THE IMPACT OF FINANCIAL INTEGRATION ON BANKING SYSTEM EFFICIENCY IN ASEAN COUNTRIES

By

HAMIZAH BINTI MAHMUD

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Universiti Utara Malaysia

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ABSTRACT

Financial integration is a situation in which financial markets of countries around the world are closely linked together through the process of banking deregulation, capital account liberalization and financial openness. In theory, the liberalized financial system would stimulate higher competition, increase the flows of funds into the domestic banking system and improve the efficiency of the financial intermediation process. The objective of the study is to determine the impact of financial integration on the banking system efficiency for five major economies in ASEAN countries. This study employs the unbalanced panel data for five selected ASEAN countries, which are Malaysia, Indonesia, Philippines, Singapore and Thailand between the periods of 2004 to 2014. The dependent variables for this study is banking system efficiency which is represented by the bank net interest margin to total earning assets ratio, the main independent variable is the financial integration and the control variables are inflation, economic growth rate, income group and real interest rate. The study discovers the positive relationship between financial integration and banking system efficiency for five ASEAN countries. In addition, the study also finds the positive link between inflation and banking system efficiency while the higher and middle income countries have a better efficiency performance as compared to the lower and middle income group. In contrary, the economic growth rate is found to have a negative relationship with the banking system efficiency. In addition, the result argues that the real interest rate is not one of the factors that determine the banking sector efficiency. For the robustness model, the bank overhead costs to total assets ratio (operational cost) is employed as the dependent variables to measure the banking system efficiency. Despite of using the bank overhead costs to total assets ratio as the dependent variable, the findings support the earlier conclusion that the financial integration, inflation and income group enhance the banking sector efficiency. Therefore, these findings would assist the policy makers in assessing the effectiveness of the current regulations on the financial integration.

Keywords: Financial Integration, Banking System Efficiency, Bank Net Interest Margin, ASEAN, Inflation, Economic Growth rate, Income Group, Real Interest Rate.

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Sincerely,

Hamizah Binti Mahmud
School of Economics, Finance and Banking
Universiti Utara Malaysia (UUM)

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CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND OF THE STUDY

In the last few decades, the financial system around the world has been transformed by the process of financial integration. Financial integration[1] is a situation in which the financial markets around the world are closely linked together through the process of liberalization in the banking system, trade openness and freedom in investment activities across countries (Baele *et al.* 2004). According to Chauhan (2012) and Patnaik and Shah (2012), financial integration also involved the removal of several restrictions in the financial sector that includes the restriction on interest rate and banking regulations.

In addition, Chinn and Ito (2006 & 2008) argue that the financial integration process that includes the financial openness and capital account liberalization would contribute positively to the economic development. They state that the liberalized financial system would stimulate higher competition, increase the flows of funds into the domestic banking system and improve the efficiency of the financial intermediation process. Other than that, Bhetuwal (2007) describes that the financial integration would also improve the risk diversification which then increase the volume of investment activities among the liberalized countries. Moreover, earlier studies conducted by

[1] Since the financial integration is conducted through various channels that also involve the reduction in regulation imposed in the financial system, thus, throughout this study, the words financial integration, financial liberalization, financial openness and financial deregulation are used interchangeably.

McKinnon (1973) and Shaw (1973) argue that the financial liberalization would allow the efficient allocation of capital to the productive investment activities.

It is widely noted that the banking industry is the major part of financial system. In ASEAN countries, the banking system is a vital component that drives economic activities. Hence, among the goals of the financial openness is to ensure the efficiency of the banking system in intermediating the funds from the surplus units to the deficit units at the lowest cost of production (Edirisuriya, 2007). According to Denizer, Desai and Gueorguiev (2000) and Aziakpono (2007), the financial integration process would increase the competition and force the banks to be more efficient through reducing operating cost and offering products and services at lower prices. Thus, the importance of financial integration in enhancing the performance of banking system is considered to be the central consideration of policy maker in the process of opening the domestic financial system to other countries.

1.1 OVERVIEW OF THE ASEAN FINANCIAL INTEGRATION

Financial integration has been practiced by the Association of Southeast Asian National (ASEAN) countries since 1970s which aims at improving the performance of the domestic financial system (Almekinders, Fukuda, Mourmouras, & Zhou, 2015). In brief, ASEAN is an entity that was established in August 1967 in Thailand, Bangkok. Currently, ASEAN comprises of 10 countries which are Malaysia, Indonesia, Singapore, Thailand, Philippines, Vietnam, Brunei, Laos, Myanmar and Cambodia. Among the ASEAN countries, Malaysia, Indonesia, Singapore, Thailand and Philippines are the largest economies in this region.

The integration in financial system among the ASEAN countries has been significantly noted since the signing of the ASEAN Framework Agreement on Services (AFAS) in 1995 Almekinders *et. al.* (2015). Moreover, in 2007, ASEAN has adopted the Economic Blueprint to enhance the financial integration in the capital market. Furthermore, in 2011, the ASEAN Financial Integration Framework (AFIF) was initiated with an objective to establish the semi-integrated financial market among the selected countries by 2020.

The latest effort towards greater financial integration in the financial system among the ASEAN countries is noted when ASEAN Comprehensive Investment Agreement (ACIA) was signed in 2012. Furthermore, the establishment of AEC Blueprint in 2015 has set more guidelines in the economic and financial collaborations between the ASEAN countries from 2016 to 2025.

In conclusion, in the recent years, the financial integration efforts have been significantly noted among the ASEAN countries. Due to the initiatives, the increasing number of trade and capital flows are evident with the aim to increase the performance of the banking and financial system.

1.2 PROBLEM STATEMENT

In theory, financial integration is conducted to improve the banking system by increasing the capital flows, deposits and investment activities and enhancing the competition that could lead into higher banking performance (Ndungu, 1997). However, the previous studies that investigate the relationship between financial integration and efficiency performance have produced mix findings (Bhattacharyya & Pal, 2013; Casu, Ferrari &

Zhao, 2013; Mwenda & Mutoti, 2011; Abaoub, Nouaili & Ochi, 2015; Luo, Tanna, & De Vita, 2016; Denizer, Dinc, & Tarimcilar, 2007).

There are several issues and problems related to the relationship between financial integration and financial system efficiency. Although, financial integration would bring positive impacts however financial integration also reduces the bank efficiency performance through various channels. Firstly, the financial integration process would also increase the bank risk that may reduce the efficiency performance in the banking system (Luo *et al*. 2016; Grifell-Tatje & Lovell, 1996). In addition, Kaminsky and Schmukler (2001) also argue that the financial crisis from other countries could be spill over into the local banking system through the process of financial openness. Thus, the infusion of risk would dampen the efficiency performance of the banking system.

Next, although competition is expected to bring positive gains in the banking sector, but, higher competition from the liberalized banking system could also reduce the bank efficiency performance. The intense competition introduces additional operational costs to the banks which then reduce their ability in providing products and services at the minimum cost. Therefore, higher financial system openness would create variability in the production cost and influence the efficiency negatively (Hao, Hunter & Yang, 2001; Zhang, Zhu & Lu, 2015; Cook, Habadou & Roberts, 2000). Besides that, when the banks are not able to control their production costs, the pricing of the products and services would be higher. Thus, the customer will pay high prices for the loans and financing which, in the long run, would have a negative influence on economic performance.

Since the financial systems of ASEAN countries are integrated with other countries around the world, the financial crisis has also affected their domestic banking system (Williams & Intarachote, 2003; Adawiyah, 2015). Nonetheless, the importance of financial integration to the countries is still relevant. Due to that, the policy makers have to continuously monitor and revise the current policies and regulations related to the financial openness. With that, the finding of the present study would help the regulators by providing information on the relationship between financial integration and banking system efficiency in five ASEAN countries (Malaysia, Indonesia, Thailand, Singapore and Philippines).

1.3 RESEARCH QUESTION

Based on the previous discussion, the following research questions are developed:

1. Does financial integration influence the banking system efficiency in five ASEAN countries?
2. Is the relationship between financial integration and the banking system efficiency robust?

1.4 OBJECTIVES OF STUDY

The objectives of the study are:

1. To analyze the relationship between financial integration and banking system efficiency in five ASEAN countries.
2. To examine the robustness of the relationship between financial integration and banking system efficiency.

1.5 SIGNIFICANCE OF THE STUDY

The findings of this study would assist the policy maker in formulating and assessing the current regulations on the financial integration in five ASEAN countries (Malaysia, Indonesia, Singapore, Thailand and Philippines). This study also provides important information on whether the current financial integration process improves the performance of financial system.

Besides that, the findings will add into the current literature that investigated the relationship between financial integration and banking sector efficiency. Moreover, this study would enrich the current literature for developing countries especially studies on ASEAN countries.

1.6 SCOPE OF THE STUDY

This study focuses on five ASEAN countries (Malaysia, Indonesia, Thailand, Singapore and Philippines) from 2004 to 2014. In addition, the efficiency measurement is based on the accounting ratio which is the bank net interest margin (the ratio from net interest revenue over to total earning assets). Furthermore, to check the robustness of the relationship between financial integration and banking system efficiency, the bank overhead costs to total assets ratio is used to measure the banking system efficiency. The main independent variable is financial integration as measured by Chinn-Ito index while the control variables are inflation, economic growth, real interest rate and income group.

1.7 STRUCTURE OF THE STUDY

This study is organized into five chapters; Chapter One provides the discussions on the introduction, financial integration in ASEAN countries and issue and problem statement. Next, Chapter Two reviews the current literature on the relationship between financial integration and banking system efficiency. Chapter Three describes the data and research methodology employed in the study. Chapter Four highlights the elaboration of the findings. Finally, Chapter Five concludes the present study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews empirical findings of the past literature on the relationship between financial integration and efficiency. The discussion is divided into three sections. Firstly is the group of studies that focuses on the relationship between financial integration and bank efficiency in developed and developing countries. Next is the discussion on the studies conducted in ASEAN countries that emphasis on investigating the relationship between financial integration and the efficiency. Finally, the last part would conclude the discussion in this chapter.

2.2 FINANCIAL INTEGRATION AND EFFICIENCY IN DEVELOPED AND DEVELOPING COUNTRIES

Theory of liberalization by McKinnon (1973) and Shaw (1973) argues the importance of financial openness and liberalization on the financial system. They state that that the efficiency and stability of the financial system would positively influence the saving rate and also the investment rate through the financial integration process. Thus, it is noted that the financial integration and liberalization efforts are needed to create a market base system and enhance competition that would increase the bank performance (Bank Negara Malaysia 2005; Shrestha 2005).

Section 2.2 will discuss the empirical evidences on the impact of financial integration on the bank efficiency in developed and developing countries. This discussion is divided into two sections; (1) developed countries and (2) developing countries. As for developed countries, few studies conclude that financial integration enhances the bank efficiency. In Spanish, Kumbhakar and Lozano-Vivas (2001) have investigated the impact of deregulation on bank efficiency for the period of 1986-1995. The result finds that the financial regulatory reforms create the improvement in technical efficiency and productivity in the Spanish bank. Similarly, Maudos and Pereze (2002) discover that the cost efficiency in Spanish banks has improved in the new competitive environment following the financial openness in the local banking system.

In Korea, Borensztein and Lee (2005) examine the effect of financial reforms on the performance of Korean financial sector between the years 1970 and 1996. Using the data of 32 bank branches, this study discovers an improvement in the financial system efficiency due to the flowing of credit to the profitable sector during financial reforms process.

In contrast, few studies conclude that financial openness reduces the banking system efficiency. In Spanish, Grifell-Tatje and Lovell (1996) assess the efficiency of Spanish savings banks during the deregulation period from 1986 to 1991. The result finds that the financial openness is followed by the decline in efficiency performance of the Spanish banks. This study argues that the deregulation process has introduced more competition and risks that finally dampens the banking sector performance.

In addition, in contrast to Borensztein and Lee (2005), Hao *et al.* (2001) discover a negative relationship between financial deregulation and bank efficiency in Korea. This study has employed a parametric Stochastic Frontier Approach (SFA) to measure the level of efficiency of 19 Korean banks for the period of 1985 to 1995. This study indicates the reduction in the banks efficiency performance after the financial liberalization process. They argue that the deregulation of the financial system in 1991 takes longer time to benefit the banking system.

Similar to the discussion for developed countries, literature conducted on developing countries also concludes mix findings on the relationship between financial liberalization and bank efficiency. On the positive side, Bhattacharyya and Pal (2013) examine the relationship between financial reform and efficiency of commercial banks in India. This study has employed a long period from 1989 to 2009 and discovers a positive impact of financial integration on bank efficiency in 103 Indian commercial banks. Similarly, Ataullah and Le (2006) also find that banking sector efficiency increases following the financial reformation in India. They argue that the bank efficiency improves due to the higher competition brought by the financial reforms process.

In the same vein, a study conducted in India by Kumar (2011) also finds a significant and positive influence of financial liberalization on the bank efficiency for the period of 1992 to 2007. Likewise, Casu *et al.* (2013) show a positive link between regulatory reform and the banks productivity and efficiency. This study shows that the changes in the bank's productivity growth are driven by the technology advancement in the local banking system. In addition, the financial openness has proved to enhance the

banking system efficiency by increasing the competition that would result in better economies of scale in the banking operations.

In Pakistan, Hardy and Patti (2001) study the impact of financial reforms on the bank efficiency between 1981 and 1998. The findings indicate a positive relationship between financial reforms and bank efficiency. In particularly, cost efficiency and revenue efficiency of the banks are found to improve significantly following the financial liberalization. Similarly in Kenya, a study by Boaz and Donatilla (2003) examine the relationship between profit efficiency of the commercial bank and financial reforms using the Stochastic Frontier Approach (SFA). The findings show a positive relationship between profit efficiency and financial reforms for the period of 1995-2004.

Another positive relationship between these variables is also found in a study conducted by Mwenda and Mutoti (2011) in Zambia. This paper investigates the effects of financial sector reforms on the competitiveness and efficiency of the Zambian commercial banks. The finding indicates that the financial efficiency has improved following the financial reforms. In Turkey, using 23 commercial banks Mahmud, Demir and Babuscu (2005) also discover that financial deregulation enhance the banking technical efficiency. Similarly, Serdaroglu (2015) discovers that financial openness improve total factor productivity (TFP) in Turkey.

Finally, Zhang *et al.* (2015) examine the relationship between financial openness and financial development (measured by size, efficiency and competition of the financial system) in China. This study finds the positive influences of financial openness on financial efficiency and competition while a negative link is found between financial

openness and size. This study states that the financial deregulation has improved the competition and efficiency in the domestic financial system which would help to enhance the performance of financial institution in transferring the funds among the economic units.

On the negative side, few studies discover a negative link between financial openness and efficiency in developing countries. An empirical study conducted by Yildirim (2002) in Turkey discovers a negative association between financial deregulation and bank efficiency 1988 until 1999. In the same vein, Denizer *et al.* (2007) conduct a study using Data Envelopment Analysis (DEA) to measure the bank efficiency. They also discover a decline in bank efficiency following the financial openness. They argue that the financial liberalization process has created serious economies of scale problems that have dampened the efficiency performance of the banks.

Similarly, Cook *et al.* (2000) examine the effect of financial liberalization on the Tunisian banking system for the period of 1992-1997. Using the DEA approach on 13 commercial banks, 8 development banks, 8 offshore banks, and 2 merchant banks, they find a negative relationship between financial integration and bank efficiency. Likewise, the recent literature conducted by Abaoub *et al.* (2015) in Tunisia also concludes a negative relationship between financial openness and efficiency. Although, they used different method to measure efficiency, which is SFA, both studies agree that the financial openness process reduces the banking system efficiency.

The next discussion is on the studies that include both developed and developing countries in the dataset. On the positive side, Luo (2014) find a positive impact of financial liberalization on banking efficiency in 88 countries using 1536 commercial

banks as their observations. Employing SFA to calculate the bank's cost and profit efficiencies, this study concludes that the strongest positive and significant impact of the financial openness on both efficiency measures is found in the banks located in higher income countries.

In the same vein, another cross-country study conducted in 21 countries Sub-Saharan African (SSA) between the periods of 1981-2009 also concludes that financial openness influences the efficiency positively (Ahmed, 2013). Using Chin–Ito index to measure the extent of the financial openness, he argues that the financial openness enhances the financial development which also includes the efficiency measurement.

Likewise, Beju and Ciupac-Ulici (2013) examine the effect of financial liberalization on financial efficiency for banks in Eastern European countries between 2001-2012. The result shows that the capital openness has a positive impact on banking system performance while the bank non-performing loan has reduced following the financial openness.

In contrast, Luo *et al.* (2016) conduct a study on commercial banks from 140 countries for the period of 1999 to 2011. This study employs the Chinn-Ito index constructed by Chinn and Ito (2008) to measure the financial openness while the banking system efficiency is measured using SFA. The result indicates a negative link between financial openness and profit efficiency. In addition, the bank risk as measured by Z-score is found to increase significantly following the financial openness.

2.3 FINANCIAL INTEGRATION AND EFFICIENCY IN ASEAN COUNTRIES

This section will discuss the literature on the relationship between financial integration and efficiency in ASEAN countries. On the positive side, Williams and Nguyen (2005)

examine the impact of financial liberalization initiatives on bank efficiency during the period of 1990-2003. This study uses the parametric method which is the SFA to calculate the bank efficiency. The findings show that the financial deregulation improves the bank efficiency in Indonesia, Korea, Malaysia, Philippines and Thailand.

Similarly, Hermes and Meesters (2015) study the impact of financial openness on the bank's cost efficiency using commercial banks from 61 countries including five ASEAN (Indonesia, Malaysia, Singapore, Thailand and Philippine). The SFA method is employed to calculate the efficiency at the bank individual level. This study argues that the financial liberalization enhances the bank cost efficiency. In addition, the quality of bank regulation and supervision are improved in the liberalized financial system. Moreover, this study also suggests that the banks in the developed countries are more efficient as compared to the banks in the emerging countries.

On the contrary, other studies discover that financial liberalization process reduces the bank efficiency. In Malaysia, an empirical study conducted by Sufian and Habibullah (2010) finds the decline in bank efficiency following the financial liberalization. This study has employed two full-fledged domestic Islamic banks, three full-fledged foreign Islamic banks, 11 domestic IBS (Islamic banking scheme) banks, and four foreign IBS banks in Malaysia for the period of 2001 to 2008. Despite including various types of bank, this study concludes the negative influence of financial openness on the banks efficiency performance.

In Indonesia, a study has been done by Adawiyah (2015). Using DEA approach, this study has demonstrated the reduction in the bank efficiency following the financial deregulation between 2009 and 2012. Although this study has examined the impact of

financial liberalization on bank efficiency by including local banks, foreign banks and Islamic banks, the negative influenced of financial openness on efficiency performance is still noted. In addition, it is also evident that there is no significant difference between the efficiency of foreign and Islamic banks during the period of study.

Similarly, a study from Williams and Intarachote (2003) in Thailand also finds a negative link between financial openness and efficiency. This study has investigated the profit efficiency of Thai banks between 1990 and1997. Employing SFA to measure the bank efficiency, this study argues that the openness of financial system has proved to have a detrimental effect on banking sector efficiency. In addition, the similar effect is found for both domestic and foreign banks. Furthermore, the empirical evidence also shows that the financial fragility increases in the deregulation period.

2.4 CONCLUSION

In summary, this chapter has conducted a literature review on the impact of financial integration on the banking system efficiency. The discussions on the literature in developed countries, developing countries and ASEAN countries conclude mix effects of financial integration on efficiency performance.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter presents the methodology used in the study. The method employed to test the relationship between financial integration and the banking system efficiency is ordinary least square (OLS). Other than that, this study also uses other statistical methods for the descriptive statistics and diagnostic tests. This chapter is organized as follows. Section 3.2 provides the data description. Section 3.3 defines the variables included in the regression model. Section 3.4 presents the research framework employed in this study. Section 3.5 discusses the methods of estimation. Finally, Section 3.6 concludes this chapter.

3.2 DATA DESCRIPTION

This study employs the unbalanced panel data for five selected ASEAN countries, which are Malaysia, Indonesia, Philippines, Singapore and Thailand. The ten-year panel data are retrieved from 2004 to 2014 as some of the data for the earlier years are not available. According to the World Bank (2017), these five countries are the major economies in the ASEAN and thus, being selected in the dataset. The data for financial integration and inflation are extracted from International Monetary Fund (IMF) while the World Bank Database is used to gather information on banking system efficiency, economic growth, income group and real interest rate. This study covers the full period of ten years for Malaysia, Indonesia, Singapore and Philippines. Due to data unavailability, the dataset

for Thailand covers only nine years from 2004 to 2013. Finally, in total there are 54 observations included in the regression model.

3.3 DEFINITION OF VARIABLES

This section presents the discussion on the selection and description of the dependent variable (banking system efficiency) and independent variables (financial integration, inflation, economic growth, real interest rate and income group) as suggested by the previous studies.

3.3.1 DEPENDENT VARIABLE (BANKING SYSTEM EFFICIENCY)

The dependent variable is banking system efficiency. For this study, this variable is represented by the bank net interest margin to total earning assets ratio. According to Claeys and Vennet (2008) and Marinkovic and Radovic (2014), higher net interest margin indicates lower banking system efficiency. This study argues that a wide net interest margin is resulted from the inability of a bank to control the production costs. As a result, the increased in the production cost would be transferred to the customer in the form of higher prices for banking services. Thus, higher net interest margin shows lower efficiency performance in the banking system.

In addition, to answer the second research objective, this study will perform a robustness test by employing the bank overhead costs to total asset ratio as a measure of the banking system efficiency. According to Demirguc-Kunt and Beck (2009), the efficient bank is able to control the production cost to produce the products and services

efficiently. Therefore, higher ratio of bank overhead costs to total asset indicates lower efficiency of the banks.

According to the Global Financial Development Database (GFDD) developed by the World Bank in 2016, these two variables (bank net interest margin to total earning assets ratio and bank overhead costs to total asset ratio) are used to measure the banking system efficiency. Thus, this study selected these ratios as the measurements for the banking system efficiency.

3.3.2 INDEPENDENT VARIABLE AND CONTROL VARIABLES

This section discusses the main independent variable (financial integration) and four control variables (inflation, economic growth, and real interest rate and income group) employed in this study.

3.3.2.1 Financial Integration

For the financial integration, the index developed by Chinn-Ito (2008) is employed. This index which known as KAOPEN index is used to measure the level of openness in the international financial transactions. The index with higher value indicates more financial integration activities. Since, financial integration is found to have a positive impact on banking system efficiency (Williams & Nguyen, 2005 and Hermes & Meesters, 2015), thus, the direction of relationship between net interest margin and financial integration is also expected to be negative.

3.3.2.2 Inflation

The inflation variable enters into the regression model to measure the impact of inflation on the banking system efficiency. This variable is measured by the consumer price index

(CPI). According to previous studies, the inflation is found to have a positive influence on the bank efficiency (Zhu, 2011; Fadzlan, 2011). According to these studies, during inflationary period the banks are forced to be more productive in utilizing the resources. Thus, if the inflationary period could be predicted earlier, the banks will adjust their strategies to focus more on profitability activities. Due to that, the inflation would increase the efficiency performance of the ban

3.3.2.3 Economic Growth

The economic growth is presented by the log transformation of GDP in US Dollar (USD). It is noted that higher economic growth influences the banking system efficiency positively (Lucchetti, Papi, & Zazzaro, 2001; Najia, 2013; Hasan, Koetter & Wedow, 2009). These studies argue that higher economic growth will stimulate a conducive environment for the banks to operate. In addition, it would also create higher demand for banking product and services as the business activities become more active. Thus, the relationship between economic growth and banking system efficiency is expected to be positive.

3.3.2.4 Income Group

The income group is measured using the dummy variable which takes the value of 1 for the higher income and middle higher income group and 0 for lower income and middle lower income group. The division of these groups is based on World Bank (2017). As suggested by previous studies (Borensztein & Lee, 2005; Maudos & Pereze, 2002), higher income group is expected to have better efficiency performance than lower income group. The higher income countries have better efficiency level because they have more resources, better banking technologies and skills than the lower income group.

3.3.2.5 Real Interest Rate

The next independent variable enters into the regression model is real interest rate. According to Sarkar and Hafiz (2007), McKinnon (1973) and Shaw (1973), the real interest rate is the important factor that determines the level of saving and investment activities. Thus, higher real interest rate is expected to influence the banking system efficiency positively. It is because the increasing of real interest rate will attract more investors to do investment and savings and to the increase in the bank's resources. Thus, this would help the banks to do their operations more efficiently.

Therefore, based on the discussions, the Table 3.1 summarizes the variables, definitions of variables and sources for data collection.

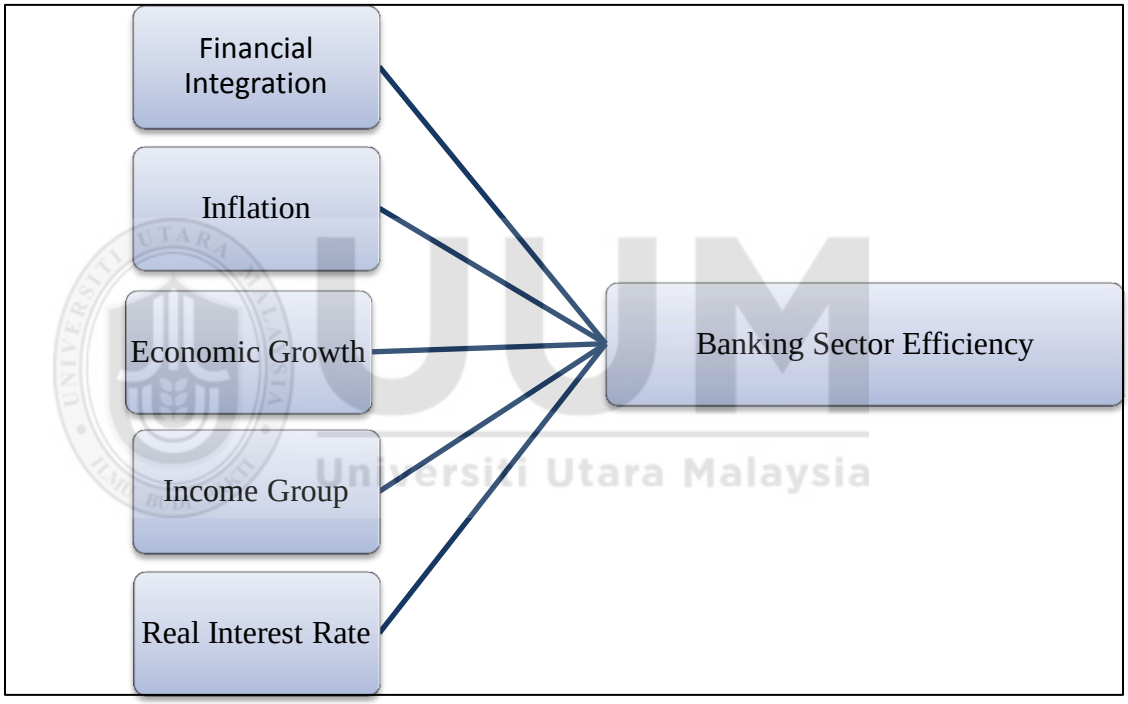
Table 3.1: Variables, Definition and Data Sources

NO	VARIABLES	DEFINITION	SOURCES
1	Banking System Efficiency (EFF)	The ratio from net interest revenue over to total earning assets	Global Financial Development Database (GFDD) by World Bank
2	Financial Integration (FI)	Chinn-Ito Index	IMF
3	Inflation (CPI)	Consumer Price Index (CPI)	IMF
4	Economic Growth(GDP)	Log transformation of GDP	World Bank
5	Income group (Income)	Dummy variable, which takes the value of 1 for the higher income and middle higher income group and 0 for lower income and middle lower income group.	World Bank
6	Real Interest rate (Real interest)	Real Interest Rate	World Bank

3.4 RESEARCH FRAMEWORK

The research framework is presented in Figure 3.1. This framework shows the relationship between the dependent variable (banking sector efficiency), the independent variable (financial integration) and four control variables (inflation, economic growth, income group and real interest rate).

Figure 3.1: Research Framework



Based on the discussion above, the relationships between banking sector efficiency and four control variables (inflation, economic growth, income group and real interest rate) are expected to be positive. In addition, the financial integration is hypothesized to have a positive influence on the banking system efficiency.

3.5 ECONOMETRICAL METHODOLOGY

This section describes the methods for data analysis. The methods employed are (i) descriptive analysis (ii) correlation analysis (iii) panel data OLS and (iv) diagnostic test.

3.5.1 Descriptive Statistic

Descriptive statistic is used to describe the data employed in the study. Among the measurements are minimum value, maximum value, mean and standard deviation. The information provided the by descriptive statistics will summarize the characteristics of a given set of data used in the regression model (Rohatgi, Vijay, & Ehsanes, 2015).

3.5.2 Correlation Analysis

The purpose of correlation analysis is to measure the linear relationship between two variable and independent variables. The range of coefficient is between -1 to +1, while zero represents no association between the two variables. The direction for both variables is determined by the positive or negative direction.

3.5.3 Panel Data OLS

Regression analysis is a process to estimate the relationships between dependent and independent variables. In this study, the panel OLS is regress using Stata Version 8. The panel data regression for this study is presented as follows:

$$\mathbf{EFF}_{it} = \alpha + \beta 1\ \mathrm{FI}_{it} + \beta 2\ \mathrm{CPI}_{it} + \beta 3\ \mathrm{GDP}_{it} + \beta 4\ \mathrm{Income}_{it} + \beta 5\ \mathrm{Realinterest}_{it} + \varepsilon$$

Where:

EFF	Banking Sector Efficiency measure using net interest margin to total earning asset and total overhead cost to total asset over the period of the study for country i
FI	Financial Integration is measured using Chinn-Ito index over the period of the study for country i.
CPI	Inflation rate is represented by CPI over the period of the study for country i.
GDP	Growth Rate over the period of the study for country i.
Income	Income Group Countries: Dummy variable (1 for the higher income and middle higher income group and 0 for lower income and middle lower income group) over the period of the study for country i.
RealInterest	Real Interest rate over the period of the study for country i.
e	Error Term

3.5.4 Diagnostic Test

The diagnostic tests are methods conducted to check the presence of problems that could lead to misspecification of the regression model. The diagnostic tests employed in study are multocollinearity test, heteroscedasticity test and auto-correlation test.

3.5.4.1 Multicollinearity Test

This test is conducted to check the existence of high correlation between the independent variables which may lead to reduction in predictive power of a regression model. According to Greene (2000), the VIF of less than 10 indicates that the multicollinearity problem does not exist.

3.5.4.2 Heteroscedasticity Test

Heteroscedasticity is a condition of which the variance of the errors terms is not constant. In this study, Modified Wald Test is used to detect the existence of heteroscedasticity problem in the regression model (Greene, 2000).

3.5.4.3 Auto-Correlation Test

Auto-correlation is one of the data characteristics that show the association between the values of the variables. The Wooldridge test is conducted to detect auto-correlation problem in the OLS model. Hence, the regression model is free from auto-correlation when the p-value is more than 0.05.

3.6 CONCLUSION

This chapter summarizes the variables selection and description, research framework, and methods for data analysis. In addition, this chapter also discusses the sources of the data collection for five ASEAN countries (Malaysia, Indonesia, Singapore, Thailand and Philippines) from 2004 to 2014. Finally, the elaboration on the panel OLS is made by explaining the selection of each variable used in the model based on suggestions from previous studies.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the findings of the study. Section 4.2 provides the discussion on descriptive statistics. The correlation analysis is presented in Section 4.3 while the analyses on diagnostic tests are provided in Section 4.4. After that, the result for pooled OLS is discussed in Section 4.5. Subsequently, the discussion on robustness test is found in Section 4.6. Finally, Section 4.7 concludes this chapter.

4.2 DESCRIPTIVE ANALYSIS

This section provides descriptive statistics for all variables employed in this study. Table 4.1 presents the summary of descriptive statistics which include the values of minimum, maximum, mean and standard deviation.

Table 4.1 Summary of Descriptive Statistics

	Observations	Minimum	Maximum	Mean	Std. Deviation
Efficiency	55	0.00	6.78	3.52	1.66
Financial Integration	55	-1.19	2.39	0.29	1.29
Inflation	55	62.18	124.39	96.77	12.50
GDP (USD)	55	91000	920000	311391.50	28032.64
Real Interest rate	55	-5.29	10.63	3.11	2.98

Based on the table 4.1, the descriptive statistics show that the mean for efficiency 3.52 and the standard deviations 1.66. In addition, the minimum and maximum values are 0.00

and 6.78 respectively. For financial integration variable, the mean value is 0.29 and standard deviation is 1.2861.The third variable which is inflation shows the highest value of 124.39 and the lowest value of 62.18. In addition, economic growth has the mean of USD311,391.50 million and the maximum value is USD920,000 million. Finally, the mean and standard deviations for real interest rate are 3.11 and 2.98 respectively.

4.3 CORRELATION ANALYSIS

Table 4.2 provides the information on the Pearson correlation matrix. The variables used are efficiency, financial integration, inflation, economic growth (GDP), income group and real interest rate. According to Rohatgi *et al.* (2015), Pearson correlation is employed to measure the linear relationship between two variables. Before the linear regression is conducted, a correlation matrix is developed in order to establish the association between the dependent and independent variables.

Table 4.2 Pearson Correlation Matrix

	Efficiency (NIM)	Financial Integration	Inflation	GDP	Income Group	Real interest rate
Efficiency (NIM)	1					
Financial Integration	-0.10328	1				
Inflation	-0.33732	-0.19439	1			
GDP	0.36885	-0.13879	0.55182	1		
Income Group	-0.74742	0.10678	0.13821	-0.25413	1	
Real interest rate	-0.05573	-0.04532	0.27264	0.14546	-0.085442	1

*NIM = Net Interest Margin/Total Earning Asset

Table 4.2 shows that income group, inflation, financial integration and real interest rate are negatively correlated with net interest margin to total earning asset ratio. Since, higher interest margin indicates lower banks efficiency. Thus, the relationship between these four variables (income group, inflation, financial integration and real interest rate) and bank efficiency is positive. The strongest positive relationship is found between efficiency and income group. While, GDP has a positive relationship with NIM, which indicates that GDP and bank efficiency is negatively related.

4.4 REGRESSION ANALYSIS

The result for the pool OLS and corrected-panel OLS are presented in Table 4.3.

Table 4.3 Results for Pooled OLS and Corrected-Panel OLS

Variables	Pooled OLS	Corrected-Panel OLS
Financial Integration	-0.159897 (-2.02)**	-0.1598967 (-4.14)**
Inflation	-0.076286 (-7.25)*	-0.076286 (-4.04)**
GDP	1.602561 (7.00)*	1.602561 (10.01)*
Income Group	-1.682036 (-7.57)*	-1.682036 (-8.63)*
Real Interest Rate	0.006231 (0.18)	0.006231 (0.20)
Constant	-30.15341 (-5.45)*	-30.15341 (-6.81)*
R-squared	0.8189	0.8189
Adjusted R-squared	0.8000	NA
F-statistics	43.41	NA
Prob (F-statistic)	0.0000	NA
N	54	54

Note : * significant at 1% level , ** significant at 5% level. NA denotes that the value is not provided by the Stata. The dependent variable is efficiency which measured using bank's net interest revenue / total earning assets.

For the purposes of discussions, only the findings on the corrected- panel OLS will be discussed. This is due to the fact that the heteroskedasticity and auto-correlation problems have been corrected using this model. Thus, the results provided by this model are more robust. A table 4.3 show that the adjusted R-squared is 0.8000 which implies is that 80.00 % of the dependent variable (banking system efficiency) is influenced by the independent

variable and control variables (inflation, economic growth, real interest rate, income group and financial integration).

In addition, all independent variables except for real interest rate show are significantly related with the financial development indicator which is efficiency. The results indicate that financial integration, inflation and income group have a negative relationship while economic growth is positively associated with banking system efficiency.

4.4.1 Financial Integration

The regression result in table 4.3 shows that financial integration has a negative and significant relationship with NIM. Since, higher NIM indicates lower bank efficiency, thus, the finding indicate that the financial integration enhances the banking sector efficiency. This result is also consistent with the previous literature: Elryah, (2014); Kumar, (2011); & Casu *et al.* (2013). This finding shows that the banking sector openness creates higher competition that forces the banks to produce their products in the most efficient way. In the liberalize environment, they have to minimize the production cost and offer the products and services at the lower prices.

4.4.2 Inflation

The result indicates a negative and significant relationship between inflation and NIM. Thus, the inflation is found to have a positive link with banking sector efficiency. This result is in line with the previous studies that find a positive relationship between inflation and the bank efficiency (Zhu, 2011; Fadzlan, 2011). In the inflationary period the banks are forced to be more productive in utilizing their resources. When the banks

can predict that the inflation will increase, so they will adjust their strategies to focus more on profitability activities. Due to that, the inflation would increase the efficiency performance of the banks.

4.4.3 Economic Growth (GDP)

The results in Table 4.3 indicate a positive and significant effect of economic growth on NIM. Since, higher NIM indicates lower efficiency performance, thus, the result shows that an increase in economic growth decreases the banking system efficiency performance for five ASEAN countries during period of study. The finding is consistent with the previous studies (Sufian & Habibullah, (2010) and Sufian, (2009). Since higher economic growth stimulates higher demand for banking products, the banks are becoming more competitive in order to meet the increasing demand for their services. Thus, higher competition could create more cost such as advertising, labor and technology. Finally, higher cost would be resulted in lower banking sector performance.

4.4.4 Income Group

Table 4.3 shows that the income group has a negative and significant relationship with NIM. Therefore, the higher and middle higher income countries are more efficient than lower and middle lower income countries. In addition, higher and middle higher income countries which have more resources, better banking technology and skill that could assist them in producing at lower operational cost and finally increasing their efficiency performance. This finding is in line with Borensztein and Lee, (2005) and Maudos and Pereze, (2002).

4.4.5 Real Interest Rate

Real interest rate shows the positive but insignificant relationship with NIM. Hence, the result from this study is unable to find any relationship between these two variables. This finding is in line with Ghazali and Ali (2002). Moreover, in the context of this study, real interest rate is not one of the factors that determine the banking sector efficiency.

4.5 ROBUSTNESS CHECK

In this section, this study conducts a robustness check on the relationship between financial integration and efficiency controlling for the effects of inflation, economic growth, income group and real interest rate. For the robustness model, the bank overhead costs to total assets ratio (operational cost) is employed as the dependent variables to measure the banking system efficiency. According to Demirguc-Kunt and Beck (2009) the bank overhead costs to total asset ratio is used to measure the efficiency in banking sector. This study argues that lower production cost indicates higher banking sector efficiency. This test is conducted to check the robustness of findings discussed in section 4.4.

Table 4.4 Result for Robustness Check

Variables	Robustness-OLS model
Financial Integration	-0.18328 (-2.88)**
Inflation	-0.03713 (-2.51)***
GDP	0.33907 (2.60)***
Income Group	-1.65461 (-8.31)*
Real Interest Rate	0.03448 (1.32)
Constant	-2.20924 (-0.62)
R-squared	0.8404
Adjusted R-squared	0.8238
F-statistics	50.55
Prob (F-statistic)	0.0000
N	54

Note : * significant at 1% level , ** significant at 5% level, *** significant at 10% level. The dependent variable is efficiency which measured using bank overhead costs to total assets.

Table 4.4 present the result for the robustness check. Similar to finding present in Table 4.3, financial integration, inflation and income group have a negative and significant relationship with the operational cost. Despite of using the bank overhead costs to total assets ratio as the dependent variable, the findings support the earlier conclusion that the financial integration, inflation and income group enhance the banking sector efficiency. In addition, a positive association is found between GDP and operational cost which indicates that higher economic growth reduces the banking sector efficiency. In

conclusion, the analysis on this section shows the robustness of finding presented earlier in Table 4.3.

4.6 DIAGNOSTIC TEST

In order to ensure the robustness of the standard errors few diagnostic tests are conducted. Those tests are multicollinearity test, autocorrelation test and heteroskedasticity test.

4.6.1 Multicollinearity Test

Multicollonearity problems exist when two or more variables in a regression model are highly correlated. The most common method used to detect multicollinearity is Variance Inflation Factor (VIF). An optimum value of VIF should be in range of 1 to 10. If the value exceeds 5, it indicates that the independent variables are highly correlated which lead to a multicollinearity problems.

Table 4.5 Results for Multicolinearity Test

Variables	VIF
Financial Integration	1.06
Inflation	1.80
GDP	1.69
Income Group	1.25
Real Interest Rate	1.11
Mean VIF	1.38

From Table 4.5, results reveal that there is no multicollinearity problem because all variables have the values of VIF below 5.

4.6.2 Heteroskedasticity Test

Modified Wald Test is used to detect the heteroskedasticity problem. According to (Holgersson and Shukur, 2004), the p-value should be above 0.05 levels to indicate that the heteroskedasticity problem that not exists. Based on the Modified Wald Test, the results are indicated in Table 4.6:

Table for 4.6 Results for Modified Wald Test

Chi-sq	Prob
31.44	0.0000

The results show that p-value is less than 0.05 levels. Thus, the heteroskedasticity problem exists in this model.

4.6.3 Auto-Correlation Test

Woolridge Test results are presented in Table 4.7. This test is employed to test the autocorrelation problem. The P-value should be less than 0.05 levels to indicate that auto-correlation problem does not exist in the model.

Table for 4.7 Results for Woolridge Test

Chi-sq	Prob
33.088	0.0045

The result presented in Table 4.7 shows that p-value is below 0.05 level. Therefore, the autocorrelation presents in this model.

The analysis on Modified Wald Test and Woolridge Test shows the existence of, heterodascitity and autocorrelation problems. Hence, to correct these problems a panel-corrected model is conducted.

4.7 CONCLUSION

Generally, this study reveals that financial integration increases the banking system efficiency for five ASEAN countries (Malaysia, Indonesia, Singapore, Thailand and Philippines). In addition, inflation and income group have a positive influence on the banking system efficiency. Lastly, the economic growth has a negative relationship with banking system efficiency performance.

CHAPTER FIVE

CONCLUSION AND SUMMARY

5.1 INTRODUCTION

Financial integration is a situation in which financial markets of countries around the world are closely linked together through few mechanisms such as banking liberalization, capital account liberalization. Theoretically, it is noted that financial integration would increase the banking system efficiency by promoting competition, transferring of more advanced skill, technology and knowledge that would allow the banking system to produce at the lowest production costs. According to McKinnon (1973) and Shaw (1973), the banking system efficiency is important because it would allow the banks to fully utilize the resources and efficiently allocate funds from savers to borrowers at the minimum price (Demirguc-Kunt & Levine 2008). In addition, Bhetuwal (2007) describes that financial integration enhances the performance of financial system by increasing the availability of funds and also allowing for the risk diversification.

Given the importance of the impact of financial integration on the banking system efficiency as suggested by previous studies (Serdaroglu 2015; Inderjit & Nirvikar 2014; Hanh 2010; Andries & Capraru 2013; Luo 2014), this present study develops two research objectives to test this relationship in five ASEAN countries (Malaysia, Indonesia, Philippines, Singapore and Thailand) from 2004 to 2014. Thus, the first objective of this study is to analyze the relationship between financial integration and banking system efficiency, whereas the second objective is to examine the robustness of the relationship between financial integration and banking system efficiency.

In order to answer the research objectives, this study employs the unbalanced panel data from 2004 to 2014 for five ASEAN countries (Malaysia, Philippines, Singapore, Thailand and Indonesia). Moreover, Chapter 4 presents the detail discussions on the descriptive analysis and followed by the assessment of the link between financial integration and banking system efficiency using ordinary least square (OLS). Additionally, the robustness test is conducted using another measurement of banking system efficiency which is the ratio of the bank overhead costs to total assets.

This chapter is organized as follows. Section 5.2 provides the summary of findings. Next, the policy implications are presented in Section 5.3 while Section 5.4 addresses the contributions of the study. Section 5.5 highlights the limitations of the study and directions for future research. Finally, Section 5.6 concludes this chapter.

5.2 SUMMARY OF THE FINDINGS

The main objective of this study is to examine the effect of financial integration on banking system efficiency for five ASEAN countries (Malaysia, Indonesia, Singapore, Thailand and Philippines) for the period 2004 to 2014. The finding shows that financial integration improves the banking system efficiency by reducing the bank net interest margin. According to Claeys and Vennet (2008), higher net interest margin indicates that the banks are inefficient in their production because there are unable to control the production cost and thus have to price their services at a higher level.

Next, in order to answer the second research objective, this study conducts a robustness test by employing the bank overhead costs to total asset ratio to measure the banking system efficiency. Consistently, this study finds that financial integration

enhances the banking system efficiency. Hence, it can be concluded that an open financial system forces the banking system to produce at the lowest production cost and finally to the increment in its efficiency performance.

In summary, this study concludes that higher financial integration promotes the banking system efficiency. Thus, the competition and spillover effects brought by the process of financial integration help the banks to produce at minimum production cost and promote the banking system efficiency performance.

5.3 POLICY IMPLICATIONS

The findings of this study provide a few policy implications for the policy makers. Since the financial integration proves to enhance banking system efficiency, the regulators should continue to open the domestic financial system to the foreign countries. Hence, the policy maker should encourage more strategies to financial openness to promote the domestic financial system performance.

From the banking management side, the findings could assist them to identify the factors that would influence the bank efficiency performance. This study finds that financial integration and inflation influence the banking system efficiency positively. Therefore, the banks should develop the banking strategies that will take advantages on the financial system openness during the inflationary period. On the other hand, the economic growth has a negative impact on efficiency. Thus, the banks should take precautionary measures during the higher economic development.

5.4 CONTRIBUTIONS OF STUDY

There are few contributions made by this study. Firstly, the findings would add to the existing literature in this area especially for the research in ASEAN countries. Secondly, for the policy makers, the findings could assist in the future policy making efforts. Lastly, for the bank management, this study provides information that would assist them in formulating more competitive banking strategies.

5.5 LIMITATIONS AND DIRECTIONS FOR THE FUTURE RESEARCH

There are few shortcomings of the present study. Firstly, the data set is only confined to the five ASEAN countries which are Malaysia, Indonesia, Singapore, Thailand and Philippines. Thus, the future research could focus on wider range of countries that cover both developed and developing countries. Secondly, this study only employs two accounting measures (bank net interest margin over total earning assets and bank overhead costs to total assets), hence, future study in this area could use other methods such as Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) methods. In addition, the inclusion of these three efficiency measures (accounting method, DEA and SFA) may provide a robust finding on the relationship between financial integration and banking system efficiency.

5.6 CONCLUSION

Finally, this study concludes that financial integration promotes banking system efficiency. The financial integration would reduce the bank operational cost and enhance the bank efficiency. Other than that, inflation is also found to have a positive influence on efficiency while the economic growth reduces efficiency. In addition, higher and middle income group has better efficiency performance than lower and middle higher income group.

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APPENDIX A

```
(9 vars, 55 obs pasted into editor)

. tsset code year
       panel variable:  code, 1 to 5
        time variable:  year, 2004 to 2014

. regress  ybni x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate

      Source |       SS       df       MS              Number of obs =      54
-------------+------------------------------           F(  5,    48) =   43.41
       Model |  111.488862     5  22.2977723           Prob > F      =  0.0000
    Residual |  24.6541928    48  .513629017           R-squared     =  0.8189
-------------+------------------------------           Adj R-squared =  0.8000
       Total |  136.143054    53  2.56873688           Root MSE      =  .71668

------------------------------------------------------------------------------
        ybni |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1fi |  -.1598967   .0792262    -2.02   0.049    -.3191917   -.0006017
       x2cpi |  -.0762086   .0105095    -7.25   0.000    -.0973393   -.0550779
    x3_lngdp |   1.602561     .22905     7.00   0.000     1.142025    2.063097
x4incomegr~p |  -1.682036   .2222442    -7.57   0.000    -2.128888   -1.235185
x5realinte~e |    .006231    .034693     0.18   0.858     -.063524     .075986
       _cons |  -30.15341   5.530597    -5.45   0.000    -41.27342    -19.0334
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
       x2cpi |      1.80    0.554397
    x3_lngdp |      1.69    0.590585
x4incomegr~p |      1.25    0.797645
x5realinte~e |      1.11    0.901467
        x1fi |      1.06    0.939458
-------------+----------------------
    Mean VIF |      1.38

. ssc install xttest3
checking xttest3 consistency and verifying not already installed...
all files already exist and are up-to-date.


. xtreg  ybni x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate, fe

Fixed-effects (within) regression               Number of obs      =        54
Group variable (i): code                        Number of groups   =         5

R-sq:  within  = 0.2910                         Obs per group: min =        10
       between = 0.0000                                        avg =      10.8
       overall = 0.0183                                        max =        11

                                                F(4,45)            =      4.62
corr(u_i, Xb)  = -0.3399                        Prob > F           =    0.0033

------------------------------------------------------------------------------
        ybni |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1fi |  -.4960277   .2146476    -2.31   0.025    -.9283501   -.0637053
       x2cpi |   -.024169    .023206    -1.04   0.303    -.0709084    .0225704
    x3_lngdp |  -.4848981   .7613376    -0.64   0.527    -2.018311    1.048515
```

```
x4incomegr~p |  (dropped)
x5realinte~e |  -.0171721   .0346525    -0.50   0.623    -.0869659    .0526216
       _cons |   18.88113   18.00131     1.05   0.300    -17.37537    55.13764
-------------+----------------------------------------------------------------
     sigma_u |  1.7137691
     sigma_e |  .66817325
         rho |  .86804766   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4, 45) =     2.56                 Prob > F = 0.0516

. ssc install xtserial
ssc install: "xtserial" not found at SSC, type -findit xtserial-
(To find all packages at SSC that start with x, type -ssc describe x-)
r(601);

. findit xtserial

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (5)  =       31.44
Prob>chi2 =      0.0000


. xtserial  ybni x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate

Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,       4) =     33.088
           Prob > F =      0.0045

. regress  ybni x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate, robust
cluster (code)

Regression with robust standard errors                Number of obs =      54
                                                      F(  3,     4) =       .
                                                      Prob > F      =       .
                                                      R-squared     =  0.8189
Number of clusters (code) = 5                         Root MSE      =  .71668

------------------------------------------------------------------------------
             |               Robust
        ybni |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1fi |  -.1598967    .038608    -4.14   0.014    -.2670896   -.0527038
       x2cpi |  -.0762086   .0188621    -4.04   0.016    -.1285783   -.0238389
    x3_lngdp |   1.602561   .1601564    10.01   0.001     1.157895    2.047226
x4incomegr~p |  -1.682036   .1949529    -8.63   0.001    -2.223313    -1.14076
x5realinte~e |    .006231   .0319408     0.20   0.855    -.0824508    .0949128
       _cons |  -30.15341   4.425083    -6.81   0.002    -42.43941   -17.86741
------------------------------------------------------------------------------

.
```

APENDIX B

```
Notes:
      1.  (/m# option or -set memory-) 10.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

. (9 vars, 55 obs pasted into editor)

. tsset code year
       panel variable:  code, 1 to 5
        time variable:  year, 2004 to 2014

. regress  gfddei04 x1fi x2cpi x4incomegroup x3_lngdp x5realinterestrate

      Source |       SS       df       MS              Number of obs =      54
-------------+------------------------------           F(  5,    48) =   50.55
       Model |  57.7405485     5  11.5481097           Prob > F      =  0.0000
    Residual |  10.9649986    48  .228437472           R-squared     =  0.8404
-------------+------------------------------           Adj R-squared =  0.8238
       Total |  68.7055471    53  1.29633108           Root MSE      =  .47795

------------------------------------------------------------------------------
    gfddei04 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1fi |  -.1832809   .0528358    -3.47   0.001    -.2895143   -.0770475
       x2cpi |  -.0371316   .0070087    -5.30   0.000    -.0512236   -.0230396
x4incomegr~p |  -1.654607    .148214   -11.16   0.000    -1.952611   -1.356602
    x3_lngdp |   .3390739   .1527528     2.22   0.031     .0319439    .6462039
x5realinte~e |   .0344831   .0231367     1.49   0.143    -.0120363    .0810025
       _cons |  -2.209241   3.688339    -0.60   0.552    -9.625144    5.206662
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
       x2cpi |      1.80    0.554397
    x3_lngdp |      1.69    0.590585
x4incomegr~p |      1.25    0.797645
x5realinte~e |      1.11    0.901467
        x1fi |      1.06    0.939458
-------------+----------------------
    Mean VIF |      1.38

. ssc install xttest3
checking xttest3 consistency and verifying not already installed...
all files already exist and are up-to-date.

. xtreg  gfddei04 x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate, fe

Fixed-effects (within) regression               Number of obs      =        54
Group variable (i): code                        Number of groups   =         5

R-sq:  within  = 0.3051                         Obs per group: min =        10
       between = 0.3802                                        avg =      10.8
       overall = 0.3113                                        max =        11

                                                F(4,45)            =      4.94
corr(u_i, Xb)  = 0.2936                         Prob > F           =    0.0022

------------------------------------------------------------------------------
    gfddei04 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
        x1fi |  -.1867062   .1447582    -1.29   0.204    -.4782641    .1048517
       x2cpi |  -.0302711   .0156501    -1.93   0.059    -.0617921    .0012499
    x3_lngdp |    .140898   .5134455     0.27   0.785    -.8932343     1.17503
x4incomegr~p |  (dropped)
x5realinte~e |   .0182757   .0233696     0.78   0.438    -.0287932    .0653445
       _cons |   1.408437   12.14007     0.12   0.908    -23.04292     25.8598
-------------+----------------------------------------------------------------
     sigma_u |  .97621167
     sigma_e |  .45061551
         rho |  .82435407   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4, 45) =     2.25                 Prob > F = 0.0785

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (5)  =       82.76
Prob>chi2 =      0.0000


. ssc install xtserial
ssc install: "xtserial" not found at SSC, type -findit xtserial-
(To find all packages at SSC that start with x, type -ssc describe x-)
r(601);

. findit xtserial

. xtserial  gfddei04 x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate

Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,        4) =     11.531
           Prob > F =      0.0274

. regress  gfddei04 x1fi x2cpi x3_lngdp x4incomegroup x5realinterestrate,
robust cluster (code)

Regression with robust standard errors                Number of obs =      54
                                                      F(  3,     4) =       .
                                                      Prob > F      =       .
                                                      R-squared     =  0.8404
Number of clusters (code) = 5                         Root MSE      =  .47795

------------------------------------------------------------------------------
             |               Robust
    gfddei04 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1fi |  -.1832809   .0637319    -2.88   0.045    -.3602291   -.0063327
       x2cpi |  -.0371316   .0148135    -2.51   0.066    -.0782605    .0039973
    x3_lngdp |   .3390739   .1303911     2.60   0.060      -.02295    .7010978
x4incomegr~p |  -1.654607   .1990385    -8.31   0.001    -2.207226   -1.101987
x5realinte~e |   .0344831   .0261303     1.32   0.257    -.0380662    .1070323
       _cons |  -2.209241    3.57816    -0.62   0.570    -12.14381    7.725324
------------------------------------------------------------------------------

.
```

APENDIX C

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
eff	55	.00	6.78	3.5238	1.65993
fi	55	-1.19	2.39	.2838	1.28605
cpi	55	62.18	124.39	96.7704	12.49534
gdp	55	25.20	27.50	26.2927	.55406
RIR	55	-5.29	10.63	3.1110	2.98297
Valid N (listwise)	55				

APENDIX D

	Y=BNI	*X1= FI*	*X2=CPI*	*x3_LNGDP*	*X4=Income Group*	*X5=Real interest rate*
Y=BNI	1					
X1= FI	-0.103281705	1				
X2=CPI	-0.337319665	-0.19439	1			
x3_LNGDP	0.368853309	-0.13879	0.551822	1		
X4=Income Group	-0.747424625	0.106775	0.138206	-0.25413	1	
X5=Real interest rate	-0.055725819	-0.04532	0.272644	0.145463	-0.085441879	1