COST EFFICIENCY AND RISKS
OF COMMERCIAL BANKS
IN EAST ASIA AND PACIFIC
REGION

Thi Minh Thu PHAN

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DBA thesis

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OF COMMERCIAL BANKS IN THE
EAST ASIA AND PACIFIC REGION

Student: **Thi Minh Thu Phan**

Supervisory Panel: **Associate Professor Kevin Daly**

                                    Dr. Linda Wu

Statement of Authentication

The work in the thesis has been prepared by me to partially fulfil the requirements of the Doctor of Business Administration at the University of Western Sydney.

I hereby declare that the work is a result of my own research, except where due acknowledgement is made. It is an original work and I have not submitted this material, either in whole or in part, for a degree at this or any other institution.

Signed:

Date: March 2015

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Preface

Research papers derived from this thesis have been published in refereed journals or presented at international conferences.

Journal

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Conferences

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Abstract

The financial system plays an important role in modern economies and the intermediary function of the banking industry has a core role in influencing economic growth. It is essential to understand and manage the efficiency of financial intermediation, especially within banks. Another issue related to bank efficiency is risk management and the effects of risk on efficiency. The interrelationship between risks and bank efficiency has received much attention in recent years, especially since the Asian Financial Crisis in 1997 and the Global Financial Crisis (GFC) in 2008.

Based on the World Bank's categories, the East Asia and Pacific area's includes countries and economies ranging from China to the Pacific Islands. With nearly 40 countries and geographic entities, this wide area contains diverse landscapes, climates, societies, cultures, religions and economies. Despite the challenging external environment, the World Bank says this area, which includes representatives from all levels of economic development (underdeveloped, developing and developed economies), continues to be the world's growth engine (World Bank, 2014).

This study examines the relationship between risks and environmental factors and bank cost efficiency by comparing developing and developed economies in a specific geographic area. Stochastic Frontier Analysis (SFA) was employed to estimate efficiency and Tobit regression was applied to examine the effects of credit, operational and liquidity risks and environmental factors on bank efficiency both before and after the 2008 GFC. The research sample covers both the developed and developing economies in East Asia (China, Indonesia, Malaysia, the Philippines, Thailand and Vietnam) and the Pacific region (Australia, Hong Kong, Japan, Korea, New Zealand and Singapore). There are two main stages in the analysis represented by measuring banks' cost efficiency and examining the relationship between cost efficiency and risks.

The overall average efficiency scores from the first stage of the research indicate that the observed banks could have produced their outputs using sixty two per cent of their actual inputs. This is not a high score when compared with previous studies of countries in the area with the same level of development. Comparing the scores between groups of economies produced a surprising result, with the mean efficiency scores of developing countries represented in the research being up to twenty per cent higher than those of developed countries.

In the second stage, the study focused on the effects of three kinds of risk (credit risk, operational risk and liquidity risk) on bank cost efficiency in the same countries' banking systems. It found significant negative effects on banks' efficiency for the three kinds of risk. However, there were differences between developed and developing economies. The research also confirmed that the environmental factors had significant effect on the banking system as most of the control variables had significant effects, at the one per cent or five per cent level, except for gross domestic product (GDP). There were different effects in the periods before and after the 2008 GFC.

 The findings of this study have several implications for policy makers, regulators, and bankers, especially in the observed area. First, X-efficiency can provide a quantitative tool for ranking and monitoring banks through their efficiency levels. Second, with regard to risk management, policy makers need to implement the Basel Accords, to guide banks in controlling risks and thus boosting the efficiency of banks in the region and keeping the banking systems of the East Asia and Pacific region safe. Finally, this study finds that some environmental factors, such as GDP per capita, consumer price index, interest rate, capital requirement, are important determinants of bank performance. It also indicates that policy makers need to ensure a mature and stable situation of their countries' economies in order to boost the efficiency level of commercial banks. This is crucial because the banking industry serves as the main channel for monetary policy transmission in the developing countries.

List of Abbreviations

BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BMI	Business Monitor International
CPI	Consumer Price Index
DEA	Data Envelopment Analysis
DFA	Distribution Free Analysis
GDP	Gross Domestic Product
GDP (PPP)	Gross Domestic Product (in purchasing power parity)
GFC	Global Financial Crisis
IMF	International Monetary Fund
OECD	Organisation for Economic Cooperation and Development
ROA	Return On Asset
ROAV	Return On Asset Volatility
ROE	Return On Equity
SFA	Stochastic Frontier Analysis
SBV	State Bank of Vietnam
TFA	Thick Frontier Analysis
US	United Nations
LLRGL	Loan loss reserves over gross loan
ETA	The ratio of equity over total assets
CDTA	The ratio of cash and due from banks to total assets

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Chapter 1: **Introduction**

1.1 Research directions: Cost efficiency and risks of banks

The important role of the financial system, especially the banking industry with its intermediary function, in modern economics and their influences on economic growth has been confirmed in the previous theories related to economics (Klein, 1971; Schumpeter, 1934). Therefore, there is a long conventional attention of the research community on both the theoretical and empirical level of banks' efficiency which refers to the ability of banks to generate revenue from a given number of assets and make a profit from a given source of income (EuropeanCentralBank, 2010). In addition, the effectiveness of a banking system is evaluated by its ability not only to provide services but also to maintain the stability of the whole system (Ngo, 2012). Understanding and managing the efficiency of financial intermediation beneficial for both the banking industry and economic development (Berger, Hunter & Timme, 1993), as well as better profit for stakeholders. Regarding to a guidance note on stakeholders analysis of World Bank, "a stakeholder is an entity with a declared or conceivable interest or in a policy concern". Stakeholders of banks can be individuals, organizations, or unorganized groups, such as bank employees, customers, business partners and suppliers, government, and non-government organizations, etc. (Standard Chartered Bank). Beside managing efficiency, another related issue is risk management and the effects of risk on efficiency.

One of first tasks for managing efficiency is measuring it that has been a long history, especially in banking field. There are many ways to measure efficiency. Among those, ratio analysis, scale and scope efficiencies, and X-efficiency are three most popular approaches. Because of overcoming the limitations related to comparing bank efficiency of the two first methods, the third one, X-efficiency were recently got more concerns and applied to many studies. Two outstanding features of the X-efficiency approach are Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). SFA with its functions on decomposing the residual of the frontier into the inefficiency and the noise by using explicit assumptions about the

inefficiency component's distribution (Irsova & Havranek, 2011) has overcome DEA that has disadvantages of attributing measurement errors and other noise to the efficiency scores, which can cause the inefficiency estimated to be overstated (Wezel, 2010) to be applied in the literature. Empirical studies on bank efficiency have been conducted by using data from the banking industry around the world in both individuals and cross-countries.

Risk management and the effects of risk on efficiency is another issue that has been a long conventional focus in the literature. It is necessary to understand risk's categories that have been different from scholars and analysts before study on managing them. One of category that covers almost kinds of risk is from Cornett and Saunders's 2003 textbook with 10 kinds of risk, including interest risk, market risk, credit risk, off-balance-sheet risk, technology risk, operational risk, foreign exchange risk, country or sovereign risk, liquidity risk and insolvency risk. Because risk can transfer across economies and banking systems via intermediation, risk management has become a key area of banks' activities (Allen & Santomero, 1997). For the same reason, the interrelationship between risks and bank efficiency has got more concern recently, especially following the Asian Financial Crisis in 1997 and the Global Financial Crisis in 2008.

1.2 Research context: East Asia and Pacific economies

According to World Bank, the East Asia and Pacific is an area include nearly 40 countries and geographic entities from China to the Pacific Island, which includes diversified landscapes, climates, societies, cultures, religions and economies (World Bank, 2014). Regarding to the economic aspect, this region remains the world's growth engine despite a challenging external environment and has enjoyed remarkable economic growth, except Japan, in the last few decades. In detail, several economies have been experiencing rapid changes in economic development, population growth and urbanisation, social transformation and technological development (World Bank, 2014). In addition, the East Asia and Pacific region has emerged as the largest recipient of capital flows in the developing world and their financial market and banking sectors become a core role in the world financial market (APFED, 2005). The differing stages of economic development and the

variations in financial sector structure within the Asia-Pacific region are reflected in the different characteristics of every economy in the region.

The East Asian Financial Crisis in 1997–1998 revealed substantial vulnerabilities in the financial sector; such as excessive borrowing, weak regulatory and supervisory frameworks, and concentrated bank ownership and family control of banks. To overcome that crisis, economies in the region have made significant progress in running current account surpluses and building up large exchange reserves, as an insurance policy against crises. They have also sought to strengthen the fundamentals, in particular the financial sector, for example the capital adequacy, asset quality, and profitability of banks; or the development and diversification of equity and bond markets (World Bank, 2007).

The Global Financial Crisis (GFC) began in the US in 2007 with the collapse of the subprime mortgage market and spread to Europe and the emerging countries as the global interbank market ceased functioning from early October 2008 (Bordo, 2008). According to a recent International Monetary Fund (IMF) report, the region is now well positioned to meet the challenges ahead, has strengthened its resilience to global risks and will continue as a source of global economic dynamism. However, because of the risk of future volatility, the region needs to nurtured its reform to secure the position as a global growth leader (IMF, 2014).

We also choose the Vietnamese banking system as a convenient sample for the first stage of applying the model on a specific dataset. That preliminary study is presented in this thesis as a case study on Chapter 6.

1.3 Research problems and the reasons for conducting the study

A review of the banking literature reveals that many reviewed papers have used the data from the banking industry around the world, especially in the US, Europe and emerging Asian countries; however, few of these have compared the level of bank efficiency and risks relations in developing and developed countries. In addition, it is also necessary to explore the effects of macroeconomic factors and of financial market shocks, on banks' activities.

The Asia-Pacific region is the most densely populated region in the world and the most diverse in natural and socio-cultural conditions. As an emerging region with diversified resources, the region will continue to be faced with challenges, but could turn them into opportunities by building on the region's strengths. As highlighted in the World Bank's statement, this area remains the world's growth engine despite the challenging external environment. Given the key role of banking system in boosting economic development, it's very important to study bank cost efficiency and its relationship with bank risks in this region.

1.4 Research objectives

This study aimed to examine the relationship between risks and environmental factors and bank cost efficiency, by comparing developing and developed economies in a specific geographic area. SFA was employed to estimate efficiency and Tobit regression was applied to examine the effects of credit, operational and liquidity risks and environmental factors on bank efficiency both before and after the 2008 GFC. The research studied representatives of both developed and developing economies in East Asia (China, Indonesia, Malaysia, the Philippines, Thailand and Vietnam) and the Pacific region (Australia, Hong Kong, Japan, Korea, New Zealand and Singapore). There were two main stages in this study: measuring banks' cost efficiency and examining the relationship between cost efficiency and bank risks.

The first stage focused on the efficiency of the banking system in the East Asia and Pacific area, based on the data of the 12 developed and developing economies mentioned above. Analysing the data of 247 commercial banks, over the period of 2003-2012, compared the cost management levels of the two groups of economies in this area. This study also conducted a preliminary examination of the effect of the 2008 GFC on cost efficiency scores.

The second stage focused on the effects of three kinds of risk (credit risk, operational risk and liquidity risk) on bank cost efficiency in the same countries' banking systems. It also attempted to identify the effects of some environmental factors on banking activities. Four macroeconomic indicators were employed as control

variables at both the country and bank level: the growth of domestic product, inflation, market interest rate and the capital requirement for banks.

The structure of the rest of this thesis is as follows:

- Chapter 2: Literature review on cost efficiency and the risks of banks
- Chapter 3: Overview of banking systems in the East Asia and Pacific area
- Chapter 4: Cost efficiency of East Asia and Pacific banks
- Chapter 5: The effects of risks on bank cost efficiency in East Asia and Pacific economies
- Chapter 6: A case study of bank cost efficiency and risks in Vietnam
- Chapter 7: Conclusions and Recommendations
- References

Chapter 2: Literature Review on Cost Efficiency and the Risks of Banks

2.1 Introduction

The financial system plays an important role in modern economies and the intermediary function of the banking industry has a core role in influencing economic growth (Klein, 1971; Schumpeter, 1934). For this reason, the efficiency of banks has long been a conventional focus at both the theoretical and empirical level. In this context, efficiency refers to the ability of banks to generate revenue from a given number of assets and make a profit from a given source of income (European Central Bank, 2010). In terms of the industrial level, the effectiveness of a banking system is demonstrated by its ability to provide services and maintain the stability of the system (Ngo, 2012). It is essential to understand and manage the efficiency of financial intermediation, especially within banks, as improvements in efficiency can lead to increases in profitability and the number of funds intermediated, as well as suitable prices and better service for customers. This is beneficial for both the banking industry and economic development (Berger, Hunter & Timme, 1993). Another related issue is risk management and the effects of risk on efficiency.

Measuring the efficiency of a firm or a financial institution has a long history. The three most popular approaches are ratio analysis, scale and scope efficiencies, and X-efficiency. The first two methods have limitations regarding measuring and comparing bank efficiency and were recently replaced by the third approach. Two outstanding features of the X-efficiency approach are Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). DEA has been applied in many studies measuring bank efficiency, but it has the disadvantage of attributing measurement errors and other noise to the efficiency scores, which can cause the inefficiency estimated to be overstated (Wezel, 2010). SFA overcomes this limitation and decomposes the residual of the frontier into the inefficiency and the noise by using explicit assumptions about the inefficiency component's distribution (Irsova

&Havranek, 2011). Empirical studies on bank efficiency have been conducted by using data from the banking industry around the world in both developed and developing countries. For example, studies have been conducted in Europe by Dietsch and Lozano-Vivas (2000), Maudos, Pastor, Pérez & Quesada(2002) and Resti (1997). Other research has been conducted in Japan (Hensel, 2006), Australia (Shamsuddin & Xiang, 2010), across countries (Berger & Humphrey, 1997; Pasiouras, Tanna & Zopounidis, 2009), and in emerging markets such as India and East Asia (Dang-Thanh, 2010; Gardener, Molyneux & Nguyen-Linh, 2011; Kalluru & Bhat, 2009; Sufian, Majid & Zulkhibri, 2007; Vu & Turnell, 2010). Most of these studies have applied two approaches to measuring bank efficiency: DEA and SFA. SFA has been dominant in recent applications because of its advantage over DEA in terms of assuming statistical noise (Sun & Chang, 2011).

Another issue related to bank efficiency is risk management and the effects of risk on efficiency. Scholars and analysts have recently grouped banking risk into various categories. According to Cornett and Saunders's 2003 textbook, there are 10 kinds of risk: interest risk, market risk, credit risk, off-balance-sheet risk, technology risk, operational risk, foreign exchange risk, country or sovereign risk, liquidity risk and insolvency risk. Risk management has become a key area of banks' activities because risk can transfer across economies and banking systems via intermediation (Allen & Santomero, 1997). The interrelationship between risks and bank efficiency has received much attention in recent years, especially following the Asian Financial Crisis in 1997 and the Global Financial Crisis in 2008. Studies on this subject have been conducted in Europe, Japan and emerging Asian countries by Berger and DeYoung (1997), Altunbas, Evans and Molyneux (2001), Fiordelisi, Marques-Ibanez and Molyneux (2011) and Sun and Chang (2011).

2.2 Role of banks as an intermediary in the financial market and the economy

As mentioned earlier, financial systems play an important role in the economy because of their intermediate functions. In his 1934 book, Schumpeter explored the relationship between a financial system and economic growth. A financial system

acts like a 'bridge' for transferring savings from depositors to capital borrowers. Through its usual activities in mobilising funds, providing loans, monitoring borrowers, controlling risks and facilitating transactions, a financial system has a direct effect on the capital flows of an economy. It is confirmed that scarcity of capital is a severe constraint for economic development (Schumpeter, 1934).

The banking industry's core role in financial systems therefore has a strong influence on a country's economic growth. In his 1971 article, Klein highlighted the importance of banks both as a major financial intermediary and as a necessary link between industries in the economy. A study by Thoraneenitiyan and Avkiran (2009) found that the financial system is usually dominated by commercial banks, especially in emerging economies. They showed that numerous studies have identified the effects of a bank's performance on economic growth as well as the result of a bank's insolvencies, due to systemic crises related to the economy as a whole. A low-efficiency banking system has a strongly negative effect on growth and even the existence of other industries in the economy (Allen & Santomero, 1997). The financial crises in Asia (1997–1998) and in the US (2007–2008) proved these effects, with their serious consequences for the growth of East Asian countries. In addition, because the developing Asian countries have a much higher share of world trade and production, a sharp decline in their growth rates and a strong decrease on their demand make it difficult for countries throughout the world (Akyüz, 1998). The 2008 GFC forced both developing and developed countries throughout the world into economic recession (Naudé & Research, 2009).

2.3 Cost efficiency of banks
2.3.1 The importance of understanding bank efficiency

Efficiency is a term that is commonly used in many aspects of life, such as technology, social science, and so on. In the context of economics, efficiency that shows the targets a firm has achieved can be a tool for assessing and comparing the operations of the firm. As mentioned earlier, bank efficiency refers to the ability of a bank to generate revenue from a given amount of assets and make a profit from a given source of income (EuropeanCentralBank, 2010), and the effectiveness of a

banking system can be confirmed through its ability to provide services and maintain the stability of the system (Ngo, 2012).

The performance of banks is a major interest for the various stakeholders, such as bankers, customers, policy makers, investors and the general public (Thoraneenitiyan & Avkiran, 2009). A review of the literature of the last decades shows that bank efficiency has been a popular topic of research from a number of viewpoints. From the point of view of the banker, efficiency has become a crucial concern because of competitive pressure and regulation changes. At the macroeconomic level, reducing the costs of financial intermediation for transferring funds from savers to producers has been an issue for the financial market as well as a socially optimal target. Consequently, central banks have tried to increase their control of the market. With regard to academic research, empirical research has explored and applied some econometric quantitative tools(Resti, 1997).

2.3.2 Measurements of bank efficiency

The efficiency and competitiveness of the banking system is not easy to measure because of the intangibility of its products and services (Kosmidou & Zopounidis, 2008). As mentioned earlier, the efficiency of firms in general, and of banks in particular, has been measured through ratio analysis, scale and scope efficiencies, and X-efficiency.

For the traditional method, ratio analysis, basic analysis of bank financial statements is used to measure a bank's performance. This method aims to forecast future movements in stock performance and design investment strategies. Accounting indicators, such as return on assets (ROA), return on equity (ROE), cost-to-income ratio, and net interest margin, are used to measure the bank's efficiency(European Central Bank, 2010). The ROA is the net income for the year divided by the average total assets. The ROE is the ratio of net income over the average total equity. The cost-to-income ratio, calculated by the fraction of total operating expenses to total operating revenues, shows the ability of a firm to generate profits from a given revenue stream. The net interest margin, related to the ratio of net interest income and total assets, represents the performance of the intermediary function

(EuropeanCentralBank, 2010). Of these, the ROE is the most effective measure of performance because it directly relates to the shareholders' value, is easy to calculate from public information and is easy to compare between firms. Although these measurements have been widely used for a long time, they no longer support the view that differences in banks' efficiency can lead to the existence of a low competitive level. This is the main reason for questioning the suitability of accounting indicators in measuring the productive efficiency of banks (Maudos et al., 2002). This type of assessment isolated a firm from their industry group and the market as a whole and when this method failed to compare the benefits among firms, it became less popular for use in assessing competitive trends(Thoraneenitiyan & Avkiran, 2009). In addition, ratio analysis focuses only on the ratios between two variables, which cannot cover the effects of variation determinants in relation to bank efficiency (Dang-Thanh, 2010).

Scale and scope economics in banking have been studied extensively. From this viewpoint, bank efficiency is examined by utilising the trans-log cost functions, which solves the problems experienced with using ratio analysis. The idea of this method is relating bank costs to output levels and input prices, to estimate an average practice cost function(Berger & Humphrey, 1992). However, the conventional studies on this trend are beset by a numbers of problems, including in the fact that it gives a poor approximation when applied to banks of different sizes and that have diverse products (Berger et al., 1993; Thoraneenitiyan & Avkiran, 2009).

From the 1990s, studies in the field of bank efficiency started to focus on the X-efficiency method, which overcomes the shortcomings of these other approaches. X-efficiency analysis can show an approximation in comparing the efficiency of banks of all sizes. In addition, it can evaluate the efficiency of an individual bank through a multi-variables aspect, unlike the scale and scope economics view (Berger et al., 1993; Dang-Thanh, 2010). In particular, this method estimates deviations in performance to confirm best-practice firms on the efficient frontier and adds a number of exogenous market or environmental factors, such as economic growth, GDP per capita, etc. into its estimation. There is evidence that the banking system is very sensitive to macro-economic conditions (Allen & Rai, 1996; Berger & Mester, 1997; Thoraneenitiyan & Avkiran, 2009). Thus, the analysis of X-efficiency has

recently replaced economies of scale and scope as the main method for empirical research (Maudos et al., 2002).

Recently, a number of studies have focused on measuring the X-efficiency of banks around the world through two main approaches: nonparametric and parametric. Nonparametric frontiers approaches include DEA, by Charnes, Cooper and Rhodes (1978); and Free Disposal Hull (FDH), by Desprins, Simar and Tulken(1984). These approaches, which impose no structure on the specification of the best-practice frontier, have the advantage of being computationally simple. DEA represents a linear programming approach to efficiency analysis, in which the piecewise linear combinations connect the set of best-practice observations, yielding a convex production possibilities set. Therefore, it does not require the explicit specification of the underlying production relation (Thoraneenitiyan & Avkiran, 2009). There are two traditional DEA models. The first one, known as the Charnes Cooper Rhodes (CCR) model, was developed by Charnes et al. (1978) and assumes constant returns to scale. The second one, called the Banker Charnes Cooper (BCC) model, was developed later by Banker, Charnes and Cooper (1984) and assumes variable returns to scale.

Three main parametric frontier approaches have been widely used in previous studies: SFA, Distribution Free Analysis (DFA) and Thick Frontier Analysis (TFA) (Berger et al., 1993). Although SFA and DFA both assume a functional form for the production of cost frontier, they separate the inefficiencies from random errors in a different way. The DFA approach has overcome SFA's shortcomings related to the strict assumption of a particular functional form and of the distribution of the non-random error terms by not imposing a certain production function. However, it required a strong assumption related to a constant situation of efficiency over periods, which is not suitable for transition economy conditions (Wezel, 2010). In the efficiency literature, SFA, which was independently developed by Aigner, Lovell & Schmidt (1977) and Meeusen and Van den Broeck (1977), is one of the most common econometric methods applied. As explained earlier, SFA decomposes the residual of the frontier into the inefficiency and the noise by using explicit assumptions about the inefficiency component's distribution (Irsova & Havranek, 2011). On the other hand, the TFA assumes a functional form for deviations from

predicted performance values within the highest and lowest performance quartiles of observations representing random error (Berger & Humphrey, 1992; Shaffer, 1993; Thoraneenitiyan & Avkiran, 2009).

In summary, both parametric and nonparametric-parametric frontier approaches have advantages as well as disadvantages. DEA has been applied in many studies to measure the efficient levels of the banking industry in Asian countries and emerging markets (Chansarn, 2008; Gardener et al., 2011; Hung, 2007; Quang & De Borger, 2003), and in developed countries (Miller & Noulas, 1996; Sherman & Gold, 1985; Wu, Yang, & Liang, 2006). However, as mentioned earlier, nonparametric frontiers approaches, especially DEA, have the disadvantage of attributing measurement errors and other noise to the efficiency scores, which can cause the overstatement of inefficiency (Wezel, 2010). Stochastic frontier approach (SFA) is one of three main parametric frontier approaches that overcome the DEA disadvantage by modifying the traditional assumption of a deterministic production frontier (Sun & Chang, 2011). On the other hand, parametric frontier approaches still have a major disadvantage in requiring an explicit functional form for the technology and specific distributional assumptions for the error term (Thoraneenitiyan & Avkiran, 2009). Several studies (Erkoc, 2012; Wezel, 2010) showed the superiority of SFA over to the DEA through empirical data. Those studies also showed the preferences of researchers in choosing a specific approach in terms of the trade-off between mis-specification bias (in SFA) and measurement error (in DEA) (Erkoc, 2012; Wezel, 2010). Because of its advantages, SFA has been widely used in recent studies (Kalluru & Bhat, 2009; Kwan, 2006; Pasiouras et al., 2009; Shamsuddin & Xiang, 2010 and; Tabak & Langsch Tecles, 2010). In summary, the stochastic frontier approach (SFA) is one of the most suitable approaches for measuring the bank efficiency and is chosen to measure bank efficiency for this study.

Research on banks' efficiency has attracted both theoretical and empirical interest and many empirical studies have tried to identify the determinants of bank efficiency and to measure their efficiencies, in both developed countries and developing countries around the world. In terms of the theoretical aspect, although traditional theories of financial intermediation have been built on the models of resource allocation based on perfect and complete markets, contemporary banking theory has

shown that the unresolved issues remain, through an excellent survey on the current state of banking literature by Bhattacharya and Thakor (1993) as well as research conducted by Santomero (1984).

Several studies in France, Spain, Italy and cross-European countries (Dietsch & Lozano-Vivas, 2000; Maudos et al., 2002; Resti, 1997) have tested the effects of the environment and regulation on banks' efficiency. They found that regulations that restrict bank activity and improve both cost and profit efficiency but there still questions about the effects of other environmental factors (Maudos et al., 2002; Resti, 1997). A study by Resti (1997) employed two separate streams in research on bank efficiency (econometric studies and DEA), to measure the performance of 270 Italian banks. This found that the results of the two methods do not differ dramatically when based on the same data set and conceptual framework. Another study on the European banking system (Pastor 2002) also applied DEA, comparing bank efficiencies among four developed European countries. The results showed that Spain and Germany had the most efficient banking system over the 1992–1994 period, followed by France and then Italy (Pastor, 2002). Some studies have attempted to measure the efficiency of banks in other developed countries, such as Japan (Hensel, 2006), Australia (Shamsuddin & Xiang, 2010), or across countries (Berger & Humphrey, 1997; Pasiouras et al., 2009). In their study of the Australian context, Shamsuddin and Xiang (2010) employed the SFA model to estimate three kinds of efficiency: profit, cost and technical efficiency. This study also compared the levels of those efficiencies between two groups of banks over the period 1985–2008 in terms of size: large and small. They found that while there was no difference in profit efficiency between bank groups, large banks were in a higher cost efficiency level and lower technical efficiency level than small banks (Shamsuddin & Xiang, 2010). Among a few cross-country studies, Pasiouras et al. (2009) use the largest sample with 4,960 bank-year observations from 752 publicly quoted commercial banks operating in 87 countries over the period 1999–2006. They estimated both the cost and profit efficiency of banks and also examined the effects of environmental factors on bank efficiencies at country level. Barth,Lin, Ma, Seade and Song(2013 examined bank efficiency and explored some of its determinants by analysing an unbalanced panel data of 4,050 bank observations in 72 countries over the period 1999–2007. The authors also investigated the effect of the 2008 GFC on bank

efficiency but the limitation in their data period to 2007 did not permit them to come to any conclusions on that topic. Most of the reviewed studies were limited to 2009 and could not explore the effects of the GFC on bank efficiency.

As there were differences between the developing levels, the results of the above studies could not be applied totally to developing countries or emerging markets. Therefore there was a need for research on banks' efficiency to explore the specific factors that affect the development of banks in emerging markets, such as India, and the East Asian market (Dang-Thanh, 2010; Gardener et al., 2011; Kalluru & Bhat, 2009; Sufian et al., 2007; Vu & Turnell, 2010). A review of studies of bank efficiency in a sample of banks in emerging or developing countries shows the use of both the DEA and SFA models. While the DEA was employed in studies of Thailand (Chansarn, 2008), Poland (Havrylchyk, 2006) and Vietnam (Hung, 2007; Dang-Thanh, 2010), SFA was applied in studies conducted in China, Vietnam, United Arab Emirates, and so on (Jiang, Yao & Feng, 2013). As they were mostly published before 2010, these studies did not have enough data to describe the current efficiency of the banking industry for the period after the 2008 GFC. Even a 2011 publication by Sun and Chang, which examined the effects of the GFC on bank efficiency in eight Asian emerging countries lacked sufficient data, as they only collected data for the period 1998–2008. There appear to be only a few studies (Sun and Chang, 2011) that have employed SFA for measuring and comparing the bank efficiencies of developing and developed economies in a same data set, especially for the post-GFC period.

2.4 Bank risks and bank risk management
2.4.1 Risk and the risks of banks

In economics and other social sciences, 'risk' is a term that indicates something could potentially happen in the future and is related to the unexpected effects of that on risk recipients (Dam, 2010). Whatever way the term is used, risk is usually defined in ways that imply negative effects. For example, the Oxford Advanced Learner's defines risk as: 'The possibility of something bad happening at some time in the future, a situation that could be dangerous or have a bad result' (Hornby, 2005, p. 1313). However, risk can be defined in a more open way, especially in economics,

where people can take a risk in a transaction with the expectation of a higher financial return. In economics, 'risk' has been defined as the combination of a probability of an event and its consequences that contain both potential opportunities of success and threats of failure. The banking business, compared with other types of business, is substantially exposed to risks through their natural activities as an intermediation. Banks manage risk to increase the opportunities and decrease the threats within their activities (Cross, 1995).

Scholars and analysts have recently grouped banking risk into various categories. Santomero (1997) divided risk into six types, based on the services provided by banks: systematic or market risk (interest rate risk), credit risk, counterparty risk, liquidity risk, operational risk and legal risks. Some of these groups overlap; for example, credit risk and counterparty risk are quite alike. In their book, Mark, Galai and Crouhy (2005) classified risks into eight different groups: credit risk, market risk, liquidity risk, operational risk, legal risks, strategic risk, business risk and reputation risk. This classification is quite comprehensive, although not specifically related to only banks (Mark et al., 2005). There is an agreement between two mentioned categories related to some main kinds of risks, including credit risk, market risk and operational risk. These main risks are also grouped and classified under the first 'pillar' in the Basel Accords, issued by the Basel Committee on Bank Supervision;[1] all other risks are defined and grouped under the second 'pillar' of the Accords (Dam, 2010). As mentioned earlier, Cornettand Saunders's textbook (2003) lists 10 types of risk: interest risk, market risk, credit risk, off-balance-sheet risk, technology risk, operational risk, foreign exchange risk, country or sovereign risk, liquidity risk and insolvency risk. The following paragraphs include in-depth definitions of each type of risk.

In the banking system, 'credit risk' is directly related to the traditional functions of a bank and is 'the risk that promised cash flow from loans and securities held by financial institutions may not be paid in full'(Cornett & Saunders, 2003, p158). Throughout history, banks have managed this risk as a main part of their business. However, since the Bank for International Settlements (BIS) Accord first set out a formalised universal approach to credit banks, it has become one of the greatest

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[1]These are explained further in the next section.

concerns of scholars, analysts and empirical managers. Based on that first BIS Accord, banks were required by their regulators to set aside a flat fixed percentage of their risk-weighted assets as regulatory capital against default (Crouhy, Galai & Mark, 2000). More formally, 'credit risk arises whenever a lender is exposed to loss from a borrower, counterparty, or an obligor who fails to honour their debt obligation as they have agreed or contracted'(Dam, 2010). In the operation of the banking industry, credit failures are not rare and they have direct, critical effects on various aspects of a bank, such as the bank's liquidity, cash flows, profitability and eventually, reputation, which is why credit risk management has become a hot topic of debate. As well as research on credit risk management in developed countries, such as Europe and the US (e.g. Fiordelisi et al., 2011; Pastor, 2002), this topic also has been researched by using cross-countries data (e.g. Ali & Daly, 2010; Berger & DeYoung, 1997; Bonfim, 2009) and in emerging-market economies (Dam, 2010; Godlewski, 2005).

Since 1998, based on the Basel Accord II, banks have been required to hold additional capital against market risk. Market risk is the risk that any changes in financial market prices and rates will reduce the value of a security or a portfolio. It can be defined as 'the risk incurred from assets and liabilities in a financial institution's trading book due to changes in interest rates, exchange rates, and other prices'(Cornett & Saunders, 2003,p158). Market risk has recently become an issue of concern in the banking field because of its relationship with other systematic factors. The four major types of market risk are interest rate risk, equity price risk, foreign exchange risk and commodity price risk. These risk market components are concerned with volatility in the prices of capital, equity, currency and commodity (Crouhy et al., 2000).

Another type of risk that has recently concerned banks is operational risk. Although this kind of risk may represent a significant share of a bank's total risk, it has only recently been added to the risk catalogue of the Basel Accord. One definition of operational risk is: 'the risks that existing technology, auditing, monitoring, and other support systems may malfunction or break down'(Cornett & Saunders, 2003, p158). However, operational risk is still not a well-defined concept and is not easy to measure. In the context of intermediation activities, it refers to a wide range of

possible failures in the operation of the organisation that are not directly related to market or credit risk. Operational risks are associated with inadequate systems, management failure, faulty controls and human errors (Crouhy et al., 2000).

Liquidity risk is a major risk that banks face, as debt maturity transformation is one of their key business areas. Cornett and Saunders define it as: 'the risk that a sudden surge in liability withdrawals may require a financial institution to liquidate assets in a very short period of time at less than fair market prices'(2003, p158). This risk happens when a bank 'will not be able to meet its current and future cash flow and collateral needs, both expected and unexpected, without materially affecting its daily operations or overall financial condition'(Lopez, 2008). In their 2013 guidance on liquidity risk management, the Basel Committee noted that a liquidity shortfall at a single institution can have system-wide repercussions and financial market developments in the past decade have increased the complexity of liquidity risk and its management (BIS, 2013).

Other kinds of risks noted by Cornett and Saunders (2003, p158) included interest rate, off-balance-sheet, technology, foreign exchange, country or sovereign risk and insolvency risk. Interest risk is 'the risk incurred by a financial institution when the maturities of its assets and liabilities are mismatched'. Off-balance-sheet risk is defined as 'the result of activities related to its contingent assets and liabilities held off the balance sheet. Technology risk occurs when a financial institution's technological investment cannot produce the anticipated cost savings. Foreign exchange risk occurs when the value of the assets and liabilities of a financial institution dominated by nondomestic currencies is affected by changes in the exchange rate. One systematic risk that has a significant effect on banks' activities is country or sovereign risk, which occurs when 'repayments to foreign lenders or investors may be interrupted because of the restrictions, interventions, or interference from foreign governments'. Finally, insolvency risk occurs when a financial institution 'may not have enough capital to offset a sudden decline in the value of its assets'.

This study focuses on two of the three main types of risks that are defined in the first pillar of Basel Accord II: credit risk, operational risk and liquidity risk, all of which

can cause crisis contagion in financial markets. These three major risks can have a significant effect on banks' activities as a whole and on bank efficiency in particular.

2.4.2   Bank risk management and the Basel Accords

Risk management has become a key area of banks' activities because of the nature of their risk transferring through their normal functions as an intermediation. Intermediaries, especially banks, are defined as risk businesses when they provide financial service, manage and trade risk between participants in a financial market (Allen & Santomero, 1997). The Basel Committee (2001) defines financial risk management as a sequence of four processes: the identification and classification of events into risk categories or subcategories (e.g. credit, market, operational or other risks); the assessment of risks using data and a risk model; the monitoring and reporting of the risk assessments on a specific period; and the implications for controlling these risks (Alexander, 2005). The operation of banks has grown over the last two decades. On the one hand, they have to make larger loans with longer maturities to lower credit-quality customers. On the other hand, banks' customers have been demanding more complicated ways to invest their capital. Accordingly, banks have provided more new products and services in a strongly competitive and risky environment. Risk has become a major consideration in taking advantage of an investment opportunity and the trading of risk appears to have become central to the role of intermediation (Allen & Santomero, 1997; Crouhy et al., 2000). Therefore, the need to understand and practise risk management in the banking industry is undisputed.

In the attempt to build a framework for risk management at both the country and institution level, and in response to disruptions in the internal financial market after the breakdown of the Bretton Woods system, a Committee on Banking Regulations and Supervisory Practices was established in 1974, at first with 10 members from the central bank governors of the G10 countries. Later renamed as the Basel Committee on Banking Supervision (BCBS) and expanded to G20 major economies in 2009, and then to 27 jurisdictions, the Committee was formed as a forum related to banking supervisory matters for its members. The main aim of this forum is 'to enhance

financial stability by improving supervisory knowhow and the quality of banking supervision worldwide (BIS, 2013).

Instead of creating a framework with legal power, the Committee formulates supervisory standards and guidelines and recommends statements of best practice for the individual national authorities to implement. A set of agreements set by the BCBS, which provides recommendations on banking regulation in relation to capital risk, was first approved and released to banks in 1988, called the Basel Capital Accord or the 1988 Basel, or more recently, Basel I. The purpose of the Accord was to ensure that financial institutions have enough capital to absorb unexpected losses. The Basel I focused on the capital adequacy of financial institutions and called for a minimum capital ratio of capital to risk-weighted assets of 8 per cent to be implemented by the end of 1992. The 1988 capital framework was always intended to evolve over time and was refined in 1996 to address risks other than credit risks; in particular, it incorporated a capital requirement for the market risks. This amendment also allowed banks to use the internal value-at-risk (VAR) model as a basis for measuring their market risk capital requirements (BIS, 2013).

In 1999, the Committee proposed a new capital adequacy framework to replace the Basel I; the second Accord, known as Basel II, was released and was to be fully implemented by 2015. It focused on three main areas, including minimum capital requirements, supervisory review and market discipline, which are known as the 'three pillars'. This new framework was designed to strengthen international banking requirements as well as to supervise and enforce these requirements. It aimed to reward and encourage continued improvements in risk management and control (BIS, 2013).

The experience of the worldwide banking system in the 2008 GFC forced the Basel Committee to propose new suitable standards, which were set out in Basel III. This new capital framework not only revised and strengthened the three pillars established by Basel II, but also extended them with innovations mostly related to liquidity risk, such as an additional layer of common equity, a countercyclical capital buffer, and additional requirements regarding capital and liquidity (BIS, 2013).

Under the Basel Accords, the supervision and regulation of banks and other financial intermediaries has increased and attracted worldwide researchers conducting both theoretical and empirical studies; examples of studies include 'Are international capital adequacy rules adequate? Basel Accord and beyond'(Tarbert, 2000);'Will Basel II Affect the Competitive Landscape?'(Blount & Streeter, 2003);'What Basel II Lag Will Mean for U.S. Banks'(Davis, 2005);'Basel III: Is the Cure Worse than the Disease?'(Allen, Chan, Milne & Thomas, 2012), etc. Although the Basel Accords are merely guidance with no legal force, there is still a challenge for central and commercial banks to apply and assess the results. Some researchers have attempted to answer the questions posed by the research titles and assess the success of these Accords by conducting a survey on bank regulations throughout the world. One of these is study conducted by Laeven and Levine (2009),which collected the survey data on the capital requirement, capital stringency and restriction level of 46 countries. In the same way, Barth et al. (2013) provided a data set from 72 countries with information about activities restriction, overall capital stringency, official supervisory power, supervisory independence, and so on. Both of these studies have contributed a wide understanding of levels of supervision and restriction on banks' activities around the world.

2.5 Relationship between bank cost efficiency and risk

The interrelationship between risk and bank efficiency has received much attention in recent years, particularly after the 1997 Asian Financial Crisis and the 2008 GFC. One of the earliest studies that focused on the effects of risk on efficiency was in 1997, by Berger and DeYoung. They employed Granger-causality techniques to test four hypotheses—the 'bad management' hypothesis, the 'bad luck' hypothesis, the 'skimping' hypothesis and the 'moral hazard' hypothesis—to show the relationship between credit risk and efficiency. Their results suggested that loan quality has both negative and positive effects on efficiency; particularly, there is a negative relationship between cost efficiency and risk in failed banks (Berger & DeYoung, 1997). Although Berger and DeYoung's study was an intensive analysis of risk effects, its procedure, based on the Granger-causality test, did not cover the causes of credit risk at the individual bank level, but came to a broader result at the industry level (Pastor, 1999, 2002). To overcome the limitations of the previous studies in

terms of credit risk measurement, a 2011 study by Fiordelisi et al. used diverse measures of credit risk, including non-performing loans, 1-year-ahead expected default frequency, and 5-years-ahead expected default frequency, to examine its effects on efficiency through three separate models. In addition, this study not only focused on cost and profit efficiency but also estimated revenue efficiency and conducted robustness checks with the other measures. In general, their results showed 'lower bank efficiency with respect to costs and revenues Granger-causes higher bank risk, thus confirming the 'bad management hypothesis'(Fiordelisi et al., 2011).

As well as examining credit risk, many recent studies have examined the relationship between different kinds of risks, such as market risk, operational risk, liquidity risk and so on. Sun and Chang considered credit risk, market risk and operational risk in their 2011 study. They first applied three separate models to test the relationship between individual risk and efficiency then tested the combined effects of all three kinds of risk on efficiency. They found that each risk measure presented a dissimilar effect on efficiency (Sun & Chang, 2011).

As mentioned in the previous section, banks play an important role in the economy and it is undeniable that the banking system is also very sensitive to macroeconomic conditions (Berger & Humphrey, 1992; Klein, 1971; Thoraneenitiyan & Avkiran, 2009). Consequently, every economic shock can strongly affect a banks' operation and conversely, instability in the financial market can push the economy into a downward trend (Berger, Bonime, Covitz & Hancock, 2000). The world economy also has evidence and lessons from the Asian Financial Crisis in 1997 and the GFC in 2008. As a result, it is believed that bank efficiency is affected by some environmental factors, such as gross domestic product (GDP) growth, interest rate, inflation and so on. Thoraneenitiyan and Avkiran (2009) explored the effects of macroeconomic environment on banks' efficiency during the 1997 Asian Financial Crisis and found that the recovery level of affected countries varied and was related to their macroeconomic conditions. In a study on bank governance, regulation and risk taking in the banking area, Leaven and Levine (2009) also examined the impacts of some policy factors on bank efficiency activities and risk taking, such as capital regulations, deposit insurance policies and restrictions. They found that impact of

those regulations on banks varied depending on each bank's governance structure. The review of studies on bank efficiency and risks showed that it is difficult to find studies that have added macroeconomic indicators as control variables or determinants of bank efficiency and risks.

2.6 Conclusion

The literature review showed that much research has been conducted using the data of the banking industry throughout the world, particularly in the US, Europe and emerging Asian countries; however, few studies have compared the relationship between bank efficiency and risk in developing and developed countries. In addition, a study on the effects of macroeconomic factors, and the effects of the economy and financial market shocks on banks' activities is needed. The Basel Accords provide guidance for bank risk management and the capital requirement ratio is proved to have an effect on a bank's operation; therefore, this study added a regulation factor, capital requirement ratio in detail, as representing environmental factors. Consequently, this research will add to the banking literature with research on the relationship between banks' cost efficiency and risks and environmental factors, by comparing developing and developed economies in a specific geographic area. SFA was employed to estimate efficiency and Tobit regression was applied to examine the effects of credit, operational and liquidity risks and environmental factors on bank efficiency over the period both before and after the 2008 GFC.

Chapter 3: Overview of Banking Systems in the East Asia and Pacific Area

3.1 Introduction

According to the World Bank's categories, the East Asia and Pacific area includes countries ranging from China to the Pacific Islands. With nearly 40 countries and geographic entities, this wide area contains diverse landscapes, climates, societies, cultures, religions and economies (WorldBank, 2014).

Despite the challenging external environment, the World Bank says this area, which includes all levels of economic development (underdeveloped, developing and developed) has enjoyed remarkable economic growth in the last four decades. Several countries are experiencing rapid changes in economic development, population growth and urbanisation, social transformation and technological development (WorldBank, 2014). The East Asia and Pacific region has emerged as the largest recipient of the developing world capital flows. Therefore, the region's financial markets and banking sectors play a core role in the world financial market(APFED, 2005).

As mentioned earlier, the 1997–1998 East Asian Financial Crisis, which mainly affected Indonesia, Korea, Malaysia, the Philippines and Thailand, revealed substantial vulnerabilities in the financial sector; namely, excessive borrowing, weak regulatory and supervisory frameworks, concentrated bank ownership and family control of banks. Economies in the region have made significant progress in running current account surpluses and building up large exchanges reserves, as an insurance policy against crises(World Bank, 2007).

Since the 2008 GFC, the region has strengthened its resilience to global risks but because of the risk of future volatility, this reform momentum must be nurtured to secure its position as global growth leader (IMF, 2014).

The last section of this chapter provides an overview of the economic environment and banking system of some outstanding economies of the East Asia and Pacific area.

3.2 Overview of the East Asia and Pacific area
3.2.1 East Asia and Pacific area: A definition

As mentioned earlier, the East Asia and Pacific area includes countries from China to the Pacific Islands. Of all regions, the East Asia and Pacific region has the second-highest number of fragile and conflict-affected states. It has sustained 61 per cent of losses from disasters in the past 20 years and has become the most disaster-stricken regions in the world (WorldBank, 2014). This region's countries and geographic entities include Australia, Brunei Darussalam, Burma, Cambodia, China (including Hong Kong and Macao Special Administrative Regions and Taiwan), Cook Islands, Democratic People's Republic of Korea (North Korea), Fiji, French Polynesia, Federated States of Micronesia, Guam, Indonesia, Japan, Kiribati, Lao People's Democratic Republic (Laos), Malaysia, Marshall Islands, Mongolia, Myanmar, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Republic of Korea (South Korea), Samoa, Singapore, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu and Vietnam (APFED, 2005).

As previously mention, the East Asia and Pacific region is a diversified area in every aspect and this diversity is source of its power in economic development. Although growth in some of the developing economies in the region dropped from 8 per cent in 2009 to 7.2 per cent in 2013, it is still the fastest-growing region in the world (WorldBank, 2014). In its final report for 2005, the Asia-Pacific Forum for Environment and Development described the area as a tight group. It stated that the expanding economy in Asia and the Pacific has brought about increased interdependence among the countries in terms of natural resources, finance and trade.

Also, their problems share common features in their cause, process and impact, while some even have direct trans-boundary implications (APFED, 2005).

This research project has focused on representatives from the area's developed economies (Australia, Hong Kong, Japan, Korea, New Zealand and Singapore) and developing economies (China, Indonesia, Malaysia, Philippines, Thailand and Vietnam).

3.2.2 East Asia and Pacific area: Economic environments

During the period 2003–2007 (before the 2008 GFC), growth in the East Asia and Pacific area averaged 5.77 per cent; between 2008 and 2012, it averaged 3.83 per cent (see Table 3.1). This drop in average growth was the result of policy tightening in most countries in the area after the GFC. In particular, after reaching an average of 4.6 per cent for the period 2003–2007, the growth of developed economies (including Australia, Hong Kong, Japan, Korea, New Zealand and Singapore) dropped to only 2.19 per cent during the period 2008–2012. At the same time, developing and emerging markets in the area (including China, Indonesia, Malaysia, Philippines, Thailand and Vietnam) dropped from 6.94 per cent for the pre-crisis period to 5.46 per cent between 2008 and 2012 (see Table 3.1). However, the East Asia and Pacific economies, especially the developing ones, navigated the global economic crisis successfully and are projected to reach high grow in the short-term (World Bank, 2014). In their final report, the Asia-Pacific Forum of Environment and Development noted:

> Economic output in the Asia-Pacific region has quadrupled during the past two decades. Globalization, in particular, has enabled the region to achieve such high economic gains. The economic structure of the region has changed remarkably over the past 30 years—showing the decline of the agriculture sector and the growth of the industrial and service sectors— leading to further intensification of the rural-urban gap (APFED, 2005, p14).

Although the GDP growth of the whole region was generally declining during the period that was divided by the 2008 GFC, the average GDP (in purchasing power parity—PPP) per capita increased during the period from $US 18, 801 to $US 23,031 (see Table 3.2). Those figures express the social aspect of economic growth and

indicate the large personal income gap between the two levels of economic development. The average GDP (PPP) per capita of developed economies is approximately six times higher than that of developing countries. However, the difference between the developed and developing economies in the East Asia and Pacific area has been diminishing in recent years, to 5.7 per cent for the period 2008–2012 and 5.2 per cent in the latest observed year, 2012 (see Table 3.2).

Inflation has become the key short-term challenge for the authorities in the region. Central banks across developing countries, such as Indonesia, Vietnam, and so on have tightened monetary policy to combat price shocks and for many middle-income East Asia and Pacific economies, reducing inflation presents difficult policy choices (WorldBank, 2011). Table 3.3 concerns the Consumer Price Index (CPI) for the period 2003–2012, shows that the average CPI of developing countries between 2008 and 2012 was 5.47 per cent, about twice the level of developed economies.

As mentioned earlier, the Asia-Pacific region is the most densely populated region in the world and the most diverse in natural and socio-cultural conditions. According to the Asia-Pacific Forum of Environment and Development:

> Respect for the rich human resources, traditional values, and enormous diversity treasured in the region should be the basis for the design of future sustainable societies. Clear vision, strong political will, and flexible social partnerships will enable the region to move along a truly sustainable path as the world leader in the 21st Century(APFED, 2005, p15).

3.2.3 East Asia and Pacific area: Financial market and banking systems

As previous mention, the East Asia and Pacific region plays an important role in the world's financial market (APFED, 2005). The differing stages of economic development and uneven financial sector structures within the Asia and Pacific region are reflected in global perceptions of their sovereign credit risk. In the midst of recent swings in capital flows to emerging-market economies, differentiation based on economic fundamentals has become increasingly evident in the region. South Korea's fiscal and current account surplus position, coupled with solid sovereign debt sustainability metrics and promising growth outlook, has translated into a positive outlook for the region's fourth-largest economy. Similarly, Hong

Kong enjoys a favourable economic outlook, supported by a strong sovereign credit profile, a solid external position, low gross public debt and large fiscal reserves; however, it is vulnerable to shifts in economic policy in China. Australia has continued to be rewarded with a solid and stable business and market environment (Scotiabank, 2014).

With regard to the macroeconomic factors that could directly affect the financial markets and banking systems of this region, the data on interest rates and capital requirements across the East Asia and Pacific economies during the period 2003–2012 is shown in Tables 3.4 and 3.5. The average interest rate declined slightly for the period after the 2008 crisis as a result of tightened monetary policies. Developing countries in the region appear to have higher market interest rates than the developed economies; their average interest rate for the post-crisis period was approximately 2.5 times the developed economies' rate (see Table 3.4).

Implementing the Basel Accords by calculating the capital requirement ratio is another concern for the banking sector. The capital requirement ratio data of some East Asia and Pacific economies, as found in an international survey of banking regulations, is shown in Table 3.5. This data shows that the average ratio for the observed years has not met the Basel minimum requirement in capital adequacy. Although this number has improved during 2008–2012, particularly for the post-crisis period, it only reached 6 per cent for the whole area and 6.35 per cent for developing countries and is still much lower than the standard ratio of 8 per cent.

3.3 East Asia and Pacific economies and the financial crises
3.3.1 East Asia and Pacific economies and the 1997 Asian Financial Crisis

As mentioned earlier, the 1997 East Asian Financial Crisis revealed substantial vulnerabilities in Indonesia, Korea, Malaysia, the Philippines and Thailand (Akyüz, 1998; Laeven, 1999; Rao, 1998). The factors that led to the crisis were established in the early 1990s, when Southeast Asia countries implemented a process of financial liberalisation and deregulation, which led to a proliferation of financial institutions and the creation of booming economies in the region (Narine, 2002). The 1999 study by Leaven, which examined the 1992–1996 data from these countries' banking

systems, found that excessive risk-taking in the banks' operations was the main cause of the 1997 financial crisis in East Asia. In particular, Leaven found that family-owned banks, together with company-owned banks, were the highest-risk groups in comparison with the foreign-owned group (Laeven, 1999). Vo and Daly's 2005 study of region integration presented an analysis of co-integration between the US and Australia markets and several South East Asian equity markets between 1993 and 1997 and found that factors such as poor accounting standards, information dissemination and political risks could have influenced the movement towards a universal Asian capital market (Vo & Daly, 2005). Along with many other scholars and researchers examining the causes of the crisis, they found that weaknesses in bank balance sheets, together with currency and maturity mismatches, severely exacerbated the downturn and led to widespread bank insolvencies (Adams, 2008). Beginning in May 1997 and ending after about two years, the crisis involved the collapse of many of the region's currencies, accompanied by economic upheaval and political instability (Narine, 2002).

Two years later, most of the East Asia economies appeared to be on the road to recovery, but the crisis had long-term effects (Narine, 2002). The rest of the world forced policy changes not only on the East Asia region but throughout the world, with substantial rehabilitation of regional banking systems in the area and reforming programmes to improve the soundness of the banking sector. As in other parts of the world, these reforms have intended to help meet the on-going challenges associated with financial innovation and globalisation (Adams, 2008). The key changes in the region's banking systems since the 1997 crisis include: increased foreign ownership, movement into new business lines, greater transparency, and shifts towards household and real estate lending. In addition, improved reporting has become a major concern for both bankers and policy makers (Adams, 2008).

In their 2001 regional overview report, the World Bank confirmed that the Asian Crisis countries had, in general, succeeded in recapitalising banks, improving bank capital adequacy and protecting depositors. 'They have made persistent if gradual progress in the complex medium-term tasks of strengthening financial transparency, supervision and regulation, corporate governance and legal and judicial regimes'(Bordo, 2008). Ten years after the crisis, the region is wealthier and has a

larger global role than ever before. The emerging East Asia of 2007 had an aggregate output of over $5 trillion, double the pre-crisis dollar value. In per-capita terms, real incomes were some 75 per cent higher (Gallego, Gardó, Martin, Molina & Serena, 2010). In the post-crisis period, East Asian economies took the opportunity to deepen financial cooperation and integration through various steps to improve the domestic financial system and promote regional financial integration (Park, 2011), running current account surpluses and building up large exchanges reserves as an insurance policy against crises; and strengthening the fundamentals (WorldBank, 2007).

3.3.2 East Asia and Pacific economies and the 2008 Global Financial Crisis

The GFC started in the US with the collapse of the subprime mortgage market in 2007 and was the end of a major housing boom. It was preceded by two years of rising policy interest rates. Its causes included major changes in regulation, lax oversight, relaxation of normal standards of prudent lending and a prolonged period of abnormally low interest rates. In early October 2008, the crisis spread to Europe and then to the emerging countries as the global interbank market ceased functioning (Bordo, 2008). A study by Gallego et al. (2010) suggested a set of standard vulnerability indicators related to market sentiment, external vulnerabilities, the banking sector, fiscal policy and monetary issues, which indicate potential risks or are known leading indicators of crises. The authors found that improved economic policies played a significant role in containing macro-financial vulnerabilities before the crisis, if authorities had learned from the earlier crisis and paid considerable policy and regulatory attention to signs of excessive short-term capital flows, credit booms and the formation of potential asset price bubbles (Gallego et al., 2010).

Although the GFC occurred at a time when many developing economies had enjoyed years of good growth, due to improved macroeconomic management following the previous financial crisis, most developing countries still suffered from its effects (Naudé & Research, 2009). Naudé & Research found that the main channels that transmitted the effects of the global crisis to developing countries were banking failures and reductions in domestic lending, reductions in export earnings and reductions in financial flows to developing countries (2009). By 2009, the Organisation for Economic Cooperation and Development (OECD) economies were sliding (or already had slid) into recession and developing Asian countries faced

weaker demand for exports, lower flows of remittances and less investment (Green, 2009). This led to determined steps in most countries towards easing credit conditions and shoring up domestic demand, to solve the issue of growth slowdown. Policy makers rapidly changed from worrying about inflation to fighting a worldwide credit crunch and falling demand (Green, 2009).

Fortunately, developing countries in the East Asia and Pacific region recovered from the 2008 crisis faster than from earlier global or regional shocks and the region emerged stronger in a weakened world economies (WorldBank, 2011). In particular, after slowing from 8.5 per cent in 2008 to 7.0 per cent in 2009, real GDP growth in developing East Asia was expected to rise to 8.7 per cent in 2010. This remarkable recovery was due to the implementation of a decisive and large fiscal and monetary policy stimulus, renewed inventory restocking and the return of buoyant demand abroad and consumer sentiment in the region (Izvorski, 2010).To some degree, the East Asia developing economies' resilience reflects the successful reforms and restructuring undertaken in the aftermath of the 1997 region crisis 10 years earlier (Park, 2011). In addition, solid economic fundamentals, including high foreign exchange reserves, well-capitalised banks and modest levels of household, corporate and government debt, were also key factors for the recovery. However, in an optimistic report about the recovery of the region, the World Bank also warned that 'large capital inflows have also raised alarms about new asset bubbles in some countries and authorities in the region are confronting these risks at the same time they are returning to a reform agenda needed to secure strong and sustained growth'(Izvorski, 2010). According to an IMF's recent report, the region is well positioned to meet the challenges ahead, has strengthened its resilience to global risks and will continue as a source of global economic dynamism. However, with the risk of further bouts of volatility ahead, the region's reform momentum must be nurtured to secure its position as global growth leader (IMF, 2014).

3.4 Developed economies in the East Asia and Pacific area
3.4.1 Australia

Although Australia's economy is likely to grow more slowly than the trend for this region, it is expected to continue with a relatively fast rate of economic growth in

comparison to many other advanced economies. While output grew by 2.4 per cent in 2013 as a whole, growth is expected to remain broadly stable at 2.6 per cent in 2014 and even increase to an average of 2.8 per cent for the period 2014–2015 (IMF, 2014; Scotiabank, 2014). According to a recent Business Monitor International (BMI) report on Australia Commercial Banking, although the Australian economy has strengths from being a free-market economy supported by a highly educated workforce and rich natural resources, it also has weaknesses in its vulnerable capital flows and currency volatility. As well as the opportunities that come from the rapid expansion of the region's economies and having low government debt, Australia faces threats from the high level of private-sector debt, a collapse in exports from a reduction in Chinese demand for resources and vulnerability to extreme weather, especially under the impact of global climate changes (BMI, 2013a).

With regard to the Australian banking sector, the 2014 Scotiabank report stated that Australia's financial system is sound, resilient, profitable and well managed. Although the banking system is narrow in terms of numbers of banks, with only 13 main commercial banks, the Australian banking sector has strong fiscal accounts and plans for a pre-funded bailout fund limit, which will help reduce the effect of another financial crisis on the wider economy. In addition, Australian banks are expanding their activities by increasing their geographic reach in the Asia-Pacific markets. The Reserve Bank of Australia has established safety nets to ensure sufficient liquidity in the financial system. In particular, the banking sector's Tier 1 Capital ratio of 10.3 per cent in the third quarter of 2013 suggests sufficient capital adequacy. However, the Australian banks' heavy reliance on overseas borrowing and high exposure to the volatile real estate market are weaknesses (BMI, 2013a; Scotiabank, 2014).

3.4.2 Hong Kong

Hong Kong's business environment and economic outlook has remained relatively favourable, with the territory ranking among the top economies in the World Bank's *Doing Business Report* and the World Economic Forum's Global Competitiveness Index. The territory's output grew by 2.9 per cent in 2013 as a whole, above the five-year average of 2.6 per cent. While net exports were a drag on growth, domestic demand maintained solid momentum and public infrastructure projects continued to

buttress the economy. However, private-sector residential construction is expected to cool, reflecting an on-going decline in residential property sales. Hong Kong has maintained its commitment to the fixed exchange rate regime and its public finances are healthy, with budgetary surpluses since 2005 allowing the territory to enjoy a strong sovereign credit profile supported by a solid external position, low gross public debt and large fiscal reserves. In addition, steady financial services provision to foreign investors in mainland China are expected to keep the services balance in a substantial surplus(Scotiabank, 2014).

With regard to Hong Kong's financial sector, "the property segment is the largest risk factor for Hong Kong's economic and financial outlook. The Government has continued its efforts to curb speculative property market transactions in a negative real interest rate environment". Meanwhile, the IMF has recently found that Hong Kong's banking system is well capitalised, with the Tier 1 Capital ratio at 13.5 per cent in the third quarter of 2013, asset quality remains high and the banking sector's non-performing loans ratio is hovering at 0.5 per cent(Scotiabank, p12, 2014).

3.4.3 Japan

The Japanese economy has continued to recover at a moderate pace, with an overall growth rate of 1.5 per cent for 2013. Despite having weak public finances, the Government has supported the economy through fiscal stimulus measures. However, it is thought that the sales tax increase implemented in 2013 might push the economy into uncertainty in the next year. With regard to the real estate market, rising prices and an impending tax increase will make it difficult for consumers to sustain their spending. More importantly, rising risks and uncertainty may depress growth. While public finances are increasingly pressured by the social security costs related to having an aging population, the Government can refinance its debt obligations at very low rates and believes that a strong income balance will maintain the current account surplus at 11.2 per cent of GDP in the period 2014–2015 (DeloitteUniversity, 2014b; Scotiabank, 2014). Japan is seen as the world's largest 'creator' nation, with years of current account surpluses resulting in a huge build-up of foreign reserves and other external assets. In addition, Japan has well-developed and high-tech manufacturing and services sectors, with strong advantages in key areas such as

electronics and heavy engineering. However, the economy is hampered by excessive regulation, state interventionism and a desire to protect politically influential special-interest groups, all of which increase business costs(BMI, 2012a). The Japanese yen is still seen as a safe haven asset in times of global financial market stress, and the Bank of Japan has a 2 per cent inflation target to overcome deflationary pressures (DeloitteUniversity, 2014b; Scotiabank, 2014).

Japan's financial sector is domestically oriented, with a strong link to sovereign borrowers reflected in substantial holdings of government securities. Credit growth has recently shown signs of a modest increase and the banking sector's Tier 1 Capital ratio hovered around 12 per cent in 2013 (Scotiabank, 2014). In addition, Japan's target of keeping the non-performing loans ratio at fewer than 4 per cent of total loans has been largely achieved and in some major banks, has even been kept below 2 per cent of client loans. According to a recent BMI report, Japan has a highly developed and independent financial system supported by high per-capita levels of deposits and a low reliance on external financing. However, the Japanese banking system is also experiencing low growth in assets, loans and deposits, and losing market share to competitors such as corporate and consumer credit companies. Compared with the region's banking systems, the Japanese system is large, with 122 full members and 64 associate members of the Japanese Bankers Association as of July 2012 (BMI, 2012a).

3.4.4 South Korea

South Korea's economy has been performing well, with real GDP growth of 2.8 per cent in 2013 as a whole. The economy has enjoyed a favourable sovereign debt-rating profile as a result of low debt-to-GDP ratios, solid fiscal accounts and an improving economic growth profile. South Korea's public-sector finances continue to be among the healthiest of advanced economies, with fiscal surpluses recorded since 2010. The Korean won has appreciated slightly in recent years, supported by a solid current account surplus, healthy Government finances and a better economic growth outlook (Scotiabank, 2014). Two main advantages of the South Korean economy are its high position in the market, being the fourth-largest economy in Asia and being home to many world-class companies employing cutting-edge

technology in the production of everything from mobile phones to ships; and the easy access to international markets supported by political alignment with the US and Europe. However, the economy is facing disruption through continuing strikes and walkouts, and the dominance of 'chaebol' business conglomerates (BMI, 2013f).

Following the GFC, the South Korean banking system has strengthened its balance sheet in recent years. Its banking system is well capitalised, with a Tier 1 Capital ratio of 11.8 per cent at the end of 2013. However, a high level of external debt within the banking sector poses a threat to financial stability, despite massive foreign currency reserves for the economy as a whole. Other issues are undisciplined lending and declining profitability with increasing industry competition. These weaknesses have made the banking system vulnerable to international risk aversion. South Korea's commercial banking sector comprises seven nationwide commercial banks, six regional banks and 37 branches of foreign banks. There are also five state-owned banks, which mostly work to develop a certain sector of the economy, two credit guarantee funds and one housing financial corporation. All of these are members of the Korea Federation of Banks, although foreign bank branches are classed as associate members (BMI, 2013f; Scotiabank, 2014).

3.4.5 New Zealand

New Zealand's economic growth has continued to be strong, with recovery from a drought and enormous terms-of-trade gains. The economic slack has been improved because of renewed currency strength and moderate wage increases (OECD, 2014).Because Australia and New Zealand belong to the Commonwealth of Nations in the same geographic area, their economies and banking systems seem to have the same characteristics (Tripe, 2006). Moody's 2013 report on global credit research stated: The outlook for banks in Australia and New Zealand remains stable as these economies continue to exhibit good growth prospects in the near term, driven by on-going recourses-sector investments in Australia and earthquake reconstruction in New Zealand. [Specifically, growth in] New Zealand should accelerate in 2014 as post-earthquake reconstruction gathers steam, with private consumption and external demand strengthening. New Zealand's economic expansion has considerable

momentum; the extended period of low interest rates and continued strong growth in construction-sector activity have supported recovery (IMF, 2014; Moody's, 2013).

The soundness of the New Zealand banking sector was crucial to the resilience of the economy during the GFC. The banking sector is dominated by four large subsidiaries of Australian banks, which have proved resilient to the recent turbulence in the global financial markets. Bank profits are strong and non-performing loans are less than 2 per cent of total loans, which is low by advanced-country standards. Sound regulation and supervision helped to maintain stability (Jang & Kataoka, 2013). Zang and Kataoka's study of the New Zealand banking system warns about the strong effects of the four dominant Australian banks in the domestic market, finding this a weakness. They concluded:

> Given the large size of the four systematically important banks in New Zealand with similar business models, careful attention needs to be paid to their vulnerabilities and resilience to shocks. Any distress in one of the four banks could have significant repercussions for the entire financial system and, in turn, the real economy in New Zealand. Furthermore, given the banks' size, markets and rating agencies perceive them as too big to fail and they could pose a sizable potential fiscal liability(Jang & Kataoka, 2013, p7).

3.4.6 Singapore

Singapore's economy has continued to expand at a steady pace, aided by healthy domestic demand and a strong services sector, with growth at 3.7 per cent in 2013. However, there are concerns about rising household debt, a possible housing bubble and emerging-market weakness. The Government also faces a challenge in ensuring high growth in the long term, with an aging population and popular opposition to immigration (DeloitteUniversity, 2014b). In addition, land scarcity is a key challenge that the Government must address (OECD, 2013). Singapore has been a remarkable success as one of the world's leading financial centres, with its central location and high concentration of financial institutions and capital markets allowing financial transactions in the region to take place efficiently. As a financial centre, Singapore has facilitated greater financial intermediation in the region, contributing to the development of capital markets and cross-border trade and business investment (Sufian, 2007).

Singapore's banking sector has enjoyed reasonable growth recent years and growth in the financial-services sector has contributed significantly to Singapore's economic growth and development. During the 1997–1998 Asian Financial Crisis, Singapore was least affected by the crisis compared with other Southeast Asian countries, due to its economic and financial fundamentals. Despite incurring losses from defaulted loans, which escalated during the crisis, Singapore's commercial banks were adequately capitalised and insolvency was not an issue (Sufian, 2007). The results of an international survey of Commercial Bank Business Environment Rating, which reflects the BMI's assessments of overall country risk, together with the regulatory and competitive environment, showed that Singapore continues to be a very attractive country in the context of the Asia-Pacific region. However, this survey result also indicated major problems related to the limits to potential returns and the small potential for growth across the banking sector here(BMI, 2012b).

3.5 Developing economies in the East Asia and Pacific area
3.5.1 China

China's economic expansion has been decelerating, due to its transition to a new stage of economic development that relies more on productivity improvements than on factor inputs. China has been the fastest-growing major economy in the world and has maintained its leading role in the region's development, with a growth rate of 7.7 per cent in 2013 and 7.5 per cent in 2014 (Scotiabank, 2014). However, because its growth has been so fast, China suffers from major imbalances and environmental degradation. China's dependency on exports to boost growth has made it vulnerable to the global recession, while private consumption remains weak at less than 40 per cent of GDP. The close relationships between provincial leaders and local businesses foster corruption and are making it harder for the central Government to enforce its policies (BMI, 2013b). China's current account surplus, which has been steadily declining, is expected to average close to 2 per cent of GDP in the period 2014–15, compared with 10 per cent seven years ago. In addition, concerns about the level of debt in China continue, with reports that non-financial companies in China have debt equivalent to 120 per cent of GDP; the IMF estimates the Government debt level was

around 45 per cent of GDP in 2013. Both of those figures are both much higher than those for most major economies (DeloitteUniversity, 2014a; Scotiabank, 2014).

With regard to the financial sector, China's system is moving towards a more market-oriented framework. The authorities' willingness to allow a default in the domestic corporate debt market indicates their acknowledgement of the increasing importance of appropriate risk pricing in the financial industry (Scotiabank, 2014). In terms of the banking market structure elements of the limits to potential returns, China rates more highly than any other country in the Asia-Pacific region (BMI, 2013b). China's banking industry is composed of several kinds of institutions that reveal the complexity of the environment. The Chinese banking market is dominated by large, domestically incorporated institutions, with the top four banks controlling nearly 50 per cent of China's banking assets (Werner & Chung, 2010). According to the BMI report, there are 81 full members of the China Banking Association, including policy banks, the 'Big Four' banks, joint-stock commercial banks, city commercial banks, asset management companies, China Government Security Depository Trust and Clearing Company, China Post Savings and Remittance Bureau, rural commercial banks, rural cooperatives, rural credit unions and locally registered foreign banks, as well as 37 associate members, including banking associations in various provinces. However, according to Werner and Chung (2010), there are more than 5,600 banking institutions, mostly small, rural banking cooperatives, operating in China.

3.5.2 Indonesia

Indonesia's real GDP growth is expected to remain strong by regional standards through to 2015, when the country's output should reach 5.8 per cent for the year 2014, in line with the average growth over the past 10 years. Momentum has continued to be driven by household spending, as indicated by solid consumer confidence, though some moderation is likely. While investment activity is slowing, Government spending is likely to underpin economic performance on the back of pre-election outlays. With a gradually recovering export sector, the country's growth structure is expected to become more balanced. Although public finances are relatively healthy, Indonesia suffers from a fairly low fiscal revenue base, which

constrains public investment spending and infrastructure development. In addition, Indonesia's weak external position continues to be a concern for the country's policymakers (Scotiabank, 2014).

According the 2013 BMI report, Indonesia's strategic location between the Indian and Pacific Oceans and its adjacency to major east–west trade routes make it an important economy in the region. Indonesia is resource-rich, as the world's largest producer of palm oil; it also has a large supply of low-cost labour, as one of the world's youngest populations. However, Indonesia's economy is not growing fast enough to reduce unemployment; many are forced to work in the informal sector and the youth unemployment rate is five times the overall rate. Conversely, the Indonesian economy has an opportunity for development in the rise of Islamic financing, having adopted new legislation in early 2008 designed to tap into this rapidly expanding area (BMI, 2013c).

According to the 2014 Scotiabank report, Indonesia's banking system is well capitalised, with the Tier 1 Capital ratio at 18.3 per cent at the end of 2013; asset quality has remained high and the non-performing loans ratio is only 1.7 per cent (Scotiabank, 2014). Overall, the economy and the banking sector have clearly moved on from a long period of turbulence into a period of sustained recovery. The banking sector also has the advantage of the corporate sector's good financial health and low loan-penetration status. In addition, the regulatory framework is amenable to the banking sector. However, growth in the banking sector is severely limited because per-capita GDP in Indonesia is among the lowest in the region. Indonesia's banks are still considered some of the weakest in the region. State banks and small private banks remain sensitive to credit risk. In addition, the rupiah is highly volatile and another major sell-off in the currency has the potential to create instability in the banking sector.

Indonesian banking institutions are typically classified into commercial and rural banks. Commercial banks differ from rural banks in the sense that the latter are not directly involved in payment systems and have a restricted operational area. There are 122 commercial banks in Indonesia, of which four are state banks and 118 are private national banks. Most of the banks in Indonesia are small (BMI, 2013c).

3.5.3 Malaysia

Malaysia's economic performance has remained relatively healthy, although real GDP growth was 4.7 per cent in 2013 as a whole, slower than the 5.6 per cent of 2012. Activity has continued to be driven by domestic demand from mainly household spending and investment. In particular, private consumption is underpinned by rising incomes and supportive labour market conditions, and investment activity is supported by private-sector outlays. Public finances are Malaysia's weakest area and the current account surplus narrowed significantly in 2013 due to subdued exports and strong imports (Scotiabank, 2014). However, an exports recovery is underway and is expected to consolidate as economic growth in the US and Europe improves during the next years. Rising exports are also expected to improve external balances and public finances (DeloitteUniversity, 2014a). According to BMI's 2013 report, Malaysia has transformed itself in the past four decades from a commodity-dependent economy into a major world source for electronics and computer parts. In addition, Malaysia is one of the world's largest producers of rubber, palm oil, pepper and tropical hardwoods, and is still a net exporter of crude oil. This provides a solid platform for economic growth. However, Malaysia's relative insulation from global energy price shocks is being eroded. It is now likely that within the next few years it will become a net importer of oil. In addition, the Malaysian economy is facing a high degree of vulnerability to global growth and capital flows because of its excessive openness. Consequently, growth is expected to be threatened by global economic instability and a falloff in global demand (BMI, 2013d).

The IMF has assessed Malaysia's financial system as being well positioned to endure potential stresses, with strong capital and liquidity buffers. Nevertheless, it highlights that elevated household indebtedness and on-going global volatility warrant close monitoring (Scotiabank, 2014). The Malaysian banking sector has been strengthening and enhancing it international status because of its Government's commitment to reform. The combination of a sophisticated banking sector with a large Muslim population puts the country in a good position to become a centre for Islamic banking, and its solid financial infrastructure makes Malaysia appealing to

the banking business. However, the country's complex bureaucracy has adversely affected the banking sector's efficiency. Bank Negara Malaysia identifies 23 commercial banks and 15 investment banks operating in the country. Bank Islam Malaysia and Bank Muamalat are the country's only 100 per cent Islamic banks, but there are also Islamic financing subsidiaries of commercial banking groups (BMI, 2013d).

3.5.4 Philippines

It is thought that the Philippine's strong real GDP growth, which was at 6.8 per cent in 2012 and 5.9 per cent in 2013, will provide opportunities for expansion by domestic and local players. Private consumption is a major driver of this growth, generating more than 70 per cent of GDP. The Government could ease pressure on its fiscal accounts by broadening the tax base and eliminating graft at the Bureau of Internal Revenue. A youthful and rapidly expanding population is likely to support these dynamics. In addition, given its low-cost English-speaking workforce, outsourcing could provide the Philippines with a valuable source of foreign exchange. In particular, homebound remittances from the 8 million workers living overseas are a key source of national income and provide much-needed support to the country's balance of payments (BMI, 2013e). However, although the Government has done well to decrease its fiscal deficit, spending inefficiencies and revenue collection efficacy continue to be significant concerns. The economy is also facing two main threats: the high jobless rate, as economic growth falls short of the level needed to create jobs for the fast-expanding labour force; and the trend of the export sector towards manufactured products, especially electronics, which have been vulnerable to a weakening of the external economic environment since late 2008 (BMI, 2013e).

With regard to banking activities, the sector's penetration is very low and its growth potential is high. Banks could target Philippines repatriating earnings; overseas workers annually inject an amount equivalent to almost 10 per cent of GDP. In addition, a large proportion of the population speaks English, which is a valuable asset for foreign banks establishing a base in the country. The sector is ripe for consolidation, particularly among the 700-odd organisations servicing the rural Philippines. However, corruption and political risk continue to be a problem for the

Philippines' economy and the banking sector. In addition, the severely under-banked nature of the Philippines, together with a low savings rate, makes bank deposits relatively hard to secure. In recent years, the sector has also faced large portfolio investment flows entering the country, and another global economic shock could lead to a reversal, undermining stability in the sector.

A number of changes have occurred in the Philippines banking sector as a result of its adaptation to new conditions, such as the deregulation of national markets and the internationalisation of competition (Sufian & Chong, 2008). The Philippines Central Bank identifies 17 universal banks and 21 commercial banks operating in the Philippines. Most of the branches and subsidiaries of foreign institutions are classified as commercial banks. Thrift banks and rural banks are also regulated by the Philippines Central Bank (BMI, 2013e).

3.5.5 Thailand

Despite political uncertainty, Thailand's economy has performed relatively well over the past few years, although many challenges remain. Thailand's vulnerability to capital outflows has been reduced substantially, with the country now boasting a sizeable foreign exchange reserve pile, which has significantly reduced the chances of a repeat of the 1997 crisis(BMI, 2013g). However, Thailand's economic outlook has weakened, given persisting social and political unrest, which has eroded consumer and business confidence and is adversely affecting the vital tourism industry. Real GDP growth was only 2.8 per cent in 2013. With almost 27 million visitors annually, the tourism sector is a major economic driver; tourism receipts amount to around 10 per cent of the country's annual output; however, because of political and social unrest, tourist arrivals have declined this year. Weaker Government finances have resulted from fiscal stimulus measures adopted to offset the adverse impact of the global economic slowdown and natural disasters. In addition, risks to the economy remain, including weak business and investor sentiment and a structural overdependence on exports (Scotiabank, 2014).

Thailand's economy has recovered strongly from the Asian Financial Crisis and local banks have performed exceptionally well. However, as the region prepares for the

establishment of the ASEAN Economic Community by 2015, the banking sector faces increasing competition from foreign banks. According to the 2014 Scotiabank report, although private-sector credit continues to grow robustly, the most significant slowdown has been evident in lending to consumers. The banking sector's Tier 1 Capital ratio of 12.6 per cent in 2013 suggests sufficient capital adequacy. The Central Bank has identified 14 commercial banks in Thailand and 16 branches of foreign banks (BMI, 2013g; Scotiabank, 2014).

3.5.6 Vietnam

Since 2005, the Vietnamese economy and banking industry have experienced two different periods. During the three years from 2005 to 2007, economic growth was strong at an average of 8.4 per cent per annum, while the financial markets had a VN-index reaching a peak of 1,100 points in March 2007 (Nguyen, 2009). From early 2008 there was a difficult period because of the effects of the previously overdeveloped period and the GFC. Vietnam's GDP grew at only 6.3 per cent in 2008, while the inflation rate was much higher, at 19.9 per cent. At that time, Vietnam implemented a tight monetary policy to control high inflation, but because of the effect of the GFC, this policy caused the economy to contract into a severe depression. In addition, the financial markets experienced a sharp decline in the stock market and property prices. The VN-index dropped to below 400 points in June 2008 and kept falling to 235.5 points in February 2009 (Nguyen, 2009). According to a recent Deloitte University report on East Asia and Pacific economies, the year 2013 was positive for the Vietnamese economy when GDP growth rose to 5.4 per cent year. Although this growth was lower than the Government's target growth of 5.5 per cent, it was an improvement on the 5.3 per cent growth of 2012. In addition, monetary policies have successfully contained inflation, reducing it from two digits to a single digit over two years. The Deloitte University report also confirmed that Vietnam continues to be an attractive investment destination for global manufacturers and investors because of its low-cost labour pool, as well as its large and growing domestic market (DeloitteUniversity, 2014a).

During the two main periods of the economy's development, the banking industry reached peak growth by 2007, with total assets increasing by 130 per cent of GDP.

This period's very strong domestic product growth and loans growth was the primary cause of high inflation during the next period. During 2008, the banking industry faced a particularly challenging environment, with loan interest rates and exchange rates fluctuating significantly. After aggressive action to tighten money supply in 2008, from early 2009, the State Bank of Vietnam (SBV) decided to apply an easy monetary policy to stimulate the economy, and then switched back to the tight monetary policy after that. These actions have created a volatile interest rate environment over recent years, with the basic interest rate adjusted several times in 24 months (Fitch Ratings, 2009). Banks have therefore experienced severe liquidity constraints, forcing them to increase interest rates to maintain their operations. Recent monetary policy in Vietnam has been oriented towards growth, increasing the resilience of the economy and banking sector. Nevertheless, apart from the advantage of having a large population with a high savings rate and potential for income growth, the sector is facing external competition as the domestic banks continue to lag behind their foreign peers in terms of financial strength and technology (DeloitteUniversity, 2014a).

With regard to the banking market structure, state-owned banks dominated Vietnam's banking industry for the period before 1990 and the first joint-stock commercial banks were established in 1990. Vietnam's banking structure now has a diversity of ownership, including state-owned banks (including joint-stock commercial banks, which dominate state-owned capital), credit unions, joint-stock banks, joint-venture banks and foreign banks. The SBV identifies six 'state-owned credit institutions' or 'state-owned commercial banks', 38 urban commercial joint-stock banks, 32 branches of foreign banks and five joint-venture banks. Small and middle-sized banks approximate 75 per cent of Vietnam's total banks (BMI, 2013h).

3.6 Conclusion

As an emerging region with diversified resources, the Asia-Pacific region has challenges but could turn these into opportunities by building on the region's strengths. As the World Bank has noted, this area continues to be the world's growth engine, despite a challenging external environment.

Table 3.1: GDP growth indicator of economies of the East Asia and Pacific area across years (%)

(Source: World Bank)

GDP growth	2003–2007	2008–2012	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
East Asia & Pacific area	**5.77**	**3.83**	**4.94**	**6.34**	**5.44**	**5.77**	**6.37**	**3.32**	**0.66**	**6.91**	**3.98**	**4.27**
Developed economies	**4.60**	**2.19**	**3.22**	**5.57**	**4.40**	**4.68**	**5.15**	**1.17**	**-1.43**	**6.18**	**2.83**	**2.20**
Australia	3.52	2.56	3.10	4.10	3.10	2.70	4.60	2.70	1.40	2.60	2.40	3.70
New Zealand	3.60	0.74	4.00	4.40	3.20	2.90	3.50	-0.80	-1.50	1.90	1.40	2.70
Hong Kong	6.54	2.56	3.10	8.70	7.40	7.00	6.50	2.10	-2.50	6.80	4.90	1.50
Japan	1.86	-0.08	1.70	2.40	1.30	1.70	2.20	-1.00	-5.50	4.70	-0.60	2.00
Korea	4.34	2.92	2.80	4.60	4.00	5.20	5.10	2.30	0.30	6.30	3.70	2.00
Singapore	7.76	4.44	4.60	9.20	7.40	8.60	9.00	1.70	-0.80	14.80	5.20	1.30
Developing economies	**6.94**	**5.46**	**6.67**	**7.12**	**6.48**	**6.85**	**7.58**	**5.47**	**2.75**	**7.63**	**5.13**	**6.33**
China	11.66	9.24	10.0	10.1	11.3	12.7	14.2	9.60	9.20	10.4	9.30	7.70
Indonesia	5.46	5.90	4.80	5.00	5.70	5.50	6.30	6.00	4.60	6.20	6.50	6.20
Malaysia	5.90	4.28	5.80	6.80	5.00	5.60	6.30	4.80	-1.50	7.40	5.10	5.60
Philippines	5.66	4.66	5.00	6.70	4.80	5.20	6.60	4.20	1.10	7.60	3.60	6.80
Thailand	5.62	2.92	7.10	6.30	4.60	5.10	5.00	2.50	-2.30	7.80	0.10	6.50
Vietnam	7.34	5.78	7.30	7.80	7.50	7.00	7.10	5.70	5.40	6.40	6.20	5.20

Table 3.2: GDP (PPP) per capita of economies of the East Asia and Pacific area across years ($US)

(Source: World Bank)

GDP (PPP) per capita	2003–2007	2008–2012	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
East Asia & Pacific area	**18,801**	**23,031**	**16,175**	**17,460**	**18,780**	**20,098**	**21,491**	**21,920**	**20,989**	**23,148**	**24,149**	**24,952**
Developed economies	**32,345**	**39,119**	**27,939**	**30,138**	**32,330**	**34,517**	**36,801**	**37,287**	**36,566**	**39,166**	**40,749**	**41,829**
Australia	34,033	39,691	30,915	32,461	33,991	35,438	37,360	38,271	38,414	39,348	40,470	41,954
New Zealand	25,118	28,089	22,586	24,008	25,082	26,287	27,629	27,681	27,177	27,698	28,408	29,481
Hong Kong	36,340	47,243	29,653	32,924	36,309	39,671	43,144	44,758	43,789	46,956	49,775	50,936
Japan	30,492	34,019	27,701	29,010	30,441	31,889	33,418	33,694	32,081	33,981	34,486	35,855
Korea	22,919	29,431	19,697	21,138	22,783	24,580	26,398	27,334	27,502	29,458	30,911	31,950
Singapore	45,167	56,242	37,080	41,289	45,374	49,236	52,854	51,986	50,430	57,556	60,441	60,799
Developing economies	**5,257**	**6,943**	**4,411**	**4,782**	**5,230**	**5,680**	**6,182**	**6,553**	**5,412**	**7,129**	**7,550**	**8,074**
China	4,240	7,544	3,217	3,614	4,102	4,740	5,526	6,145	6,730	7,487	8,305	9,055
Indonesia	3,211	4,370	2,803	2,979	3,185	3,415	3,675	3,917	4,072	4,316	4,620	4,923
Malaysia	11,799	15,242	10,027	10,718	11,840	12,715	13,694	14,448	14,062	15,018	15,890	16,794
Philippines	3,087	3,949	2,720	2,905	3,061	3,255	3,493	3,636	3,685	3,945	4,098	4,380
Thailand	6,880	7,195	5,920	6,350	6,835	7,387	7,910	8,193	796	8,674	8,810	9,503
Vietnam	2,324	3,360	1,781	2,124	2,354	2,567	2,793	2,976	3,128	3,334	3,574	3,788

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Table 3.3: CPI indicator of economies of the East Asia and Pacific area across years (%)

(Source: World Bank)

CPI	2003–2007	2008–2012	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
East Asia & Pacific area	**3.15**	**4.07**	**1.78**	**3.03**	**3.70**	**4.02**	**3.19**	**6.94**	**1.78**	**3.24**	**5.23**	**3.15**
Developed economies	**1.59**	**2.66**	**0.82**	**1.58**	**1.60**	**2.07**	**1.90**	**4.23**	**1.10**	**2.08**	**3.58**	**2.30**
Australia	2.72	2.84	2.70	2.30	2.70	3.60	2.30	4.40	1.80	2.90	3.30	1.80
New Zealand	2.56	2.70	1.70	2.30	3.00	3.40	2.40	4.00	2.10	2.30	4.00	1.10
Hong Kong	0.38	3.32	-2.60	-0.40	0.90	2.00	2.00	4.30	0.60	2.30	5.30	4.10
Japan	-0.18	-0.18	-0.90	0.00	-0.30	0.20	0.10	1.40	-1.30	-0.70	-0.30	0.00
Korea	2.92	3.32	3.50	3.60	2.80	2.20	2.50	4.70	2.80	2.90	4.00	2.20
Singapore	1.16	3.96	0.50	1.70	0.50	1.00	2.10	6.60	0.60	2.80	5.20	4.60
Developing economies	**4.70**	**5.47**	**2.75**	**4.48**	**5.80**	**5.97**	**4.48**	**9.65**	**2.45**	**4.40**	**6.87**	**4.00**
China	2.64	3.32	1.20	3.90	1.80	1.50	4.80	5.90	-0.70	3.30	5.40	2.70
Indonesia	8.64	5.88	6.80	6.10	10.5	13.1	6.70	9.80	4.80	5.10	5.40	4.30
Malaysia	2.22	2.52	1.10	1.40	3.00	3.60	2.00	5.40	0.60	1.70	3.20	1.70
Philippines	4.42	4.82	2.30	4.80	6.60	5.50	2.90	8.20	4.20	3.80	4.70	3.20
Thailand	3.18	2.94	1.80	2.80	4.50	4.60	2.20	5.50	-0.90	3.30	3.80	3.00
Vietnam	7.08	13.36	3.30	7.90	8.40	7.50	8.30	23.10	6.70	9.20	18.7	9.10

Table 3.4: Interest rate indicator of economies of the East Asia and Pacific area across years (%)

(Source: IMF)

Interest rate	2003–2007	2008–2012	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
East Asia & Pacific area	**4.82**	**4.00**	**4.34**	**4.21**	**4.59**	**5.48**	**5.45**	**5.17**	**4.24**	**2.98**	**3.56**	**4.04**
Developed economies	**3.68**	**2.34**	**3.05**	**2.91**	**3.49**	**4.35**	**4.63**	**4.63**	**1.77**	**1.56**	**1.94**	**1.82**
Australia	5.40	4.60	4.80	5.20	5.20	5.50	6.30	6.80	3.30	3.80	4.80	4.30
New Zealand	6.42	4.08	5.80	5.00	6.50	7.40	7.40	8.40	4.00	2.50	3.00	2.50
Hong Kong	4.42	1.58	2.80	2.70	3.90	5.90	6.80	5.90	0.50	0.50	0.50	0.50
Japan	0.05	0.12	0.00	0.00	0.00	0.00	0.25	0.50	0.10	0.00	0.00	0.00
Korea	3.90	3.00	4.25	3.75	3.25	3.75	4.50	5.00	2.00	2.00	2.75	3.25
Singapore	1.91	0.68	0.63	0.81	2.06	3.56	2.50	1.19	0.69	0.56	0.56	0.38
Developing economies	**5.95**	**5.65**	**5.63**	**5.52**	**5.70**	**6.60**	**6.28**	**5.70**	**6.72**	**4.40**	**5.18**	**6.25**
China	5.60	6.20	5.30	5.30	5.60	5.60	6.20	7.50	5.30	5.60	6.60	6.00
Indonesia	11.58	7.20	12.0	12.0	12.1	12.8	9.00	8.00	9.00	6.50	6.50	6.00
Malaysia	2.92	2.65	2.70	2.70	2.70	3.00	3.50	3.50	2.00	2.00	2.75	3.00
Philippines	7.12	4.76	7.00	6.80	6.80	7.50	7.50	5.50	6.00	4.00	4.00	4.30
Thailand	2.86	2.38	1.80	1.30	2.00	4.20	5.00	3.20	3.00	0.30	2.20	3.20
Vietnam	5.60	10.7	5.00	5.00	5.00	6.50	6.50	6.50	15.0	8.00	9.00	15.0

Table 3.5: Capital requirement ratio of banking systems of the East Asia and Pacific area across years (%)

(Source: International surveys on bank regulations)

Capital requirement	2003–2007	2008–2012	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
East Asia & Pacific area	**5.7**	**6.0**	**5.7**	**5.7**	**5.7**	**5.7**	**5.7**	**6.0**	**6.0**	**6.0**	**6.0**	**6.0**
Developed economies	**5.8**	**5.65**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.7**	**5.7**	**5.7**	**5.7**	**5.7**
Australia	7.0	8.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0
New Zealand	4.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Hong Kong	7.0	6.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0
Japan	6.0	5.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0
Korea	3.0	8.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0
Singapore	8.0	7.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0
Developing economies	**5.5**	**6.35**	**5.5**	**5.5**	**5.5**	**5.5**	**5.5**	**6.3**	**6.3**	**6.3**	**6.3**	**6.3**
China	5.0	8.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0	8.0	8.0
Indonesia	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Malaysia	3.0	8.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0
Philippines	5.0	6.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0
Thailand	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vietnam	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0

Chapter 4: Cost Efficiency of East Asia and Pacific Banks

4.1 Introduction

According to the European Central Bank (2010), a bank's efficiency refers to its ability to generate revenue from a given amount of assets and make profit from a given source of income. At the industrial level, the effectiveness of a banking system is confirmed through its ability to provide services and maintain the stability of the system (Ngo, 2012). Improvements in bank efficiency can lead to increases in profitability and the number of funds intermediated, as well as suitable prices and better service for customers, which contributes to both the banking industry and economic development (Berger et al., 1993).

Although there has been much research conducted into the topic of banks' efficiency, few studies have measured and compared the cost efficiency of developed and developing economies in a data set. There is a gap in the literature regarding the banking system of a whole geographic region, particularly the East Asia and Pacific area.

As mentioned earlier, the East Asia and Pacific region is now the largest recipient of the developing world capital flows and thus has a core role in the world's financial market (APFED, 2005). The differing stages of economic development and uneven financial sector structures within the Asia and Pacific region are reflected in global perceptions of their sovereign credit risk. In the midst of recent swings in capital flows to emerging-market economies, differentiation based on economic fundamentals has become increasingly evident in the region.

Therefore, this research project has focused on the efficiency of the banking system in the East Asia and Pacific area, specifically studying the data of 12 developed and developing economies. Analysing the data set from 247 commercial banks during the

2003–2012 periods has compared the cost management level of the two groups of economies in this area. This study also has a preliminary examination of the effects of the 2008 GFC on cost efficiency scores.

The remaining sections of this chapter are:
- methodology regarding cost efficiency measuring methods, model specification and data set description
- empirical results and discussions regarding the cost efficiency of the 12 selected East Asia and Pacific economies: Australia, New Zealand, Hong Kong, Japan, Korea, Singapore, China, Indonesia, Malaysia, Philippines, Thailand and Vietnam
- the effects of the 2008 GFC on cost efficiency during the years 2003–2012, and cost efficiencies across East Asia and Pacific economies
- Conclusions.

4.2 Methodology

4.2.1 Empirical method: Stochastic Frontier Analysis approach for measuring cost efficiency of banks

The first aim of this study was to measure the efficiency of East Asia and Pacific banking industries. As discussed earlier, this can be achieved by using one of two common approaches: the parametric SFA and the nonparametric DEA. 'DEA is a linear programming technique where the set of best-practice or frontier observations are those for which no other decision-making unit (DMU) or linear combination of units has as much or more of every output (given inputs) or as little or less of every input (given outputs)'(Berger & Humphrey, 1997, p5).

DEA approach is built under the assumption that there is no random error that creates a disadvantage. 'The stochastic frontier approach (SFA) specifies a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors, and allows for random error'(Berger & Humphrey, 1997, p6). Thus, SFA, which modified the traditional assumption of a deterministic production frontier, had an advantage (Sun & Chang, 2011).

Because of the advantages of SFA over DEA in terms of attributing statistic noise to inefficiency, this study employed SFA to measure the efficiency of the East Asia and Pacific banking systems.

Studies by Aigner et al. (1977) and Meeusen and Van den Broeck (1977) employed SFA, composed of a deterministic production frontier. In those modified traditional models, the authors believed that the production process is subject to random disturbances that have different characteristics. In line with the attempt to expand the traditional models, Koop, Osiewalski and Steel (1999)suggested the technique of applying Bayesian methods with cross-sectional data and panel data. In their study, the authors paid attention to the advantages of SFA and DEA. They confirmed that most economic data sets are quite noise and the treatment of measurement error is important to reach precise results in evaluating efficient or inefficient scores (Koop et al., 1999).

A later study by Wang (2002) combined traditional and extended models, where TC_{it} represents total costs for the i_{th} bank in year t, then Y_{it}, P_{it} are the vectors of the output and the price of input, respectively. They presented the equation as:

$$TC_{it} = f_1(Y_{it}, P_{it}) + v_{it} + u_{it}, \ v_{it} \sim N(0, \sigma_v^2), \ u_{it} \sim N^+(\mu_{it}, \sigma_{it}^2) \quad (4.1)$$
$$\mu_{it} = \delta_0 + Z_{it}\delta$$
$$\sigma_{it}^2 = exp(\gamma_0 + Z_{it}\gamma)$$

where v_{it} is the stochastic error term with i.i.d. normal distribution and u_{it} has a truncate normal distribution with an observation-specific mean (μ_{it}) and variance (σ_{it}^2), which are assumed a function of some determinants (Z_{it}) of its pre-truncated distribution.

Wang's model allows exogenous variables (Z_{it})to have effects on inefficiency in two flexible ways: the relationship between exogenous variables and inefficiency not only increases or decreases monotonically, it can shift within the sample (Wang, 2002). Since behavioural assumptions such as cost minimisation are appropriate for banks, this appears to be the best way to find a cost frontier model for the estimation. Lai and Huang (2010) and Sun and Chang (2011) both described Wang's model as the best specification model from eight well-known stochastic frontier models.

The empirical specification of the cost frontier in trans-log form derived from equation 4.1 is shown in equation 4.2 (Jiang et al., 2013).

$$lnTC_j = \beta_0 + \sum_{rj} \beta_r \, lnY_{rj} + \sum_{ij} \beta_i \, lnP_{ij} \qquad (4.2)$$
$$+ \frac{1}{2} \sum_i \sum_k \beta_{ik} \, lnY_{ij} \, lnY_{kj} + \frac{1}{2} \sum_i \sum_z \beta_{iz} \, lnp_{ij} \, lnP_{zj}$$
$$+ \sum_r \sum_i \beta_i \, lnY_r \, lnP_i + v_i + u_j$$

where TC is total cost, Y_r are outputs and P_i are input prices. The standard restriction of linear homogeneity in input prices is imposed using one input price. To control for scale biases and heteroskedascity, total assets is used to normalise all output variables and total cost.

4.2.2 Model specification and data description

An unbalanced panel data of banks covering the 2003–2012 period was analysed by using Stata 12.0 software. The financial data, such as financial statements and other financial ratios, were mostly taken from Bankscope, a comprehensive world banking information source provided by Bureau van Dijk. The data sets of the banking sectors of the 12 East Asia and Pacific economies in the study were analysed, a total of 247 banks. An average of 20 banks in each economy was intended, but in the cases of New Zealand and Singapore there were less than 10 banks. The highest number of selected banks was in Japan, with 50 banks. That scope built an unbalanced panel data consisting of 2,378 year-bank observations for the 10 years from 2003 to 2012. The detail distribution of observations across economies is shown in Table 4.1.

Table 4.1: Unbalanced panel data descriptions

Year	Number of observations	Number of banks	Area	Number of observations	Number of banks
2003–2012	2,378	247	East Asia & Pacific area	2,378	247
2003–2007	1,154	247	Developed economies	1,046	108
2008–2012	1,224	247	Developing economics	1,332	139
2003	202	202	Australia	108	13
2004	217	217	New Zealand	36	4
2005	240	240	Hong Kong	175	18
2006	247	247	Japan	500	50
2007	247	247	Korea	160	16
2008	247	247	Singapore	67	7
2009	247	247	China	251	26
2010	247	247	Indonesia	337	34
2011	246	246	Malaysia	203	21
2012	237	237	Philippines	184	19
			Thailand	198	20
			Vietnam	159	19

Note: This table shows the number of observations and banks in the unbalanced panel data of the East Asia and Pacific area over the period 2003–2012.

The empirical method requires the information about outputs and input prices of the DMU in the industry. In the banking literature, there is no general agreement regarding the proper definition of inputs and outputs. There are some different views that define banking as a service industry, such as the production approach, operating approach, value-added approach and intermediation approach, which affect the output and input price categories of an industry. According to the production approach, banks are treated as firms producing their products in different forms of deposit and loan accounts by using capital and labour (Colwell & Davis, 1992). According to the operating approach, all expenses, including interest expenses, non-interest expenses, personnel expenses and other expenses, are defined as inputs and the relevant outputs are all kind of revenue (for example, interest income, non-interest income, etc.). According to the value-added approach, the inputs are labour, capital and interest expenses, producing outputs such as deposits, loans and investments(Eltivia, 2013). In the intermediation approach, banks are viewed as

providers of intermediate financial services, rather than producers of loan and deposit account services (Colwell & Davis, 1992).

This study used the intermediation approach to classify the outputs and input prices of the banking industry. According to the intermediation approach, banks are considered financial intermediaries that take deposits from savers and make loans to economic agents who require capital (Allen & Santomero, 1997). Allen & Santomero's study on the theory of intermediation confirmed the fact that the role of intermediations has changed significantly from the traditional theory and become much more important in financial markets. That change has also affected the definition of the outputs and input prices of an intermediation.

For this study, four outputs and two input prices were chosen. Four outputs previously adopted in studies by Bonin, Hasan and Wachtel (2005) and Berger, Hasan and Zhou (2009) included total loans (TOTALLOAN), other earning assets (OEASSET), total deposits (TOTALDEPOSIT) and liquid assets (LIQUIDASSET). Three input prices that have been applied widely in previous studies are the price of capital, price of funds and price of labour (Altunbaş, Gardener, Molyneux & Moore, 2001; Beccalli, Casu & Girardone, 2006). As the data on the personnel expenses of several sample banks (needed to calculate the price of labour) was not available, this price was omitted for this study, which focused only on the two first prices; specifically, price of funds (PFUND), measured by the ratio of interest expenses to total deposits; and price of capital (PCAPITAL), defined by the ratio of non-interest expenses to total fixed assets. In addition, the total cost (TOTALCOST) of banks was the total of interest expenses and non-interest expenses (Altunbas, Evans & Molyneux, 2001; Y. Altunbaş, Gardener, Molyneux & Moore, 2001). All of the variable measurements of this stage, including total interest expenses, total non-interest expenses, total assets, total fixed assets, total short-term deposits, total long-term deposits, total loans, other earning assets and liquid assets, were available from the financial statements of sample banks, on the Bankscope database. Table 4.2 shows the definitions of all variables used in this stage.

Table 4.2: Definitions of variables for estimating cost efficiency

Variable	Definition
TOTALCOST	Total interest expenses and non-interest expenses
TOTALLOAN	Total loans
OEASSET	Other earning assets
TOTALDEPOSIT	Total short-term deposits and long-term deposits
TOTALASSET	Total assets
LIQUIDASSET	Liquid assets
PCAPITAL	Price of capital—ratio of non-interest expenses to total fixed assets
PFUND	Price of fund—ratio of interest expenses to total deposits

The descriptive statistics of all variables are provided in Table 4.3. Some of the main indicators shown in Table 4.3 indicate the 'big picture' of the East Asia and Pacific banking sector. It is clear that there is a large gap between the banks of developed and developing economies; the mean of banks' total assets in developed economies is almost double the size of the mean for banks in developing group.

Table 4.3: Sample descriptive statistics of variables used in estimating cost efficiency (2003–2012)

(Source: Bankscope database)

	Full sample			Developed economies			Developing economies		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
TOTALCOST									
(in thousand US$)	2,211,279	1,182	72,900,000	2,739,106	7,895	33,800,000	1,796,785	1,182	72,900,000
Output quantities (in thousand $US)									
GROSSLOAN	47,600,000	27	1,360,000,000	64,400,000	28,886	917,000,000	34,400,000	26	1,360,000,000
OEASSET	34,800,000	0	1,330,000,000	47,100,000	2,082	904,000,000	25,200,000	0	1,330,000,000
TOTALDEPOSIT	77,500,000	12,925	2,490,000,000	104,000,000	95,071	1,770,000,000	56,800,000	12,925	2,490,000,000
LIQUIDASSET	14,100,000	4,180	728,000,000	148,000,000	8,545	388,000,000	13,600,000	4,180	728,000,000
TOTALASSET	88,100,000	29,380	2,790,000,000	121,000,000	154,604	2,010,000,000	62,400,000	29,380	2,790,000,000
Input prices									
PCAPITAL	5.3339	0.0285	810.9945	8.1459	0.1179	810.9945	3.1257	0.0285	184.5000
PFUND	0.0277	0	0.1967	0.0174	0	0.1111	0.0359	0.0001	0.1967

Note: This table reports the minimum, maximum and average of all the variables defined in Table 4.2. All nominal monetary variables are transferred to the 2005 price level.

4.3 Results and discussion

4.3.1 Cost efficiency of East Asia and Pacific developed and developing economies over the period 2003–2012

The overall average of efficiency scores shown in Table 4.4 indicate that the observed banks could have produced their outputs using 62 per cent of their actual inputs. Although the mean of the cost efficiency scores is at the medium level, there is a large gap in cost management between the banks in the East Asia and Pacific banking system, in which the cost efficiency scores range widely, from a very low 0.2 per cent up to 98 per cent.

Table 4.4: Summary of cost efficiency scores of individual economies in the East Asia and Pacific area over the period 2003–2012

COSTEFF of	Mean	Std. Dev.	Min.	Max.
East Asia & Pacific area	**0.6226**	**0.2423**	**0.0025**	**0.9808**
Developed economies	**0.5153**	**0.2936**	**0.0254**	**0.9808**
Australia	0.8187	0.1334	0.1315	0.9415
New Zealand	0.8565	0.0192	0.8177	0.9155
Hong Kong	0.6446	0.1751	0.1689	0.8732
Japan	0.2801	0.2055	0.0254	0.9031
Korea	0.7782	0.0855	0.3523	0.9808
Singapore	0.6282	0.2458	0.0794	0.9647
Developing economies	**0.7063**	**0.1459**	**0.0025**	**0.9714**
China	0.7329	0.0899	0.4371	0.9171
Indonesia	0.7319	0.1018	0.4021	0.9714
Malaysia	0.7174	0.1675	0.0025	0.9576
Philippines	0.5941	0.1358	0.1819	0.8526
Thailand	0.6014	0.1525	0.0360	0.8648
Vietnam	0.8603	0.0350	0.7381	0.9286

The mean efficiency scores of the two groups of economies, in developing countries (i.e. China, Indonesia, Malaysia, Philippines, Thailand and Vietnam) and developed countries (i.e. Australia, New Zealand, Hong Kong, Singapore, Japan and Korea), showed a surprising result. The mean for developing countries was much higher (70 per cent) than that of the developed countries (51 per cent). However, this was mainly because Japan, which had around 50 per cent of the developed group's bank-

year observations, had the worst level of cost efficiency, with mean scores of only 28 per cent during the period 2003–2012. In fact, most of developed countries that were observed had mean efficiency scores that were equal to or higher than the overall score. Australia and New Zealand scored 82 per cent and 86 per cent respectively, in line with previous studies of developed countries (e.g. the US, Germany, France, Italy and Spain), which also found average efficiency scores of around 80 per cent(Berger & DeYoung, 1997; Pastor, 2002).

In the developing countries group, the two countries with the lowest efficiency (the Philippines and Thailand) scored around the average level, at about 60 per cent. The efficiency scores of other countries in this group ranged from 72 per cent (Malaysia) to 86 per cent (Vietnam), leading to a group average of 70 per cent. In a previous study on 12 transition economies in Central and Eastern Europe during the period 1993–2000, Yildirim and Philippatos measured bank cost efficiencies by using both SFA and DEA. Their SFA results had an average score that was higher than the mean for our research, at around 77 per cent. This score means about one-quarter of bank resources are wasted during the provision of banking services in transition economies, on average (Yildirim & Philippatos, 2007). The results of our analysis are comparable with those of a previous study in Asian emerging countries by Sun and Chang (2011), which were typically in the vicinity of 70 per cent.

Table 4.5 also provides a picture of cost management of each economy in terms of their cost efficiency score. Most of sampled banking systems had a wide range of bank efficiency scores; for example, New Zealand and Vietnam. Varied ranges in cost efficiency from the minimum scores to the maximum scores of those mentioned countries are only around 10 per cent and 20 per cent respectively. In the other economies in the East Asia and Pacific area, minimum efficiency scores were less than 40 per cent, even less than 10 per cent in the cases of Japan, Singapore, Thailand and Malaysia. However, this cannot be used to draw any conclusions about the stability of their banking systems; further examination would be required for that. According to a study of European transition economies by Yildirim and Philippatos, Poland and Spain were the most efficient countries during the period 1993–2000, at 85 per cent and 82 per cent respectively, while the Russian Federation and the three Baltic States were the least efficient, at around 70 per cent.

Table 4.5: Means of cost efficiency scores of economies of the East Asia and Pacific area across years

Mean of COSTEFF	2003–2007	2008–2012	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
East Asia & Pacific area	**0.6299**	**0.6159**	**0.5980**	**0.6014**	**0.6264**	**0.6501**	**0.6656**	**0.6564**	**0.6146**	**0.5976**	**0.6101**	**0.5996**
Developed economies	**0.6623**	**0.6471**	**0.5402**	**0.6377**	**0.6949**	**0.7046**	**0.7343**	**0.7177**	**0.6345**	**0.6228**	**0.6316**	**0.6286**
Australia	0.6294	0.8171	0.1315	0.6210	0.7874	0.7906	0.8164	0.8171	0.8536	0.8721	0.8676	0.8432
New Zealand	0.8534	0.8573	0.8177	0.8841	0.8616	0.8441	0.8593	0.8573	0.8529	0.8675	0.8539	0.8447
Hong Kong	0.7274	0.7274	0.6161	0.6086	0.7738	0.8191	0.8194	0.7274	0.4420	0.4456	0.5779	0.6077
Japan	0.2942	0.3620	0.2330	0.2478	0.2685	0.3238	0.3979	0.3620	0.2935	0.2492	0.2219	0.2036
Korea	0.7518	0.8273	0.7753	0.7673	0.7155	0.7278	0.7730	0.8273	0.8196	0.8211	0.7726	0.7829
Singapore	0.7178	0.7153	0.6675	0.6976	0.7622	0.7220	0.7398	0.7153	0.5453	0.4812	0.4960	0.4897
Developing economies	**0.7114**	**0.7017**	**0.7240**	**0.7156**	**0.6998**	**0.7115**	**0.7063**	**0.7087**	**0.6969**	**0.6849**	**0.7082**	**0.7096**
China	0.7041	0.7450	0.7012	0.7188	0.6977	0.6888	0.7140	0.7450	0.7267	0.7320	0.7875	0.8091
Indonesia	0.7557	0.7042	0.8104	0.7580	0.7541	0.7531	0.7029	0.7042	0.7480	0.7099	0.7086	0.6749
Malaysia	0.7219	0.7166	0.7383	0.7292	0.7064	0.7044	0.7309	0.7166	0.7108	0.7138	0.6954	0.7345
Philippines	0.6562	0.5842	0.6704	0.6944	0.6766	0.6466	0.5929	0.5842	0.5865	0.5403	0.5035	0.4726
Thailand	0.5859	0.6316	0.5776	0.5301	0.5306	0.6398	0.6515	0.6316	0.5475	0.5335	0.6686	0.6980
Vietnam	0.8449	0.8708	0.8459	0.8632	0.8334	0.8365	0.8456	0.8708	0.8622	0.8799	0.8859	0.8686

4.3.2 Effects of the 2008 GFC on cost efficiencies in separated groups of economies in the East Asia and Pacific area

As shown in Table 4.5, the means of the efficiency scores in groups of years are generally similar, at around 62 per cent. However, the periods before and after the 2008 GFC show different trends. From 2003 to 2007, the means of the efficiency scores increased steadily from 59 per cent to 66.5 per cent; the scores declined after 2008, to less than 60 per cent in 2012. It could be predicted that the GFC event would have an effect on efficiency scores and that the effects would be more discernible for developed economies than for the developing group. Table 4.5 shows that the means for developed economies rose from 54 per cent to 73.4 per cent during the period 2003–2007; conversely, the average cost efficiency scores of developing countries' banking systems was quite stable, with average scores across years of 70 per cent for both the period before and after the GFC.

4.3.3 Cost efficiency across the East Asia and Pacific economies

Figures 4.1 and 4.2 introduce the cost efficiency scores of separated countries across years, divided into the two groups of developing level. These results enable a comparison of the trend in average cost efficiency scores across countries from 2003 to 2012. The detailed data for these figures are shown in Table 4.5.
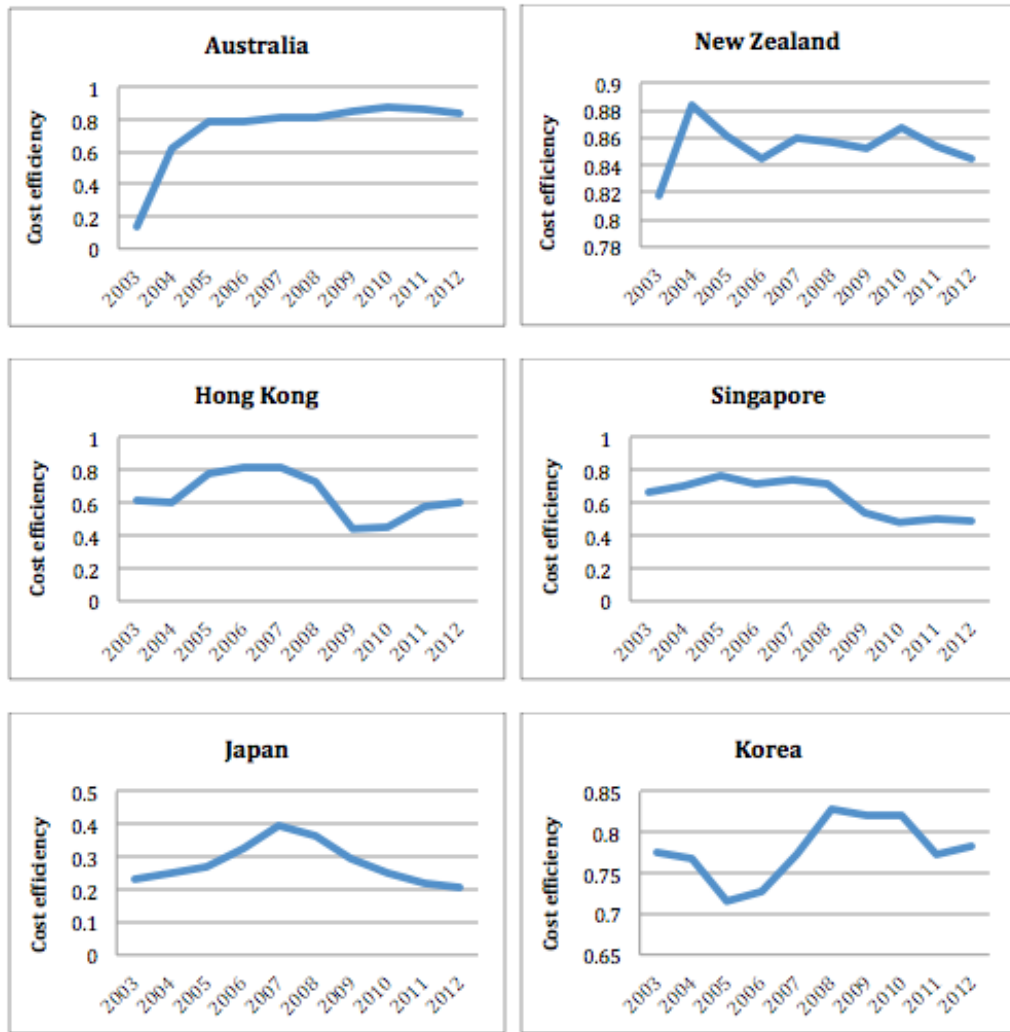
Figure 4.1: Cost efficiency for developed East Asia and Pacific countries during the period 2003–2012

Figure 4.1 shows that while Australia and Singapore had consistent trends, upwards and downwards respectively, the cost efficiency of the other countries fluctuated widely during the period 2003–2012.

Figure 4.2 indicates two different trends among the developing countries. While the average cost efficiency scores in Indonesia and the Philippines consistently declined, the scores of other countries in this group were very volatile over years, particularly in Malaysia.
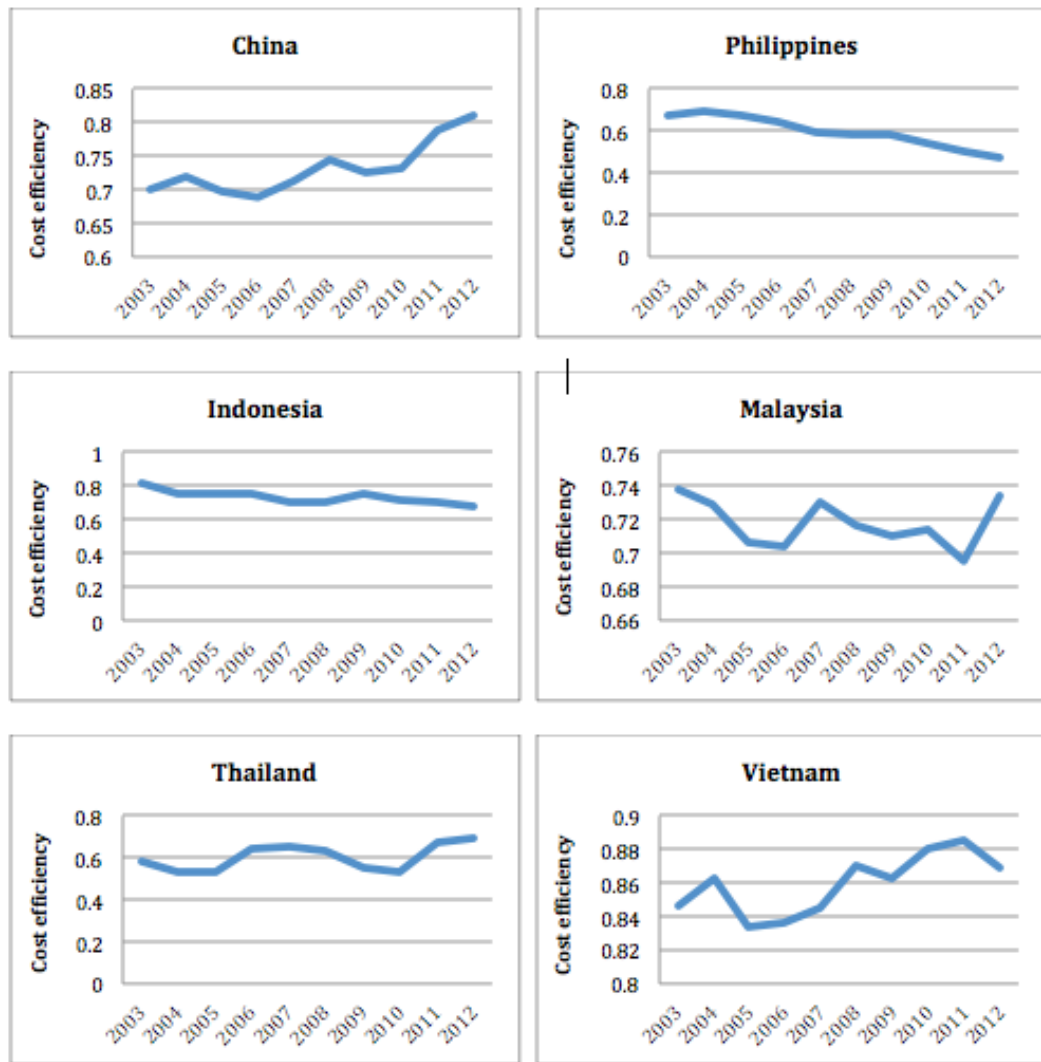
Figure 4.2   Cost efficiency for developing East Asia and Pacific countries during the period 2003–2012

A 2011 study on cost efficiency in Asian emerging countries by Sun and Chang showed some trends that were similar to our results, but in a different period: 1998–2008. Their study included five of the countries in our sample: China, Korea, Malaysia, Philippines and Thailand. Their results confirmed our results, with China presenting consistently higher cost efficiency and Thailand and the Philippines being in the lowest group of cost management.

4.4 Conclusion

This chapter has presented the results of using SFA to measure and compare the cost management of a range of banking systems in the East Asia and Pacific area: Australia, New Zealand, Japan, Hong Kong, Singapore, Korea, China, Malaysia, Philippines, Indonesia, Thailand and Vietnam. The overall average of efficiency scores indicates that the observed banks could have produced their outputs using 62 per cent of their actual inputs. This is not a high score when compared with previous studies on countries in the area with the same level of development. Comparing the scores between groups of economies produced a surprising result, with the mean efficiency scores of developing countries being up to 20 per cent higher than those of developed countries.

The 2008 GFC had a clear effect on efficiency scores. Although the mean efficiency scores overall were similar at around 62 per cent, the periods before and after 2008 showed different trends; from 2003 to 2007, the mean efficiency scores increased steadily from 59 per cent to 66.5 per cent, but declined after 2008 to less than 60 per cent in 2012.

Chapter 5: The Effects of Risks on Bank Cost Efficiency in East Asia and Pacific Economies

5.1 Introduction

Risk management and the effects of risk on efficiency is an emerging issue related to bank efficiency. In economics term, risk has been defined as the combination of the probability of an event and its consequences, whether opportunities for success or threats of failure. Banks manage risk to increase their opportunities and decrease the threats to their activities (Cross, 1995). Compared with other types of business, banking is substantially exposed to risks through their natural activities as an intermediation Risk management has become a key area of banks' activities because risks can transfer across economies and banking systems via intermediation (Allen & Santomero, 1997).

The interrelationship between risk and bank efficiency has received much attention in recent years, especially since the Asian Financial Crisis in 1997 and the GFC in 2008. Studies have been conducted in both developed and developing/emerging markets in Europe, Japan and emerging Asian countries, and have found that most kinds of risk (e.g. credit risk, operational risk, liquidity risk and market risk) affect bank cost efficiency. However, these previous studies had limitations that blocked the development of a view of risk and cost management around the world. First, they were not conducted on the same data set, which would enable comparison of the effects of risk between groups. Second, the effects of some environmental factors as macroeconomics indicators were not examined sufficiently. Third, because the observed period was mostly before 2009, there had not been enough time following the 2008 GFC to allow an examination of its effects.

As mentioned earlier, this study focused on the effects of risk on bank cost efficiency in economies of the East Asia and Pacific area. The relationship between risk and cost management was compared by analysing the data set from 247 commercial

banks for the period 2003–2012. The effects of some environmental factors on banking activities were also examined, using four macroeconomics indicators as control variables at both country and bank level: growth of domestic product, inflation, market interest rate and the capital requirement for banks.

The remaining sections of this chapter are as follows:
- methodology for examining the relationship between three kinds of risk and bank cost efficiency,
- model specification,
- data set description,
- empirical results and discussion regarding the effects of risks on the cost efficiency of East Asia and Pacific economies; the effects of the 2008 GFC on these relationships; and those relationships across the East Asia and Pacific economies,
- Conclusions.

5.2 Methodology

5.2.1 Empirical method: Tobit regression for testing the relationship between cost efficiency and risks measures

The following equations were used to estimate the relationships between three kinds of risks and efficiency:

$$x.eff_{it} = f_2(C.risk_{it}, Z_{it}) + \varepsilon_{it} \qquad (5.1)$$
$$x.eff_{it} = f_3(L.risk_{it}, Z_{it}) + \varepsilon_{it} \qquad (5.2)$$
$$x.eff_{it} = f_4(O.risk_{it}, Z_{it}) + \varepsilon_{it} \qquad (5.3)$$
$$x.eff_{it} = f_5(C.risk_{it}, L.risk_{it}, O.risk_{it}, Z_{it}) + \varepsilon_{it} \qquad (5.4)$$

where $C.risk_{it}$, $L.risk_{it}$, $O.risk_{it}$ represents credit risk, liquidity risk and operational risk respectively; Z_{it} are control variables at both bank and country level; ε_{it} is the random error term (Fiordelisi et al., 2011); and eff_{it} are the efficiency scores measured from the last analysed stage of this study (from Chapter 4). Bank efficiency is always positive and the best-practice or zero-inefficient banks should have a score of 1. As bank cost efficiency with a value from 0 to 1 made the dependent variable a truncated distribution, the Tobit model was applied to estimate

the distribution characteristics of the cost efficiency scores. Equations 5.1–3 were used to test the three kinds of risk separately; and equation 5.4 tested the combined effects of those risks on efficiency.

5.2.2 Model specification and data description

As mentioned in Chapter 4, an unbalanced panel data covering the period 2003–2012 was analysed. The detailed descriptions of the panel are shown in Table 4.1. Most special financial ratios, such as ratio of loan loss reserve over gross loans, ROA, and so on, were calculated from data available on Bankscope. Other macroeconomics indicators, such as CPI, interest rate (IR), GDP, and so on, were all published on the World Bank and IMF databases.

This stage of the study focused on testing the relationships between three kinds of risk (credit risk, operational risk and liquidity risk) and cost efficiency. Credit risk is measured by the ratio of loan loss reserves over gross loans (LLRGL), which is used to measure output quality and how the manager invests in highly risky assets (Sun & Chang, 2011). A set of two variables is used for accounting operational risk: the ratio of equity and total assets (ETA) and return on asset volatility (ROAV) (Sun & Chang, 2011). In particular, the role of ETA is to capture financial distress and the probability of bankruptcy; ROAV is an accounting-based volatility indicator calculated by a logged three-year standard deviation of ROA. The equity to asset ratio measures the equity position of a bank as a fraction of total assets. The ratio of cash and due from banks to total assets (CDTA) is used to measure liquidity risk(Altunbas et al., 2000). The dependent variable is the COSTEFF estimated in the last analysed stage in Chapter 4. The country and year effects are also considered and measured with country and year dummy variables.

This stage of the study also employed six control variables, with two at bank level and four at country level. At the bank level, log of TOTALASSET and TOTALDEPOSIT plays the role of bank size indicators, used to control banking scale (Bauer, Berger, Ferrier & Humphrey, 1998; Berger et al., 2009; Westman, 2011). At the country level, two groups of control variables represented the macroeconomic indicators and financial market indicators. For the first group, GDP

and CPI were chosen to control the effect of the macroeconomics environment, and IR and Capital Ratio Requirement (REGULATION) were the factors of financial market effects. The idea and theory of controlling bank activities by using REGULATION came from studies by Laeven and Levine (2009) and Barth et al. (2013) and the data used for this study came from the worldwide surveys on the application of Basel and the capital ratio requirements. In addition, a dummy variable for the 2008 GFC (YCRISIS) and another one for the developed and developing groups of countries (DEVLOP) were used. YCRISIS employs value '0' for years 2003-2007, value '1' for the years 2008–2012; DEVLOP takes value '0'for developing economies and '1' for developed economies. Moreover, following Sun and Chang (2011), two instrument variables for testing endogeneity were used: Total Equity (EQUITY) and the ratio of liquid assets to total liabilities (LIQUIRATIO). Table 5.1 lists all the variable definitions of the testing process.

Table 5.1: Definitions of variables for testing the relationship between bank cost efficiency and risks

Variables	Definitions
LLRGL	Ratio of loans loss reverses to gross loans
ETA	Ratio of equity to total assets
ROAV	Volatility of ROA
CDTA	Ratio of cash and due from bank to total assets
CPI	Consumer price index
IR	Interest rate
GDP	Gross domestic product (purchasing power parity) per capita
REGULATION	Capital ratio requirement
EQUITY	Total equity
LIQUIDRATIO	Ratio of liquid assets to total liabilities
YCRISIS	Dummy variable for a specific event: 2008 GFC, with value '0' for the period before 2008, and value '1' for the remaining years from 2008
DEVLOP	Dummy variable for two groups of countries: developed and developing, with value '0' for developing countries, and value '1' for developed countries

Table 5.2 shows the statistics summaries of all of the variables. The statistics measurements of risks between groups of economies show that the means of the ratios of developing economies were much higher than the other group.

Table 5.2: Statistics of the variables used in testing the relationship between risks and cost efficiency

	Full sample			Developed economies			Developing economies		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Risk measures									
LLRGL (%)	3.125	0.005	80.149	1.436	0.015	15.639	4.452	0.005	80.149
ETA (%)	8.729	-27.489	74.123	7.104	-16.881	42.957	10.005	-27.489	74.123
ROAV	0.411	0	43.699	0.255	0	14.187	0.533	0	43.699
CDTA (%)	5.396	0.000035	98.313	4.251	0.0009	74.062	6.295	0.000035	98.313
Control variables									
CPI (%)	3.465	-2.6	25	1.304	-2.6	25	5.164	-0.9	23.1
IR (%)	4.232	0	15	1.835	0	8.4	6.115	0.3	15
GDP (US$)	18,494	796	60,799	34,357	1,146	60,799	6,037	796	16,794
REGULATION (%)	5.905	3	8	5.65	3	8	6.104	3	8
Instrument variables									
EQUITY									
(in thousand $US)	5,196,780	-99,600,000	179,421,710	7,249,949	-6,510,110	113,000,000	3,584,458	-99,600,000	179,000,000
LIQUIDRATIO (%)	20.162	0.138	189.982	13.039	0.138	114.175	25.756	0.355	189.982

Note: This table reports the average, minimum and maximum of all variables, as defined in Table 5.1. The data sources are Bankscope, World Bank and the IMF database.

5.3 Results and discussion

5.3.1 Effects of risks on cost efficiency of the East Asia and Pacific banks

Tobit regression was used to examine the relationship between risk measures and cost efficiency. The results are provided in Table 5.3. As a problem can arise, related to multicollinearity, if all the risk measures were put into the same model, the process of testing the relationships went through four main models: models 1–3 examined the separate effects of credit risk, operational risk and liquidity risk, and model 4 examined the combined effects of three kinds of risk on cost efficiency, estimated from the last stage of this research, over the period 2003–2012.

Model 1 in Table 5.3 examines credit risks measured by the ratio of LLRGL as a determinant of cost efficiency. It was found that this ratio had a significant negative effect on cost efficiency at the 5 per cent level, which means that a bank with a higher loan loss reserves ratio will have reduced cost efficiency. A higher ratio of loan loss reserves over gross loan would mean that a bank has a larger possibility of non-performing loans (Sun & Chang, 2011). The results of this study are in line with the conclusions of most studies on credit risk effect, such as a study of eight Asian emerging countries by Sun and Chang (2011) and studies of developed economies, such as the ones of the European banking system by Pastor (2002) and Fiordelisi et al. (2011); or of the American market, by Berger and DeYoung (1997). This is a reasonable explanation for the depressing effect on cost efficiency of higher credit risk measures. The implication is that the higher loans loss reverses ratio leads to a higher cost of dealing with these non-performing loans and leads to a lower management level (Berger & DeYoung, 1997).

Table 5.3: Results for the effects of risks on the cost efficiency of economies in the East Asia and Pacific area during the period 2003–2012

	Model 1	Model 2	Model 3	Model 4
Dependent variable—COSTEFF				
Independent variables				
LLRGL	**-0.0015****			**-0.0013****
ETA		**-0.0064*****		**-0.0064*****
ROAV		**-0.0029****		**-0.0021****
CDTA			-0.0012***	-0.0012***
TOTALASSET	0.1039***	0.1593***	0.1027***	0.1570***
TOTALDEPOSIT	-0.0734***	-0.1408***	-0.0717***	-0.1411***
CPI	0.0024***	0.0023***	0.0025***	0.0025***
IR	0.0158***	0.0153***	0.0155***	0.0154***
REGULATION	0.0207***	0.0237***	-0.0211***	0.0243***
GDP	0.0038	0.0107	0.0045	0.0115
YCRISIS	**-0.0394*****	**-0.0337*****	**-0.0386*****	**-0.0342*****
DEVLOP	**-0.1727*****	**-0.1531*****	**-0.1719*****	**-0.1413****
Year fixed effects	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES
Log likelihood	2,156.895	2,223.0837	2,158.2574	2,230.5633
Observations	2378	2378	2378	2378

Note: This table reports the results of examining the relationships between three kinds of risk and cost efficiency.

  * Significant at the 10% level.

 ** Significant at the 5% level.

*** Significant at the 1% level.

Model 2 in Table 5.3 illustrates the effects of operational risk measures on bank cost efficiency. In this case, operational risk is measured by ETA ratio and ROAV. The results show that both the ETA ratio and ROAV have significant negative effects on the cost efficiency scores. The first effect from the ETA ratio, with a negative significance at the 1 per cent, level indicates reduced benefits for banks in this higher ratio. The implication is that a riskier bank operation tends to have a higher efficiency. This also explains why bank managers choose a higher debt ratio to reach a more efficient level of operating.

Previous studies have had inconsistent results regarding capital ratio. While Sun and Chang (2011) a similar trend to that shown in this study in the relationship between ETA ratio and cost efficiency, other studies conducted in United Arab Emirates, Poland, Turkey and Europe have come to the opposite conclusions; Havrylchyk (2006)and Isik and Hassan (2002),examining the Polish and Turkish banking systems respectively, found a positive relationship between two variables. In addition, both Rao (2005) and Fiordelisi et al. (2011) defined ETA as a capitalisation risk and confirmed that well-capitalised banks have higher quality management. Their results support the Basel recommendations on bank capital adequacy as a standard of controlling operational risk and raise the issue of moral hazard in banking operations. These conflicting conclusions indicate that the ideas of safe operating, moral hazard and cost management are still controversial issues for researchers in the banking field.

With regard to the effect of ROAV, the negative relationship, at the 5 per cent level, means that a bank with higher ROAV has an increased uncertainty in its operations and tends to be less efficient than other banks. This result is in line with the findings of Berger & Mester (1997) and Sun and Chang (2011), which confirmed that poor bankers might be unfavourable as regards both cost and risk management.

Model 3 in Table 5.3 shows the relationship between liquidity risk factor and bank cost efficiency. The result indicates that a bank with a lower ratio of cash and due from banks to total assets (i.e. higher liquidity risk) has a higher level of cost efficiency. It confirms the conclusion of risk taking related to ETA ratio in the previous model; that is, the safer banks in terms of liquidity risk tend to be lower in cost efficiency. It is common knowledge that the cost of liquidity is one of the highest costs in an operating bank, because banks have to pay without earning to maintain a high amount of cash and cash equivalent. A study in United Arab Emirates by Rao (2005) found conflicting evidence on this relationship and concluded that a higher liquidity ratio tended to increase banks' cost efficiency during the observed time. This raises the same issue regarding risky and efficient operations in the banking system, such as ETA ratio analysis, and requires further study.

Model 4 in Table 5.3 examines the combined effects of all risk variables on cost efficiency simultaneously and provides exactly the same trends as the separate models. Thus is can be concluded that all kinds of risks have negative effects on banks' cost efficiency. That means a high level of risk factors in all mentioned fields, including credit, operation and liquidity, leads to a low level of cost management.

This study found that the control variables also had significant effects on cost efficiency. Interestingly, all of the control variables had the same effects on cost efficiency across all the models, indicating that multicollinearity was not a concern in this study. Another interesting finding shown in Table 5.3 is that most of control variables have significant effects at the 1 per cent or 5 per cent level, except for GDP. The reason that GDP has no effect on bank efficiency is that it is unlike the other control variables (e.g. the banks' assets and deposits, inflation, interest, banking system regulation, etc.), which all relate to the banking system operation at both bank and country level.

At the bank level, TOTALASSET and TOTALDEPOSIT had opposite relationships with bank cost efficiencies: TOTALASSET has a positive effect on cost efficiency; TOTALDEPOSIT has a significant negative effect at the 1 per cent level. This could imply that banks that are bigger in terms of total assets are more efficient in cost management. However, banks that are bigger in terms of total deposits tend to have lower cost efficiency because they deal with a high liquidity ratio and face a high pressure of paying interest expenses. This is additional evidence for the effect of liquidity risk on cost efficiency, as previously mentioned.

At the country level, most of the control variables (except for GDP) have a positive relationship with bank efficiency in terms of cost management. It is difficult to explain this situation when high inflation (represented by CPI) and high IR are reputed to be bad indicators of the economy, especially of the banking sectors. In addition, the ratio of capital requirement (represented by REGULATION) is one of factors that limit the operation and income of banks. The most reasonable explanation is the intermediary role of banks in the economy. Banks run their business on trading money and the above macroeconomic factors provide materials for their business. This implies that higher ratios of inflation, interest and capital

requirements help the banks to get more jobs, earn more income with the same expenses, and then push the cost efficiency upwards. This study's analysis of the environmental variables contributes to the literature on the banking system, with the confirmation of more determinants of bank performance.

5.3.2 Effects of risks on cost efficiency in the East Asia and Pacific developed and developing economies

In Table 5.3, the result of the relationship between a dummy variable (DEVLOP) and COSTEFF does not fit with expectations. DEVLOP is a dummy variable that divides full sample banks into two groups of countries by their development level, with value '0' for developing countries and '1' for developed countries. The results show a negative effect for the developed countries, implying that they have a lower level of cost efficiency than the developing countries. There was also strong evidence in the first stage that the average cost efficiency scores of developed countries were lower than those for developing countries. As mentioned earlier, a bank that is safer in operations usually has lower cost efficiency. This might explain why developed countries' banking systems seem to be operating at a low risk level. However, further tests and research would be required to confirm this theory.

The results in Table 5.4 provide further detail about the differences in cost management and risk relations between the two groups of economies in terms of their development level. The results of the four models in the previous section were analysed, but only the combined models (4a and 4b) are discussed here. For the four measurements of risk (LLRGL, ETA, ROAV and CDTA), the same negative effects were found in both groups of economies. These effects were consistent with the analysis of the full sample in the previous section, which conformed that there were strong relationships between credit risk and operation risks, measured by ETA, whether in a developing or developed banking system. This implies that controlling these risks has a role in managing cost efficiency at all levels of economic development. However, while ROAV and CDTA were still significant factors in developing economies, at the 1 per cent level, they seemed to have no effect on cost efficiency in developed countries.

5.3.3 The 2008 Global Financial Crisis and the relationship between cost efficiency and risks for separated groups of economies in the East Asia and Pacific area

The analysed data confirmed that the specific event dummy variable (YCRISIS) had a negative effect on cost efficiency (see Table 5.3), with obvious evidence for that statement from the last stage (see Chapter 4), in which cost efficiency scores steadily rose during the period 2003–2007 but then declined after the 2008 GFC. That indicated that the GFC did harm banks' operations, especially their level of cost management.

Table 5.5 provides the results of the examination of the full sample, for both developed and developing economies, divided into two periods: pre-crisis and post-crisis. With regard to the full sample, only the effects of LLRGL and ROAV changed from significant in the pre-crisis period to insignificant in the post-crisis period. This could imply that the way banks dealt with the GFC affected their level of cost and risk management and changed these relationships. Further research would be required to confirm this theory. This also applies when dividing the full sample into the two groups of economies. In particular, developed groups seemed to be much more affected by the GFC than the developing group. While LLRGL and CDTA both lost their relationship of significance when changing from before to after the financial crisis, ROAV had a significant effect on cost efficiency for the whole 2008–2012 period. ROAV was also the only risk factor with a changed relationship in both the developed group and developing group.

5.3.4 Risks and cost efficiency across economies

Table 5.6 provides the results of testing the relationships between three kinds of risks and bank cost efficiency across the 12 studied economies in the East Asia and Pacific area. The analysis shows large differences in the relationships. This means that these relationships were affected by the context of each economy and therefore requires further examination to allow comparisons between the countries.

Table 5.4: Results for effects of risks on cost efficiency for developing and developed economies in the East Asia and Pacific area

	Developing countries				Developed countries			
	Model 1a	Model 2a	Model 3a	Model 4a	Model 1b	Model 2b	Model 3b	Model 4b
Dependent variable—COSTEFF								
Independent variables								
LLRGL	-0.0006***			**-0.0004*****	-0.0203***			**-0.0253*****
ETA		-0.0062***		**-0.0062*****		-0.0062***		**-0.0081*****
ROAV		-0.0034***		**-0.0031*****		-0.0002		0.0031
CDTA			-0.0009**	**-0.0010*****			-0.0009	-0.0010
TOTALASSET	0.0787***	0.1341***	0.0767***	0.1319***	0.1144***	0.1828***	0.1231***	0.1899***
TOTALDEPOSIT	-0.0654***	-0.1325***	-0.0637***	-0.1320***	-0.0652**	-0.1400***	-0.0718**	-0.1548***
CPI	0.0015*	0.0015**	0.0015*	0.0016**	0.0080***	0.0069***	0.0080***	0.0069***
IR	0.0124***	0.0119***	0.0122***	0.0120***	0.0439***	0.0355***	0.0364***	0.0325***
REGULATION	0.0005	0.0050	0.0001	0.0059*	0.0740***	0.0692***	0.0695***	0.0755***
GDP	0.0097	0.0156**	0.0099	**0.0160*****	-0.0399	0.0164	0.0017	**-0.0240**
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Log likelihood	1,293.4006	1,357.4021	1,295.4984	1,360.9813	974.15341	966.87653	957.96432	991.98627
Observations	1332	1332	1332	1332	1045	1045	1045	1045

Note: This table reports the results of examining the relationships between three kinds of risk and cost efficiency.

 ** Significant at the 5% level.

*** Significant at the 1% level.

Table 5.5: Results for effects of risks on cost efficiency for economies in the East Asia and Pacific area for the periods before and after the 2008GFC

	Full sample		Developed economies		Developing economies	
	Pre-2008	Post-2008	Pre-2008	Post-2008	Pre-2008	Post-2008
LLRGL	**-0.0017***	0.0005	**-0.0227***	0.0107	-0.0012	0.0019
ETA	**-0.0038***	**-0.0034***	**-0.0072***	**-0.0098***	**-0.0045***	**-0.0025****
ROAV	**-0.0054***	-0.0022	-0.0054	**0.0256****	-0.0038	**-0.0037***
CDTA	**-0.0016***	**-0.0011****	**-0.0028****	-0.0006	**-0.0012****	**-0.0011****
TOTALASSET	0.1687***	0.1389***	0.4519***	0.1710***	0.1335***	0.1340***
TOTALDEPOSIT	-0.1541***	-0.1229***	-0.4154***	-0.1460***	-0.1256***	-0.1274***
CPI	-0.0003***	0.0068***	0.0207***	0.0137***	-0.0014	0.0038***
IR	0.0290***	0.0149***	0.0160***	0.0169***	0.0225***	0.0092***
REGULATION	0.0491***	0.02490***	-0.0051	-0.0490	0.0290**	0.0442***
GDP	0.0133***	0.0210***	0.1206***	-0.1108**	-0.0799***	0.0308***
Log likelihood	1,091.3593	1,257.0114	526.9066	479.9259	660.5120	862.9133
Observations	1,153	1,153	505	540	648	684

  * Significant at the 10% level.

  ** Significant at the 5% level.

  *** Significant at the 1% level.

Table 5.6: Results for the effects of risks on cost efficiency for individual economies in the East Asia and Pacific area

	Developed economies						Developing economies					
	Australia	New Zealand	Hong Kong	Singapore	Japan	Korea	China	Philippines	Indonesia	Malaysia	Thailand	Vietnam
LLRGL	**-0.018***	-0.011	-0.021	-0.004	**-0.007***	-0.014	**-0.008***	-0.002	**-0.002****	-0.001	**0.003****	0.002
ETA	**-0.011***	0.001	-0.001	**-0.012***	-0.001	-0.005	**-0.009***	**-0.009***	**0.003***	**-0.012***	-0.002	**-0.002****
ROAV	**0.007***	0.006	-0.009	0.054	0.003	-0.009	-0.028	0.006	-0.001	**-0.023****	-0.013	0.013
CDTA	-0.003	**0.003****	**0.003****	0.001	**-0.003***	0.001	-0.001	-0.001	**-0.004***	-0.001	**-0.004***	**-0.002***
TOTALASSET	0.135*	0.187***	0.298	0.462***	0.119	0.101***	0.524***	0.342***	-0.211**	0.060**	0.277*	0.262***
TOTALDEPOSIT	-0.023	-0.188***	-0.288	-0.425***	-0.088	-0.087**	-0.520***	-0.328***	0.247**	-0.054**	-0.225	-0.260***
CPI	-0.003	0.002	0.036***	0.020***	-0.034***	0.001	0.005*	0.005*	-0.003*	-0.001	-0.005	0.001**
IR	-0.001	-0.001	0.031***	0.069***	0.408***	0.006	-0.002	-0.003	0.008*	0.004	0.030***	0.001
REGULATION	0.008	0.000	0.155***	0.057	0.115***	0.051***	0.007	-0.025	0.000	-0.015	0.000	0.000
GDP	-0.384***	-0.069*	-0.167	-0.513***	0.372***	0.001	0.066***	-0.477***	-0.262***	-0.080	0.046***	0.213
Log likelihood	186.0185	107.8355	180.1397	70.2373	627.1776	185.4395	364.1614	223.9751	426.8603	195.9820	185.6297	365.4070
Observations	108	36	175	67	499	160	251	184	337	203	198	159

Note: This table focuses on Model 4, which combines all kinds of risks into one model.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

5.3.5 Robustness test: Testing for endogeneity

The analysed process used for this research has a potential endogeneity issue that could lead to biased results. A Durbin-Wu-Hausman test(Davidson & MacKinnon, 1993) was applied, to deal with this issue. In particular, LLRGL, ETA, ROAV and CDTA were treated as endogenous but all control variables at the country level, including CPI, IR, GDP and REGULATION, were treated as exogenous. Total equity (EQUITY) and the ratio of liquid assets to total liabilities (LIQUIDRATIO) of each bank were selected as the instrument variables. The results of the Durbin-Wu-Hausman test, shown in Table 5.7, do not indicate that the endogeneity problem was a concern in this study, with no evidence for any statistically significant problem arising from risk measures' endogeneity.

Table 5.7: Results of testing for endogeneity

	F-test statistics	p-value	Decision
LLRGL_*res*	8.68	0.602	No endogeneity
ETA_*res*	16.48	0.403	No endogeneity
ROAV_*res*	4.89	0.214	No endogeneity
CDTA_*res*	16.59	0.901	No endogeneity

Note: LLRGL_*res*is the residual of LLRGL. ETA_*res*is the residual of ETA. ROAV_*res*is the residual of ROAV. CDTA_*res*is the residual of CDTA. The residual value of every independent variable was obtained from the first procedure of the tests, and then used in the second procedure to test for endogeneity.

5.4 Conclusion

This chapter has presented the results of examining the risk and cost management levels of banking systems in the East Asia and Pacific area. Tobit regression was used to test the relationships between three kinds of risk and bank cost efficiency of the 12 selected developed and developing economies. The relationships were studied for both the full sample and data divided by groups of economies and by the timing before and after the 2008 GFC. The analysed process passed through four models.

The first three models were used for separated risks (credit risk, operational risk and liquidity risk). With regard to the first model, the ratio loan loss reserve over gross loans that represented credit risks was found to have significant negative cost

efficiency effect, at the 5 per cent level, implying that a bank with a higher loan loss reserves ratio will have reduced cost efficiency.

Model 2 examined the effects of operational risk as measured by the ETA and the ROAV. The results indicated that both the ETA ratio and ROAV had significantly negative effects on the cost efficiency scores. First, the effect from the ETA ratio, with a negative significance at the 1 per cent level, indicated reduced benefits for banks in this higher ratio, implying that a bank with risky operations tends to have a higher efficiency. The negative relationship with ROAV, at the 5 per cent level, implies that a bank with higher ROAV has an increased uncertainty in its operations and could be less efficient than other banks.

The third model showed that liquidity risk has a negative effect on efficiency, at the 1 per cent level. The result indicates that a bank with a lower ratio of cash and due from banks to total assets (i.e. a higher liquidity risk) has a higher level of cost efficiency.

Model 4 produced an interesting result, with most of the control variables having significant effects at the 1 per cent or 5 per cent level, except for GDP, which, unlike the other variables, does not relate to the banking system's operations. This finding confirmed that environmental factors have a significant effect on the banking system. There was also evidence of the significant role of the two dummy variables (groups of economies and the 2008 GFC) in bank cost efficiency, both for developing and developed economies and for the periods before and after the GFC.

Chapter 6: A Case Study of Bank Cost Efficiency and Risks in Vietnam

6.1 Introduction

As mentioned earlier, the financial system plays an important role in modern economies and the intermediary function of the banking industry has a core role in influencing economic growth (Klein, 1971; Schumpeter, 1934).

The Vietnamese economy and its banking industry have undergone two major periods of development in the last decade. In the period before 2008, the Vietnamese economy and banking industry had very strong domestic product growth and loans growth and there were concerns about high inflation rates. After 2008, the economy experienced a difficult period because of the effects of the previously overdeveloped period and the 2008 GFC, with the loan interest and exchange rates fluctuating widely. Vietnamese commercial banks had difficulty in managing their performance in terms of efficiency and high risk in their daily operations. In addition, the Vietnamese Government attempted to rank the commercial banks in terms of efficiency but they lacked the quantitative tools to do that.[2]

Several studies have been undertaken in Vietnam to measure the banking industry's efficiency (e.g. Dang-Thanh, 2010; Hung, 2007; Vu & Turnell, 2010), but only the study by Vu and Turnell employed SFA, with data from 2000 to 2006. However, this obviously could not describe the current problems facing the Vietnamese banking industry, especially since the 2008 GFC. In addition, previous studies related to bank efficiency in Vietnam failed to mention the effects of risks. Given this background, this research conducted a study employing SFA to measure bank efficiency in Vietnam over the period 2006–2012. SFA was used to examine the relationships between credit risk, liquidity risk, operational risk and bank efficiency, using data

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[2]Decision N° 254/QĐ-TTg of the Prime Minister on 1 March 2012

from 26 Vietnamese commercial banks over the period 2006–2012. The results show the efficiency scores of banks in Vietnam and compare the scores in two groups of banks, separated by ownership. This research also examined the effects of the three risks on cost efficiency under special conditions, such as the 2008 GFC, and by groupings of banks.

6.2 History of the Vietnamese banking sector

6.2.1 Vietnamese macroeconomics environment

During the first period, the three years from 2005 to 2007, economic growth was strong, at an average of 8.4 per cent per annum, while the financial markets had a VN-index that peaked at 1,100 points in March 2007 (Nguyen, 2009). In particular, the banking industry had strong growth, with total assets increasing by 130 per cent of GDP in 2007. The average growth rate of total loans and deposits for the period was stable, at around 37 per cent, while total loans grew by 54 per cent and deposits grew by 42 per cent(Biallas & Dam, 2008). In this advantageous environment, the performance of the banking industry improved: the average ROA and ROE in 2007 were approximately 1.9 per cent and 17 per cent respectively, at a time when the averages for Asian banks were 1.1 per cent and 11 per cent(Biallas & Dam, 2008). This period's very strong domestic product growth and loans growth was the primary cause of high inflation rates.

Table 6.1: Key growth indicators of the Vietnamese
macroeconomic environment (%)
(Source: www.gso.gov.vn)

	2006	2007	2008	2009	2010	2011	2012
GDP growth	8.2	8.5	6.3	5.3	6.8	5.9	5.03
Inflation	6.6	12.6	19.9	6.9	11.8	18.6	6.81

After this overdeveloped period and the 2008 GFC, the Vietnamese economy went through a difficult period, with 2008's GDP growing at only 6.3 per cent while the inflation rate was much higher at 19.9 per cent (see table 6.1). At that time, Vietnam implemented a tight monetary policy to control high inflation but because of the effects of the GFC, this policy caused the economy to contract into a severe

depression. In addition, the financial markets experienced a sharp decline in the stock market and property prices. The VN-index dropped to below 400 points in June 2008 and kept falling to reach 235.5 points in February 2009 (Nguyen, 2009).

6.2.2 History of the Vietnamese banking system

The Vietnamese banking sector has had two main periods of development, divided by the comprehensive reform programme that was launched after the December 1986 Communist Party Congress, which changed it from a one-tier model to a two-tier model. Before 1986, the Vietnamese banking system followed a typical administered model of socialist economies, which had a one-tier system with the central bank as the sole bank in the economy. The central bank covered all the functions of the banking system and all financial services by controlling the volume, cost and sector allocation of credit (François-Xavier Bellocq, 2008).

From the late 1980s and the early 1990s, the Vietnamese banking system was hugely reformed into a two-tier system. In this system, the central bank played the role of an administration department with the mission of regulating the financial sector. This reform process also created the second tier of the system, including five state-owned commercial banks, around 45 joint-stock banks and many people's credit funds (François-Xavier Bellocq, 2008). Although there were only a small number of state-owned commercial banks, they dominated the Vietnamese financial market even when the first commercial banks were established in 1990 and their numbers continued to grow during the next 10 years.

Since the beginning of the 2000s, the Vietnamese banking sector has had further opportunities to reform under the US bilateral trade agreement (USBTA, 2001) and the accession of Vietnam the World Trade Organisation (WTO) in 2007. The USBTA framework required the Vietnamese authorities to commit to liberalising the banking system before 2010 and this commitment has since been extended to all WTO members (François-Xavier Bellocq, 2008). These reforms related to the activities of foreign banks in Vietnam, banking sector regulation and the ownership structure of state-owned banks. Under those frameworks, foreign banks have the right to expand their activities in the Vietnamese financial market and have been

given access to a greater share of Vietnamese banks' capital. With regard to regulation, the SBV started to allow for the implementation of Basel I prudential indicators. There is also a campaign to privatise the state-owned commercial banks and diversify their ownership.

6.2.3 Overview of the current Vietnamese banking industry

As previously mentioned, state-owned banks dominated Vietnam's banking industry during the period before 1990 and the first joint-stock commercial banks were established in 1990. Vietnam's financial structure now has a diversity of ownership, including state-owned banks (including joint-stock commercial banks, which dominate state-owned capital), credit unions, joint-stock banks, joint-venture banks and foreign banks. By 31 December 2011, Vietnam had five state-owned commercial banks, 35 joint-stock commercial banks, five joint-venture commercial banks, five foreign commercial banks and 50 branches of foreign commercial banks whose average capital was approximately US$ 20 million/branch (see Table 6.2). It also had a credit union system with over 1,000 transition offices with a very small total basic capital. In addition, the banking system of Vietnam is dominated by small-sized and middle-sized banks, whose charter capital ranged from VN$ 3,000 billion to VN$ 5,000 billion, equivalent to US$ 150–250 million. Among the 40 Vietnamese commercial banks, only 10 banks have a charter capital of more than VN$ 5,000 billion (Source: www.sbv.gov.vn). These small-sized and middle-sized banks approximate 75 per cent of Vietnam's total banks.

Table 6.2: Development in the number of commercial banks in Vietnam
(Source: www.sbv.gov.vn)

Types of banks	2004	2005	2007	2009	2011
State-owned commercial banks	5	5	5	5	5
Joint-stock commercial banks	36	35	34	37	35
Joint-venture banks	-	4	6	5	4
Foreign bank branches	28	30	34	45	50
Development and policy banks	-	1	2	2	2
Number of banks	**69**	**75**	**81**	**94**	**96**

As mentioned earlier, the banking industry faced a particularly challenging environment during 2008, with loan interest rates and the exchange rate fluctuating significantly. Aggressive action was taken to tighten the money supply in 2008, followed by an easy monetary policy to stimulate the economy, and then a tight monetary policy again after that. The basic interest rate was adjusted several times in 24 months (Fitch Ratings, 2009).

Severe liquidity constraints forced banks to increase their interest rates, to a maximum loan interest rate of 21 per cent in 2008 (Nguyen& Anh, 2008). Banks found it difficult to manage their output and input prices, particularly the commercial banks, which still measured their efficiency based on traditional analysis (e.g. ROA or ROE), which is not adequate for cost management purposes. Banks could not estimate their efficiency until the annual financial statements were published, normally one year after the end of the financial year.

The banking sector in Vietnam has continued to experience severe constraints, especially regarding their liquidity position and the volatile interest environment. In a recent report, Moody's noted negative prediction for Vietnamese banking operations in the short-term future, showing evidence of the banking sector's vulnerable status (Moody's, 2011). The credit growth of the industry has been consistently higher than the growth of capital and GDP during the period 2000–2010; the average growth of outstanding loans in that period was 32 per cent, compared with 29 per cent for mobilising capital and 7.15 per cent for GDP (Bao Viet Securities Company [BVSC], 2011). In addition, the loan/deposit ratio in Vietnam is usually much higher (95 per cent in 2008) than the average ratio in Asia (80 per cent) (Biallas & Dam, 2008), and it was even higher in 2010, at 130.7 per cent (BVSC, 2011). One of the indicators that show the risk situation of the industry is the loans/loss ratio, which increased to approximately 5 per cent in 2003.

Another issue for Vietnamese banks is related to their income structure, as the majority of income for most banks comes from interest income rather than non-interest income. The average proportion of interest income was 76.8 per cent in 2010 and reached 90 per cent for some small-sized banks (BVSC, 2011). From this evidence, there is no doubt that Vietnamese banks are facing a high risk in their

operations and it is crucial to conduct a study to examine the effects of risk measure on the banks' efficiency, especially credit risk and liquidity risk.

The above data shows that the Vietnam banking industry is in the middle stage of development in terms of number and size, and needs further improvement to advance its competitive position. The Vietnamese Government has been involved in reforming the banking system from 2011 to 2015, under Decision N° 254/QĐ-TTg of the Prime Minister on 1 March 2012. As part of this programme of reform, the SBV has attempted to rank Vietnamese commercial banks and divide them into groups for management purposes. [3] The ranking results based on the commercial banks' performance of the most recent year were intended to help the SBV decide on specific policies for each group. However, the SBV did not publish any criteria for ranking the banks or any guidance for them to follow to upgrade to a higher group. In particular, the SBV plans to implement a Basel II-type supervisory framework, but it gave no guidelines on the expected rules for commercial banks (KPMG, 2013). Therefore it is necessary to conduct studies in Vietnam on professional tools to measure commercial banks' cost efficiency. These tools will not only help the banks manage their efficiency but also help the SBV set standard criteria for managing the banks.

The overview analysis of the Vietnam banking industry noted three main issues. First, Vietnamese commercial banks find it difficult to manage their output and input prices and control their performance in terms of efficiency, especially following the 2008 GFC and in the situation of a high inflation rate. Second, Vietnamese banks are faced with high risk in their operations. Finally, the Vietnamese Government is attempting to rank the banks and make them follow the requirements of Basel 111, but they are lacking in the quantitative tools to do this. The review of the banking literature also confirmed that these are researchable problems.

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[3] Project 'Restructure the system of credit institutions the period 2011 – 2015'

6.3 Results and discussion

6.3.1 Methodology and data description

This research had two stages. In the first stage, the efficiency scores of a number of Vietnamese commercial banks were measured, using SFA. In the second stage, the effects of three risk measures (credit risk, liquidity risk and operational risk) on bank efficiency were examined. Tobit regression was applied to examine the relationships between the three kinds of risk on bank cost efficiency.

As explained earlier, the empirical method requires the information about outputs and input prices of the DMU in the industry and various views define banking as a service industry, such as the intermediation approach, production approach and value-added approach, which affect the output and input prices categories of an industry. This study was based on the intermediation approach to classify the outputs and input prices of banking industry. According to this approach, banks are considered as financial intermediaries that take deposits from savers and making loans to economic agents who require capital (Allen & Santomero, 1997).

This study focused on four outputs—total loans (TL), other earning assets (OEA), total deposits (TD) and liquid assets (LA)—and two input prices—the price of capital (PC) and the price of funds (PF). The PF was measured by the ratio of interest expenses to TD and the PC was defined by the ratio of non-interest expenses to total fixed assets. The TC of banks was the total of interest expenses and non-interest expenses.

This study also focused on testing the relationship among three kinds of risk: credit risk, operational risk and liquidity risk. As explained earlier, credit risk can be measured by the ratio of LLRGL. Operational risk is defined by the ratio of ETA, and ROAV. ROAV is calculated by a logged 5-year standard deviation of ROA. The cash and due from banks is used to measure the liquidity risk (Altunbas et al., 2000). The dependent variable was measured by the cost efficiency result of the first stage of this research. A dummy variable (YCRISIS) for special event (the 2008 GFC)was

also used, as well as another dummy variable, treated as an interaction term, to examine the different impacts on the relationship between risk and cost efficiency between two groups of ownership: state-owned banks and private banks.

An unbalanced panel data covering 26 Vietnamese commercial banks for the period 2006–2012 was analysed with Stata 12.0 software. The financial data, such as financial statements and other financial ratios, was taken from Bankscope, a comprehensive world banking information source provided by Bureau van Dijk.

6.3.2 Measuring cost efficiency

SFA was used to measure the efficiency scores of a number of Vietnamese commercial banks. Table 6.3 reports the summary statistics of all the variables in estimating cost efficiency, including total cost (dependent variables), four outputs (TL, OEA, deposits and liquid assets) and two input prices (PC and PF).

Table 6.3: Statistics of variables used in estimating cost efficiency

	Mean	Std. Dev.	Min.	Max.
Total cost (in thousand US$)	1,750,717	903,102.1	850,673.3	6,369,942
Output quantities (in thousand US$)				
TL	4,643,599	7,420,430	12,230.2	41,900,000
OEAs	2,653,774	3,225,281	2,550.8	17,000,000
Deposits	7,376,515	9,887,886	8,894.9	49,300,000
Liquid assets	1,922,471	2,227,626	2,641.9	11,600,000
Input prices				
PC	129.7198	334.8648	1.6861	2,816.307
PF	0.068922	0.026265	0.011162	0.138566

Note: All nominal monetary variables are transferred to the 2005 price level.

The results of maximum likelihood function estimations employed the Wang's code (2002) using Stata 12.0 software, shown in Table 6.4. Although the mean of the cost efficiency scores was in the medium level, at approximately 60 per cent, there was a large gap in cost management between Vietnamese banks, with cost efficiency scores ranging from 0.306 to 0.877. Some banks had very high efficiency, at nearly 90 per cent, and some had efficiency of less than 40 per cent.

This research also tried to find the differences in cost efficiency between the groups of banks divided by ownership. As shown in Table 6.4, the mean of the state-owned banks' efficiency scores reached 0.802, compared with only 0.544 for private banks. It could be concluded from these results that the state-owned banks, which have the dominant portion of equity (over 50 per cent) from the Government, are more efficient in cost management than the private banks.

Table 6.4: Summary of cost efficiency estimations

	Mean	Std. Dev.	Min.	Max.
Number of observations: 166				
Full sample				
INEFF	1.852128	0.545828	1.139306	3.263317
COSTEFF	0.586688	0.167322	0.306437	0.877727
State-owned banks*				
COSTEFF1	0.802952	0.061507	0.700687	0.851129
Private banks				
COSTEFF2	0.544622	0.148082	0.306437	0.877727

Note: This table reports the summary statistics of the inefficiency scores (INEFF) and cost efficiency scores (COSTEFF), which were measured by using SFA.

*These banks have the dominant portion of equity (over 50%) from the Government.

6.3.3 Relationship between risk and cost efficiency

Tobit regression was employed to examine the relationship between risk measures and cost efficiency. The results are provided in Table 6.5. The process of testing the relationships went through the four main models: models 1–3 examined the separate effects of credit risk, operational risk and liquidity risk, and model 4 examined the combined effects of the three kinds of risk on cost efficiency for the period 2003–2012 that were estimated from the last stage of the research. Four more models (5–8) were conducted to examine the effects of ownership on the relationship between risk and cost efficiency, by using an interaction term.

Model 1 in Table 6.5 focuses on the effects of credit risk measured by the ratio of LLRGL. This ratio was found to have a significant positive effect on cost efficiency, which means a bank with a higher loan loss reserves ratio will have higher cost

efficiency. This result was in conflict with the conclusion of Sun and Chang (2011) on empirical research on some emerging Asian countries and shows an opposite phenomenon in the Vietnamese banking system, but is in accord with Berger and DeYoung's conclusion (1997) about the existence of both positive and negative effects. This could explain why most banks in Vietnam have operated with high credit risk ratio and they take risks to achieve high cost efficiency.

Model 2 in Table 6.5 relates to the relationship between operational risk, which is measured by ROAV and cost efficiency. The result was not in line with previous research by Sun and Chang (2011), in which the ROAV had a significant positive effect on cost efficiency, but it was in line with the results of empirical studies on banks in Poland and Turkey (Havrylchyk, 2006; Isik & Hassan, 2002), which also found a positive relationship. This finding implies that a riskier bank tends to have higher efficiency.

Model 3 in Table 6.5 found a significant negative effect between liquidity risk and cost efficiency. The result shows that a bank with a higher amount of cash and due from banks has a lower level of cost efficiency. This confirms the conclusion regarding risk taking in the previous model; that is, banks that are safer in liquidity risk tend to have lower cost efficiency.

Model 4 examined the combined effects of the three kinds of risks on cost efficiency and found the same trends as the separate models. In addition, the research also found that some control variables had significant effects, including total assets (TA_log), total deposit (TD_log) and Y_crisis. The latter two variables indicated negative effects on efficiency. Along with the results of the first stage of this research in measuring cost efficiency, it was confirmed that the larger banks, in terms of total assets, had higher efficiency scores. The results also showed that because of high interest expenses, banks with a large volume of deposits had a high liquidity risk and a low cost efficiency. In addition, the analysed data confirmed that the 2008 GFC had a negative effect on the banks' cost efficiency. The results of four models showed this, which explain the actions of the Vietnamese banking system over the period from 2006-2012, operating under high risk because there a positive trend in cost efficiency for higher-risk banks.

This research also examined the effects of the different ownerships structures of Vietnamese banks on the relationship between risks and cost efficiency, using the dummy variable (DSTATE) with value of '1'for the state-owned banks, which have a dominant proportion of equity (over 50 per cent) from the Government. Models 5–7 show the results of the separate effects of DSTATE on the relationship between risks and cost efficiency, and the total effects of all risks are shown in model 8.

In model 5, DSTATE had a positive effect on the relationship with credit risk, which meant that the positive impact of credit risk on cost efficiency in state-owned banks was higher than in private ones. Conversely, in model 7, DSTATE had a negative effect on the relationship between liquidity risk and efficiency. It was concluded that private banks suffer from high liquidity risk and low cost efficiency more than the other group, state-owned banks.

In model 8, DSTATE had insignificant effects on credit and liquidity risks, but there were significant values with operational risk. As mentioned earlier, operational risk (measured by the ratio of ETA) and ROAV had positive effect on cost efficiency. The results of model 8 appeared to indicate a contradictory effect of DSTATE on the relationships of ETA and ROAV with cost efficiency. While DSTATE had a positive effect on operational risk, which means the state-owned banks had an advantage regarding a high ETA ratio, it had a negative effect on ROAV, which means the private banks with higher ROAV were more efficient than the state-owned ones.

Dependent variable:	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COSTEFF								
Independent variables:								
LLRGL	0.0011068***			0.0009181***	-0.0009820***			-0.0003326***
ETA		0.0003162***		0.0003735***		0.0000298***		0.0001796***
ROAV		0.0419050***		0.0090221***		0.1675942***		0.1654828***
CD_log			-0.0001168***	-0.0001830***			-0.0000459***	-0.0001059***
DSTATE					0.2112792***	0.1712671***	0.2574544***	0.1597303***
LLRGL*DSTATE					0.0015958***			0.0005883***
ETA*DSTATE						0.0007315***		0.0012742***
ROAV*DSTATE						-0.2261843***		-0.2101796***
CD_log*DSTATE							-0.0002921***	-0.0002718***
TA_log	0.0121256***	0.0189399***	0.0296267***	0.0300854***	0.0385242***	0.0075630***	0.0169568***	0.0204572***
TD_log	-0.0094685***	-0.0096404***	-0.0227944***	-0.0179038***	-0.0309209***	-0.0050311***	-0.0134561***	-0.0133252***
Year_crisis	-0.0039869***	-0.0115648***	-0.2189711***	-0.0160740***	-0.0085903***	-0.0033666***	-0.0045348***	-0.0087936***
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Log likelihood	731.42558	714.61180	654.69762	575.59853	631.1911	796.0553	737.48653	669.5933
Observations	166	166	166	166	166	166	166	166

*   Significant at the 10% level.

**   Significant at the 5% level.

*** Significant at the 1% level.

6.4 Conclusion

The issues related to the efficiency and risk management of the financial system has been a particular focus of regulators since the 2008 GFC. Vietnamese commercial banks have found it difficult to manage their outputs and input prices and control their performance in terms of cost efficiency, especially since the 2008 GFC. In addition, the Vietnamese Government has been attempting to rank the banks and force them to abide by the requirements of Basel III; however Vietnamese banks generally lack the quantitative tools to perform such evaluations.

This research was conducted to measure the efficiency of Vietnamese banks by applying SFA to examine the relationships between risks (credit risk, operational risk and liquidity risk) and cost efficiency, as previous studies of banking in Vietnam have not allowed for the effects of risks on banks' cost efficiency. This research performed this analysis by employing an unbalanced panel data set (mostly taken from Bankscope) of Vietnamese commercial banks, covering the period 2006–2012; the empirical results showed the cost efficiency scores of banks and the effects of risks on those scores.

The results indicated difference in the means of efficiency scores between groups of bank in terms of ownership. Specifically, state-owned banks had a higher mean score than the private banks. There were differences in the trends of the effects of the three kinds of risk. While credit risk and operational risk had positive effects on cost efficiency, liquidity risk had a negative effect. That means a higher-risk bank, in terms of giving credit and operating, tended to have higher cost efficiency, and a safer bank, in terms of liquidity management, tended to have lower cost efficiency. This study also found differences in the effects of risks on cost efficiency between the groups of bank. In addition, the results of this research confirmed a negative effect on cost efficiency of the 2008 GFC. These findings can assist bankers in managing their cost efficiency and the Vietnamese Government in building quantitative tools, for example estimating efficiency with SFA, to control the banking system.

For future research, it is needed to conduct more studies on Vietnam banking system to have implications on scale and scope of economies, ownerships and interest rate's volatility with efficiencies and risk management.

Chapter 7: Conclusions and Recommendations

7.1 Conclusions

As outlined in the objectives of this study, the data set from 247 East Asia and Pacific commercial banks over the period of 2003–2012 was analysed in two main stages. In the first stage, the efficiency of the banking system of 12 developed and developing economies in the East Asia and Pacific area (Australia, New Zealand, Japan, Hong Kong, Singapore, Korea, China, Malaysia, Philippines, Indonesia, Thailand and Vietnam) was examined. In the second stage, the effects of three kinds of risk (credit risk, operational risk and liquidity risk) on bank cost efficiency in the banking system in the observed area were examined. This section of the research also attempted to identify the effects of some environmental factors on banking activities.

The first-stage analysis provided the results of measuring and comparing the cost management levels of banking systems in the East Asia and Pacific area. The SFA was employed to measure the cost efficiency scores of the 12 developed and developing economies in the observed area. The overall average of efficiency scores indicated that the sample banks could have produced their outputs using 62 per cent of their actual inputs. This is not a high score when compared with previous studies on countries in the area with the same level of development. Comparing the scores between groups of economies produced a surprising result, with the mean efficiency scores of developing countries being up to 20 per cent higher than those of developed countries. The 2008 GFC had a clear effect on efficiency scores. Although the mean of efficiency scores were similar at around 62 per cent, the periods before and after 2008 showed different trends; from 2003 to 2007, the mean efficiency scores increased steadily from 59 per cent to 66.5 per cent, but declined after 2008 to less than 60 per cent in 2012.

Tobit regression was employed for the second stage of the research to test the relationships between the three kinds of risk and bank cost efficiency of the 12

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developed and developing economies in the observed area. The relationships were studied for both the full sample and data divided by groups of economies and by the timing before and after the 2008 GFC. The analysed process passed through four models.

The first three models were used for separated risks (credit risk, operational risk and liquidity risks). With regard to the first model, the ratio loan loss reserve over gross loans that represented credit risks was found to have significant negative effect cost efficiency, at the 5 per cent level, implying that a bank with a higher loan loss reserves ratio will have lower cost efficiency. Model 2 show that both the ETA ratio and ROAV, which are two measurements of operational risks, had significantly negative effects on the cost efficiency scores. First, the effect from the ETA ratio, with a negative significance at the 1 per cent level, indicated reduced benefits for banks in this higher ratio, implying a bank with risky operations tends to have a higher efficiency. The negative effect of ROAV, at the 5 per cent level, implies that a bank with higher ROAV has an increased uncertainty in its operations and could be less efficient than other banks. The third model showed that liquidity risk has a negative effect on efficiency, at the 1 per cent level. The result illustrates that a bank with lower ratio of cash and due from banks to total assets (i.e. a higher liquidity risk) has a higher level of cost efficiency.

Model 4produced an interesting result, with most of the control variables having significant effects at the 1 per cent or 5 per cent level, except for GDP, which, unlike the other variables, does not relate to the banking system's operations. This finding confirmed that environmental factors have significant effect on the banking system. There was also evidence of the significant role of the two dummy variables (groups of economies and the 2008 GFC) in bank cost efficiency, both for developing and developed economies and for the periods before and after the GFC.

7.2 Policy Implications

Based on the findings of this research, which measured banks' cost efficiency and examined the relationships between risks and cost efficiency of the selected East

Asia and Pacific banking systems, this study has several implications for policy makers, regulators, and bankers, especially in the Asian-Pacific region.

As previously mentioned, X-efficiency analysis can show an approximation in a comparison of the efficiency of banks of all sizes, overcoming the disadvantages of traditional methods such as ratio analysis (which isolates a firm from their industry group and the market as a whole) and economies of scale and scope (which give a poor approximation when applied to banks of different sizes and with diverse products). Consequently, using the X-efficiency method (especially the SFA) to measure bank cost efficiency can help bankers to calculate their own efficiency and understand their competitors and partners, which allows them to confirm their position in the market. Likewise, applying X-efficiency can provide policy makers or regulators with a quantitative tool for ranking and controlling the banks through understanding their efficiency levels.

The overall average of efficiency scores indicated that the East Asia and Pacific banks could have produced their outputs using 62 per cent of their actual inputs. This is not a high score when compared with previous studies on countries in the area with the same level of development. Comparing the scores between groups of economies produced a surprising result, with the mean efficiency scores of developing countries being up to 20 per cent higher than those of developed countries. In addition, this study also found the negative effects of all three observed kinds of risk (credit risk, operational risk and liquidity risk), on bank cost efficiency. The results confirmed that poor bankers might be unfavourable as regards both cost and risk management. These results raise a concern for East Asia and Pacific bankers, especially those in the developed group, regarding finding a way to improve their cost efficiency to align with the scores of other areas or economies that have a same level of development. Policy makers need to implement the Basel Accords, to guide the banks in controlling risks, thus boosting the efficiency of the banks in the region and keeping the banking systems of the entire East Asia and Pacific region safe.

With regard to the environmental factors, there was evidence that most of the control variables relating to the economic environment, such as inflation, market interest rate and capital requirement, have positive significant effects on banks' cost efficiency.

The analysis of the environmental variables that was conducted in this study contributes to the literature, with the confirmation of more determinants of bank performance. It also indicates that policy makers need to ensure that their countries' economies are in a mature and stable situation, to boost the level of efficiency of the commercial banks. This is crucial, because the banking industry serves as the main channel for monetary policy transmission in the developing countries.

7.3 Limitations and future research

There were some limitations in this study that give rise to further research opportunities in this field. First, this study applied only SFA to estimate efficiency scores. An alternative approach could employ DEA to estimate efficiency, or apply both SFA and DEA to the same data set to achieve a compared result and a deeper finding in measuring cost efficiency.

Second, when measuring banks efficiency functions, there are three points of view that can affect the efficiency scores: cost efficiency (selected for this study), profit efficiency and production efficiency. Future research applying all three functions in estimating efficiency scores for the same data set would achieve deeper findings and stronger recommendations for both bankers and regulators. Moreover, there are evidences to confirm that the estimation of stochastic cost (or production) frontier functions based on the assumption that the underlying production technology is the same for all kinds of firms. However, each individual firm might choose a different technology. Regarding to a study of Orea and Kumbhakar (2004), in such case, for future research, it is necessary to measure efficiency using a latent class stochastic frontier model.

There is a need for opening a continued research on this dataset to provide an appropriate economic rationale for the findings and policy implications. In addition, examining the volatility of real interest rate and other market factors, and the differences in the level of development matter for risk and efficiency is two more future directions for doing research on this field.

Although 12 observed economies in the East Asia and Pacific area is a large enough sample to have representatives in all levels of economic development, a future study with the same methodology could expand its sample to regions throughout the world, thus providing a 'big picture' in the field of efficiency and risk, as well as an overview of the world's banking systems, especially for the five years since the 2008 GFC.

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