THE EFFECTS OF EXCHANGE RATE VOLATILITY ON ECONOMIC GROWTH: EVIDENCE FROM THAILAND, SINGAPORE AND MALAYSIA

BY

MISS NAWAN LIMPAVATHANYOO

AN INDEPENDENT STUDY SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
PROGRAM IN FINANCE (INTERNATIONAL PROGRAM)
FACULTY OF COMMERCE AND ACCOUNTANCY
THAMMASAT UNIVERSITY
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ENTITLED

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ABSTRACT

According to the economic globalization, many of international businesses are worked across the countries. Exchange rate is used as an intermediary to make the business transaction or market force from one country and another country. The excessive in exchange rate volatility is represented the risk. Thus, if the exchange rate volatility is high, it will obstruct business activities and also may lead to reduce the level of economic growth. In this article, the author intents to study the effects of exchange rate volatility on economic growth in ASEAN-3 countries including Thailand, Singapore and Malaysia. The data were collected in quarterly term covering 2005Q1 - 2015Q4. In term of technique of estimation, standard deviation is used to measure the exchange rate volatility and Fist-Differencing Generalized Method of Moment (GMM) is employed to assess the relationship between exchange rate volatility and economic growth. The main finding reveals that in short-term, exchange rate volatility negatively and significantly influenced economic growth while this relationship also negative but less power to affect economic growth in long-term period.

Keywords: Exchange Rate Volatility, Economic Growth, Standard Deviation, Dynamic panel data, GMM

ACKNOWLEDGEMENTS

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CHAPTER 1
INTRODUCTION

In the world of globalization, it does not define for technology and communication only but also the world of economic is more liberalization. After the failure of the Bretton Woods system in 1973, the financial system of many countries was changed to be more liberalization and deregulation. The exchange rate system was changed from fixed exchange rate become floating exchange rate. The consequence of this situation may cause the exchange rate fluctuation because it depends on demand and supply of that currency. The changing of exchange rate system is a great debate among economist to argue that which exchange rate regime is better (Frenkel and Goldsstein, 1987; Cote, 1994; Hanke and Schuler, 1994; Rose, 2000; Calvo and Mendoza, 2000; Calvo, 2001; Frankel and Rose, 2002; Alagidede and Ibrahim, 2016).

Hanke and Schuler, 1994 revealed that fixed exchange rate will improve fiscal policy because government can manage budgetary of the country by controlling the spending. Calvo and Mendoza, 2000; Calvo, 2001 argued that when flexible exchange, the policy makers are hardly to set up a new policy because variability in exchange rate cannot earn enough evidence to support. Rose, 2000; Frankel and Rose (2002); Alagidede and Ibrahim, 2016 found that flexible exchange rate will increase trade uncertainty because of output, cost, and profit of the company.

Exchange rate is a key important variable to exchange products or services from one country to another country by using a currency as an intermediate to make an agreement or transaction in international business. Exchange rate volatility is defined as the fluctuation of exchange rate that is represented the risk or uncertainty of business through cost and benefit. The main cause of exchange rate volatility is created from shocks, as an analyzed by Clarida and Gali, 1994. However, Hausmann et al., 2006 indicates that developing countries are highly possibility to create shock in exchange rate volatility than developed countries. In addition, the paper of Insukindro and Rahutami, 2007 reveal that the movement of exchange rate in up or down is just defined the exchange rate depreciation or appreciation while the exchange rate volatility is defined as exchange rate risk.

Nowadays, the world is linked together; the economic activities in many countries are jointly together such as import, export, trade, investment, productivity. These activities are linked with the exchange rate. (Cushman, 1986; Caballero and Corbo, 1989; Bosworth et al.,1996; Serven, 2003; Fuentes, 2006; Aghion et al., 2009). When the exchange rate is variability, it will obstruct these international activities which may turn to reduce the performance of economic growth in both direct effect through cost and revenue and indirect effect through output and investment of developed and developing countries followed by Cote, 1994; Serven, 2002; Pickard, 2003; Cheong, 2004; Kikuchi, 2004; Arize et. Al., 2004. Furthermore, the macroeconomics variables in domestic country such as government spending, gross-fixed capital formation, inflation, labor, trade openness, and term of trade are also a factor to drive the economic growth (Baxter and Stockman, 1990; Flood and Rose, 1995; Rose, 2000; Frankel and Rose, 2002).

According to the several theoretical works, Clark, 1973 reveals that the profitability of the multinational company is determined from exchange rate. When the exchange rate is unstable, it represents risk of the company. The grater exchange rate volatility will make the cost and profit's firm variability. Moreover, the work of McKinnon and Ohno, 1997 finds that the excessive of exchange rate volatility will deleterious the level of economic growth by obstruct the international trade, reduce the investment, and make the profit not smoothing. As the note of Obstfeld and Rogoff's, 1998 reveals that the cost of domestic country will increase when the exchange rate is fluctuated. This cost affects in both households and firms. The consumption and leisure of household is unstable when the exchange rate is fluctuating while the firms will face higher cost because they have to hedge their risk of exchange rate uncertainty by buying a contract. So, they will set the higher price of goods and service to cover their cost. Therefore, it can be concluded that the exchange rate volatility will deleterious the level of economic growth.

The research questions of this study are to investigate the exchange rate volatility influences on economic growth and what macroeconomics variables impact on level of growth in Thailand, Singapore, and Malaysia?

The GDP growth rate in Thailand is average 0.92% over the period from 1993 to 2016. The highest level reaches 9.60% in 2012 because the government lunched

project to stimulate household consumption while the lowest value is recorded in -6.30% in 2011. After 2014, the trend of economic growth in Thailand is quite slowdown because of export decreasing. Figure 1.1 presents the GDP growth rate in Thailand.

Figure 1.1: Thailand's GDP Growth Rate
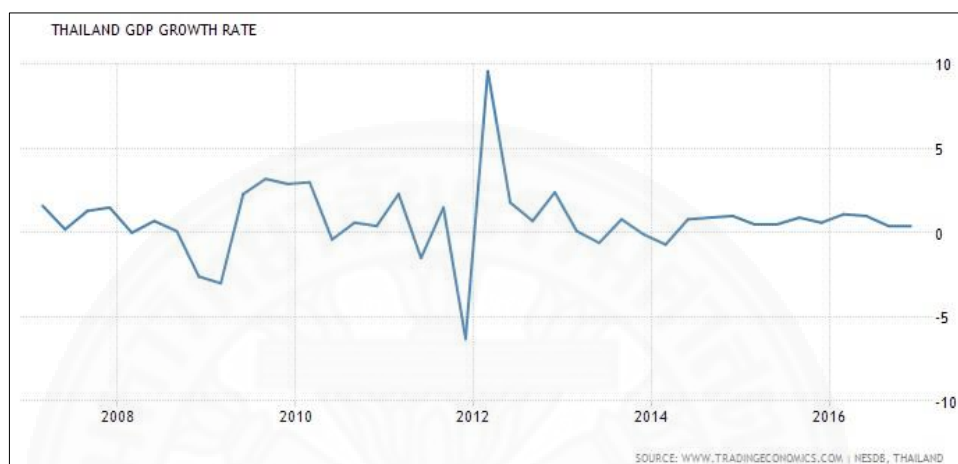
The mean of GDP growth rate in Singapore is 6.86% cover the period 1975 to 2016. In 2010, growth level sharply increases to 37.20% because of the structure rebounding in manufacturing sector. In contrast, the minimum growth is -13.50% in 2008 during the Hamburger Crisis. Figure 1.2 illustrates the GDP growth rate in Singapore.

Figure 1.2: Singapore's GDP Growth Rate
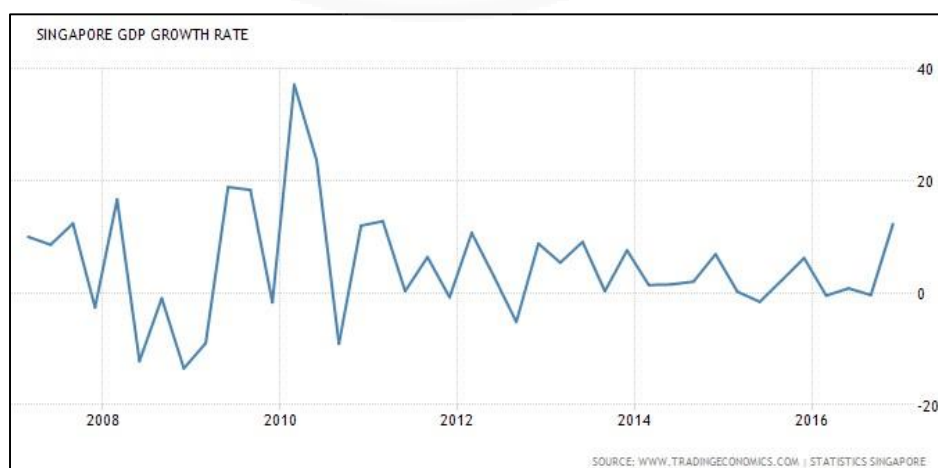
The average GDP Growth Rate in Malaysia is around 1.20% from 2000 to 2016. The maximum value is 5.50% in 2002 while the lowest value is -5.90% in 2001. In 2009, growth level is dramatically dropped that related to the Hamburger crisis in US. Figure 1.3 displays the GDP growth rate in Malaysia.

Figure 1.3: Malaysia's GDP Growth Rate

This paper selects Thailand, Singapore, and Malaysia countries to estimate because these countries are the top 10 of trade competitiveness in Asia and the top trade countries in South East Asia. The nature of South East Asia countries is export market. Thus, it cannot deniable that international trade is a major key factor to drive the level of economic growth in these countries.

Thus, the main purpose of this study is to investigate the effects of exchange rate volatility on economic growth in Thailand, Singapore, and Malaysia relies on quarterly data from period of 2005 to 2015. This paper employs Standard Deviation to measure the exchange rate volatility and Generalized Method of Moments approach (GMM) to determine the influenced of exchange rate volatility on economic growth.

The rest of this research is structured as follows: chapter 2 presents the theoretical framework and literature review. Chapter 3 describes the data selection and the research methodology of measuring exchange rate volatility and empirical model to estimate this relationship of variables. Chapter 4 illustrates the empirical result. Finally, chapter 5 explains the conclusion.

CHAPTER 2
REVIEW OF LITERATURE

2.1 Theoretical Framework

2.1.1 Exchange Rate Volatility

In exchange rate system, it composes of fixed and floating exchange rate regimes. Fixed exchange rate is the rate that constant and not vary by market force of that currency. The movement of fixed exchange rate is controlled by government only. On the other hand, floating exchange rate begins to adopt in many countries after the Breton Woods in 1973 was collapsed. The movement exchange rate is very sensitive because it represents the risk and uncertainty in many activities of business. The excessive in exchange rate volatility such as reduce profit of the firm, limitation in an international trade, unemployment rate, output, and international investment can lead to reduce the level of economic growth as noted of McKinnon and Ohno, 19997. In addition, Barkouas et al., 2002 find out the cause of exchange rate volatility. The study revealed that the cause of exchange rate volatility come from changing in exchange rate system, and changing in economic factor such as inflation, interest rate, output growth.

2.1.2 Exchange Rate Volatility and Economic Growth

According to previous studies, there are many papers, for example Clark, 1973; Cushman, 1983; Cote, 1994; McKinnon and Ohno, 1997; Obstfeld and Rogoff's, 1998; Devereux and Engel, 2003 study the linkage between exchange rate volatility and level of economic growth. These papers try to find which component is mainly effected in economic growth performance.

To illustrate this relationship, the study will begin with an example from the paper of McKinnon and Ohno, 1997. This paper reveals that an excessive in exchange rate volatility will create trade uncertainty, distort investment decision, reduce productivity and restrict level of economic growth. Moreover, as a note of Cote, 1994; Serven, 2002; Pickard, 2003; Cheong, 2004; Kikuchi, 2004; Arizeet. Al., 2004 find the same conclusion as McKinnon and Ohno, 1997. Most of result shows that an increase in exchange rate volatility will directly effect in international trade through an

unsmoothing in cost and profit of firm, trading volume, and unemployment rate. This uncertainty will lead the firm to set a higher price of product because firms have to bare more cost on risk premium. In addition, the excessive in exchange rate volatility also obstruct the investment decision and productivity through an operating facilities and output. Therefore, it can be concluded that an excessive of exchange rate volatility will deleterious the level of economic growth as an analyzed by Cote, 1994.

To reduce the effect of exchange rate fluctuation, it is advantage for the multinational corporation where they trade with many countries. Thus, they have a chance to offset some financial transaction and benefit for hedging currency risk and other variables. From the paper of Cushman (1983), assumes that if the exporters hurt from export price of one currency, they can offset the export price of other countries that they export. Moreover, if the firms trade with a large number of countries, the movement of exchange rate in each country is not the same. Thus, the exporters can prevent their risk by offsetting from different exchange rate direction of each country. Furthermore, if the firms import some input in process of their production. When they face with lower export earning, they can offset by lower cost of input. These conclusions as described by Clark (1973).

According to the theoretical literature of the relationship between exchange rate volatility and international trade. Clark, 1973 examines a competitive firm which producing a product to sell in foreign countries. After exporting is done, the firm gains money in foreign currency as it is one risk factor of company to covert currency back, which is uncertainty and unpredictable. Moreover, the cost of production is also another risk of the company because company orders input and makes the production in advance. Thus, the amount of input factors and output scale is already fixed and cannot be changed even the exchange rate is fluctuating. Therefore, the profitability of the company is dependent on the exchange rate movement where it represents risk of the company. This means that the exchange rate risk is presented by exchange rate volatility. The grater exchange rate volatility will make the profit's firm variability. Furthermore, as the note of Obstfeld and Rogoff's, 1998 reveals that the fluctuation in exchange rate will make the domestic economy more costly and affected in both household and corporation. In household, the variability of exchange rate will affect in household's consumption and leisure. Household is not favor when they buy something

from foreign countries and price is uncertainty because of exchange rate fluctuation. In corporations, before they import an input from foreign countries, they have to check foreign price and exchange rate. If countries that they import input are high exchange rate fluctuation, they will make a contract to prevent their risk by buying a future or forward contract. To buy these contract, firm have to pay more on risk premium even they exercise or not. This will increase cost of the company that will lead the firm have to set the higher price to protect their losses. Therefore, this reason will obstruct an international trade. On the other hand, the theoretical work of Devereux and Engel, 2003 contradicts that if the price is fixed with foreign currency, the exchange rate movement will not affect the domestic cost. In addition, the document of Franke, 1991 and Sercu and Vanhulle, 1992 explained about an "options" approach. The papers point out an option of the company to enter or exit in export market. The main reason of this judgment depends on the cost of the firms which come from the exchange rate volatility. Therefore, the conclusion of this paper reveals that higher exchange rate variability trend to make the firm's decision to enter or exit very sluggishly.

In relation of investment and productivity, exchange rate volatility will obstruct an international investment and level of productivity because of an increase in cost of capital as it represents the risk of investor. As from the paper of IMF, 2004 assumed that if foreign investors invest in the countries which are high exchange rate fluctuation. Foreign investors will want high interest rate to compensate their risk of exchange rate movement and to get the better yield or return. This cause the cost of capital in our countries increases because of interest rate increases. Moreover, an increase in exchange rate volatility will distort the investment decision in both operating structure and finance structure through the output, cost and profit. This also affects the business cycle of the company as an analyzed by Barkoulas, Baum & Caglaya, 2002; Agolli, 2002. In addition, "Sunk costs" is also another factor that impact on investment. Some company builds a manufactory or facilities in order to produce, to inventory and to distribute their product in foreign countries. This massive investment is call "sunk costs". Firm will loan money from bank of foreign country and pay interest rate in each month. If the exchange rate movement arise, it will affect cost of the company unstable. Moreover, an increase in loan interest rate of that country will lead to higher cost of the firm, followed by McDonald and Segel, 1986.

Welfare is also one factor that argues among theoretical work in productivity, as an analyzed by Devereux and Engel, 2003. When the firms produce a goods in foreign country, they have to hire labor from that country as an employee. If the exchange rate is variability, the cost that firms have to pay wage to labor will fluctuate which may turn to increase in cost of production of the company. As the hypothesis of Balassa-Samuelson believes that if the firm produce more in tradable goods, the wage will be increased. However, in reality, the higher productivity is not reflected from the higher wage. To balance this situation, the price of non-tradable goods is expected to be high in relative price of non-tradable to tradable goods. Furthermore, in process of producing a product, firms have order demand of input and output in advance. If the exchange rate movement arise. It also affected cost of input and output price of the company. These problems will also affect in change in profit of the company, as analyzed by Clark, 1973. Therefore, this is the reason why exchange rate volatility obstructs the level of productivity.

According to several theoretical works (Cote, 1994; Serven, 2002; Barkoulas, Baum, &Caglaya, 2002; Agolli, 2002; Pickard, 2003; Cheong, 2004; Kikuchi, 2004; Arizeet. Al., 2004), it can be concluded that exchange rate is a significant factor in many businesses. When the exchange rate movement arise, it is represented the risk of the company. These will lead more costly not only in business but also in household that will interrupt in major part of economics such as international trade, international investment, and level of productivity. Therefore, in generally, exchange rate volatility will adversely affect economic growth performance of the country.

2.2 Literature Review

Apart from theoretical works from previous section, the works reveal that the exchange rate volatility represents exchange rate risk. As it adversely affected in many activities such as international trade, international investment, level of productivity, and economic growth performance. In this section, the authors will analyze a vast of empirical literature to review many viewpoints of other papers that which variables impact on economic growth.

2.2.1 The relationship between exchange rate volatility and economic growth

As the relationship between exchange rate volatility and international trade, Bilquees, Mukhtar, and Malik, 2010 investigate the impact of exchange rate volatility on export growth from some South Asian countries. The authors analyze by employing Co-integration and VECM techniques for time spanning from 1960 to 2007. The empirical result revealed that real exchange rate volatility has negative significant effects on export activity in both short-term and long-term. Another paper of Aey, Gupta, and Myo, 2015 also examine the impact of real effective exchange rate uncertainty on exports in South Africa from 1986 to 2013. The main finding shows that exchange rate uncertainty has a negative significant on exports. These results are also similar as the studies of Cushman, 1986; Peree and Steunherr, 1989; Caballero and Corbo, 1989; Chowdhurry, 1993; Kim and Lee, 1996; Dell'Ariccia, 1999; Arize, Osang, &Slottje, 2000; Bahmani, 2002; Dogalar, 2002; Cho, G., Sheldon, &McCorriston, 2002; Coric and Pugh, 2010. These papers also find the negative relationship between exchange rate volatility and trade.

On the other hand, some articles reveal the positive relationship between two variables that are found by De Grauwe, 1988; Franke, 1991; Sercu and Vanhulle, 1992; De Grauwe and Skudelny, 2000; Bacchetta and van wincoop, 2000; Langley et al., 2000; Doyle, 2001; Bredin et al., 2003. It shows the positively effects of exchange rate volatility on export and trade will be better when increasing in volatility. From the paper of Mahmoodb and Vixathepc, 2007 find the long-run relationship between exchange rate volatility and export by using Japanese export data. The result shows that it is significant in both positive and negative between two variables.

Furthermore, some papers (Dan Bailey, Tavlas, & Ulan, 1986; Gagnon, 1993; Goeltom, 1997; Aristotelous, 2001; Susilo, 2001; Rahutami and Kusumastuti, 2007; Tenreyro, 2007; Eicher and Henn, 2009; Baum and Caglayan, 2010) cannot find any evidence to support this relationship between two variables. Aristotelous, 2001 analyses the impact of exchange rate volatility on the British exports to the USA. The data are analyzed in 10 years. The main finding indicates that the volatility does not effect on the British exports to the US. Therefore, the relationship between exchange rate volatility and trade are ambiguous because the finding of many empirical studies has many directions of answer.

In relation of investment and productivity on exchange rate volatility, the main finding is also mixed. As the noted of Kandil, 2004 investigates the effects of exchange rate fluctuation on inflation and output growth of 22 developing countries. The result shows that the exchange rate volatility will destroy in economic performance and negatively impact on both inflation and output in short-run while it has positive inflation and negative output in long-run. Moreover, the paper of Campa and Goldberg, 1995 studies the linkage between real exchange rate volatility and investment decision in USA and Canada. The result presents that the movement of exchange rate will distort on investment decision only in US data. Darby et al., 1999 examines the relationship between two variables in five European countries. The result also shows the negatively significant. Bosworth et al., 1996 analyzes the nexus of volatility and economic growth of 88 countries in both developing and industrial countries. The answer revealed that the cause of decreasing in output growth come from the exchange rate fluctuation by lowing in total factor productivity and export is a key factor to drive an economic growth. Bleaney and Greenaway, 2001 also study the impact of exchange rate volatility on investment and economic growth by setting the sample of 14 Sub-Saharan African in 15 years. The answer indicates that the exchange rate fluctuation affected only in investment. Lastly, as the empirical work of Aghion et al., 2009 examine the nexus of exchange rate volatility and long-run productivity growth by adding some financial tools of 83 countries over the period of 40 years. The authors also found the same result of negatively affected in long-term productivity growth and obstruct an investment. These results are also similar to others empirical work of Ghura and Grennes, 1993; Ndambendia and Alhayky, 2011.

Lastly, the exchange rate volatility-economic growth nexus will be reviewed by Alagidede and Ibrahim, 2016 analyzed the cause of exchange rate volatility effect on economic growth in Ghana by employing Co-integration and GMM methods. They found that the excessive fluctuations in exchange rate is deleterious on economic growth. Vieira, and Bottecchia, 2013 analyzed the impact of exchange rate volatility on long-run economic growth by setting 82 advanced and emerging countries and using two-step system of GMM over the period from 1970 to 2009. The finding shows that a higher level of exchange rate volatility has a negative significant effect on economic growth. This finding is also similarity with Dollar, 1992; Schnabl, 2009. In addition,

the work of Ghosh et al., 1997 studies the relationship rely on 30 years' period in 140 countries. The result does not find any evidence to prove that this relationship is significant.

2.2.2 The relationship between macroeconomic variables and economic growth

According to the note of MAS, 2003 investigates the relationship between exchange rate volatility and macroeconomic volatility including export and import volume, money supply, interest rate, and domestic output in Singapore over 22 years from 1980 to 2002. GARCH(1,1) model is used to measure the volatility and Folld and Rose, 1995 is used to assess the relationship between two variables. The result reveals that exchange rate volatility has a small impact on macroeconomic volatility.

Alagidede and Ibrahim, 2016 analyzed the impact of macroeconomic variables including government spending, gross-fixed capital formation, labor, trade openness, and inflation on economic growth. Generalized Method of Moments (GMM) estimator is used to estimate the result over 34 years. The main finding shows that government expenditure, gross-fixed capital formation, labor, trade openness positively influences on economic growth. In contrast, inflation is expressed as negative relationship on growth.

As the paper of Vieira, andBottecchia, 2013 investigated the nexus among inflation, government spending, and trade on economic growth of 82 advanced and emerging countries by using panel data cover the period from 1970 to 2009. The result reveals that government consumption and trade are positive relationship with growth. In contrast, inflation is deleterious on economic growth.

Musyoki and Pundo, 2012 also examined the effects of government expenditure, health, secondary education, primary enrolment and term of trade on growth. The methodology of this paper is GMM estimator cover the period from January 1993 to December 2009. The final answer shows that government expenditure, health, secondary education, and term of trade propel the economic growth. On the other hand, primary enrolment negatively impacts on growth.

In the relation of economic growth and inflation, the note of Holland and Silva, 2016 also study the nexus between inflation and growth of 82 advanced and emerging economics rely on 40 years' period. The result also shows that inflation negatively

impacts on growth. Furthermore, Schnabl, 2009 examines the effects of inflation, export on growth in 26 emerging countries of Europe and East Asia. The paper also finds that export factor drives the economic growth while inflation is harmful on growth.

As for the relation of employment and economic growth, Feldmann, 2011 analyze the nexus of these two variables by using the data of 17 industrial countries and time spanning 1982-2003. The result displays a higher level of exchange rate volatility adversely employment growth. Balke and Kaas, 2004 collects the data from Eastern European countries and found that the higher level of exchange rate volatility causes lower of employment growth. Furthermore, Bagella et al., 2006 reveals that exchange rate volatility also effect on income per capita. Therefore, the huge amount of exchange rate volatility will increase the level of unemployment rate.

As an empirical review, there are no evidence to present the definitely final result of the relationship between exchange rate volatility and economic growth performance. The answer is quite ambiguous. As a context of Eichengreen (2008) illustrates that many countries should maintain the optimal level and less fluctuation of exchange rate to drive a better economic growth and avoid an excessive fluctuation in exchange rate because it will deleterious not only economic performance but also others activities such as productivity, business, and competitiveness.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Data Selection

3.1.1 Real Exchange Rate Concept

The real exchange rate is determined by market force or demand and supply of goods and services that produced from one country can be exchanged to another country by using currency as an intermediate to exchange between goods and services across countries. The exchange rate can be divided into nominal exchange rate and real exchange rate. A Nominal exchange rate (NER) is the rate that included inflation while the real exchange rate (RER) is a nominal exchange rate by adjusting an inflation followed by Copeland, 1989; Lothian and Taylor, 1997. Moreover, the exchange rate can be classified into bilateral and multilateral exchange rate as an analyzed by Copeland, 1989. A bilateral exchange rate is the rate that one currency is pegged with another currency only such as USD/THB, USD/SGD, or USD/MYR while multilateral exchange rate is come from weight average of bilateral exchange rate in trading partner countries because it is represented the whole trading partner countries.

3.1.1 Real Effective Exchange Rate

In this paper, the exchange rate is presented by Real Effective Exchange Rate (REER) to calculate as exchange rate volatility because, in the real world, price is changing all the time and inflation is unstable. This will lead the nominal exchange rate movement arises that directly impacts on the trade competitiveness. Thus, real exchange rate is better to use because it reflects the real purchasing power, exclude inflation and covers the limitation of nominal exchange rate. However, in bilateral exchange rate is not reflecting the whole partner countries because it is pegged with only one currency or represent only one country. So, the multilateral exchange rate is efficiency to represent the whole country and more accuracy than bilateral exchange rate.

Real Effective Exchange Rate (REER) is an indicator to measure the international trade competitiveness. The index is determined by comparing the relative trade balance of the country against trading partner countries. The REER index is the weighted geometric average of the bilateral nominal exchange rates of a country's currency relative to index of major currencies adjusted for the effect of inflation.

The data of REER in Thailand is gleaned from Bank of Thailand (BOT) while REER of Singapore and Malaysia is gathered from Federal Reserve Economic Data (FRED). The process of REER calculation is as follow:

The equation of nominal exchange rate at time t is equal to:

$$NEER_t = NEER_0 * \prod_{i=1}^{n} \left(\frac{E_{it}}{E_{i0}}\right)^{w_{i,t}} \tag{1}$$

Where

$$\prod_{i=1}^{n} \left(\frac{E_{it}}{E_{i0}}\right)^{w_{i,t}} = \left(\frac{E_{1t}}{E_{10}}\right)^{w_{1,t}} \left(\frac{E_{2t}}{E_{20}}\right)^{w_{2,t}} \dots \left(\frac{E_{nt}}{E_{n0}}\right)^{w_{n,t}}$$

Where $NEER_0$ = the nominal effective exchange rate index at base year

E_{it} = the exchange rate in term of currency I at time t

E_{i0} = the exchange rate I in term of currency I at base year

$w_{j,t}$ = the weight of currency I in the index at time t

n = the number of foreign currency in the index

3.1.2 Data

In this research, dynamic panel data is used to analyze and find out the result because the lagged term of dependent variable is included in independent variables. The data are collected in quarterly term. The time spanning is from 2005Q1 to 2015Q4 covering 11 years and 44 samples size of each country. In this period, it captures the huge crisis is called "US subprime crisis" in 2008 which may affect a lot in economics in many countries including Thailand, Singapore, and Malaysia. The data of this study is gleaned from different sources including Bank of Thailand, The national economic and social development board, National Statistic Office Thailand, Bank Negara

Malaysia, Monetary Authority of Singapore, Department of Statistics Malaysia, Singapore Department of Statistics, World Bank indicator and CEIC database.

Throughout this paper, the aim of this paper is to find the relationship between exchange rate volatility and economic growth. In order to estimate the impact of level of economic growth, economic growth is set as a dependent variable. The proxy of economic growth is measured by real GDP per capita. It can be calculated by real GDP divided by population. In addition, initial growth is measured by lag of dependent variable, exchange rate volatility is measured by standard deviation of REER, and control variables are set as independent variables. Then, control variables are explained as follow:

Government Spending (CON) is one factor that affects in changing of economic growth. The Keynesian proposition believed that government spending is expected to improve the economic growth of country in term of more investment. However, if spending too much, it also reduces the level of economics because it can be occurred crowding-out effect. Therefore, the expected sign of government spending is ambiguous. The proxy of government expenditure is measured by final government consumption expenditure.

Gross-Fixed Capital Formation (FCF) is one component to determine the national income and expenditure (GDP). This indicator reflects the overall investment in the country that is related to an economy performance in term of production, employment, cost and benefit of business and household. Thus, this indicator will drive the economic growth of country.

Trade openness (TRA) is reflected trade liberalization. It encourages creating international activities and the demand and supply of goods and services of country. The amount of trade openness can be calculated by the sum of total value of exports and imports in goods and services divided by nominal GDP. A rise in this value reflects the extra degree of trade liberalization. Therefore, the expected sign of coefficient is positively influenced growth.

Inflation (INF) is also a significant factor that effects in both exchange rate and economic growth. It is used to measure the change in price level in goods and services. The high inflation reflects higher price of trade goods and services which can be slowed down the trade competitiveness of country by comparing with trading

partner countries. Thus, inflation is expected negatively impact on growth. Consumer price index (CPI) is used to measure inflation by reflecting the percentage change.

Labor (LAB) is also one variable that reflects the economic performance. It represents the economically active population in country. The high employment rate reflects the expanding in economic. Thus, labor is positive relationship with economic growth.

3.2 Research Methodology

3.2.1 Volatility Model

In order to measure the exchange rate volatility. The papers of Caballero and Cordo, 1989; Bahmani & Ltaifa, 1992; Stokman, 1995; Carrera and Vuletin, 2002used standard deviations to determine the exchange rate volatility. In this paper, Standard Deviation (SD) is employed to measure the volatility by computing the standard deviation of REER in time rolling sample of 3-month, 6-month, 9-month, and 12-month volatilities. Thus, the exchange rate volatility can be calculated under the standard deviation equation as follows:

$$V_i = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(REER_i - \overline{REER_i^n})^2} \qquad (2)$$

Where
V_i = the exchange rate volatility
i = month
n = 3, 6, 9, 12 month

Nevertheless, the standard deviation approach has some limitation. The first drawback is standard deviation is assumed to normal distribution in exchange rate. Secondly, Moreover, it doesn't cover past value of exchange rate. Thus, this weakness limits to measure the accuracy of exchange rate volatility from standard deviations.

Furthermore, we can realize that there are another way to measure the exchange rate volatility that called Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model as introduced from Bollerslev, 1986. In order to use GARCH model,

the model is quite same as ARCH model by adding q lags in past conditional variance. The frequent data that suitable for this estimator is high frequency such as daily or weekly data.

In this study, we also try to estimate volatility by employing GARCH model. However, the data collection was gleaned in monthly frequency. Therefore, this paper doesn't find any affect at all.

3.2.2 Growth Model

In order to access the impact of exchange rate volatility and economic growth the simple equation of the relationship between exchange rate and economic growth are set as follows:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 \widehat{h_t} + \beta_3 Z_t + \varepsilon_t \tag{3}$$

Where y_t = the economic growth at time t proxied by real GDP per capita

y_{t-1} = the initial growth condition proxied by lag of dependent variable

$\widehat{h_t}$ = the exchange rate volatility at time t

Z_t = the macroeconomics variables; including government spending, gross-fixed capital formation, trade openness, inflation, and labor

ε_t = error term

In term of estimation technique, Dynamic Panel Data of Generalized Method of Momentum Estimators Model (GMM) is employed to find out the effects of this relationship by applying the First-differenced Generalized Method of Moment.

According to the first-differenced generalized methods of moments (GMM) as developed by Holtz-Eakin, et. al., 1998; Arellano and Bond, 1991. The equation of first-differenced generalized methods of moments is as followed:

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta x_{i,t} + \varepsilon_{it} \tag{4}$$

Where $\qquad \varepsilon_{i,t} = u_i + v_{i.t}$

$$E(u_i) = E(v_{i,t}) = E(u_i v_{i,t}) = 0$$

It can be rewritten as follow;

$$y_{i,t} = \alpha y_{i,t-1} + \beta x_{i,t} + \varepsilon_{it} \qquad (5)$$

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta(x_{i,t} - x_{i,t-1}) + (v_{i,t} - v_{i,t-1}) \qquad (6)$$

Where

$y_{i,t}$	=	Dependent Variable
$x_{i,t}$	=	Independent Variables
u_i	=	Country specific effect
$v_{i,t}$	=	Idiosyncratic Shocks

In order to estimate the economic growth of different countries, it will create the problem of country specific effect which means that economic systems in each country are not the same. To solve this problem, we use lagged dependent variables included in independent variables as an initial growth.

Even though, first-differenced generalized methods of moments can eliminate problem of country specific effect by using lagged variable. However, it still has endogeneity problem because $y_{i,t-1}$ has relationship with $v_{i,t}$ or independent variables are correlated with error term.

To solve this problem, Arellano and Bond, 1991 developed the moment conditions for Endogenous Variables by setting the instrument in difference as lagged level and in level as lagged difference. The assumption of this approach is no serial correlation in variance and all explanatory variables are endogenous. Therefore, lagged variable of independent variables can be used as instrument variable.

In order to robust GMM estimator, we have to check the validity of the instruments by using Hansen's test of over-identification of restriction. The null hypothesis is set as there are no relationship with instruments and residual. Thus, fail to reject the null hypothesis shows the null hypothesis is valid while the reject null hypothesis means the instruments are not robust.

CHAPTER 4
EMPIRICAL RESULTS

4.1 Descriptive Statistics

Firstly, this section will begin with descriptive statistics for all variables in this study. The primary statistics show the trend and pattern of all variable before the estimation. Table 4.1 illustrates the basic descriptive statistics of all variables.

Table 4.1: Descriptive Statistics

Variable	Observations	Mean	SD	Min	Max
Real GDP per Capita	132	3.7983	5.5022	-11.5359	28.7861
Final Government Consumption	132	6.9157	7.8658	-8.7796	37.9775
Gross Fixed Capital Formation	132	8.1524	16.1418	-32.5082	80.0471
Trade Openness	132	6.3488	5.8378	1.1574	22.1923
Inflation	132	2.1694	1.7640	-2.2848	8.3991
Labor	132	1.7354	9.3576	-100.0000	11.9017
Exchange Rate Volatility in 3 months	132	0.7096	0.6091	0.0451	5.0653
Exchange Rate Volatility in 6 months	132	1.3236	1.5063	0.1474	12.1110
Exchange Rate Volatility in 9 months	132	1.7349	1.7851	0.2296	11.2191
Exchange Rate Volatility in 12 months	132	2.0511	1.9571	0.2167	11.8154

The average value of GDP per capita is approximately half of standard deviation at 3.7983 while the standard deviation is 5.5022. During the US subprime crisis, it affected the economics of many countries around the world which make the minimum level of economic growth at -11.5359. On the other hand, the maximum growth rate is at 28.7861 for the period 2010 to 2011. The final government consumption as an indicator to measure the expenditure of the country. The mean value is 6.9157, with a standard deviation of 7.8658. The maximum government spending is used to boost the economic growth at 37.9775 cover the period 2006 to 2009 while the lowest spending around -8.7796 after the crisis period. The next variable is gross fixed capital formation as it represents an investment of the country. The mean value is 8.1524, with the

standard deviation is double in mean around 16.1418. The top value of capital formation is in 2012 at 80.0471. In contrast, the lowest level of investment is during the Subprime crisis at -32.5082. Trade Openness which combines import and export divided by GDP has a mean approximately 6.3488 over the standard deviation of 5.8378. The minimum trade has a 1.1574 in 2014 while the maximum trade value has a 22.1923. The overall trade openness of this 3 countries, Thailand is a country that lowest trade openness while the highest trade openness is Malaysia. The next indicator is inflation. It reflects the price of goods and services in country, with a mean value of 2.1694 that is a double value of standard deviation of 1.7640. The highest level of inflation is in 2008 which is 8.3991. In contrast, the lowest level is -2.2848 in 2009. At last but not least, labor is used to measure. It represents the active population in the country has a mean value 1.7354, with the high standard deviation of 9.3576. The lowest value is reach -100 because most of labors are hired in country is come from alien worker that is not represented the true economically population while the maximum labors value is 8.3991. Finally, the average level of exchange rate volatility is 0.7096, 1.3236, 1.7349, and 2.0511 while the standard deviation is 0.6091, 1.5063, 1.7851, and 1.9571 in 3, 6, 9, 12 months respectively. This represent the higher variability. The highest volatility is 12.1110 in 6 months whilst 3 months show the lowest level of volatility at 0.0451.

4.2 Volatility Model

There are many ways to measure exchange rate volatility as it is discussed in previous section. In this study, the standard deviation approach is used to determine the exchange rate volatility.

4.2.1 Standard Deviation

In order to measure the standard deviation, this paper follows the standard deviation equation by classifying the time rolling sample variance in 4 series including 3 months, 6 months, 9 months, and 12 months. Figure 4.2, 4.3, 4.4, and 4.5 are presents the exchange rate volatility in Thailand, Singapore, and Malaysia respectively in 4 series.

Figure 4.2: Exchange Rate Volatility in 3 months
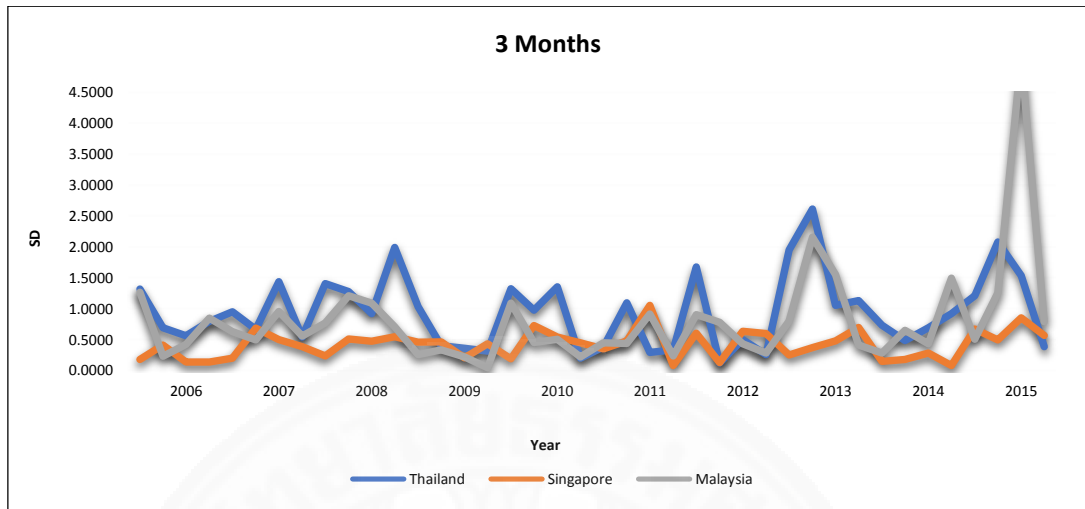
Figure 4.3: Exchange Rate Volatility in 6 months
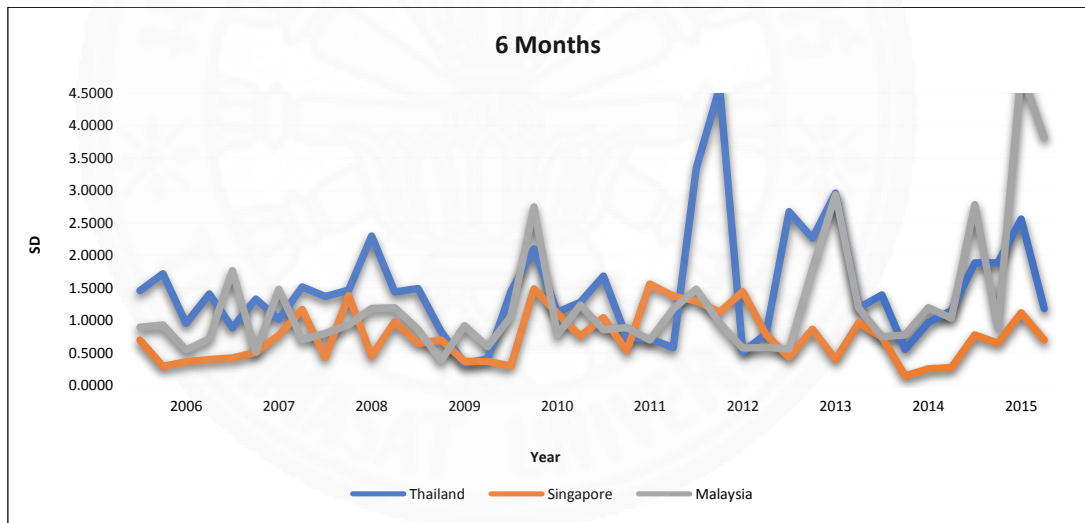
Figure 4.4: Exchange Rate Volatility in 9 months
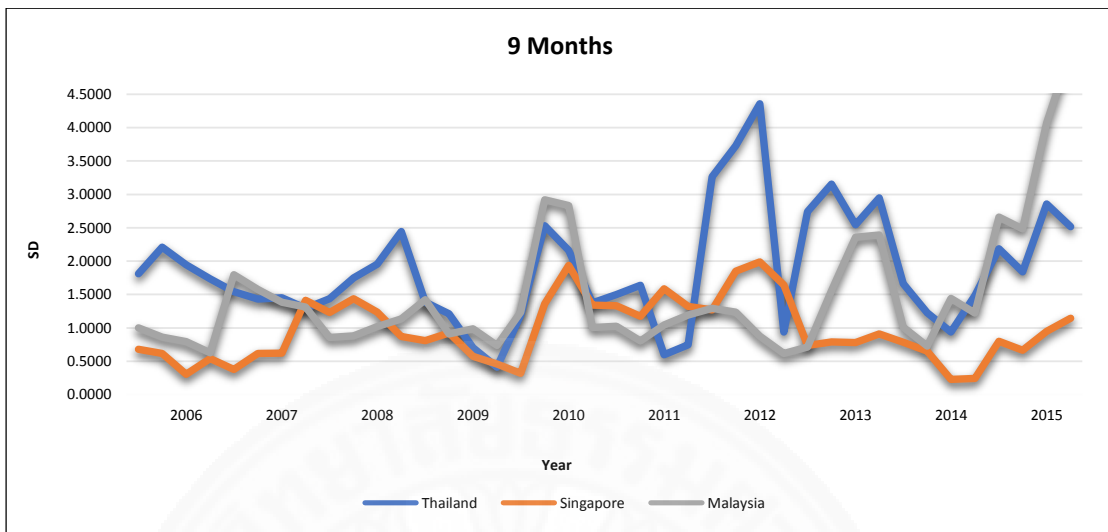
Figure 4.5: Exchange Rate Volatility in 12 months
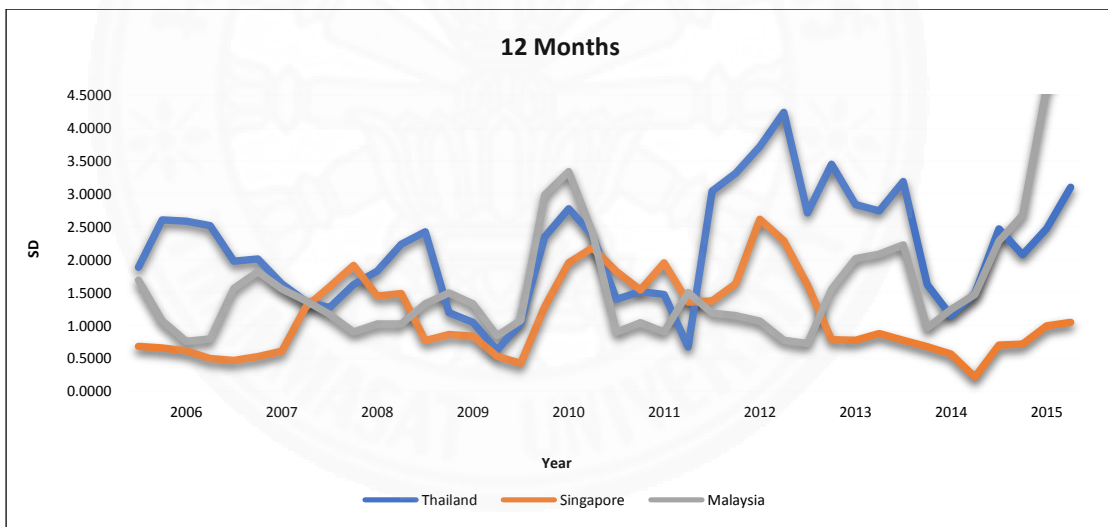
In Thailand, the mean value of exchange rate volatility is 1.8276, with standard deviation of 1.6580. The maximum volatility level is appeared in 6 months with 10.2585 whereas volatility in 3 months displayed the minimum volatility at 0.1250. Singapore has an average level at 1.1471 while the variability equal to 1.9420. The period of highest and lowest volatility is the same as Thailand, but the value is 12.111 and 0.0794 respectively. Lastly, Malaysia average volatility is equal to 1.3897, with the standard deviation is less than mean value in 0.2813. Therefore, the maximum mean value is captured by Thailand, with highest standard deviation level from Singapore.

4.3 Growth Model

Before starting the model of estimation, this section will refer to a review of past several theoretical works of exchange rate volatility and economic growth. Most of works reveal that the changing in exchange rate is represented the risk or uncertainty which may affect in many activities decision of the country such as trade, investment, consumption, and productivity. Thus, the consequence of this uncertainty decision can lead to distort the level of economic growth.

4.3.2 Aggregate ASEAN-3 Analysis

As for dynamic panel data of Generalized Method of Moments (GMM) estimator, this model is estimated into 2 segments. Firstly, it estimated for all countries including Thailand, Singapore, and Malaysia is called Aggregate analysis. Secondly, the estimation is tested separately in each country that called disaggregate analysis. Table 4.6 and 4.7 reports the estimated result of GMM technique in aggregate level. Table 4.8, 4.9, and 4.10 presents the test of GMM in single country including Thailand, Singapore, and Malaysia respectively.

In first section, the result indicates that the exchange rate volatility is negatively but not significantly affected in economic growth except 3 months of exchange rate volatility which statistically significant at 0.1. The result may imply that the movement of exchange rate volatility will reduce the level of economic growth. Even though, the exchange rate fluctuation negatively but it not affected on economic performance. The reason might be come from the data collection is estimated after the Asian crisis for long time. This made people can absorb the shocks and adapt to control this volatility. Gross fixed capital formation is positively significant at 10% to influences the economic growth which may imply that the more invest in fixed capital formation increased the economic performance. However, inflation is also negatively significant at 5% which indicated that an increase in inflation will deleterious the economics.

Table 4.6: Generalized Method of Moment in ASEAN-3

Variable	3 months	6 months	9 months	12 months
GDP L1.	0.7337***	0.7303***	0.7282***	0.7277***
Final Government Consumption	0.0502	0.0467	0.0426	0.0499
Gross Fixed Capital Formation	0.0396*	0.0441*	0.0443*	0.0419*
Trade Openness	-0.0494	-0.0729	-0.0402	-0.0352
Inflation	-0.4487***	-0.4290**	-0.4771**	-0.4746**
Labor	-0.0200	-0.0210	-0.0221	-0.0229
Exchange Rate Volatility in 3 months	-1.0220*			
Exchange Rate Volatility in 6 months		-0.6758		
Exchange Rate Volatility in 9 months			-0.3277	
Exchange Rate Volatility in 12 months				-0.0738
_cons	2.3813**	2.5275**	2.2115**	1.7703
N	126	126	126	126
Chi-Square	174.8156***	170.2066***	176.0091***	169.6669***
Sargan	126.1284	124.6076	129.4307	128.0080

Notes   * means statistically significant at 0.1, ** means statistically significant at 0.05,
         *** means statistically significant at 0.01

According to the exchange rate policy of Malaysia, the adoption of floating exchange rate policy was started since 2005. Thus, the movement of exchange rate in Malaysia is quite stable as fixed exchange rate regime. Thus, this paper tries to estimate the impact of exchange rate volatility and economic growth again by cutting Malaysia country out of the estimation. The estimated result indicated that the exchange rate volatility is negative and significant to reduce the level of economic growth only in short-term volatility because the value of exchange rate is intervened by central bank to control the level of exchange rate not sharply increase or decrease.

Table 4.7: Generalized Method of Moment in Thailand and Singapore

Variable	3 months	6 months	9 months	12 months
GDP L1.	0.7297***	0.7223***	0.7206***	0.7229***
Final Government Consumption	0.0696	0.6634	0.7135	0.0814
Gross Fixed Capital Formation	0.1882***	0.1925***	0.1863***	0.1848***
Trade Openness	-2.7177	-2.7192	-2.1739	-2.3256
Inflation	-0.4774	-0.3800	-0.5134	-0.5038
Labor	-0.1817	-0.1780	-0.1627	-0.1515
Exchange Rate Volatility in 3 months	-3.2514***			
Exchange Rate Volatility in 6 months		-1.3519*		
Exchange Rate Volatility in 9 months			-0.3339	
Exchange Rate Volatility in 12 months				-0.0186
_cons	10.5189	9.6171	7.4806	7.2853
N	84	84	84	84
Chi-Square	136.6344***	116.3115***	120.3945***	115.8487***
Sargan	76.1271	73.7247	79.8898	78.9198

Notes: * means statistically significant at 0.1, ** means statistically significant at 0.05,
*** means statistically significant at 0.01

4.3.2 Disaggregate Single Country Analysis

According to estimate separately result in each country. The impact of exchange rate volatility and economic growth in Thailand are negatively and significantly for all periods which imply that the higher exchange rate fluctuation hurts the economic growth between 1% and 10% significant level. The effect of gross fixed capital formation on economics is significantly positive at the level of 5% and 10% covering all time spanning. Trade openness measures trade competitiveness, import and export of the country. The outcome also positively and significantly affected growth when the exchange rate volatility is at 9 months. Moreover, the past value of GDP indicates the market adjustment. This means that the market is proficient to adjust to equilibrium.

Table 4.8: Generalized Method of Moment in Thailand

Variable	3 months	6 months	9 months	12 months
GDP L1.	0.5462**	0.6607***	0.6102***	0.5407**
Final Government Consumption	-0.0415	0.0678	0.0968	0.1948
Gross Fixed Capital Formation	0.2522**	0.2474**	0.2513***	0.2947**
Trade Openness	6.3960	6.5688	10.9710*	7.5729
Inflation	-0.7552	-0.8442	-0.7443	-0.1891
Labor	0.1402	-0.0540	-0.2757	-0.3382
Exchange Rate Volatility in 3 months	-3.7716***			
Exchange Rate Volatility in 6 months		-1.7997*		
Exchange Rate Volatility in 9 months			-2.7153***	
Exchange Rate Volatility in 12 months				-1.1797*
_cons	-2.9741	-5.0272	-9.0332	-7.4399
N	42	42	42	42
Chi-Square	55.0643***	88.9428***	98.7445***	45.0237***
R-Square	0.6312	0.5988	0.6486	0.5889
Hansen Test	7.4381	7.1926	7.6413	7.2142

Notes: * means statistically significant at 0.1, ** means statistically significant at 0.05, *** means statistically significant at 0.01

The effects of exchange rate volatility in Singapore are negative and insignificant on economic growth except the last term which means that the more exchange rate fluctuation will distort the growth of the country. At the 12-month of exchange rate volatility, inflation shows negative and significant to propel the growth at 5%. Although trade is deficit in this season, it also significantly driven the economic growth. Furthermore, the value of market adjustment in Singapore is close to one. It shows the market is efficient to adjust in equilibrium.

Table 4.9: Generalized Method of Moment in Singapore

Variable	3 months	6 months	9 months	12 months
GDP L1.	0.7262***	0.7240***	0.7529***	0.7050***
Final Government Consumption	0.1075	0.0972	0.0901	0.1011
Gross Fixed Capital Formation	0.1699**	0.1654**	0.1800**	0.2010***
Trade Openness	-4.0541	-3.9302	-5.0717	-4.6602*
Inflation	-0.3137	-0.3012	-0.0521	-0.3624
Labor	-0.1156	-0.1110	-0.1504	-0.0949
Exchange Rate Volatility in 3 months	-1.2819			
Exchange Rate Volatility in 6 months		-0.4360		
Exchange Rate Volatility in 9 months			-1.7813	
Exchange Rate Volatility in 12 months				-0.4661***
_cons	16.2718	15.6126	20.6836	17.3269
N	42	42	42	42
Chi-Square	73.6514***	72.2640***	69.0842***	85.2673***
R-Square	0.7102	0.7078	0.7214	0.7196
Hansen Test	8.5281	8.2634	8.9321	8.5342

Notes: * means statistically significant at 0.1, ** means statistically significant at 0.05,
*** means statistically significant at 0.01

Eventually, the estimated result of exchange rate volatility effects on growth is quite weird. It shows the different direction affected on the economics. The pattern is not only positive over the exchange rate fluctuation in 3 and 6 months but also negative covering 9 and 12 months exchange rate volatility. Fixed capital formation is positive and significant to push the country growth for all time at 10%. On the other hand, trade openness reflects negatively and significantly influences on economic performance. The impact of labor, an indicator to gauge the economically active population, is negative and significant on economic expansion covering all time length. The market equilibrium in Malaysia is not quite well. This may be because of the policy that effect in market system.

Table 4.10: Generalized Method of Moment in Malaysia

Variable	3 months	6 months	9 months	12 months
GDP L1.	0.0602	0.0828	0.0987	0.1206
Final Government Consumption	0.0941**	0.0941**	0.0933**	0.0900**
Gross Fixed Capital Formation	0.0529***	0.0503***	0.0500***	0.0501***
Trade Openness	-0.1119*	-0.1071*	-0.1175*	-0.1189*
Inflation	0.1559	0.1680	0.1625	0.1422
Labor	-0.0145**	-0.0138***	-0.0133***	-0.0142***
Exchange Rate Volatility in 3 months	0.4710			
Exchange Rate Volatility in 6 months		0.2584		
Exchange Rate Volatility in 9 months			-0.0255	
Exchange Rate Volatility in 12 months				-0.0982
_cons	1.9618**	1.8784**	2.2776**	2.5172***
N	42	42	42	42
Chi-Square	25.2769***	26.4016***	26.4304***	29.2294***
R-Square	0.5871	0.5860	0.5860	0.5958
Hansen Test	7.7832	7.4361	7.8549	8.1346

Notes: * means statistically significant at 0.1, ** means statistically significant at 0.05, *** means statistically significant at 0.01

CHAPTER 5
CONCLUSIONS, DISCUSSIONS AND RECOMMENDATIONS

5.1 Conclusions

The first objective of this article examines the impact of exchange rate volatility on economic growth in Thailand, Singapore, and Malaysia rely on quarterly data covering the period of 2005 to 2015. The standard deviation is used to measure the exchange rate volatility and dynamic panel data model of Generalized Method of Moments (GMM) is employed to estimate influences of exchange rate volatility and growth. Before finding the relationship of these two variables, exchange rate volatility is calculated by standard deviation equation. This volatility is separated into 4 series including 3 months, 6 months, 9 months, and 12 months for each country. Then, dynamic panel data GMM is employed to estimate the nexus. The main finding reveals that exchange rate volatility negatively and significantly influenced on Thailand and Singapore's economic growth except only in Malaysia that is insignificant and the coefficient is quite weird because it shows in both positive and negative ways.

Furthermore, the second objective of this paper analyses which macroeconomics variables effects to propel the economic performance. The macroeconomics variables are applied in this paper including government expenditure, gross fixed capital formation, trade openness, inflation, and labor. In this section, the estimation is segregated into aggregate analysis and disaggregate analysis. The estimated result of aggregate analysis shows that gross fixed capital formation and inflation influenced to drive the economic growth in all countries. The capital formation effects in positive way while the inflation effects in negative way. Next, the disaggregate analysis is take into account. The fixed capital formation presents positively and significantly to move the economic performance in all countries. Trade openness also displays significant and negative way except in Thailand shown positive way. In addition, inflation effects negatively and significantly on the level of economic only in Singapore.

5.2 Discussions

According to the economic globalization, many business activities are linked across the countries. Exchange rate is like an intermediate to exchange goods and services form one country to another country. Nowadays, the exchange rate regime is floating exchange rate that means the movement of the exchange rate is determined by market force or demand and supply of country's currency. As the noted of Insukindro and Rahutami, 2007 studies about the movement of exchange rate, the paper exposes that the depreciation and appreciation in exchange rate is presented by the exchange rate move up or down while the exchange rate volatility is represented the exchange rate risk.

The excessive of exchange rate volatility will distort many parts of business transaction through consumption, import, export, international trade, investment, productivity followed by Clark, 1973; McKinnon and Ohno, 1997; Obstfeld and Rogoff's, 1998, Aghion et al., 2009. Therefore, it may turn to reduce the level of economic growth in the country. These final results show the finding similar to this study that is exchange rate volatility will hurt the economic performance. However, some papers (Aristotelous, 2001; Tenreyro, 2007; Eicher and Henn, 2009) cannot find any relationship of exchange rate volatility and economic growth.

Furthermore, macroeconomic variables also as a factor influence the economic performance. Several studies try to use a different variables to find the direction that effect on economic growth. As the noted of MAS, 2003 reveals that there are small effects of exchange rate volatility and macroeconomic volatility. Moreover, many empirical studies (Musyoki and Pundo, 2012; Vieira, and Bottecchia, 2013; Algidede and Ibrahim, 2016) reveal that government spending, capital formation, trade openness, labor, term of trade, secondary education influence positive to drive the economic growth. In contrast, only inflation is harmful to economic performance. In this study, the estimated result is quite similar as empirical study. Government expenditure and gross fixed capital formation present positive way to propel the economic whereas trade openness, inflation, and labor show the negative way.

5.3 Recommendations

The main purpose of this article wants to contribute to all readers to understand the meaning of exchange rate volatility and effects on economic growth. Firstly, it would be benefited for household, firms, and trading sectors to recognize the exchange rate risk and how to control the uncertainty of exchange rate. Secondly, investors who are types of risk loving will have a chance to gain more money when they invest in the country that high exchange rate volatility. Moreover, it would be advantaged for Forex trader to comprehend the trend and risk of exchange rate before hedging a currency. Lastly, this study will help the policy makers to understand the pattern of the exchange rate volatility and macroeconomics factors before they launch a new policy to encourage the economic growth.

Finally, there are two limitations of this study. Firstly, this paper ignores some macroeconomics variables such as health and education to estimate the impact on economic growth. Secondly, the sample period of this study is covering 11 years. It should be observed more time period to know the trend and pattern of this study. For further study, it should be captured more about managed floating exchange rate. It would be better or not that central bank control the exchange rate system.

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APPENDICES

APPENDIX A

RESULT FROM STANDARD DEVIATION

Table A.1: Exchange Rate Volatility in Thailand

Year		Thailand			
		3 Months	6 Months	9 Months	12 Months
2005	Q1	0.5948	10.2585	8.9857	7.8429
2005	Q2	0.6300	0.8627	9.6825	9.6980
2005	Q3	0.8250	0.7201	0.7978	8.7720
2005	Q4	0.3301	1.0395	1.1056	0.9874
2006	Q1	1.3186	1.4565	1.8106	1.8861
2006	Q2	0.6901	1.7208	2.2076	2.6051
2006	Q3	0.5615	0.9555	1.9457	2.5844
2006	Q4	0.7951	1.4071	1.7324	2.5202
2007	Q1	0.9498	0.8871	1.5426	1.9789
2007	Q2	0.6665	1.3322	1.4335	2.0120
2007	Q3	1.4365	1.0222	1.4515	1.6345
2007	Q4	0.5444	1.5168	1.2915	1.3716
2008	Q1	1.4069	1.3693	1.4374	1.2744
2008	Q2	1.2794	1.4690	1.7509	1.6249
2008	Q3	0.9199	2.2994	1.9571	1.8267
2008	Q4	1.9926	1.4391	2.4429	2.2363
2009	Q1	1.0335	1.4946	1.3861	2.4274
2009	Q2	0.4015	0.8288	1.2135	1.1944
2009	Q3	0.3592	0.3416	0.7029	1.0505
2009	Q4	0.3148	0.4102	0.4092	0.6260
2010	Q1	1.3246	1.4471	1.1908	1.0404
2010	Q2	0.9767	2.1048	2.5280	2.3469
2010	Q3	1.3563	1.1289	2.1589	2.7783
2010	Q4	0.2000	1.2817	1.3760	2.3770
2011	Q1	0.3844	1.6857	1.4988	1.3994
2011	Q2	1.0950	0.7343	1.6379	1.5185
2011	Q3	0.2955	0.7175	0.5990	1.4753
2011	Q4	0.3356	0.5794	0.7463	0.6739
2012	Q1	1.6741	3.3467	3.2650	3.0441
2012	Q2	0.1250	4.5885	3.7305	3.3177
2012	Q3	0.5027	0.5197	4.3600	3.7213
2012	Q4	0.2570	0.7933	0.9357	4.2405
2013	Q1	1.9522	2.6755	2.7425	2.7135
2013	Q2	2.6122	2.2682	3.1548	3.4496
2013	Q3	1.0557	2.9606	2.5453	2.8374

Year		Thailand			
		3 Months	6 Months	9 Months	12 Months
2013	Q4	1.1319	1.1904	2.9462	2.7400
2014	Q1	0.7328	1.3969	1.6614	3.1880
2014	Q2	0.4864	0.5572	1.2272	1.6258
2014	Q3	0.6947	0.9690	0.9372	1.1518
2014	Q4	0.9200	1.1555	1.4855	1.4886
2015	Q1	1.2120	1.8885	2.1871	2.4707
2015	Q2	2.0805	1.8866	1.8403	2.0772
2015	Q3	1.5341	2.5642	2.8560	2.4739
2015	Q4	0.3873	1.1834	2.5164	3.1031

Table A.2: Exchange Rate Volatility in Singapore

Year		Singapore			
		3 Month	6 Month	9 Month	12 Month
2005	Q1	0.2095	12.1110	11.1518	10.0750
2005	Q2	0.4949	0.4843	11.2191	11.8154
2005	Q3	0.5338	0.4847	0.4671	10.1557
2005	Q4	0.6116	0.5147	0.5008	0.4765
2006	Q1	0.1801	0.6979	0.6795	0.6867
2006	Q2	0.4110	0.2940	0.6187	0.6590
2006	Q3	0.1389	0.3640	0.3041	0.6158
2006	Q4	0.1400	0.3980	0.5422	0.4994
2007	Q1	0.2021	0.4222	0.3791	0.4730
2007	Q2	0.6879	0.5093	0.6184	0.5317
2007	Q3	0.4994	0.7740	0.6217	0.6113
2007	Q4	0.3868	1.1712	1.4133	1.2786
2008	Q1	0.2350	0.4358	1.2309	1.5890
2008	Q2	0.5110	1.3847	1.4372	1.9168
2008	Q3	0.4751	0.4530	1.2340	1.4474
2008	Q4	0.5486	0.9812	0.8709	1.4897
2009	Q1	0.4574	0.6474	0.8092	0.7708
2009	Q2	0.4654	0.7020	0.9214	0.8667
2009	Q3	0.2066	0.3711	0.5717	0.8415
2009	Q4	0.4359	0.3693	0.4569	0.5348
2010	Q1	0.1900	0.3008	0.3200	0.4292
2010	Q2	0.7263	1.4908	1.3587	1.2890
2010	Q3	0.5401	1.1070	1.9344	1.9559
2010	Q4	0.4508	0.7578	1.3423	2.1833
2011	Q1	0.3493	1.0464	1.3319	1.8219
2011	Q2	0.4788	0.5336	1.1720	1.5423
2011	Q3	1.0557	1.5613	1.5831	1.9541

Year		Singapore			
		3 Month	6 Month	9 Month	12 Month
2011	Q4	0.0819	1.3754	1.3205	1.3566
2012	Q1	0.6035	1.2999	1.2711	1.3736
2012	Q2	0.1277	1.1285	1.8470	1.6382
2012	Q3	0.6338	1.4448	1.9882	2.6142
2012	Q4	0.6002	0.7854	1.6432	2.2886
2013	Q1	0.2516	0.4338	0.7388	1.6182
2013	Q2	0.3704	0.8690	0.7903	0.7898
2013	Q3	0.4801	0.3969	0.7804	0.7779
2013	Q4	0.6955	0.9649	0.9098	0.8800
2014	Q1	0.1473	0.7445	0.7861	0.7787
2014	Q2	0.1801	0.1474	0.6507	0.6818
2014	Q3	0.2811	0.2578	0.2296	0.5689
2014	Q4	0.0794	0.2769	0.2402	0.2167
2015	Q1	0.6694	0.7804	0.7982	0.7062
2015	Q2	0.4957	0.6505	0.6667	0.7200
2015	Q3	0.8516	1.1174	0.9476	0.9982
2015	Q4	0.5682	0.7009	1.1436	1.0512

Table A.3: Exchange Rate Volatility in Malaysia

Year		Malaysia			
		3 Month	6 Month	9 Month	12 Month
2005	Q1	0.4823	5.1897	4.8719	4.2193
2005	Q2	1.1729	1.0823	4.4652	4.7716
2005	Q3	0.1200	1.3708	1.6262	3.8086
2005	Q4	0.6035	0.8035	1.6207	1.9970
2006	Q1	1.2647	0.8962	0.9996	1.6920
2006	Q2	0.2339	0.9327	0.8624	1.0728
2006	Q3	0.4251	0.5485	0.7948	0.7625
2006	Q4	0.8488	0.7204	0.6264	0.7950
2007	Q1	0.6301	1.7689	1.7986	1.5650
2007	Q2	0.4934	0.5114	1.5748	1.8168
2007	Q3	0.9564	1.4819	1.3847	1.5580
2007	Q4	0.5567	0.7047	1.3140	1.3817
2008	Q1	0.7677	0.8025	0.8558	1.1739
2008	Q2	1.2108	0.9303	0.8785	0.9056
2008	Q3	1.0886	1.1885	1.0182	1.0244
2008	Q4	0.7062	1.1993	1.1339	1.0245
2009	Q1	0.2600	0.8610	1.4238	1.3329
2009	Q2	0.3361	0.3850	0.9094	1.4967
2009	Q3	0.2196	0.9194	0.9870	1.3320

Year		Malaysia			
		3 Month	6 Month	9 Month	12 Month
2009	Q4	0.0451	0.5941	0.7376	0.8463
2010	Q1	1.0891	1.0628	1.2331	1.0781
2010	Q2	0.4545	2.7488	2.9170	2.9865
2010	Q3	0.5052	0.7807	2.8346	3.3392
2010	Q4	0.2237	1.2389	1.0068	2.4216
2011	Q1	0.4513	0.8591	1.0221	0.8989
2011	Q2	0.4414	0.8938	0.8024	1.0468
2011	Q3	0.9143	0.6988	1.0434	0.9062
2011	Q4	0.2386	1.1764	1.1932	1.5042
2012	Q1	0.9034	1.4813	1.2936	1.1924
2012	Q2	0.7812	0.9628	1.2368	1.1527
2012	Q3	0.4332	0.5765	0.8768	1.0719
2012	Q4	0.2843	0.5859	0.6170	0.7771
2013	Q1	0.7988	0.5603	0.7148	0.7278
2013	Q2	2.1562	1.7936	1.5571	1.5508
2013	Q3	1.5520	2.9364	2.3597	2.0166
2013	Q4	0.4149	1.1916	2.3904	2.0867
2014	Q1	0.2829	0.7514	1.0106	2.2246
2014	Q2	0.6501	0.7777	0.7287	0.9606
2014	Q3	0.4341	1.1952	1.4394	1.2433
2014	Q4	1.4939	1.0350	1.2215	1.4735
2015	Q1	0.5057	2.7829	2.6600	2.2853
2015	Q2	1.2586	0.8926	2.4819	2.6764
2015	Q3	5.0653	4.8283	4.0679	4.6171
2015	Q4	0.7903	3.8130	5.1537	4.9599

APPENDIX B

RESULT FROM STATA

Aggregate ASEAN-3 countries Analysis

```
. xtset Id Time
      panel variable:  Id (strongly balanced)
       time variable:  Time, 1 to 44
               delta:  1 unit

. xtabond GDP CON FCF TRA INF LAB EXV3

Arellano-Bond dynamic panel-data estimation   Number of obs      =        126
Group variable: Id                            Number of groups   =          3
Time variable: Time
                                              Obs per group:  min =         42
                                                              avg =         42
                                                              max =         42

Number of instruments =    127                Wald chi2(7)       =     174.82
                                              Prob > chi2        =     0.0000
One-step results
```

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7337361	.0614069	11.95	0.000	.6133809	.8540914
CON	.0501625	.0472446	1.06	0.288	-.0424351	.1427602
FCF	.039633	.0229003	1.73	0.084	-.0052508	.0845168
TRA	-.0494073	.1476484	-0.33	0.738	-.3387928	.2399782
INF	-.4487414	.1965422	-2.28	0.022	-.8339569	-.0635259
LAB	-.0199842	.0339489	-0.59	0.556	-.0865228	.0465545
EXV3	-1.021952	.5505702	-1.86	0.063	-2.10105	.0571457
_cons	2.381344	1.086486	2.19	0.028	.25187	4.510818

```
Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV3
Instruments for level equation
        Standard: _cons

. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(119)   =   126.1284
        Prob > chi2 =     0.3099

. est store MBond3
```

```
. xtabond GDP CON FCF TRA INF LAB EXV6
```

Arellano-Bond dynamic panel-data estimation   Number of obs   =   126
Group variable: Id   Number of groups   =   3
Time variable: Time

                                                Obs per group: min =   42
                                                                 avg =   42
                                                                 max =   42

Number of instruments =   127   Wald chi2(7)   =   170.21
                                                Prob > chi2   =   0.0000
One-step results

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7303352	.0619852	11.78	0.000	.6088463	.851824
CON	.04671	.0478264	0.98	0.329	-.047028	.140448
FCF	.0440706	.0232019	1.90	0.058	-.0014042	.0895455
TRA	-.072854	.1509588	-0.48	0.629	-.3687279	.2230199
INF	-.4289582	.2002378	-2.14	0.032	-.821417	-.0364993
LAB	-.0209677	.0342878	-0.61	0.541	-.0881706	.0462353
EXV6	-.6758109	.4430297	-1.53	0.127	-1.544133	.1925113
_cons	2.527502	1.177547	2.15	0.032	.2195536	4.835451

Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV6
Instruments for level equation
        Standard: _cons

```
. estat sargan
```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(119)   =   124.6076
        Prob > chi2 =   0.3442

```
. est store MBond6
```

```
. xtabond GDP CON FCF TRA INF LAB EXV9

Arellano-Bond dynamic panel-data estimation   Number of obs      =        126
Group variable: Id                            Number of groups   =          3
Time variable: Time
                                              Obs per group:   min =         42
                                                               avg =         42
                                                               max =         42

Number of instruments =    127                Wald chi2(7)       =     176.01
                                              Prob > chi2        =     0.0000
One-step results
```

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7281752	.0608829	11.96	0.000	.608847	.8475034
CON	.0425857	.0472854	0.90	0.368	-.0500919	.1352634
FCF	.0442949	.0228215	1.94	0.052	-.0004345	.0890243
TRA	-.0401505	.146408	-0.27	0.784	-.327105	.246804
INF	-.477115	.1946718	-2.45	0.014	-.8586648	-.0955653
LAB	-.022142	.0336748	-0.66	0.511	-.0881434	.0438595
EXV9	-.327651	.2272498	-1.44	0.149	-.7730523	.1177504
_cons	2.211533	1.07954	2.05	0.041	.0956734	4.327393

```
Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV9
Instruments for level equation
        Standard: _cons

. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(119)    =  129.4307
        Prob > chi2  =    0.2419

. est store MBond9
```

```
. xtabond GDP CON FCF TRA INF LAB EXV12

Arellano-Bond dynamic panel-data estimation    Number of obs      =        126
Group variable: Id                             Number of groups   =          3
Time variable: Time
                                               Obs per group:     min =       42
                                                                  avg =       42
                                                                  max =       42

Number of instruments =     127               Wald chi2(7)        =     169.67
                                               Prob > chi2        =     0.0000
One-step results
```

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7277142	.0616869	11.80	0.000	.60681	.8486184
CON	.0499042	.0476417	1.05	0.295	-.0434718	.1432802
FCF	.0418919	.0230875	1.81	0.070	-.0033587	.0871426
TRA	-.0351571	.1482825	-0.24	0.813	-.3257853	.2554712
INF	-.4745726	.1972066	-2.41	0.016	-.8610904	-.0880549
LAB	-.0229184	.0341417	-0.67	0.502	-.0898348	.0439981
EXV12	-.0738078	.1855428	-0.40	0.691	-.437465	.2898494
_cons	1.770261	1.078666	1.64	0.101	-.3438853	3.884407

```
Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV12
Instruments for level equation
        Standard: _cons


. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(119)    =    128.008
        Prob > chi2  =     0.2700

. est store MBond12
```

```
. xtabond GDP CON FCF TRA INF LAB EXV3

Arellano-Bond dynamic panel-data estimation   Number of obs      =         84
Group variable: Id                            Number of groups   =          2
Time variable: Time
                                              Obs per group:   min =         42
                                                               avg =         42
                                                               max =         42

Number of instruments =     85               Wald chi2(7)       =     136.63
                                              Prob > chi2        =     0.0000
One-step results
```

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7296835	.0729458	10.00	0.000	.5867123	.8726547
CON	.0696031	.0831164	0.84	0.402	-.093302	.2325082
FCF	.1881835	.0617482	3.05	0.002	.0671592	.3092078
TRA	-2.717703	2.991461	-0.91	0.364	-8.580859	3.145452
INF	-.477377	.3052156	-1.56	0.118	-1.075589	.1208346
LAB	-.1816654	.2226239	-0.82	0.414	-.6180002	.2546694
EXV3	-3.251444	1.023593	-3.18	0.001	-5.257648	-1.245239
_cons	10.51891	7.514509	1.40	0.162	-4.209257	25.24708

```
Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV3
Instruments for level equation
        Standard: _cons


. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(77)    =   76.12708
        Prob > chi2 =    0.5067

. est store MBond3
```

```
. xtabond GDP CON FCF TRA INF LAB EXV6

Arellano-Bond dynamic panel-data estimation    Number of obs       =        84
Group variable: Id                              Number of groups    =         2
Time variable: Time
                                                Obs per group:  min =        42
                                                                avg =        42
                                                                max =        42

Number of instruments =       85               Wald chi2(7)        =    116.31
                                               Prob > chi2         =    0.0000
One-step results
```

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7223338	.0771542	9.36	0.000	.5711143	.8735534
CON	.0663362	.0882548	0.75	0.452	-.10664	.2393124
FCF	.1925107	.0654609	2.94	0.003	.0642098	.3208116
TRA	-2.719189	3.169416	-0.86	0.391	-8.931131	3.492753
INF	-.379971	.3298575	-1.15	0.249	-1.02648	.2665377
LAB	-.1780135	.2357955	-0.75	0.450	-.6401642	.2841371
EXV6	-1.351937	.7460777	-1.81	0.070	-2.814223	.110348
_cons	9.617065	7.981015	1.20	0.228	-6.025437	25.25957

```
Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV6
Instruments for level equation
        Standard: _cons


. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(77)      =   73.72475
        Prob > chi2   =     0.5847

. est store MBond6
```

```
. xtabond GDP CON FCF TRA INF LAB EXV9
```

Arellano-Bond dynamic panel-data estimation   Number of obs   =   84
Group variable: Id   Number of groups   =   2
Time variable: Time

                                                  Obs per group: min =   42
                                                                    avg =   42
                                                                    max =   42

Number of instruments =   85   Wald chi2(7)   =   120.39
                                                  Prob > chi2   =   0.0000
One-step results

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7205709	.0751867	9.58	0.000	.5732076	.8679342
CON	.0713526	.0860526	0.83	0.407	-.0973075	.2400127
FCF	.1863273	.0636459	2.93	0.003	.0615837	.3110709
TRA	-2.173899	3.084994	-0.70	0.481	-8.220376	3.872577
INF	-.5133753	.3146176	-1.63	0.103	-1.130015	.103264
LAB	-.1626663	.2294541	-0.71	0.478	-.6123881	.2870554
EXV9	-.3339005	.296135	-1.13	0.260	-.9143143	.2465134
_cons	7.480569	7.676315	0.97	0.330	-7.564732	22.52587

Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV9
Instruments for level equation
        Standard: _cons


```
. estat sargan
```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(77)   =   79.8898
        Prob > chi2 =   0.3884

```
. est store MBond9
```

```
. xtabond GDP CON FCF TRA INF LAB EXV12

Arellano-Bond dynamic panel-data estimation   Number of obs      =        84
Group variable: Id                            Number of groups   =         2
Time variable: Time
                                              Obs per group:  min =        42
                                                              avg =        42
                                                              max =        42

Number of instruments =      85              Wald chi2(7)       =    115.85
                                             Prob > chi2        =    0.0000
One-step results
```

GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7228731	.0762639	9.48	0.000	.5733985	.8723476
CON	.0813969	.0867963	0.94	0.348	-.0887207	.2515145
FCF	.1847985	.0645503	2.86	0.004	.0582823	.3113147
TRA	-2.325559	3.142285	-0.74	0.459	-8.484325	3.833207
INF	-.5037828	.3192475	-1.58	0.115	-1.129496	.1219307
LAB	-.1514826	.2324847	-0.65	0.515	-.6071442	.3041789
EXV12	-.0185533	.236067	-0.08	0.937	-.4812362	.4441296
_cons	7.285282	7.790974	0.94	0.350	-7.984746	22.55531

```
Instruments for differenced equation
        GMM-type: L(2/.).GDP
        Standard: D.CON D.FCF D.TRA D.INF D.LAB D.EXV12
Instruments for level equation
        Standard: _cons

. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(77)     =   78.91976
        Prob > chi2  =     0.4180

. est store MBond12
```

Disaggregate Single Country Analysis

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV3 (l.GDP=L2.GDP) if Id==1

Instrumental variables (GMM) regression          Number of obs =        42
                                                  Wald chi2(7)  =    55.06
                                                  Prob > chi2   =   0.0000
                                                  R-squared     =   0.6312
GMM weight matrix: Robust                         Root MSE      =    4.577
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.5462094	.2174218	2.51	0.012	.1200705	.9723483
CON	-.0414986	.1334808	-0.31	0.756	-.3031163	.220119
FCF	.2522233	.0992313	2.54	0.011	.0577335	.446713
TRA	6.396008	7.560413	0.85	0.398	-8.42213	21.21415
INF	-.7551567	.825653	-0.91	0.360	-2.373407	.8630934
LAB	.1402453	.2651484	0.53	0.597	-.3794359	.6599266
EXV3	-3.771574	1.283523	-2.94	0.003	-6.287233	-1.255914
_cons	-2.974139	11.43128	-0.26	0.795	-25.37903	19.43075

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV3 L2.GDP


. est store Thai3


. ivregress gmm GDP CON FCF TRA INF LAB EXV6 (l.GDP=L2.GDP) if Id==1

Instrumental variables (GMM) regression          Number of obs =        42
                                                  Wald chi2(7)  =    88.94
                                                  Prob > chi2   =   0.0000
                                                  R-squared     =   0.5988
GMM weight matrix: Robust                         Root MSE      =    4.7736
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.6607421	.1691452	3.91	0.000	.3292235	.9922606
CON	.0677624	.1464601	0.46	0.644	-.2192942	.354819
FCF	.2474272	.1008549	2.45	0.014	.0497552	.4450993
TRA	6.568845	6.662131	0.99	0.324	-6.488692	19.62638
INF	-.8442378	.627694	-1.34	0.179	-2.074495	.3860198
LAB	-.0540448	.3019113	-0.18	0.858	-.6457801	.5376906
EXV6	-1.799696	1.030144	-1.75	0.081	-3.818741	.2193485
_cons	-5.027241	9.465617	-0.53	0.595	-23.57951	13.52503

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV6 L2.GDP


. est store Thai6
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV9 (l.GDP=L2.GDP) if Id==1
```

Instrumental variables (GMM) regression

```
Number of obs  =      42
Wald chi2(7)   =   98.74
Prob > chi2    =  0.0000
R-squared      =  0.6486
```
GMM weight matrix: Robust

```
Root MSE       =  4.4675
```

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.6102206	.167695	3.64	0.000	.2815445	.9388967
CON	.0968241	.130869	0.74	0.459	-.1596745	.3533226
FCF	.2512842	.0904942	2.78	0.005	.0739189	.4286495
TRA	10.97097	6.569695	1.67	0.095	-1.905396	23.84734
INF	-.7443297	.695854	-1.07	0.285	-2.108179	.619519
LAB	-.2756767	.3572043	-0.77	0.440	-.9757842	.4244308
EXV9	-2.715271	.8128874	-3.34	0.001	-4.308501	-1.122041
_cons	-9.033151	9.222225	-0.98	0.327	-27.10838	9.042078

Instrumented: L.GDP
Instruments: CON FCF TRA INF LAB EXV9 L2.GDP

```
. est store Thai9


. ivregress gmm GDP CON FCF TRA INF LAB EXV12 (l.GDP=L2.GDP) if Id==1
```

Instrumental variables (GMM) regression

```
Number of obs  =      42
Wald chi2(7)   =   45.02
Prob > chi2    =  0.0000
R-squared      =  0.5889
```
GMM weight matrix: Robust

```
Root MSE       =  4.8323
```

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.5406933	.2479606	2.18	0.029	.0546995	1.026687
CON	.19478	.1734456	1.12	0.261	-.145167	.5347271
FCF	.294686	.1193664	2.47	0.014	.0607322	.5286398
TRA	7.572851	8.130592	0.93	0.352	-8.362817	23.50852
INF	-.1891369	.8483046	-0.22	0.824	-1.851783	1.47351
LAB	-.3381911	.4248996	-0.80	0.426	-1.170979	.4945967
EXV12	-1.179727	.6953878	-1.70	0.090	-2.542663	.1832076
_cons	-7.439912	11.96498	-0.62	0.534	-30.89085	16.01103

Instrumented: L.GDP
Instruments: CON FCF TRA INF LAB EXV12 L2.GDP

```
. est store Thai12
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV3 (l.GDP=L2.GDP) if Id==2
```

Instrumental variables (GMM) regression

	Number of obs	=	42
	Wald chi2(7)	=	73.65
	Prob > chi2	=	0.0000
	R-squared	=	0.7102
GMM weight matrix: Robust	Root MSE	=	2.7873

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7261696	.1203347	6.03	0.000	.4903179	.9620213
CON	.1074849	.086346	1.24	0.213	-.0617501	.27672
FCF	.1699432	.0806494	2.11	0.035	.0118733	.3280131
TRA	-4.054111	3.14879	-1.29	0.198	-10.22563	2.117404
INF	-.3137165	.2205633	-1.42	0.155	-.7460126	.1185796
LAB	-.1156027	.15509	-0.75	0.456	-.4195735	.1883682
EXV3	-1.281941	2.48485	-0.52	0.606	-6.152157	3.588275
_cons	16.27176	11.59555	1.40	0.161	-6.455097	38.99863

Instrumented: L.GDP
Instruments: CON FCF TRA INF LAB EXV3 L2.GDP

```
. est store Sing3
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV6 (l.GDP=L2.GDP) if Id==2
```

Instrumental variables (GMM) regression

	Number of obs	=	42
	Wald chi2(7)	=	72.26
	Prob > chi2	=	0.0000
	R-squared	=	0.7078
GMM weight matrix: Robust	Root MSE	=	2.7987

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7239969	.1243516	5.82	0.000	.4802722	.9677216
CON	.0972179	.0765668	1.27	0.204	-.0528502	.2472861
FCF	.1653761	.0741964	2.23	0.026	.0199539	.3107984
TRA	-3.930185	3.136929	-1.25	0.210	-10.07845	2.218083
INF	-.3012305	.2734537	-1.10	0.271	-.83719	.2347289
LAB	-.1110325	.1567925	-0.71	0.479	-.4183401	.196275
EXV6	-.4359658	1.559232	-0.28	0.780	-3.492004	2.620072
_cons	15.61258	11.50832	1.36	0.175	-6.943307	38.16847

Instrumented: L.GDP
Instruments: CON FCF TRA INF LAB EXV6 L2.GDP

```
. est store Sing6
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV9 (l.GDP=L2.GDP) if Id==2
```

Instrumental variables (GMM) regression

```
                                              Number of obs =        42
                                              Wald chi2(7)  =     69.08
                                              Prob > chi2   =    0.0000
                                              R-squared     =    0.7214
GMM weight matrix: Robust                     Root MSE      =    2.7329
```

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.752909	.1190867	6.32	0.000	.5195033	.9863146
CON	.0900669	.0761278	1.18	0.237	-.0591409	.2392747
FCF	.1799639	.0806949	2.23	0.026	.0218048	.338123
TRA	-5.071707	3.446336	-1.47	0.141	-11.8264	1.682988
INF	-.0521378	.3598404	-0.14	0.885	-.757412	.6531363
LAB	-.1504155	.1409102	-1.07	0.286	-.4265943	.1257634
EXV9	-1.781338	1.567184	-1.14	0.256	-4.852962	1.290287
_cons	20.68358	12.83542	1.61	0.107	-4.473369	45.84054

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV9 L2.GDP

. est store Sing9


. ivregress gmm GDP CON FCF TRA INF LAB EXV12 (l.GDP=L2.GDP) if Id==2
```

Instrumental variables (GMM) regression

```
                                              Number of obs =        42
                                              Wald chi2(7)  =     85.27
                                              Prob > chi2   =    0.0000
                                              R-squared     =    0.7196
GMM weight matrix: Robust                     Root MSE      =    2.7418
```

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.7049972	.1193208	5.91	0.000	.4711328	.9388616
CON	.1011097	.0796668	1.27	0.204	-.0550343	.2572537
FCF	.2009806	.0678978	2.96	0.003	.0679032	.3340579
TRA	-4.660157	2.578488	-1.81	0.071	-9.7139	.3935874
INF	-.3623582	.1755521	-2.06	0.039	-.7064341	-.0182824
LAB	-.0948707	.1653973	-0.57	0.566	-.4190434	.2293021
EXV12	.4660836	.1220393	3.82	0.000	.226891	.7052762
_cons	17.32693	9.11836	1.90	0.057	-.5447232	35.19859

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV12 L2.GDP

. est store Sing12
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV3 (l.GDP=L2.GDP) if Id==3

Instrumental variables (GMM) regression          Number of obs =        42
                                                  Wald chi2(7)  =     25.28
                                                  Prob > chi2   =    0.0007
                                                  R-squared     =    0.5871
GMM weight matrix: Robust                         Root MSE      =    1.7796
```

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.0602252	.2347992	0.26	0.798	-.3999727	.5204231
CON	.0940706	.0378087	2.49	0.013	.0199668	.1681743
FCF	.0529219	.0172352	3.07	0.002	.0191416	.0867023
TRA	-.1119426	.0637792	-1.76	0.079	-.2369475	.0130622
INF	.1559169	.231609	0.67	0.501	-.2980284	.6098622
LAB	-.0145154	.0056978	-2.55	0.011	-.0256828	-.003348
EXV3	.4710097	.3110105	1.51	0.130	-.1385597	1.080579
_cons	1.961753	.8471941	2.32	0.021	.301283	3.622223

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV3 L2.GDP

. est store Malay3
. ivregress gmm GDP CON FCF TRA INF LAB EXV6 (l.GDP=L2.GDP) if Id==3

Instrumental variables (GMM) regression          Number of obs =        42
                                                  Wald chi2(7)  =     26.40
                                                  Prob > chi2   =    0.0004
                                                  R-squared     =    0.5860
GMM weight matrix: Robust                         Root MSE      =     1.782
```

GDP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.0827515	.239657	0.35	0.730	-.3869676	.5524706
CON	.0940912	.0384933	2.44	0.015	.0186458	.1695366
FCF	.0502506	.0171895	2.92	0.003	.0165597	.0839414
TRA	-.1070548	.0644024	-1.66	0.096	-.2332812	.0191715
INF	.1680186	.2323486	0.72	0.470	-.2873763	.6234135
LAB	-.0138258	.0053042	-2.61	0.009	-.0242219	-.0034297
EXV6	.2583831	.2340715	1.10	0.270	-.2003887	.7171548
_cons	1.878373	.9560476	1.96	0.049	.0045544	3.752192

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV6 L2.GDP

. est store Malay6
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV9 (l.GDP=L2.GDP) if Id==3
```

```
Instrumental variables (GMM) regression            Number of obs =      42
                                                    Wald chi2(7)  =   26.43
                                                    Prob > chi2   =  0.0004
                                                    R-squared     =  0.5860
GMM weight matrix: Robust                           Root MSE      =  1.782
```

| | | Robust | | | | |
GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.0987226	.2467522	0.40	0.689	-.3849029	.5823481
CON	.0933328	.0392129	2.38	0.017	.0164769	.1701886
FCF	.0499537	.0169734	2.94	0.003	.0166865	.083221
TRA	-.1174562	.0685588	-1.71	0.087	-.251829	.0169166
INF	.1625402	.2406975	0.68	0.499	-.3092183	.6342986
LAB	-.0132583	.0048456	-2.74	0.006	-.0227555	-.0037611
EXV9	.0255177	.2528046	0.10	0.920	-.4699701	.5210055
_cons	2.277612	1.065135	2.14	0.032	.189986	4.365238

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV9 L2.GDP
```

```
. est store Malay9
```

```
. ivregress gmm GDP CON FCF TRA INF LAB EXV12 (l.GDP=L2.GDP) if Id==3
```

```
Instrumental variables (GMM) regression            Number of obs =      42
                                                    Wald chi2(7)  =   29.23
                                                    Prob > chi2   =  0.0001
                                                    R-squared     =  0.5958
GMM weight matrix: Robust                           Root MSE      =  1.7608
```

| | | Robust | | | | |
GDP	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
GDP						
L1.	.1206479	.2262081	0.53	0.594	-.3227117	.5640075
CON	.0900106	.0381676	2.36	0.018	.0152035	.1648178
FCF	.0501193	.0167864	2.99	0.003	.0172185	.0830201
TRA	-.1188672	.065517	-1.81	0.070	-.2472781	.0095438
INF	.1421668	.2227813	0.64	0.523	-.2944765	.5788101
LAB	-.0141924	.0041702	-3.40	0.001	-.0223659	-.0060189
EXV12	-.0981671	.2068161	-0.47	0.635	-.5035191	.3071849
_cons	2.517186	.9471355	2.66	0.008	.6608341	4.373537

```
Instrumented:  L.GDP
Instruments:   CON FCF TRA INF LAB EXV12 L2.GDP
```

```
. est store Malay12
```

BIOGRAPHY

Name	Miss Nawan Limpavathanyoo
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