dollarization country groups, Cambodia's economy has remained stable for the past decade, with stable economic growth and inflation. However, from a long-term perspective, we need to undertake a more rigorous review on whether dollarization, economic growth and stable prices would have been able to coexist in the past decade because the economy of Cambodia has been at an initial developing stage in which discretionary monetary, fiscal, foreign exchange, and industrial policies or their mix are not so much called for. As we have seen in the impossible trinity, once the economy is on a stable track after the initial stage of development, most industrial countries adopt a floating exchange rate rather than a fixed exchange rate and they make use of an appropriate policy mix to counteract their withdrawal from a fixed rate regime.

In this context, the results of the panel empirical analysis and country case study can be a reference for future economic and financial development in Cambodia. For the development of foreign exchange and financial markets, it is necessary to consider taking the following measures gradually and in a market-oriented approach. First of all, it is desirable to post the price of all goods and services at the same time in dollars and riel. Currently, there appear to be dual price markers such that prices of urban consumer goods are mainly displayed in dollars terms, while those of agricultural products are mainly posted in riel. Even if most of the transactions are carried out in dollars, if the reliability and credibility of the riel can be raised, it should be possible to increase its circulation ratio naturally through the autonomous choice of economic agents.

Second, efforts should be made to widen the volatility of the exchange rate within the current $\pm 1\%$ bands given the securing of economic and price stability. Cambodia adopts a type of managed soft-pegging that has a fluctuation band of 1% above or below the official exchange rate. In the long term, it is necessary to secure exchange rate flexibility of by widening the band beyond 1% to 2-3% and 5%. According to the results of the panel empirical analysis, a 1% appreciation of the domestic currency in the case of the fixed exchange rate country group shows a significant effect on the inflation, such as a 0.7-1.1%p increase. However, the magnitude of such a ripple effect is analyzed as being smaller under a floating exchange rate regime. Going forward, Cambodian policy makers need to gradually widen the band based on empirical analysis and simulation results of the effects on macroeconomic variables such as inflation.

Third, the prudential regulation of financial institutions, which enhances incentives for riel holdings, can be considered. A case study from other countries shows that lowering the reserve requirement for deposits in domestic currencies is generally effective in reducing dollarization. According to Garcia-Escribano and Sosa (2011), coercive de-dollarization policies, such as the forced-exchange of dollars to domestic currencies, involve considerable economic costs. And, as seen in the case of Bolivia and Peru in the 1980s, it is very likely to induce a return to dollarization. Therefore, rather than imposing punitive regulations against the use of the US dollar, we can consider various ways to raise incentives to hold the riel by the voluntary decisions of economic agents, such as reductions in financial income tax and reserve requirement ratio on deposits denominated in the domestic currency. As discussed above, once the institutional conditions such as improvement of the overall reliability of the monetary and exchange rate policy framework, consistent price stability, and the development of the financial market in the medium and long-term are more mature, such financial prudential policies can be implemented more efficiently.

5. Summary

According to several existing studies, a certain degree of dollarization is a

token of integration with the world economy, and conveys some benefits, such as promoting domestic financial markets and foreign investment. In Cambodia, the dollar exchange rate has been stable for almost two decades, the financial market has stabilized and the economy has been steadily growing. However, if high dollarization continues, there will be significant costs, such as a deterioration in policy effectiveness as independent monetary and foreign exchange market policies are constrained, as well as the heightened vulnerability of the domestic economy to external shocks. In other words, in order for the Cambodian economy to continue on a steady growth path in the future, analyses on the deepening of dollarization based on various empirical studies on the foreign exchange market, inflation and growth under a dollarization economy need to be expanded, and it is necessary to propose medium- and long-term policy recommendations to stabilize dollarization based upon the research.

From this point of view, this chapter has constructed panel data for countries that have experienced or are experiencing dollarization and conducted empirical analysis of the exchange rate and inflation under dollarization. First, estimation results of the determinants of dollarization are overall similar to those of previous discussions. In other words, the factors that increase dollarization are high inflation, rigid or sticky exchange rate fluctuations, a slump of the real economy, and qualitative deterioration of social and market institutions. On the other hand, real appreciation of the local currency is an important factor in mitigating the degree of dollarization in view of country group studies such as those concerning de-dollarization and dollarization.

Analysis on the correlation between inflation and the key variables in the foreign exchange market is executed using the same country panel data. As expected, high dollarization and a high depreciation rate of domestic currency are found to increase inflation. On the other hand, the results of additional analysis on the de-dollarized country group show that the pass-through effect and the degree of dollarization have no significant effect on inflation. In contrast, foreign exchange related variables are found to have significant effects on inflation in the on-going dollarization country group.

The quantitative effects of the above exchange rate on inflation is as follows: a 1%p depreciation of the domestic currency in the floating exchange-rate system country group increased inflation by 0.6-0.7%p, while in the fixed exchange-rate system country group, it increased inflation by 0.7-1.1%p, which is a higher order of magnitude than in the floating exchange rate group. On the other hand, in the case of the dollarization country group, a 1%p appreciation (depreciation) of the domestic currency reduced (increased) inflation by 0.8-1.1%p. However, the magnitude of this ripple effect is significantly reduced or disappears in the de-dollarization country group.

Meanwhile, it may be difficult to apply the stylized facts confirmed in the case of the country group directly to the economic and financial system of Cambodia. This is because the dollarization factors of the Cambodian economy are differentiated from those of other countries. Unlike other dollarization countries in the last decade, the Cambodian economy has maintained stable inflation with solid economic growth amid consistent dollarization. However, when the Cambodian economy reaches a certain stage of economic development after completing the early stage of development, Cambodian policy makers should consider the fact that many industrial countries are adopting an activist monetary policy along with various discretionary monetary policies as they opt for a floating exchange rate rather than a fixed exchange rate.

In this context, the results of the panel empirical analysis and country case study can serve as a reference for future economic and financial development in Cambodia. For the development of the foreign exchange and financial markets, the following measures can be considered taking a gradual and market-oriented approach. First, it is necessary to display prices for all goods and services at the same time in dollars and riel. If the credibility of the riel is raised in the future, the stipulation of double price marking can naturally increase its circulation ratio through autonomous choice of economic agents. Second, efforts should be made to widen the bands of the exchange rate from the current $\pm 1\%$ bands given the securing of economic and price stability. According to the results of the panel empirical analysis, the effect of such exchange rate changes on prices is

reduced when the degree of dollarization is eased or when a floating exchange rate system is implemented. Third, the financial prudential measures raising incentives for holding riel can be considered such as lowering financial income tax and reserve ratios on domestic-currency denominated deposits in. In this regard, the National Bank of Cambodia seems to be steadily implementing mid-to long-term challenges for the development of the financial and foreign exchange markets in Cambodia, as can be seen in <Appendix 2>.

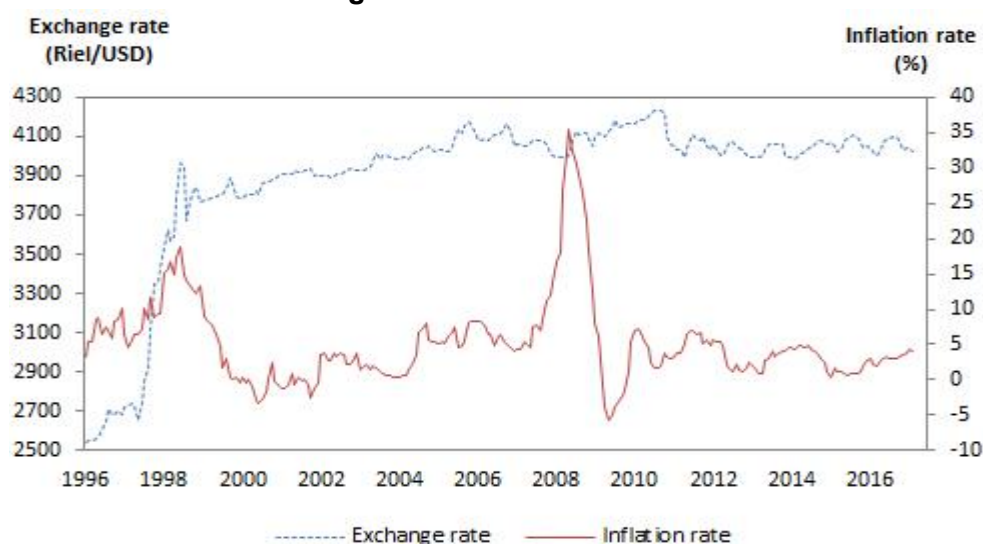
IV. Impact of Exchange Rate on Inflation

1. Overview

Inflation in Cambodia rose sharply as growth picked up strongly between 2007 and mid-2008, reflecting sustained increases in international commodity prices and growing excess demand, due in large part to a surge in foreign direct investment. When the inflation rate was running at an elevated level, Cambodia made efforts to disinflate using different policy tools including a reserve requirement increase up to 16% from 8% in the wake of inflation and real estate price bubbles in the country. Inflation getting back on a stable track the Global Financial Crisis, the National Bank of Cambodia decided to relax the reserve requirements by reducing them to only 12% for foreign currency and 8% for local currency to stimulate economic growth. As of July 2017, inflation remained low at around 2.3%, being mainly driven by increases in the prices of food, restaurants and clothing as a result of rising domestic demand in line with the improvement of living standards. It was also partially due to the low oil price environment in combination with supportive fiscal and monetary policies.

<Figure 4-1>

Riel/USD Exchange Rate and Cambodian Inflation Rate



Source: IMF IFS

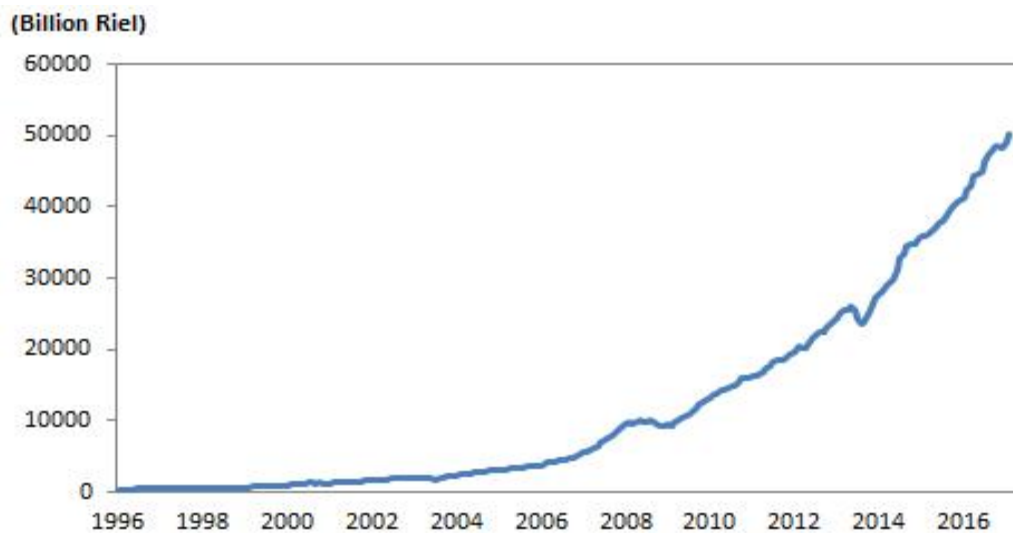
The exchange rate between the Khmer riel and the US dollar has been stable over the years. Monthly fluctuations of the exchange rate between the riel and US dollar were low, being mostly around 1% to 2%. This suggests that Cambodia is one of the countries that have almost stable exchange rates. Many countries including developed economies target exchange rate movements around the 1 to 2% level, while some developing countries even allow their exchange rate to fluctuate by up to 4-5%. Conventionally, the depreciation of the local currency will lead to a rise in domestic inflation. Yet, this may not be fully applicable to a highly dollarized economy such as Cambodia. In a dollarized economy, the policy authority cannot manipulate the exchange rate in order to spur the real sector due to the absence of flexibility in exchange rate policy. Owing to the predominant role of foreign-currency denominated assets in the economy, changes in the domestic currency's exchange rate are largely irrelevant. Going a step further, the reason behind such an a priori is that the bulk of trade-related and large financial transactions are settled in US dollars, while the local currency is mainly used for dealing with small-scale and non-tradable transactions. Hence, the effect of depreciation of the local currency exchange rate on import prices is very limited and thus confined to domestic prices. We can see from <Figure 4-1>, in which the Riel/USD exchange rate and Cambodian inflation are graphed together, that except for the two periods of financial crisis, inflation in Cambodia, in general, tends to move in the same direction as the Riel/USD exchange rate.

Meanwhile, Cambodia's foreign currency deposits (FCD) have constantly increased over the years, as shown in <Figure 4-2>. The share of FCD in broad money supply (M2) reached its peak of 85 percent in June 2017, having risen from 69% percent in 2003. As the Cambodian economy and financial system become more developed and interconnected, dollarization remains high, making implementation of monetary policy ineffective, especially in the event of the economy being hit by a shock. The increase in foreign currency deposits would greatly amplify the capacity of banks and financial institutions to provide credit to the public, which in turn spurs credit growth and potential liquidity in the economy. As a result, domestic inflation will increase correspondingly. We can

also observe the co-movement between FCD growth rate and the inflation rate which is shown in <Figure 4-3>.

<Figure 4-2>

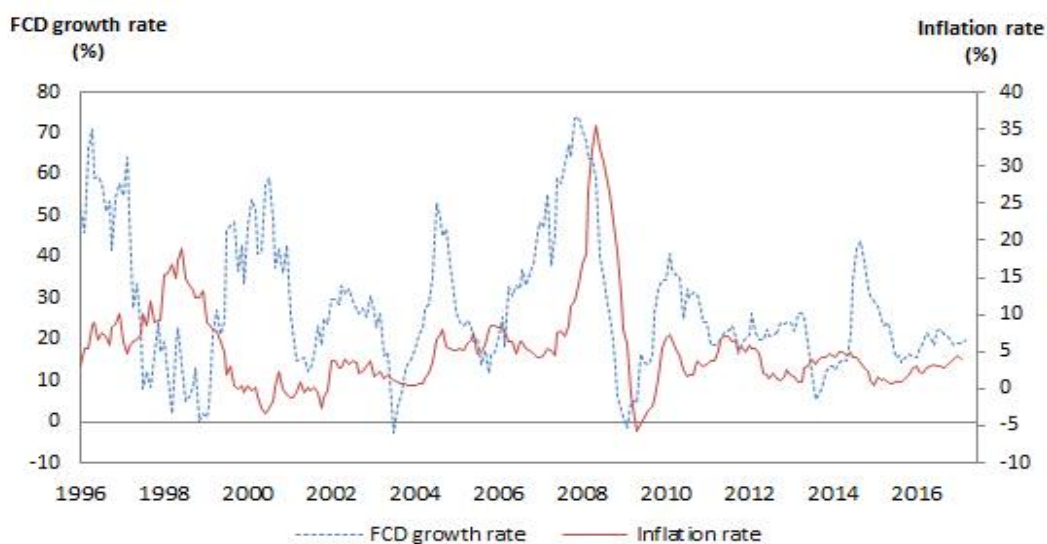
Cambodia's Foreign Currency Deposits



Source: IMF IFS, NBC

<Figure 4-3>

Cambodia's Foreign Currency Deposits Growth Rate and Inflation Rate

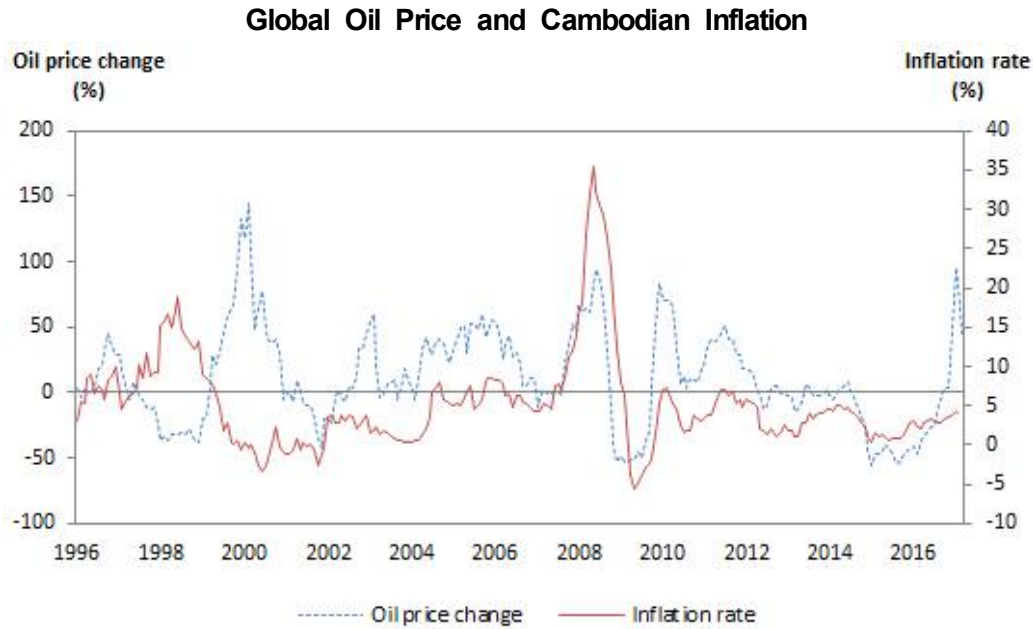


Source: IMF IFS, NBC

In addition to the influences from domestic variables, Cambodia's inflation tends to be affected by other global factors also, particularly global oil prices and US interest rates. An increase in interest rates would normally lead to an appreciation of the exchange rate. Exchange rate is affected when the Federal Reserve change the Federal Funds rate in conducting monetary policy. This means that exchange rate channel is effective for monetary policy in the US, so raising the Federal Funds rate would lead to the appreciation of the US dollar against other currencies and to the extent that Cambodian riel is held stable against the US dollar, the latter's strength would bring an appreciation of the Cambodian riel as well. Raising interest rates would lower the inflation rate in the US. Given high dollarization, Cambodia could be influenced by the Fed's monetary policy stance.

Also, the global crude oil price has a significant impact on inflation in Cambodia, as an oil-importing country, during the period under review. In the crisis period, the oil price soared to almost double to approximately 134 US dollars per barrel. In consequence, Cambodia's inflation also surged during the period. Cambodia's low inflation rate from early 2014 until late 2016 was also driven by the subdued oil price. Over supply of oil on the international market as a result of the boom in US shale oil production dragged down the global crude oil price and reduced inflationary pressure, even though food inflation remained high in Cambodia. Since the end of 2016, the global oil price has rebounded driven by the restriction on oil production of OPEC member countries except Nigeria and Libya, leading to greater inflationary pressure and a rising inflation rate in the beginning of 2017. We can observe the co-movement between the global oil price and Cambodian inflation in <Figure 4-4>.

<Figure 4-4>



Source: IMF IFS

2. Data and Model Specifications

In this section, we examine the nonlinear impact of an exchange rate shock on inflation in Cambodia's economy by employing the following Threshold VAR-X model:

$$Y_t = A_1(L)Y_t + A_2(L)Y_t I(y_{t-d} > \gamma) + B_1 X_t + \varepsilon_t$$

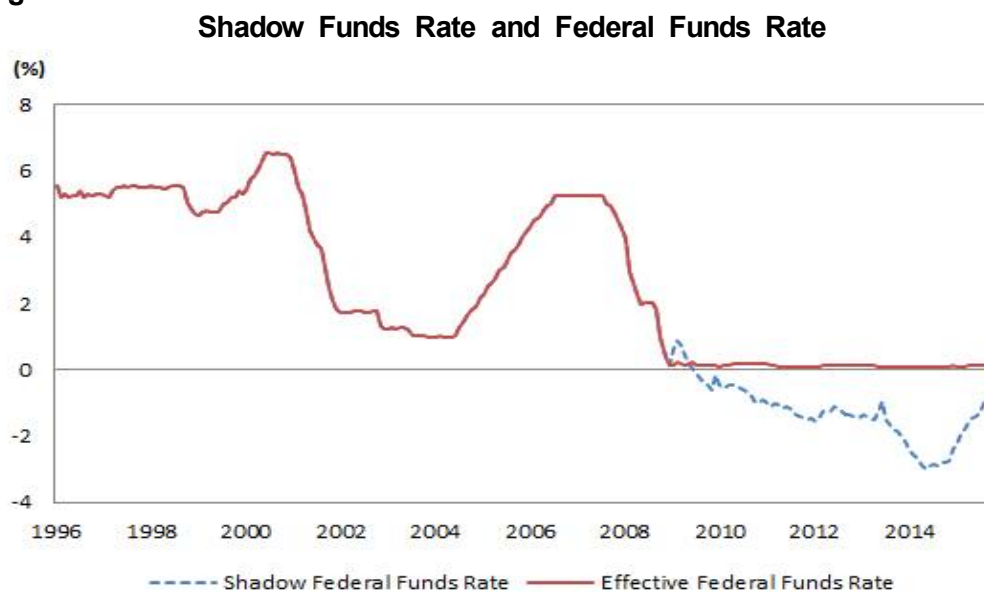
where y_{t-d} is the threshold variable at delay lag d . $I(\cdot)$ is an indicator function that takes value of 1 if the threshold variable y_{t-d} is greater than the threshold and 0 otherwise.

Y_t , X_t denote the vectors of endogenous variables and exogenous variables.

X_t consists of two exogenous variables: oil price and the US shadow funds rate, which is provided by Wu and Xia (2014). Our choice of US shadow funds rate as an exogenous variable in this model derives from the nearly-zero US Federal Funds rate from the second half of 2008 until recently. The comparison between US effective Federal Funds rate and the US shadow funds rate is

visualized as <Figure 4-5>.

<Figure 4-5>



Source: Federal Reserve Bank of St. Louis, Wu and Xia (2014)

In the baseline model, Y_t consists of 3 endogenous variables, which are the exchange rate growth rate, the change in interest rate (the average of annualized lending rate and deposit rate) and the change in the consumer price index. The data sample is monthly data from 1996M1 to 2015M11. In the extended model, we added a foreign currency deposit growth rate variable besides the three variables used in baseline model. The change in consumer price index and the foreign currency deposits growth rate are seasonally adjusted.

In order to deal with the non-stationarity in VAR estimates, we took the log-difference form of the oil price index, exchange rate, seasonal-adjusted consumer price index and seasonal-adjusted foreign currency deposits. The average interest rate and US shadow funds rate are included into model under the first difference form. We have employed the Augmented Dicker-Fuller test for the unit root test, the results of which are presented in <Table 4-1>. In addition, the descriptive statistics of all variables used in this paper are shown in <Table 4-2>.

<Table 4-1>**Unit Root Tests**

	Augmented Dickey-Fuller test	
	t-statistic	p-value
Exchange rate growth rate	-5.1343	0.0000
Interest rate change	-15.8448	0.0000
Consumer price index change	-7.0358	0.0000
Foreign currency deposits growth rate	-12.6553	0.0000

The baseline model and extended model used in this paper can be written as follows:

Baseline model:

$$Y_t = \{\Delta er_t, \Delta ir_t, \Delta cpi_t\}; X_t = \{\Delta oil_t, \Delta fundrate_t\}$$

Extended model:

$$Y_t = \{\Delta er_t, \Delta fcd_t, \Delta ir_t, \Delta cpi_t\}; X_t = \{\Delta oil_t, \Delta fundrate_t\}$$

<Table 4-2>**Descriptive Statistics**

Variable	Definition	Obs.	Mean	Standard Deviation	Min	Max
Δoil_t	Oil price change (%)	239	0.39	8.44	-33.55	20.38
$\Delta fundrate_t$	US shadow funds rate change (%)	239	-0.02	0.20	-0.96	0.53
Δer_t	Exchange rate growth rate (%)	239	0.20	1.20	-7.20	7.24
Δir_t	Interest rate change (%)	239	-0.03	0.20	-1.24	0.90
Δcpi_t	Consumer price index change (%)	239	0.42	0.99	-2.85	6.84
Δfcd_t	Foreign currency deposits growth rate (%)	239	1.97	3.22	-20.86	17.61

Source: IMF IFS, NBC, Wu and Xia (2014).

3. Results of Empirical Analyses

A. Threshold Estimation

In both baseline model and extended model, each endogenous variable will be in turn set as the threshold variable. In order to examine the impact of exchange rate changes on inflation, we will compute the impulse responses of the consumer price index variable to the shocks in exchange rate for each case separately. <Table 4-3> presents the estimated threshold values of Threshold VAR-X baseline models. When using the increase in the exchange rate as the threshold variable, the threshold value is estimated to be at the 0.0657% level, which indicates two regimes: the regime of high exchange rate volatility, which includes rates of increase in the exchange rate values above 0.0657% and the regime of low exchange rate volatility, which includes those lower than 0.0657%. When the interest rate variable is used to define two regimes in this threshold VAR-X model, the estimated threshold value is at -0.05%, which determines the raising interest rate regime and lowering interest rate regime. For the third case with inflation as threshold variable, the dataset is divided into two regimes: a high inflation regime which consists of the observations with inflation rate greater than 0.6721% and a low inflation regime with the inflation rate lower than 0.6721%.

<Table 4-3>

Threshold Estimation: Baseline Model

Threshold Variable	Estimated Threshold Value
Exchange rate growth rate	$\gamma = 0.0657\%$
Interest rate change	$\gamma = -0.05\%$
Inflation rate	$\gamma = 0.6721\%$

<Table 4-4> presents the estimated threshold values of the extended model. Similarly, the threshold values of models with rates of increases in the exchange rate, the change in interest rate and the change in the consumer price index as threshold variables are estimated. The estimated threshold value is -0.0896% in

the case of the exchange rate threshold, -0.05% in the case of the interest rate threshold and 0.6721% in the case of the consumer price index threshold. In this model, another threshold variable is also considered, the foreign currency deposits threshold. The threshold value is at the 2.0073% level of the increase in foreign currency deposits, which defines two regimes: Regime 1 with a high level of increasing foreign currency deposits and regime 2 with a lower level of increase in foreign currency deposits.

<Table 4-4>

Threshold Estimation: Extended Model

Threshold Variable	Estimated Threshold Value
Exchange rate growth rate	$\gamma = -0.0896\%$
Interest rate change	$\gamma = -0.05\%$
Inflation rate	$\gamma = 0.6721\%$
Foreign currency deposits growth rate	$\gamma = 2.0073\%$

B. Generalized Impulse Responses

The computation of Impulse Response Function in nonlinear VAR models is more complicated than in linear VAR models due to the possibility of endogenous regime-switching, in which the shocks initially affect the system in one regime and then switch to another regime. Therefore, in order to capture the reactions of inflation to a shock in Riel/USD exchange rate in the threshold VAR-X model, we compute the Generalized Impulse Response Function (GIRF) proposed by Koop, Pesaran and Potter (1996). GIRF allows us to consider the history of the shock (the regime that the system is initially in), the direction of the shock (whether it is positive or negative shock) and the magnitude of the shock (whether it is a small shock, which is set to be 1SD, or a large shock, which is set to be 3SD).

Furthermore, another characteristic of generalized impulse responses is that they will not be affected by the ordering of endogenous variables.

GIRF is defined as follows:

$$\text{GIRF} = E[Y_{t+k}|e_t^{(i)}, W_{n,t-1}] - E[Y_{t+k}|W_{n,t-1}]$$

where k is the pre-specified forecast horizon, which is set to be 20 here. $e_t^{(i)}$ is the realized shock and $W_{n,t-1}$ is the regime that the system is initially in ($n=1, \dots, N$ and N : the number of the observations).

How to compute the estimated conditional expectation $E[Y_{t+k}|W_{n,t-1}]$?

1. Randomly draw vectors of shock u_{t+k}
2. Simulate a series of Y_{t+k} using u_{t+k} , the information set $W_{n,t-1}$ and the estimated coefficients of the Threshold VAR-X.
3. These two steps are repeated R times and the resulting average is the estimated conditional expectation $E[Y_{t+k}|W_{n,t-1}]$.
4. Apply the same method, but add a shock to the i th variable of u_{t+k} to compute $E[Y_{t+k}|e_t^{(i)}, W_{n,t-1}]$
5. $\text{GIRF} = E[Y_{t+k}|e_t^{(i)}, W_{n,t-1}] - E[Y_{t+k}|W_{n,t-1}]$

Repeat steps 1 to 5 B times to allow accurate estimation of aspects of interest of the GIRF and get the average GIRF.

In this study, R and B are set to be 100.

Figures 4-6 to 4-8 show the impulse responses of inflation to the exchange rate shocks, dependent on whether the system is initially on the Low Regime or High Regime, using rate of increase in the exchange rate the change in interest rate and the change in consumer price index as the threshold variable, respectively. The responses of inflation to four types of shocks, which are a positive one-standard-deviation shock, a negative one-standard-deviation shock, positive three-standard-deviation shock, and a negative three-standard-deviation shock, are presented. All Generalized IRFs are scaled to correspond to one-standard-deviation (+1SD or -1SD) shocks to make the comparison of impulse response functions easier.

The generalized impulse responses of inflation in the model with rate of increase in the exchange rate as threshold variable are presented in <Figure 4-6>. In general, the reactions of inflation correspond to the conventional results

in both two regimes. An increase (decrease) in Riel/USD exchange rate leads to a rise (fall) in Cambodia's inflation. In both regimes, the effects of the exchange rate on inflation are at their peak in the first two months, then become weaker and disappear after 5 to 7 months. When comparing between the two regimes, we can easily point out the asymmetries of inflation's responses depending on the regime that the system is initially on. The responses of inflation are approximately 1.5 times stronger and more statistically significant in the high regime of exchange rate increase than in the low regime. Besides, the impulse responses of inflation to the different types of shocks are generally symmetric in each regime. For instance, in the same regime, the responses of inflation to the small shock and large shock of exchange rate are almost equal in size.

<Figure 4-7> shows how inflation responses to the exchange rate's impulses in the Threshold VAR-X model with an interest rate threshold. While in the high regime, inflation positively (negatively) responds to a positive (negative) exchange rate shock, the opposite results are shown in the low regime. In addition, in the low regime, the responses of inflation are 1.5 times stronger than in the high regime, yet only last for 2 to 3 months, compared with the 5-month reaction after the shock in the high regime.

The results of the final case of baseline model, in which inflation is adopted as the threshold variable, are shown in <Figure 4-8>. In both regimes, inflation is seen to increase in response to positive exchange rate shocks, yet its response in the low regime is approximately 2.5 times stronger than in the high regime. In the low regime, the impact of exchange rate on inflation is at the highest level in the first month, gradually then vanished after 4 months. Besides this, these reactions are symmetric, regardless of the direction and magnitude of the shock to exchange rate.

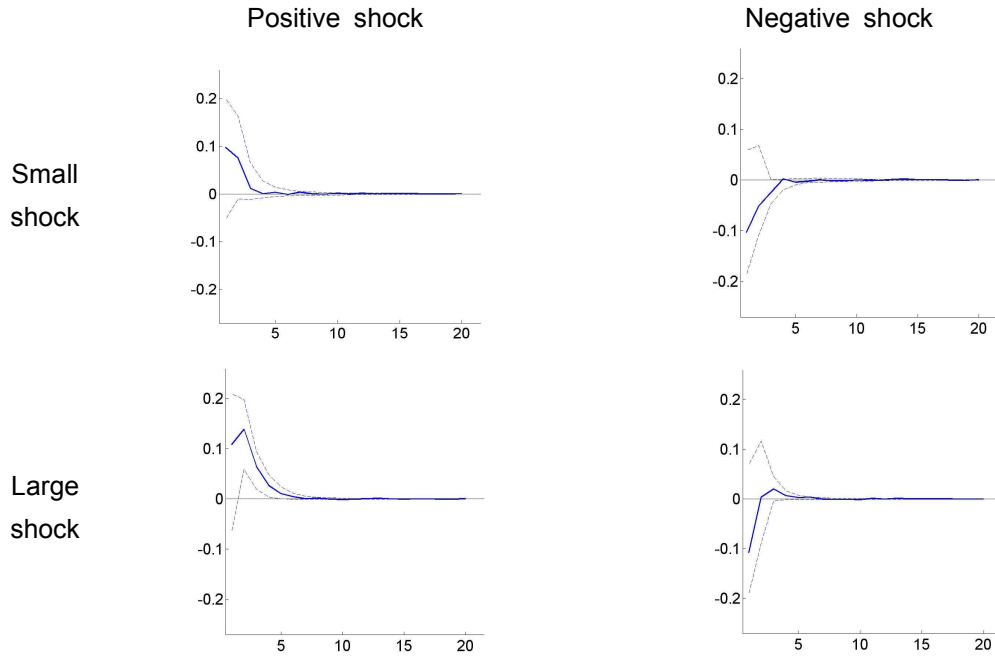
<Figure 4-6>

Generalized Impulse Responses of Inflation to Exchange Rate Shocks (1)

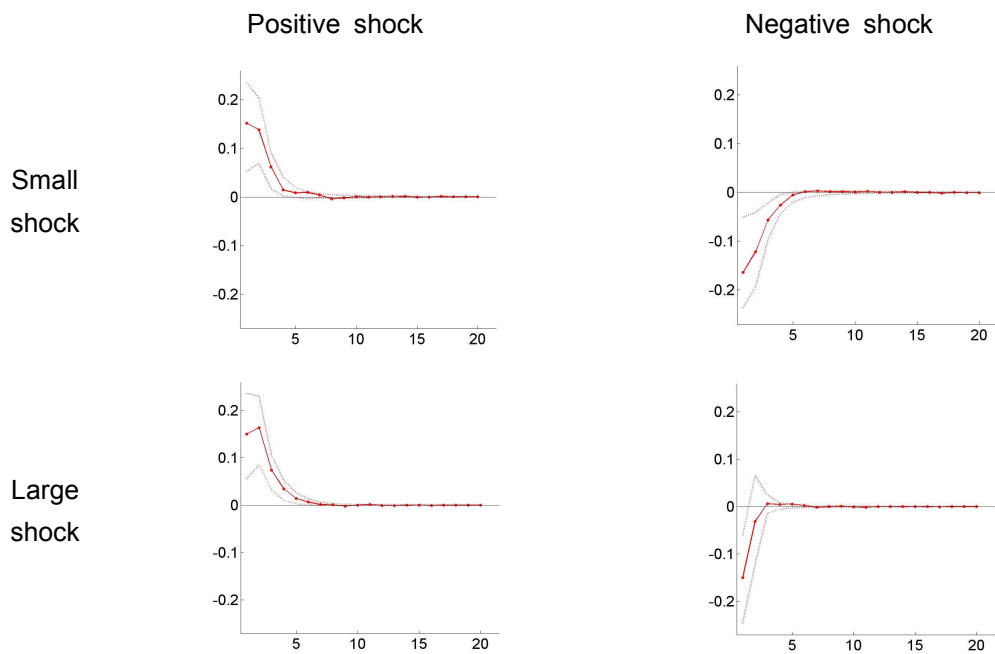
<Baseline Model, Exchange Rate Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime



High Regime



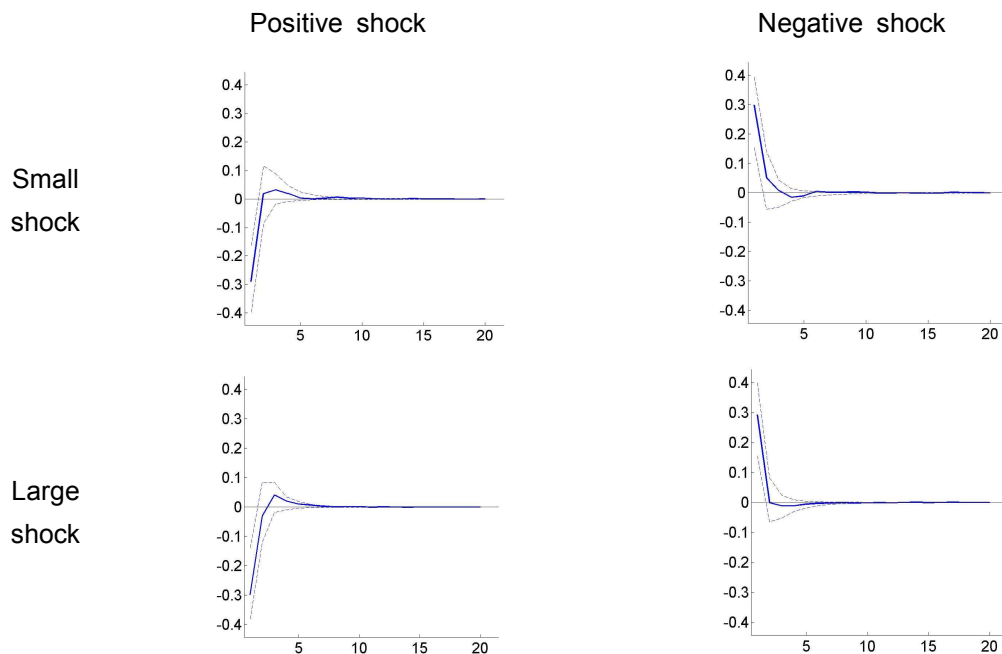
<Figure 4-7>

Generalized Impulse Responses of Inflation to Exchange Rate Shocks (2)

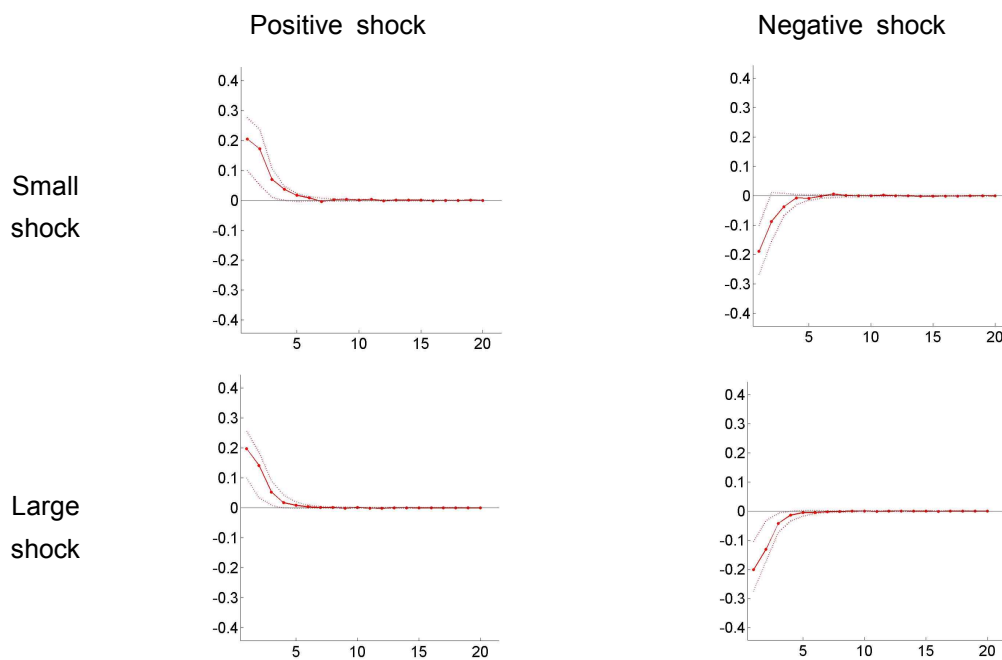
<Baseline Model, Interest Rate Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime



High Regime

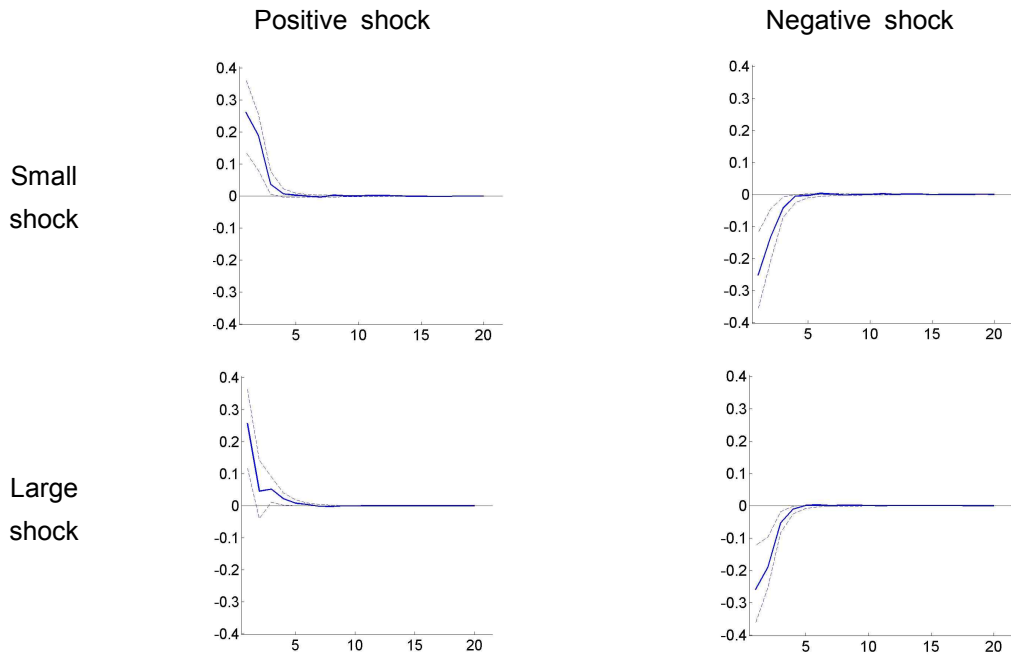


<Figure 4-8>

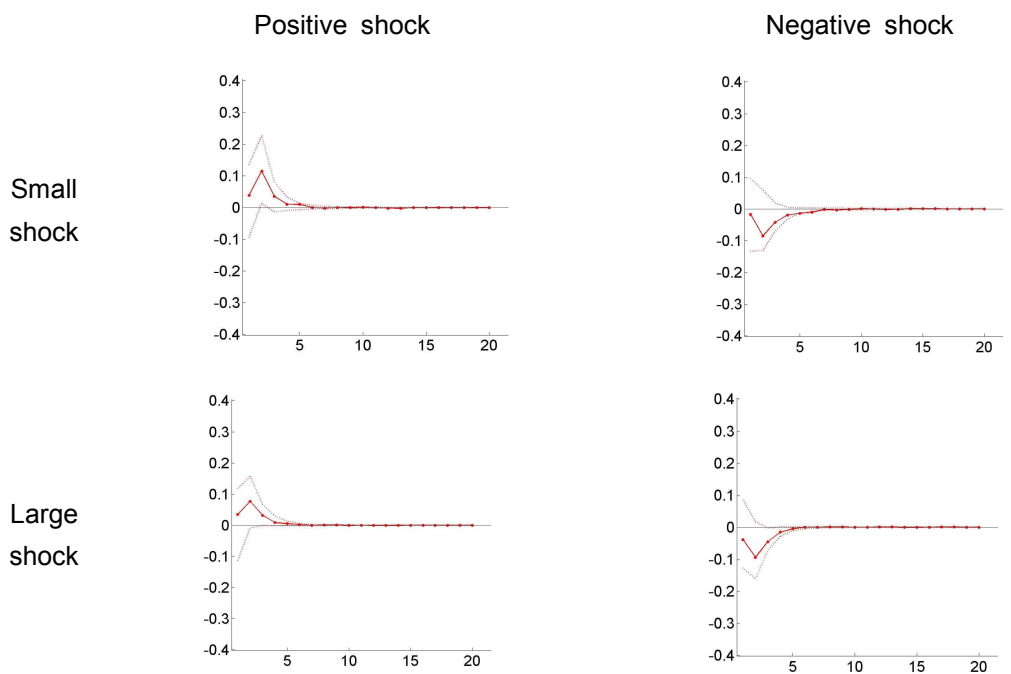
Generalized Impulse Responses of Inflation to Exchange Rate Shocks (3)
<Baseline Model, Inflation Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime



High Regime



Figures 4-9 to 4-12 show the results of inflation's impulse responses of the models with the rate of increase in the exchange rate, the change in interest rate, the inflation rate and the foreign currency deposits growth rate as threshold variables.

First, as shown in <Figure 4-9>, the results of the extended model with the exchange rate threshold generally correspond to the results of the baseline model. The responses of inflation are regime-dependent as they are bigger in size in the high regime of exchange rate increase, yet the responses of inflation to different types of shocks in the same regime are symmetric.

The results of inflation's responses in the extended model with interest rate threshold and inflation threshold (<Figure 4-10> and <Figure 4-11>) are almost identical to those of the baseline model, which were described above. In the regime of decreasing interest rate, inflation's response to the exchange rate shock is observed to be larger, and its response in the low inflation regime is twice as strong as that in the high inflation regime.

Finally, the results of the model using the rate of increase in foreign currency deposits as the threshold of the exchange rate on inflation are different across regimes as well as across the different types of shocks. Inflation's response of 3SD negative exchange rate shock is seen to be twice as strong as the response to a 1SD negative shock in the regime of low foreign currency deposits increase. On the other hand, in the high regime, the response of inflation to a 3SD positive shock is 1.5 times larger than the response to 1SD positive exchange rate shock.

In summary, when the threshold variable exceeds a certain threshold value, the impact of the exchange rate change on inflation will be different, yet in general, a positive exchange rate shock will lead to a rise in inflation. However, in the model using the change in interest rate as threshold variable, the inflation rate declines in response to the increase in the regime of declining interest rates. On the other hand, the responses of inflation to different types of shocks are fairly symmetric in most cases, but asymmetry is found in the model where the

foreign currency deposits growth rate is used as the threshold variable.

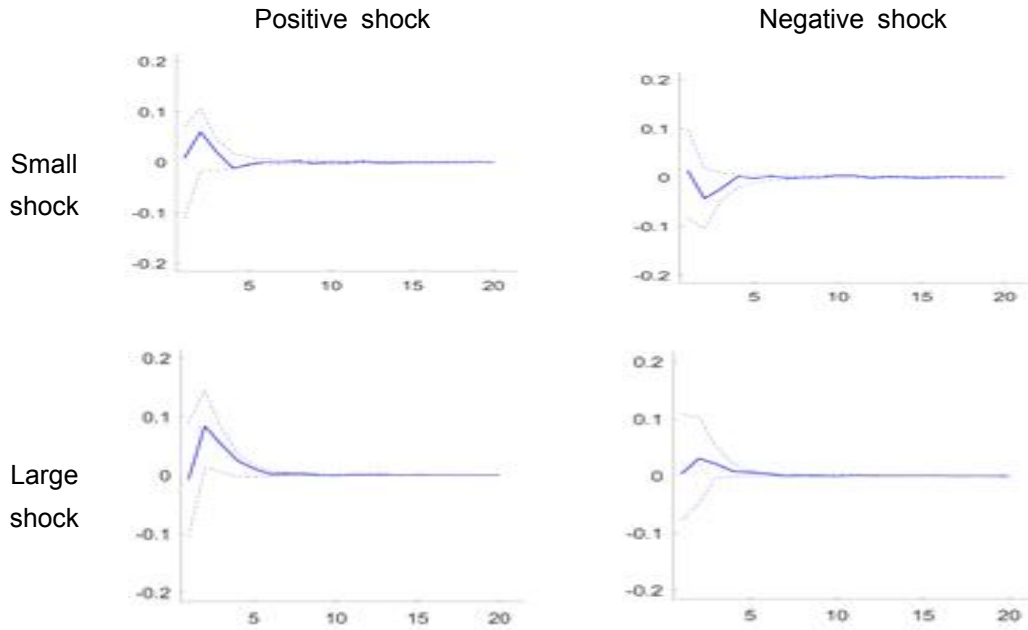
<Figure 4-9>

Generalized Impulse Responses of Inflation to Exchange Rate Shocks

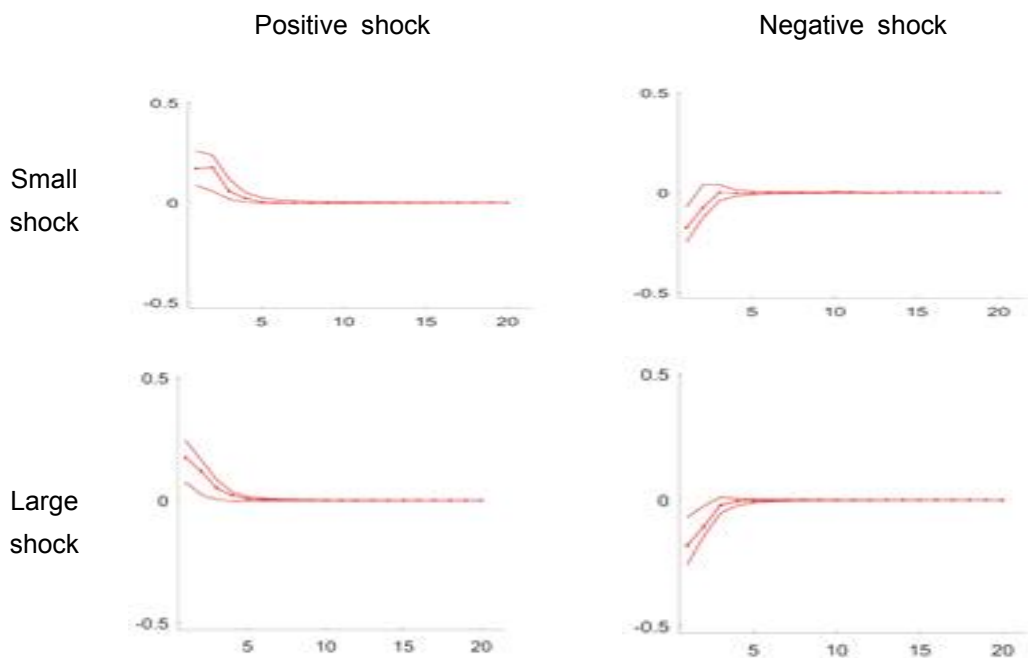
(4) <Extended Model, Exchange Rate Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime



High Regime



<Figure 4-10>

Generalized Impulse Responses of Inflation to Exchange Rate Shocks (5)

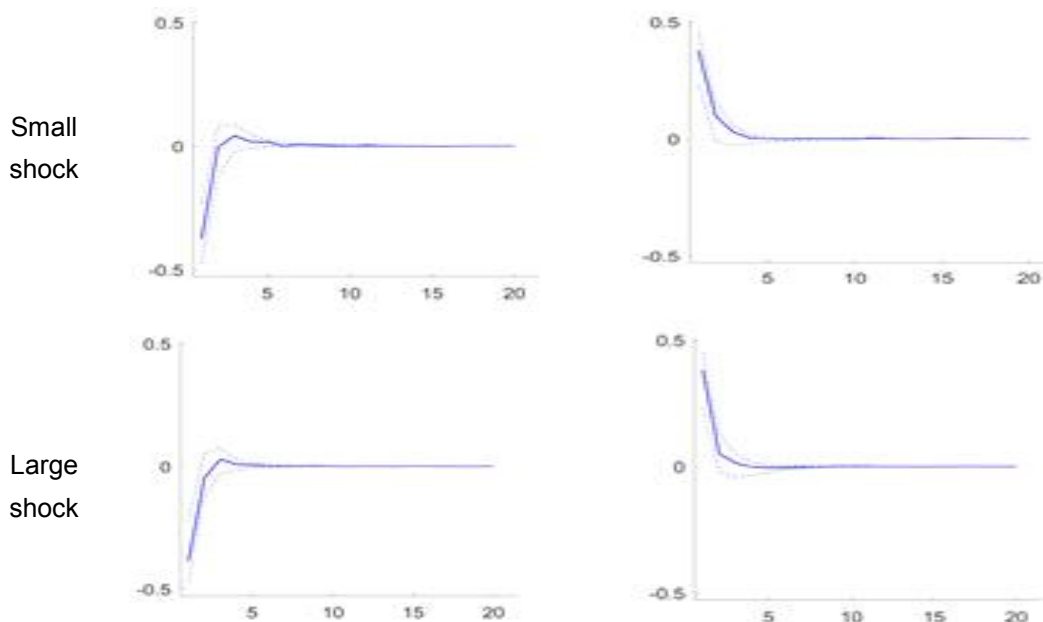
<Extended Model, Interest Rate Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime

Positive shock

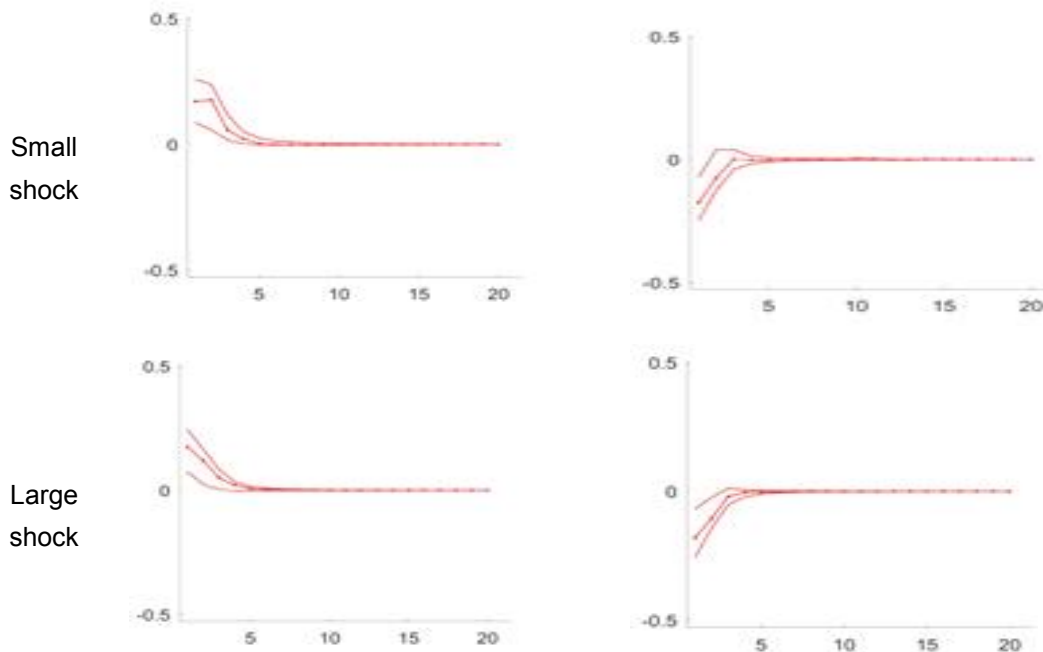
Negative shock



High Regime

Positive shock

Negative shock

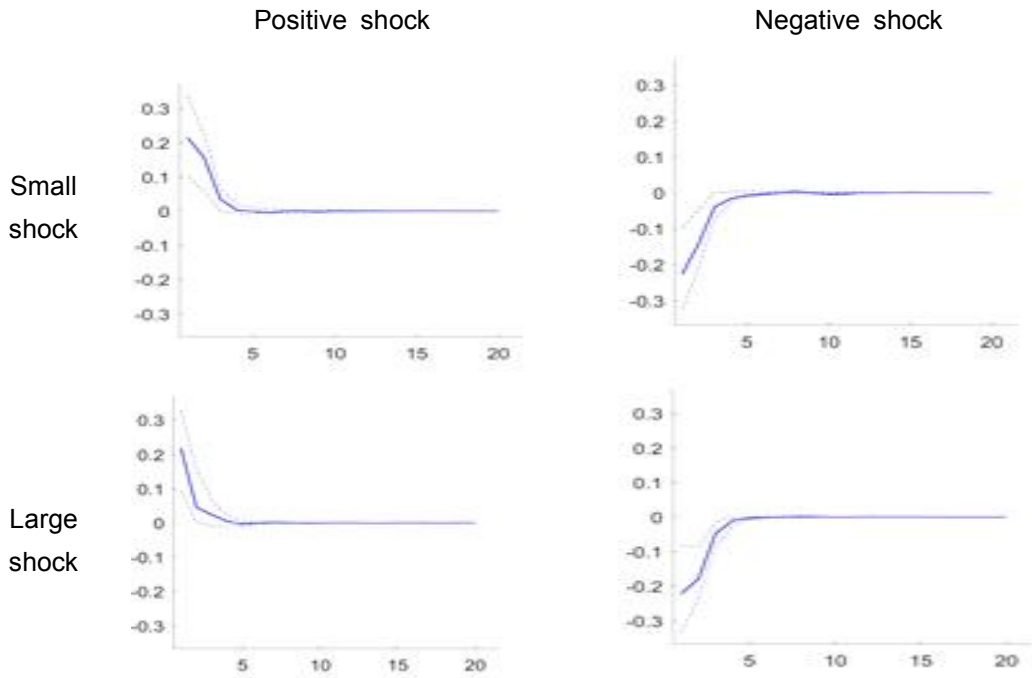


<Figure 4-11>

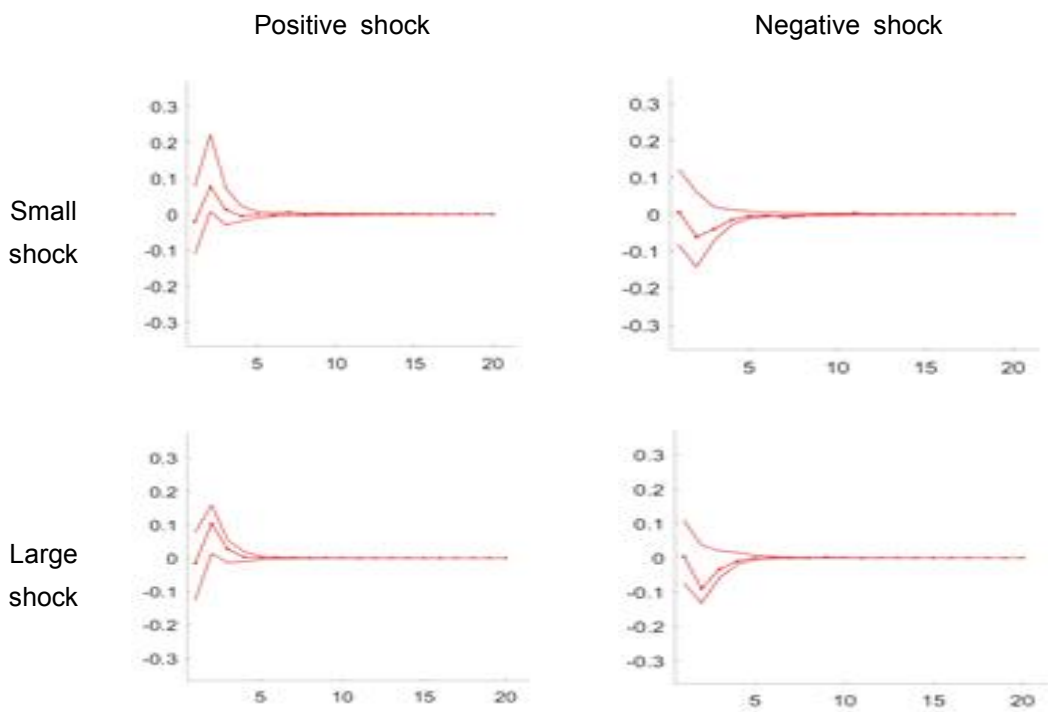
Generalized Impulse Responses of Inflation to Exchange Rate Shocks (6)
<Extended Model, Inflation Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime



High Regime

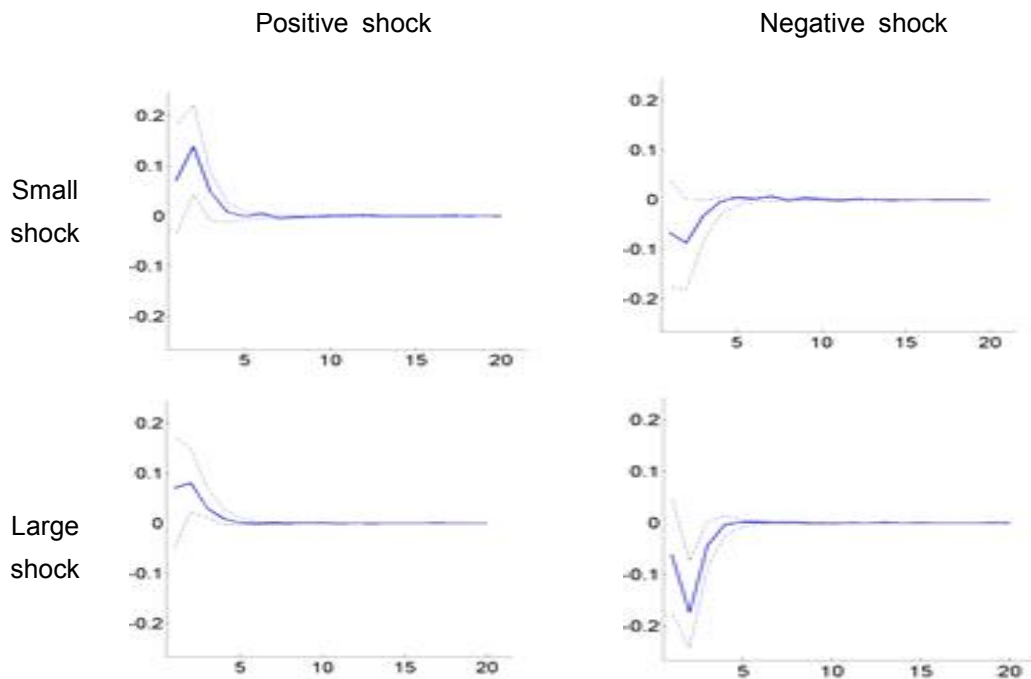


<Figure 4-12>

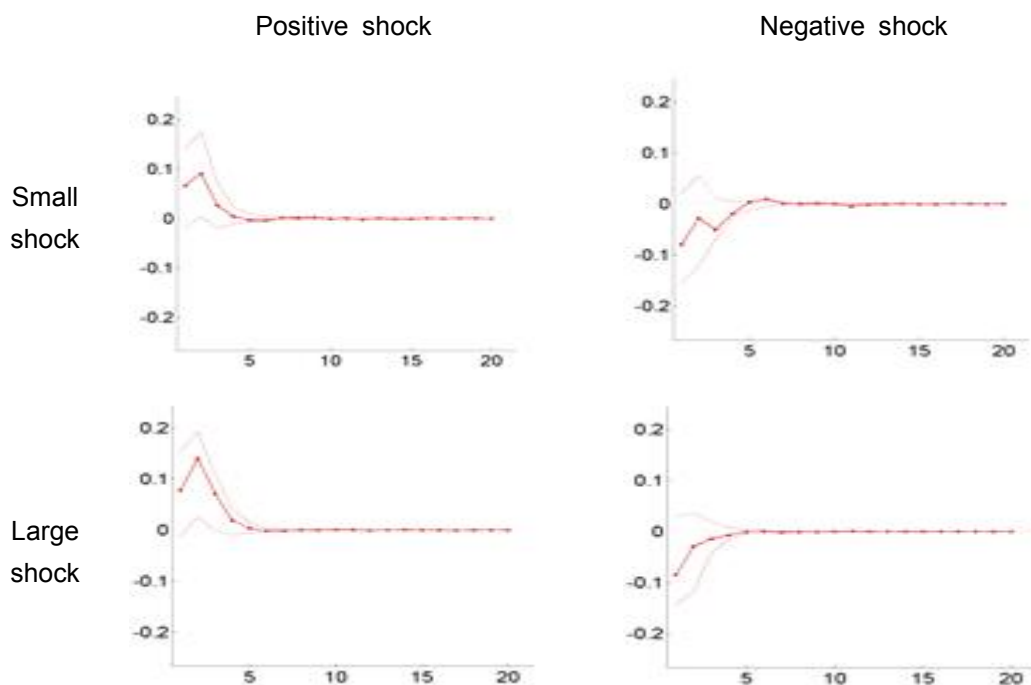
Generalized Impulse Responses of Inflation to Exchange Rate Shocks (7)
<Extended Model, Foreign Currency Deposits Threshold>

(Data Sample : 1996M1~2015M11)

Low Regime



High Regime



C. Generalized Forecast Error Variance Decomposition

In this section, in order to examine the relative contribution of each endogenous variable to inflation, we have calculated the Generalized Forecast Error Variance Decomposition of Inflation in each case.

Following Lanne and Nyberg (2014), the Generalized Forecast Error Variance Decomposition (GFEVD) of shock i , variable j , horizon h and history $W_{n,t-1}$ can be calculated by using the following equation:

$$\text{GFEVD}_{ij, W_{n,t-1}}(h) = \left[\sum_{l=0}^h \text{GIRF}(l, e_t^{(i)}, W_{n,t-1})_j^2 \right] / \left[\sum_{i=1}^K \sum_{l=0}^h \text{GIRF}(l, e_t^{(i)}, W_{n,t-1})_j^2 \right]$$

$$i, j = 1, \dots, K$$

$\sum_{l=0}^h \text{GIRF}(l, e_t^{(i)}, W_{n,t-1})_j$: the cumulative effect of the i th shock

$\sum_{i=1}^K \sum_{l=0}^h \text{GIRF}(l, e_t^{(i)}, W_{n,t-1})_j$: the aggregate cumulative effect of all the shocks

For the j th variable, the denominator is the aggregate cumulative effect of all the shocks while the numerator is the cumulative effect of the i th shock. Accordingly, when calculating GFEVD using this method, $\text{GFEVD}_{ij, W_{n,t-1}}(h)$ will take value between 0 and 1, measuring the relative contribution of a shock to the i th equation (the variable that got shocked) to the total impact of all K shocks after h periods on the j th variable (the response variable), and these contributions sum to 100. Thus, the advantage of this method is that it is easy to interpret the results and it can be applied in any nonlinear model for which the conditional expectations in Generalized Impulse Response Functions can be computed.

Tables 4-5 to 4-7 show the results of Generalized Forecast Error Variance Decomposition of Inflation in the VAR-X Baseline Model using exchange rate growth rate, the change in interest rate and the change in consumer price index as threshold variables. In each case, we have calculated the GFEVDs of a

one-standard-deviation positive shock.

In the baseline model using the rate of increase in the exchange rate as the threshold variable in are shown in <Table 4-5>, the contribution of exchange rate shocks to the variance decomposition of inflation are much higher if the system is initially in the high regime of exchange rate increase. One year after the shock, the contribution of exchange rate accounts for a 15% effect of all the shocks in the high regime, while this figure is only 3% in the low regime.

<Table 4-6> shows the variance decomposition of inflation in the Threshold VAR-X baseline model with interest rate threshold. In the first month after the shock, the contribution of the exchange rate to inflation's variance decomposition in the low regime is higher than in the high regime, but it is decreasing over time, while that in the high regime is increasing. Following that, after 12 months, the contribution of exchange rate in the high regime is almost 11 times as high as that in the low regime.

In the final case of the baseline model in which the change in consumer price index is used as threshold variable, one year after the shock, exchange rate's contribution to GFEVD of inflation in the low inflation regime is 5 times higher than in the high regime (<Figure 4-7>).

<Table 4-5>

Generalized Forecast Error Variance Decomposition of Inflation (1)
(Baseline Model, Exchange Rate Threshold)

Period (Month)	Low Regime			High Regime		
	Exchange rate	Interest rate	Inflation	Exchange rate	Interest rate	Inflation
1	1.14	0.00	98.86	2.98	0.02	97.01
2	2.16	0.62	97.21	9.75	0.08	90.16
3	2.51	1.45	96.04	12.62	0.07	87.32
4	2.77	1.84	95.39	14.31	0.01	85.68
5	3.07	2.19	94.74	14.88	0.00	85.12
6	3.16	2.42	94.42	14.92	0.00	85.08
7	3.16	2.58	94.26	14.99	0.00	85.00
8	3.09	2.68	94.23	15.01	0.01	84.98
9	3.08	2.72	94.20	14.92	0.00	85.08
10	3.07	2.78	94.15	15.17	0.01	84.82
11	3.06	2.79	94.15	15.41	0.01	84.58
12	3.01	2.82	94.18	15.20	0.01	84.79

Note: Generalized Forecast Error Variance Decomposition in the case of +1SD shock.

<Table 4-6>

Generalized Forecast Error Variance Decomposition of Inflation (2)
(Baseline Model, Interest Rate Threshold)

Period (Month)	Low Regime			High Regime		
	Exchange rate	Interest rate	Inflation	Exchange rate	Interest rate	Inflation
1	8.38	3.47	88.16	4.91	0.46	94.63
2	3.87	4.12	92.01	8.63	0.20	91.17
3	1.98	3.85	94.16	10.31	0.31	89.38
4	1.47	4.07	94.47	11.17	0.37	88.47
5	1.30	4.27	94.43	11.13	0.50	88.36
6	1.23	4.52	94.25	11.06	0.54	88.40
7	1.13	4.47	94.40	10.98	0.44	88.58
8	1.02	4.40	94.58	10.87	0.37	88.76
9	0.99	4.34	94.67	10.85	0.36	88.79
10	0.97	4.38	94.65	10.88	0.35	88.77
11	0.96	4.40	94.65	10.89	0.34	88.77
12	0.93	4.41	94.66	10.97	0.31	88.73

Note: Generalized Forecast Error Variance Decomposition in the case of +1SD shock.

<Table 4-7>

**Generalized Forecast Error Variance Decomposition of Inflation (3)
(Baseline Model, Inflation Threshold)**

Period (Month)	Low Regime			High Regime		
	Exchange rate	Interest rate	Inflation	Exchange rate	Interest rate	Inflation
1	6.98	0.00	93.02	0.15	2.19	97.67
2	13.58	0.60	85.83	2.12	4.02	93.86
3	14.51	0.52	84.98	2.53	4.35	93.12
4	15.19	0.47	84.35	2.81	4.62	92.57
5	15.42	0.52	84.06	2.69	4.66	92.65
6	15.54	0.57	83.89	2.71	4.55	92.74
7	15.44	0.56	83.99	2.75	4.49	92.76
8	15.37	0.57	84.06	2.80	4.57	92.63
9	15.37	0.60	84.03	2.79	4.62	92.59
10	15.38	0.59	84.03	2.82	4.68	92.50
11	15.32	0.59	84.10	2.87	4.70	92.43
12	15.26	0.60	84.14	2.93	4.70	92.37

Note: Generalized Forecast Error Variance Decomposition in the case of +1SD shock.

Similarly, the variance decomposition of inflation in the Threshold VAR-X Extended model with exchange rate, interest rate, inflation and foreign currency deposits threshold are presented in <Table 4-8> to <Table 4-11>.

The contribution of exchange rate to the variance decomposition of inflation in the Threshold VAR-X Extended model with exchange rate threshold, as shown in <Table 4-8>, is much higher in the high regime of exchange rate increase compared to the low regime, which is consistent with the results of the baseline model. However, in both regimes, the contribution of exchange rate is smaller than the case of baseline model (0.6% in the low regime and 4.4% in the high regime, compared to 3% and 12% in the baseline model).

The variance decomposition results of the extended model with the change in interest rate and inflation rate as the threshold variable, also correspond to the results of the baseline model. The contribution of exchange rate to the GFEVD of inflation is higher in the regime of increasing interest rates, while the impact

of exchange rate on inflation is seen to be larger in the low inflation regime.

Finally, the generalized forecast error variance decomposition of inflation in the Threshold VAR-X extended model with foreign currency deposits threshold is presented in the <Table 4-11>. The contributions of exchange rate to inflation's variance decomposition in the two regimes are observed to be fairly similar. One year after the shock, the exchange rate accounts for 4% and 3% of all total in the low regime and high regime, respectively.

<Table 4-8>

**Generalized Forecast Error Variance Decomposition of Inflation (4)
(Extended Model, Exchange Rate Threshold)**

Period (Month)	Low Regime				High Regime			
	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation
1	0.00	0.33	0.03	99.64	1.30	0.75	0.15	97.81
2	0.24	1.44	0.17	98.16	3.52	0.10	0.63	95.75
3	0.46	1.92	0.43	97.20	4.69	0.00	0.53	94.78
4	0.57	2.38	0.54	96.50	4.60	0.01	0.48	94.91
5	0.62	2.43	0.59	96.35	4.66	0.02	0.55	94.76
6	0.68	2.43	0.61	96.28	4.77	0.02	0.55	94.66
7	0.69	2.45	0.60	96.26	4.77	0.03	0.55	94.65
8	0.70	2.61	0.64	96.05	4.78	0.02	0.53	94.67
9	0.64	2.75	0.74	95.87	4.74	0.02	0.45	94.79
10	0.61	2.74	0.72	95.92	4.72	0.02	0.47	94.78
11	0.62	2.77	0.74	95.86	4.53	0.03	0.48	94.95
12	0.61	2.77	0.81	95.81	4.44	0.02	0.46	95.08

Note: Generalized Forecast Error Variance Decomposition in the case of a +1SD shock.

<Table 4-9>

Generalized Forecast Error Variance Decomposition of Inflation (5)
(Extended Model, Interest Rate Threshold)

Period (Month)	Low Regime				High Regime			
	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation
1	12.65	3.03	3.93	80.39	3.76	0.25	0.28	95.70
2	7.94	0.16	4.67	87.23	8.02	1.22	0.12	90.64
3	6.52	0.00	4.63	88.85	9.78	2.90	0.20	87.12
4	5.89	0.04	4.76	89.32	10.12	3.94	0.30	85.64
5	5.67	0.07	4.77	89.49	10.10	4.50	0.35	85.04
6	5.38	0.08	4.74	89.80	10.20	4.71	0.39	84.70
7	5.41	0.08	4.78	89.73	10.10	4.93	0.41	84.56
8	5.32	0.07	4.83	89.78	10.11	5.07	0.45	84.38
9	5.26	0.08	4.80	89.86	10.10	5.08	0.46	84.36
10	5.27	0.08	4.78	89.87	10.07	5.06	0.48	84.40
11	5.21	0.08	4.83	89.88	10.24	4.97	0.45	84.34
12	4.99	0.08	4.90	90.03	10.22	4.94	0.46	84.39

Note: Generalized Forecast Error Variance Decomposition in the case of a +1SD shock.

<Table 4-10>

Generalized Forecast Error Variance Decomposition of Inflation (6)
(Extended Model, Inflation Threshold)

Period (Month)	Low Regime				High Regime			
	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation
1	5.92	0.59	0.00	93.50	0.12	3.13	1.39	95.36
2	11.33	1.20	0.86	86.61	0.24	0.41	2.51	96.85
3	13.19	2.59	0.99	83.24	0.47	0.05	2.32	97.16
4	13.50	3.19	1.08	82.23	0.47	0.08	2.03	97.42
5	13.40	3.11	1.07	82.41	0.49	0.08	1.77	97.66
6	13.24	3.11	1.02	82.63	0.63	0.08	1.59	97.70
7	13.38	2.98	0.95	82.69	0.69	0.09	1.51	97.72
8	13.17	2.86	0.91	83.06	0.70	0.10	1.53	97.66
9	13.17	2.77	0.90	83.17	0.72	0.08	1.49	97.71
10	13.04	2.72	0.88	83.37	0.71	0.09	1.48	97.72
11	13.07	2.73	0.88	83.33	0.75	0.09	1.48	97.68
12	12.92	2.71	0.87	83.49	0.77	0.09	1.52	97.62

Note: Generalized Forecast Error Variance Decomposition in the case of a +1SD shock.

<Table 4-11>

Generalized Forecast Error Variance Decomposition of Inflation (7)
(Extended Model, Foreign Currency Deposits Threshold)

Period (Month)	Low Regime				High Regime			
	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation	Exchange rate	Foreign Currency Deposits	Interest rate	Inflation
1	0.40	1.76	0.20	97.64	0.60	0.14	0.27	98.98
2	2.40	0.01	1.96	95.63	2.17	0.09	0.77	96.97
3	3.31	0.18	2.19	94.32	2.78	0.47	0.39	96.35
4	3.80	0.31	1.99	93.90	2.92	0.74	0.23	96.11
5	3.92	0.28	1.99	93.81	2.86	0.67	0.17	96.30
6	3.90	0.25	2.03	93.82	2.88	0.66	0.20	96.26
7	3.84	0.22	2.04	93.91	2.85	0.70	0.25	96.20
8	3.99	0.19	2.11	93.71	2.81	0.69	0.25	96.25
9	3.97	0.17	2.11	93.75	2.84	0.67	0.27	96.22
10	3.99	0.15	2.19	93.68	2.88	0.66	0.28	96.18
11	3.96	0.15	2.23	93.66	2.85	0.67	0.27	96.21
12	3.98	0.16	2.24	93.62	2.82	0.67	0.27	96.24

Note: Generalized Forecast Error Variance Decomposition in the case of a +1SD shock.

Additionally, we have made a comparison between the relative contribution of the exchange rate to the variance decomposition of inflation in (linear) VAR-X and (nonlinear) Threshold VAR-X models, the results of which are shown in Figures 4-13 and 4-14.

As shown in <Figure 4-13>, the contribution of exchange rate to the variance decomposition of inflation in the VAR-X model is almost the same as that in the low regime of Threshold VAR-X baseline model with exchange rate threshold, at around 3% level, which is very much smaller than in the high regime of exchange rate increase. On the other hand, the exchange rate's contribution in the linear VAR-X model and in the high inflation regime of threshold VAR-X model, compared to 15% of the contribution of exchange rate in the high inflation regime.

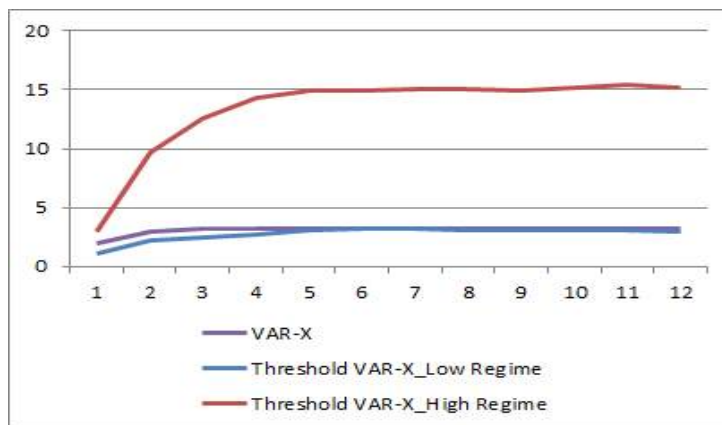
The four cases of the Threshold VAR-X extended model are shown in <Figure 4-14>. When including one endogenous variable into the model, the contribution of exchange rate becomes somewhat smaller. For example, the

exchange rate's contribution in the low regime of exchange rate increase in the threshold VAR-X baseline model is almost identical with that of VAR-X baseline model, yet that of threshold VAR-X extended model is only one third of that in the VAR-X extended model. In the Threshold VAR-X extended model using foreign currency deposits growth rate as threshold variable, the contributions of exchange rate to the variance decomposition in the VAR-X model, the low regime and high regime of threshold VAR-X model are broadly similar, making up to 3-4% of all the shocks observed.

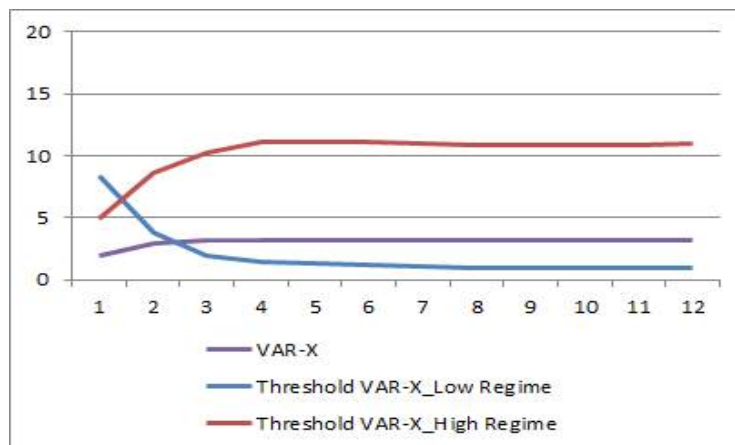
<Figure 4-13>

**Relative Contribution of Exchange Rate to the Forecast Error Variance
Decomposition of Inflation (1)**

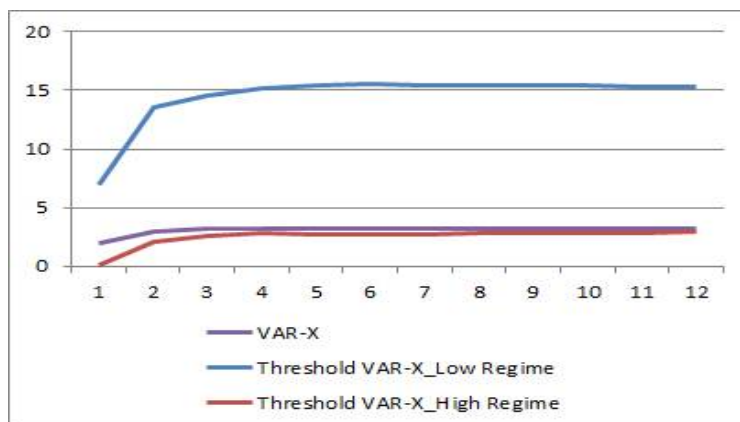
<Baseline Model, Exchange Rate Threshold>



<Baseline Model, Interest Rate Threshold>

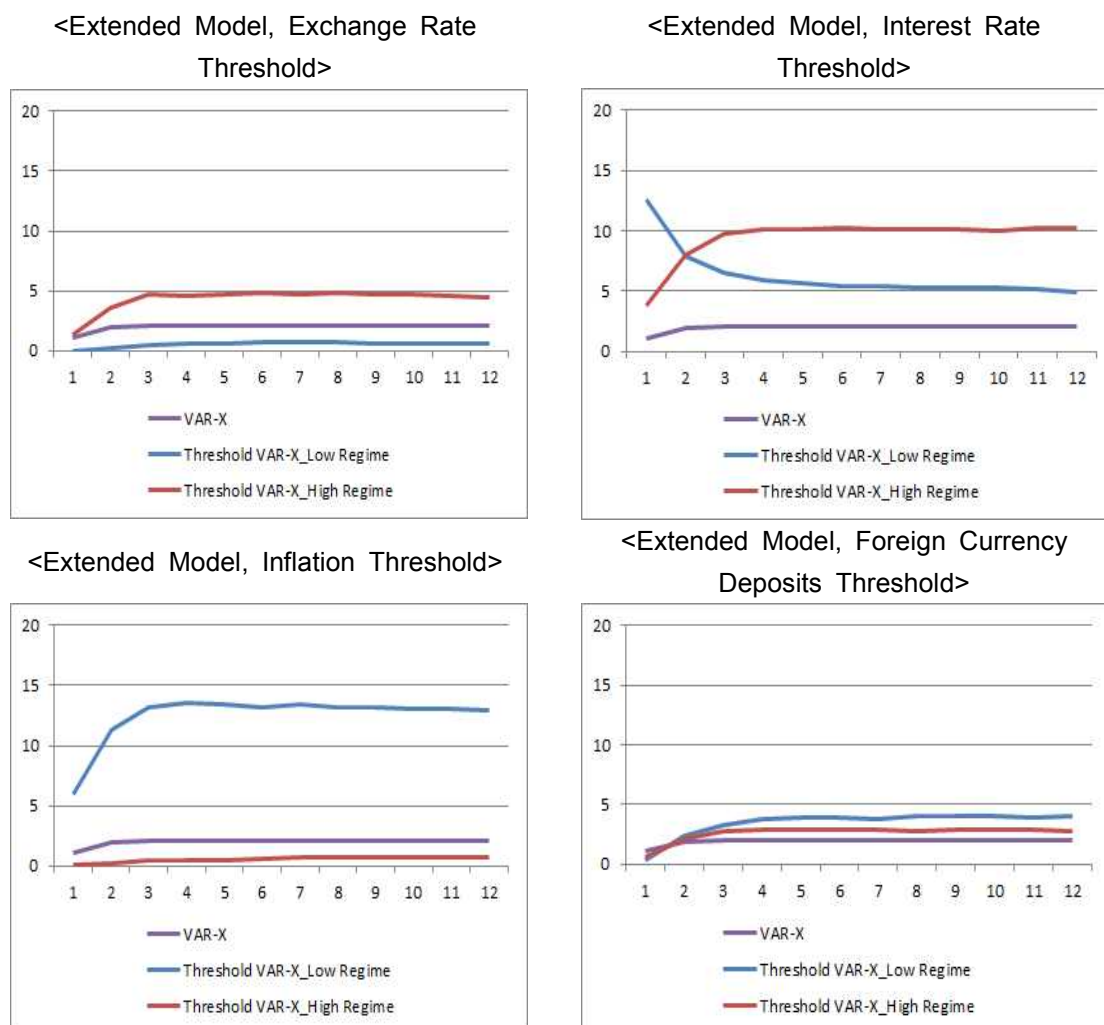


<Baseline Model, Inflation Threshold>



<Figure 4-14>

**Relative Contribution of Exchange Rate to the Forecast Error Variance
Decomposition of Inflation (2)**



4. Summary

In this Chapter, we investigated the impact of the exchange rate on inflation in Cambodia using Threshold VAR-X models in which each endogenous variable, including exchange rate growth rate, the change in average interest rate, inflation rate and foreign currency deposits growth rate, was set to be the threshold. As Cambodia's inflation is also affected by oil price and US interest rate, these two global factors are included into the models as exogenous

variables. The data sample is monthly data from 1996M1 to 2015M11.

According to the results of generalized impulse response functions, when the threshold variable exceeds a certain threshold value, the impact of the exchange rate change on inflation will be different, yet in general, the positive exchange rate shock will lead to a rise in inflation. However, in the model using the change in interest rate as threshold variable, the inflation rate declines in response to the increase in the regime of declining interest rate. On the other hand, the responses of inflation to different types of shocks are fairly symmetric in most of the cases, but asymmetry is found in the model where the foreign currency deposits growth rate is used as the threshold variable.

Additionally, we have calculated the Generalized Forecast Error Variance Decomposition of Inflation in each case in order to examine the relative contribution of each endogenous variable on inflation. The relative contribution of exchange rate to inflation variance decomposition is seen to be bigger in the high regime of exchange rate growth rate, the low inflation regime and the regime of increasing interest rate, while it is almost equal in the case of different foreign currency deposits growth regime.

V. Conclusions

This study examines the relationship between exchange rate and inflation in various aspects of the Cambodian economy, which has basic weaknesses such as an under-developed financial system under high dollarization. It is based on the medium-to long-term perspectives for the Cambodian economy to promote policy directions for sustainable growth.

To this end, we analyzed the relationship between the exchange rate and inflation in Cambodia since the 1990s. First, we analyzed the exchange rate and inflation change under dollarization in various ways including theoretical, empirical and case studies: reviewed the benefits and costs of dollarization; undertook analysis of the dollarization determinants; analysis of country panel data and exchange rate - inflation relations for countries around the world that have or are currently adopting dollarization; inflation and economic growth rate - exchange rate analysis; a case study of countries with historically gradual dollarization mitigation experience and a comparison with Cambodia. In line with this, the effects of the exchange rate on inflation were analyzed step by step in the Cambodian economy: analysis using the Threshold VAR-X models; a comparative analysis by phase (low regime and high regime) of each endogenous variable through Generalized Forecast Error Variance Decomposition.

The results of this multi-angle empirical analysis suggest that some useful policy implications for the economy of Cambodia. First, we can derive policy implications from short-term and medium-term perspectives from the analysis of the impact of exchange rate on inflation under current dollarization. The impact of domestic currency depreciation is largely symmetric, leading to inflation. However, in the case of interest rate decline, the impact on inflation may change. In line with this, the effect of exchange rate shocks on inflation can be asymmetric if exchange rate fluctuations are largely at high or low levels, and when foreign exchange rate fluctuations are high or low. In addition, the impact of the exchange rate shock on inflation was analyzed as being larger in the

period of rising interest rates and in the low inflation period. Although the exchange rate has not been so volatile relatively and there are limitations to policy implementation under the high dollarization economy of Cambodia, it is recommended that Cambodian monetary and foreign exchange authorities consider the implications suggested by the results of the empirical analysis in policy-making.

In line with this, we can derive policy implications from medium to long-term perspectives from various analysis results such as dollarization benefits-costs review, dollarization determinants analysis, dollarization national panel data analysis, and country-by-country comparison analysis. According to the previous research, dollarization is an integrated index with the world economy, which has advantages such as development of the domestic financial market and promotion of foreign investment. Cambodia also can be evaluated as having maintained financial market stability and growth under dollarization. However, if the high dollarization continues, policy effectiveness will be greatly reduced due to the constraints on independent monetary and foreign exchange policies, and the domestic economy will be vulnerable to external shocks. In this respect, Cambodia's economy needs to continue to secure a steady growth path by analyzing the factors of deepening dollarization through various empirical analyses of exchange rate, inflation and growth under a dollarization economy, and look for policy directions of mitigating the dollarization from the medium to long-term perspective.

Empirical results of determinants of dollarization are that high inflation, rigid exchange rate fluctuations, a sluggish real economy and under-developed market system are analyzed as the main factors enhancing dollarization. This is similar to the results of preceding studies. The results of the analysis of the dollarization and de-dollarization countries group show that real appreciation of the local currency is needed to mitigate the degree of dollarization, including the mentioned factors. Using the same country panel data, the correlation between inflation and the key variables of the foreign exchange market is analyzed. As expected, high dollarization and high depreciation rate of the domestic currency

are factors that increase inflation. In addition, as a result of further analysis on the de-dollarization country group, the degree of pass-through of the exchange rate and the degree of dollarization have no significant effect on inflation, while in the dollarization country group, these foreign exchange market variables do have a significant effect on inflation. The result of analyzing the effect of exchange rate change on inflation classified into the floating exchange rate system group and fixed exchange rate system group is that the exchange rate's effect on inflation is larger in the fixed exchange rate system group.

Thus, it may not be appropriate to apply the stylized facts identified in the cases of dollarization and de-dollarization countries group directly to the economic and financial systems of Cambodia. This is because the factors making for dollarization of the Cambodian economy are different from those of other countries. Unlike other dollarization groups in the past decade, the Cambodian economy has sustained stable inflation with solid economic growth. As Cambodia's economy enters the stage of full-fledged economic development in the future, the Cambodian government needs to change the exchange rate system from a fixed exchange rate system to a floating exchange rate system as in most advanced countries. In line with this, the Cambodian government should establish a foundation for independent monetary and foreign exchange policies through financial market development.

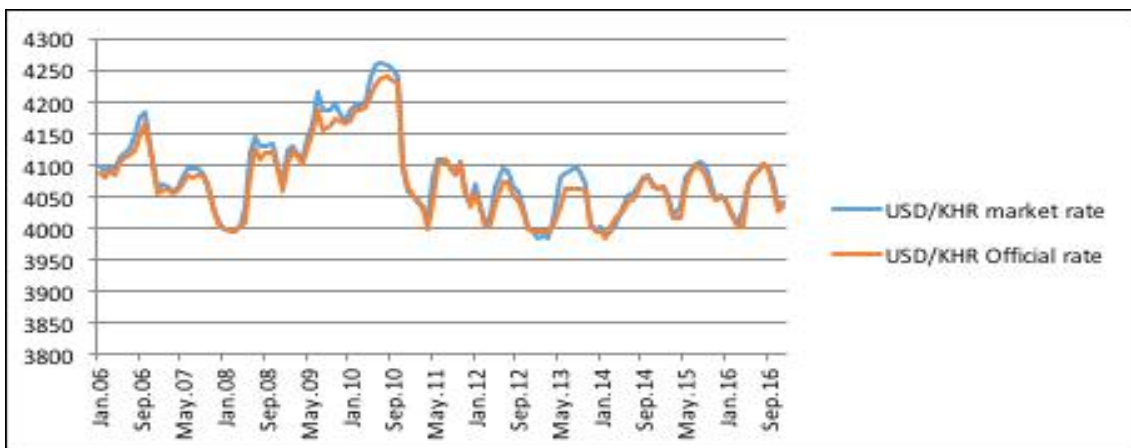
In this regard, the Cambodian economy needs to gradually promote policies in the following direction for the development of financial and foreign exchange markets. First, it is necessary to promote a system of posting dual prices in US dollar and Cambodian riel together for all goods and services. If the credibility of the riel is enhanced through quoting and displaying prices in riel, an increase of its use will be possible through the autonomous choice of economic agents. Efforts also should be made to widen the current band gradually allowing the upward and downward fluctuations of the exchange rate while maintaining the stability of prices and the economy. According to the results of the national panel empirical analysis, the effect of such exchange rate fluctuations on the inflation rate is reduced when the degree of dollarization is eased or when the

exchange rate system changes to a floating exchange rate system. In addition, it is desirable to consider policies to increase the incentives for holding the Khmer Riel such as decreasing the financial income tax and reserve requirement ratio on riel deposits.

Appendix 1

NBC's Evaluation on the Developments in Cambodian Dollarization

The NBC stated official policy for FX is managed float and implicitly will only allow market rate to move within +/- 1% of the official rate. Historically, the exchange rate has been maintained within 3900-4150 riel per dollar range since 2011, leading some to think that the NBC is adopting a soft peg in practice. However the NBC, with managed float regime stance, remain open to allowing the currency to move outside of historical range should it deem appropriate. Nevertheless as a dollarized economy and with confident in the local currency still requiring confidence building among the general public, maintaining stability of the FX rate is seen as most appropriate for current circumstance.



1. Regulation

In term of regulation for FX, the NBC impose very minimal restriction on FX flow and transactions in favor of a more liberal regime. Foreign currency loan and deposit are permitted and widely used, FX transactions as long as done through approved intermediary such commercial banks and money changers are permissible as long as it is reported when exceeding certain amount. In general, Cambodia adopts a very liberal stance towards FX flows and transactions.

2. Rational for anchoring with dollar

As a dollarized economy, fluctuating riel exchange rate to the dollar can have many complications. Different sections of the economy get impacted differently by change in exchange rate and they are mindful when rate moves adversely against them. Sharp movement in either direction often draws political pressure and scrutiny, leading the NBC to reach a consensus that a stable exchange rate is a neutral stance widely accepted by all for the time being.

In a case of an appreciating riel against the dollar for example, workers being compensated in dollar could have their purchasing power eroded when purchasing necessities such food which are often quoted in Riel unlike high priced items. With that, their already modest purchasing power would be lessened and quality of life affected.

On the other hand in a case of a depreciating riel against the dollar, government tax revenue mostly in Riel will have their purchasing power erode when making payment in foreign currency for infrastructure project and foreign debt repayment, to name a few. Moreover as consumer price index is calculated in Riel, a weak riel would automatically translate into higher price for goods and services quoted in dollar. This can be partly regarded as imported inflation or exchange rate pass through to inflation in the case of Cambodia as goods quoted in USD are often imported goods. Therefore maintaining exchange rate stability can be considered as effort to control excessive exchange rate pass through to inflation and thus price stability. The Monetary Policy Committee (MPC) takes into account movements in exchange rates, among other things, when formulating the policy stance.

In addition to that, maintaining the anchor against USD, ensure disciplined approach to managing Riel supply into the economy and prevent excessive injection that could devalue the Riel and fracture the current fragile confidence in it.

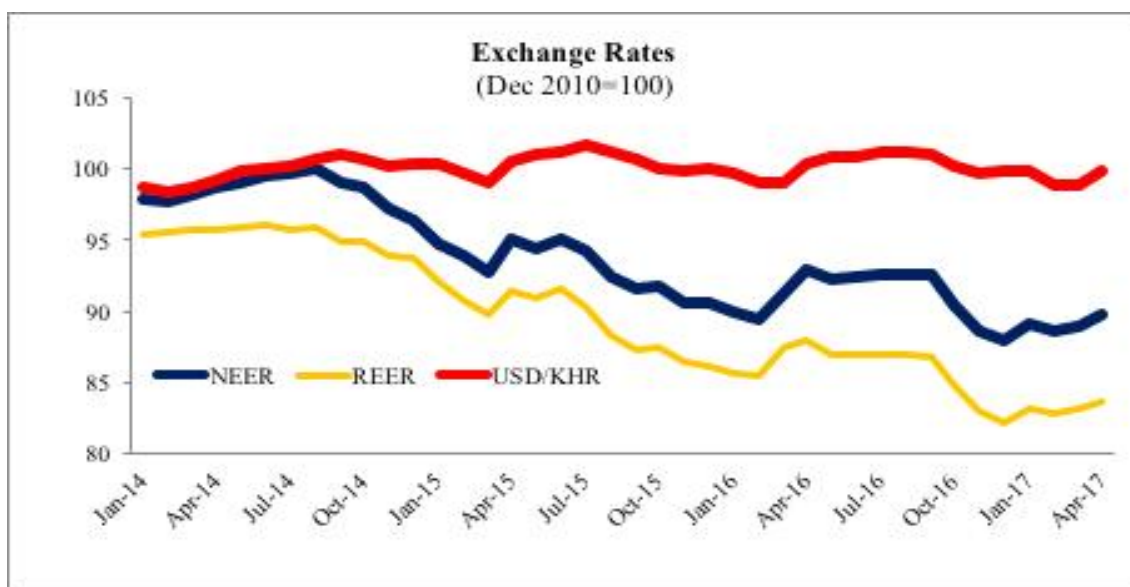
Due to all the above factors, and different section of the economy that would be disadvantaged by an appreciating and others by a depreciating currency, adopting a stable exchange rate is thus a neutral stance that would be optimal for all sections of the economy.

The anchoring of riel to the dollar nevertheless has its drawbacks. Maintaining the anchor for a country with very free capital flow regime means foregoing a fully independent monetary policy and importing those of the Federal Reserve. The accommodative monetary policy of the Federal Reserve since the GFC has led to high capital inflow and lower domestic interest rate.

Higher capital inflow of USD even in a dollarized economy lead to higher demand for riel as these foreign businesses need Riel for certain transactions and tax payments etc. and this has led to sharp increase in selling of riel by the NBC as shown in the graph in order to cater to increase in demand.

3. Impact on Economic competitiveness

To monitor foreign exchange rate movements, the nominal effective exchange rate (NEER) and the real effective exchange rate (REER) are both used as important pieces of information to make sure that our medium and long-term competitiveness, compared to the rest of the world, are in check. The NBC duly note that current policy of anchoring Riel to the dollar can sometime lead to volatile NEER and REER movement that can have large divergence from economic fundamental as has been the case in recent years.



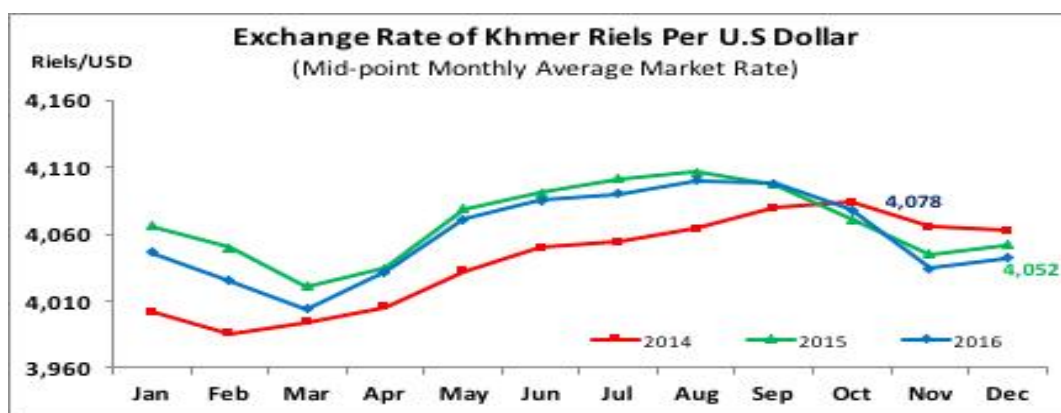
*NOTE: Graph uses trade weighted foreign currencies as base currency, therefore a declining line mean that less Riel is needed to exchange for the foreign currency thus meaning that Riel has appreciated

The gaining strength of the dollar index since the global financial crisis has translated into higher Nominal Effective Exchange Rate (NEER) and Real Effective Exchange Rate (REER) for the riel and has eroded export competitive of Cambodian based companies relative to our competitors. The impact on export goods price however has not been as severe as stronger dollar also lead to lower price of imported raw material which lowers the price of the end product in USD, partly offsetting the impact of stronger dollar for foreign importer.

Being an economy in which garment export and tourism as the main two driver of growth, sectors highly susceptible to movement in exchange rate, the cost of maintaining an anchor to the dollar in period of strengthening dollar is often felt. While there has been dilemma on tying the riel to trade partners index however given our circumstances as a heavily dollarized economy, ultimately anchoring with dollar remain the better more practical choice.

4. Seasonality of FX rate

The Riel exchange rate moves in a distinguishable pattern throughout the year due to seasonality effect as shown in graph. The Riel tend to follow an appreciating trend after October as demand for Riel to make year end profit tax and as import and therefore import tax payments increases. Subsequently during the harvesting season between January and April, demand for Riel increase further as merchants buy up harvest from farmers. This also consequently lead to higher import and import tax as farmers spend their windfall from the harvest and which then leads to more Riel demand for import tax payment purposes. From April to October relative demand for Riel is weak and that shows in the depreciation of the Riel in the period.



5. Implementation

In establishing the official exchange rate, the NBC survey market price from money changers as indicator for underlying market demand and supply before setting an official exchange rate that it think is appropriate and intervene accordingly to bring market price closer to official target rate. In determining official target rate, the NBC is mindful to not diverge significantly from market rate and only does so when market rate is out of range. The NBC often allow market to determine price and only step in to intervene when exchange rate move out of certain range, and to contain excessive shortage or supply of riel and the accompanying volatility.

Intervention comes in the form spot buying/selling Riel for the dollar with commercial bank and moneychangers. Sterilization is not needed, as a dollarized economy, the act of buying dollar and selling Riel simply replaced the dollar bought from the system with same value of Riel without impacting the overall money supply in the system.



Intervention in the currency market follows the exchange rate seasonal pattern with selling of Riel peaking during the period of its high demand in March and subsiding after April in an attempt to keep exchange rate within range but without defying underlying market demand and supply despite the ability to do so. The NBC means to ease depreciation pressure is often to stop selling Riel into the market, and it has rarely bought Riel from market for that purpose as there has been reluctant to use the dollar reserve and thus far halting the sale of

Riel has been sufficient to bring the exchange rate back in range. The Riel bought are only to Ministry of Economy and Finance and state owned Electricity company in which The NBC as an agent has contractual obligation to transact in currency on their behalf.

6. Policies going forward

Exchange rate policy going forward will mainly account for how it could aid in the de-dollarization process and at the same time ensure price stability as oppose to secondary goal of optimizing sustained economic competitiveness. The possible policies discussed is to maintain the status quo of stable exchange rate around the dollar, other is to increase volatility and using weighted trade partners currencies as benchmark rate. It is important to note that these are merely informal discussion among senior economists.

Maintaining the current status quo of stable exchange rate is appropriate because confidence in Riel still needs to be built and this policy has been beneficial in attracting capital flow as investors are able to mitigate currency risk. On the downside, there will be little impetus to switch from dollar to Riel as the two are perfect substitutes.

The other is proposal to widen the movement band with the dollar and to provide a sense of two-way risk to the market. It is believed that some degree of volatility is healthy and conducive to the development of a liquid foreign exchange market. This added volatility would also encourage companies to slowly adopt the use of FX hedging products. Moreover volatility of the exchange rate would discourage holding of the foreign currency as dollar and Riel are no longer almost perfect substitute for the general public. Holders of a more volatile dollar would find the purchasing power of their dollar changes when buying goods and services quoted in Khmer Riel. This policy however could have opposite effect as currently most goods and services are quoted in USD, and that could discourage holding of Riel. The policy would be relevant once prices are all quoted in KHR.

Finally, the option to tie the Riel with a trade weighted basket of trade partners' currencies would ensure the Riel will track more closely with trade fundamentals.

Appendix 2

NBC's Evaluation and Policy Implementations on Cambodian Dollarization

1. The National Bank of Cambodia (NBC)'s evaluation on driving factors for the dollarization in Cambodia

Vetlov (2001) expresses in general two main factors contributed to dollarization, institutional factors and the differences in real rates of return on domestic and foreign assets. Institutional factors include the level of economic openness that require foreign currency to operate international transaction; depth/size of the domestic financial market; and lower costs of exchanging currencies. Another key determinant comprises of interest rate differential between local currency and foreign currency deposits/bonds and devaluation expectation of domestic currency. Similarly, Zamaróczy & Sa (2002) reveals some dollarization factors reflecting Cambodian economy, such as a high degree of openness, low transaction costs for acquiring foreign currency and lingering deprecation concern. Menon (2008) addresses the cause of dollarization in Cambodia is a lack of confidence in riel.

Dollarization in Cambodia did not exist due to a policy decision of the royal government, yet there were some historical determinants that the country has become dollarized unofficially. The overview of dollarization should be shown backward over four decades ago. Cambodia has enjoyed some years of development in the previous century. After receiving independence from France in 1953, the National Bank of Cambodia, established in 1954, created its own national currency the riel (KHR), in order to substitute using the Indochina currency, the piastre.

From 1970 to 1975, there were internal conflicts in the country and a coup to dethrone the king resulted in an economic recession. After that, Cambodia fell into a new regime from 1975-1979 called “Pol Pot genocide regime.” The NBC building was bombed down and the banking system was completely destroyed. All bank notes were abolished and no one wanted anything besides survival. After that regime, Cambodian people’s confidence in domestic currency was eroded; as a

result, the use of US dollars, Thai bahts, and Vietnamese dong widespread gradually.

Even after the collapse of the Pol Pot regime, the economy had to develop from much lower levels of social infrastructure, human capital, and political institutions. The central bank has been reopened in 1980 and the domestic currency riel has been re-introduced to serve as a mean of payment aimed at avoiding a barter form. During that time, the banking system is one tier, which the NBC functioned not only the central bank but also the commercial bank to provide loans, deposits, and payment transactions. Cambodian economic, political and social conditions were fragile; the nation was still not in peace as there were internal conflicts between politicians. By experiencing in instability and unsafe, Cambodian people have lower and lower confidence in the banking system and local currency, leading to a continuous preference of using other currencies including US dollars, Thai bahts, and Vietnamese dong instead of the domestic one.

The transformation of planned economy to market economy to the rest of the world in late 1980s, which allowed trade openness and economic and political relations was also a major root for currency substitution in Cambodia. People need foreign currency to deal with international transactions, in particular, trade. As a result, Thai bahts and Vietnamese dong were used along both countries borders, and US dollars were used simultaneously as well.

The result of great destruction during Pol Pot regime combined with the peace keeping effort and rebuilding the country by the UNTAC (United Nations Transitional Authorities in Cambodia) became important in dollarization phenomenon in Cambodia. Between 1991 and 1993, a significant inflow of US dollars under the UNTAC approximately USD 1.7 billion to Cambodian economy for generating the first election process has mainly contributed to dollarization. As low confidence in riel already existed and the US dollar, a strong currency, was convenient to pay and save, people started to use it from time to time. Feige (2003) demonstrates that US currency has many desirable properties. It is well-known and deemed to be a stable currency; thus, it becomes a reliable store of value. Additionally, the US dollar is available in many countries and is broadly accepted as a medium of exchange.

Another cause which put pressure on public confidence was hyperinflation until 1992 and plummeted value of riel until 1993. Feige (2003) expresses de facto dollarization is typically the rational response of economic agents to a loss of confidence in the domestic currency, often resulting from episodes of inflation and currency devaluations. As the figure illustrates, Tal & Dabadie (2007) addressed the exchange rate devalued significantly, from about 50 percent in 1989 to around 75 percent in 1991 and continued to sharply grow by approximately 110 percent in 1993. The inflation rate also surged, which reached to 90 percent in 1989, while the rate accounted for three digits of 150 percent in 1990 and 180 percent in 1992. These unfavourable results were due to a noticeable increase in money supply since the government budget deficits were financed by the central bank owing to constraint sources of fiscal revenue and international grants and loans during that time. Consequently, public confidence in the domestic currency was persistently ruined, and in Cambodian people's view points, the US dollar is considered as a stronger currency compared to the riel, resulted in choosing it for every using purposes.

2. NBC doesn't have specific time table for de-dollarization as market base strategy will be employed. Thus, a soft and cautious approach will be under taken. Please note that NBC has opted to use the term of promotion of the use of local currency, rather than de-dollarization.

3. Cambodian government's (or the NBC's) policies to be taken to develop financial and foreign exchange market in Cambodia Move from Money changer to Commercial Banks dominance model in the foreign exchange market

Currently a few major money changer dominate the FX transactions in number and volume. These money changers are often the only few to take part in FX auction with the NBC. In the current money changer dominated market, FX transaction in Cambodia in general has low bid ask spread for spot and small size transactions. There are however some constrains by concentrating FX market dominance in the hands of a few money changers. One, due to lack of sophistication, money changers has not been developing

other FX related businesses, offering other FX product such as Forward, SWAP and FX hedging tool for commercial entities' use. Second, as they are not under the stringent supervisory authority of the NBC, as such they have been reluctant to properly collect and provide data on their FX activities to NBC for analysis. Third, eventually the NBC want to move FX market online and onto our electronic payment system and the money changers do not have the economy of scale to justify the purchase and is reluctant to use these platforms unlike banks which are already active on them. Unlike the money changer commercial banks have the human resource, already on our payment system, have capital and as a supervisee under the NBC have already been collecting and reporting required information.

Encourage development of major foreign FX dealer banks

With participation of a major dealer banks, trading volume would expand and Cambodian market could be integrated into the regional and global market. These foreign FX dealer bank is already integrated into the regional and global economy with a vast network and a variety of FX product offering. These major foreign FX dealer bank also already have the capacity to develop more sophisticated FX product offering which can better suits the need of large multi-national corporations operating in Cambodia. More sophisticated monitor and analytical model from them will also lead to better data for NBC's analysis.

Facilitate the Internationalization of the Khmer Riel

The NBC is currently already working with Chinese and Thai authorities and other commercial partners to find solutions to have Khmer Riel listed and transacted more actively in these international markets. Khmer riel is already listed in a province in China, where Chinese merchants or individual (tourists) can exchange their Reminbi for the Riel although there is yet to have active activities. Whereas for Thailand, the NBC is working with the Bank of Thailand and commercial partner to list Khmer riel in money changer and banks in major Cambodian tourists hot spots. Internationalization of the Khmer Riel can better serve both businesses and tourist in and out of Cambodia and this will also affirm international acceptance of Khmer riel, thus further boosting the credibility of this currency.

Enhance the FX electronic trading platform

Very recently the NBC developed a FX trading platform for banks and money

changers where they can trade FX among themselves and also where NBC does its FX auctions with these participants. The electronic platform intent to be a place to negotiate FX transactions, register large FX transactions, settle and clear, and where market making function can be developed. This platform though has yet to be prevalently used by market participants as it still not able to settle and clear the transaction efficiently. NBC intent to improve on this online platform to ensure more user friendliness.

Strengthening the mechanism for interventions on the foreign exchange market

In order to increase the NBC effectiveness in its interventions on the FX market, the NBC will expand the usage and application of new instrument – the foreign exchange swap. The NBC currently offers the FX swap to micro finance institutions but intent to provide it to more participants, to increase its price competitiveness and ease of use. The FX swap as an intervention tool is widely used by central banks and is a more flexible instrument than current only method of intervention which is FX sale/purchase.

Increase NBC's surveillance capacity

The NBC intend to develop a comprehensive framework for analyzing and assessing sources of potential exchange rate pressures. Reporting requirements and enforcement of reporting provisions is to be strengthened and include all important market participants, in particular the money changers.

References

[References in English]

- Balino, Bennett, and E. Borensztein (1999), "Monetary Policy in Dollarized Economies", *IMF Occasional Paper*, No. 171, International Monetary Fund.
- Catao, Luis and Marco Terrones (1997), "Financial De-dollarization: A Global Perspective and the Peruvian Experience", *IMF Working Paper*, No. 16, International Monetary Fund.
- De Nicolo, Gianni, Patrick Honohan and Alain Ize (2005), "Dollarization of Bank Deposits: Causes and Consequences", *IMF Working Paper*, No. 32, International Monetary Fund.
- Duma, Nombulelo (2011), "Dollarization in Cambodia: Causes and Policy Implications," *IMF Working Paper*, No. 49, International Monetary Fund.
- Feige, E. L. (2003), "Dynamics of currency substitution, asset substitution and de facto dollarization and Euroization in transition countries", *Comparative Economic Studies Journal*, No 45, 358–383.
- Fischer, Felix, Charlotte Lundgren, and Samir Jahjah (2013), "Making Monetary Policy More Effective: The Case of the Democratic Republic of Congo", *IMF Working Paper*, No. 226, International Monetary Fund.
- Garcia-Escribano, Mercedes and Sebastian Sosa (2010), "What is Driving Financial De-dollarization in Latin America?", *IMF Working Paper*, No. 10, International Monetary Fund.
- Ize, A. and E. Yeyati (2005), "Financial Dollarization: Is It for Real?", *IMF Working Paper*, No. 187, International Monetary Fund.
- Kokenyne, Annamaria, Jeremy Ley and Romain Veyrune (2010), "Dedollarization", *IMF Working Paper*, No. 188, International Monetary Fund.
- Koop, G., M. H. Pesaran and S. M. Potter (1996), "Impulse Response Analysis in Nonlinear Multivariate Models", *Journal of Econometrics*, 74(1), pp. 119-147.

- Lanne, M. and H. Nyberg (2014), “Generalized Forecast Error Variance Decomposition for Linear and Nonlinear Multivariate Model”, *CREATES Research Paper*.
- Leiderman, L., R. Maino and E. Parrado (2006), "Inflation Targetting in Dollarized Economies", *IMF Working Paper*, No. 157, International Monetary Fund.
- Menon, Jayant (2008), “Cambodia’s Persistent Dollarization: Causes and Policy Options,” *Working Paper Series on Regional Economic Integration*, No. 19, Asian Development Bank.
- Naceur, Sami, Amr Hosny and Gregory Hadjian (2013), "How to De-dollarize Financial Systems in the Caucasus and Central Asia?", *IMF Working Paper*, No. 15, International Monetary Fund.
- Reinhart, Carmen, Kenneth Rogoff and Miguel Savastano (2003), "Addicted to Dollars", *NBER Working Paper Series*, No. 10015, National Bureau of Economic Research.
- Rennhack, R. and M. Nozaki (2006), "Financial Dollarization in Latin America", *IMF Working Paper*, No. 7, International Monetary Fund.
- Tal, N. I. and D. Michel (2007), Dollarization in Cambodia. Cambodia, Phnom Penh.
- Vetlov, I. (2001), “Dollarization in Lithuania: An econometric approach”, (Discussion Papers, 1), Bank of Finland, Institute for Economies in Transition.
- Wu, J. C., and F. D. Xia (2014), "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound", NBER Working Paper No 20117.
- Yeyati, Eduardo (2006), "Financial Dollarization: Evaluating the Consequences", *Economic Policy* 21(45): 61118.
- Zamaróczy, de M. & S. Sa (2002), “Economic Policy in a Highly Dollarized Economy: The Case of Cambodia”, (IMF Occasional Paper No. 219), International Monetary Fund. Washington DC.

[References in Korean]

Bank of Korea (2005), *Monetary Policy in Korea*