UNIVERSITI PUTRA MALAYSIA

EFFECTS OF BANK MERGERS AND ACQUISITIONS ON REVENUE EFFICIENCY DURING THE PRE-MERGER AND POST-MERGER PERIODS IN THE MALAYSIAN BANKING SECTOR

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GSM 2011 15

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By

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November 2011

Chair: **Dr Junaina Muhammad, PhD**

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The objective of this study is to identify the effects of the mergers and acquisitions (M&As) on revenue efficiency over the pre-merger and post-merger periods in the Malaysian banking sector. The main goal of bank M&As is to enhance and maximise the profit efficiency. Nevertheless, revenue inefficiency could contribute to lower profit efficiency when banks produce too few outputs for the given inputs, and produce too little of a high-priced output and too much of a low-priced output. This finding is supported by previous studies carried out in developed and developing countries which practice voluntary and forced M&As (Ariff and Can, 2008 and Houston et al., 2001).

The study also examines the potential bank specific determinants that influence revenue efficiency during post-merger period. Although several studies have identified the potential bank specific and macroeconomic determinants that could contribute to higher level of efficiency to reduce revenue inefficiency, the results remain inconclusive.

The data gathered in this study are divided into two event windows; namely, pre-merger period (1995-1996) and post-merger period (2002-2009). The data collected included the year of mega-merger 2000 in which M&As took place in Malaysia (Sufian, 2009). To represent the Malaysian banking sector, a sample of 34 local and foreign commercial banks including the control group of banks were selected to participate in the study.

The level of revenue efficiency was measured using Data Envelopment Analysis (DEA) method which applied the intermediation approach. The data were tested by using the parametric (t-test) and non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests. The results showed that revenue efficiency in Malaysian banking sector did not improve during the post-merger period.

The determinants that could improve the revenue efficiency in Malaysian banking sector during the post-merger period were identified using Multivariate Regression Analysis (MRA). The analysis applied the Generalized Least Square (GLS) method consisting of Fixed Effect Model (FEM) and Random Effect Model (REM) run by Hausman test. Three bank specific determinants were found to influence the improvement of revenue efficiency: size of bank, market power and management quality. Another factor, the inflation factor (macroeconomic) was also found to influence the improvement of the revenue efficiency in Malaysian banking sector during the post-merger period.

The research concludes that findings from studies on M&As on revenue efficiency in the Malaysian banking sector provide guidance, better information and fill in the gap

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in current literature which can benefit the regulators, the banking sector itself, investors and academics when they make decisions on future M&As.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra
Malaysia untuk memenuhi sebahagian daripada keperluan untuk ijazah
Sarjana Sains

**KESAN PENGGABUNGAN DAN PENGAMBILALIHAN BANK KE ATAS
KECEKAPAN HASIL SEBELUM DAN SELEPAS TEMPOH
PENGGABUNGAN DALAM SEKTOR PERBANKAN MALAYSIA.**

Oleh

FAKARUDIN BIN KAMARUDIN

November 2011

Pengerusi: **Dr Junaina Muhammad, PhD**

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Objektif kajian ini adalah untuk mengenal pasti kesan penggabungan dan
pengambilalihan ke atas kecekapan hasil sebelum dan selepas tempoh penggabungan
dalam sektor perbankan Malaysia. Tujuan utama penggabungan dan pengambilalihan
bank adalah untuk menigkatkan dan memaksimumkan kecekapan untung.
Walaubagaimanapun, ketidakcekapan hasil boleh menyumbangkan kepada
kecekapan untung yang rendah kerana bank menghasilkan output yang terlalu sedikit
daripada input yang diberikan, dan menghasilkan terlalu sedikit output yang bernilai
tinggi dan terlalu banyak output yang bernilai rendah. Penemuan ini disokong oleh
kajian terdahulu yang dijalankan di negara maju dan membangun yang mengamalkan
penggabungan dan pengambilalihan sukarela dan paksaan (Ariff dan Can, 2008 dan
Houston et al., 2001).

Kajian ini juga mengkaji penentu bank khusus yang berpotensi mempengaruhi
kecekapan hasil selepas tempoh penggabungan. Walaupun beberapa kajian telah
mengenalpasti penentu bank khusus dan makroekonomi yang berpotensi untuk

menyumbang kepada tahap kecekapan yang lebih tinggi untuk mengurangkan ketidakcekapan hasil, namun keputusan tersebut tidak meyakinkan.

Dalam kajian ini, data yang dihimpunkan dibahagikan kepada dua acara tetingkap iaitu tempoh sebelum penggabungan (1995-1996) dan tempoh selepas penggabungan (2002-2009). Data yang dikumpul merangkumi tahun (2000) penggabungan mega di mana berlakunya penggabungan dan pengambilalihan secara besar-besaran di Malaysia (Sufian, 2009). Sebanyak 34 buah bank perdagangan domestik dan asing termasuk bank dari kumpulan kawalan telah dipilih untuk mewakili sektor perbankan Malaysia.

Tahap kecekapan hasil ini telah diukur menggunakan kaedah *"Data Envelopment Analysis"(DEA)* dengan menggunakan pendekatan pengantaraan *(intermediation approach)*. Data diuji dengan mengunakan ujian *"parametric"* iaitu *"t-test"* dan ujian *"non-parametric"* iaitu *"Mann-Whitney (Wilcoxon)"* dan *"Kruskal-Wallis"*. Kajian telah menunjukkan bahawa kecekapan hasil dalam sektor perbankan Malaysia tidak bertambah baik selepas tempoh penggabungan.

Penentu yang boleh meningkatkan kecekapan hasil dalam sektor perbankan Malaysia selepas tempoh penggabungan telah dikenalpasti dengan menggunakan Analisis Regresi Multivarian *(MRA)*. Analisis telah menggunakan kaedah *"Generalized Least Square" (GLS)* terdiri daripada Model Kesan Tetap *(FEM)* dan Model Kesan Rawak *(REM)* yang diuji dengan ujian *"Hausman"*. Hasil mendapati bahawa terdapat tiga penentu bank khusus yang mempengaruhi peningkatan kecekapan hasil iaitu, saiz bank, kuasa pasaran dan kualiti pengurusan. Selain itu, faktor inflasi (makroeconomi)

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juga mempengaruhi peningkatan kecekapan hasil dalam sektor perbankan Malaysia selepas tempoh penggabungan.

Kajian ini merumuskan bahawa keputusan terhadap penggabungan dan pengambilalihan ke atas kecekapan hasil dalam sektor perbankan Malaysia ini mampu memberikan panduan, informasi yang lebih baik dan melengkapkan kajian terkini. Semua ini memberikan kemudahan kepada pihak pengawal selia, bank, para pelabur dan ahli akademik untuk membuat keputusan penggabungan dan pengambilalihan pada masa akan datang.

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I certify that an Examination Committee met on **15th November 2011** to conduct the final examination of **Fakarudin Bin Kamarudin** on his **Master of Science** thesis entitled "**Effects of Bank Mergers and Acquisitions on Revenue Efficiency During the Pre-Merger and Post-Merger Periods in the Malaysian Banking Sector**" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as partial fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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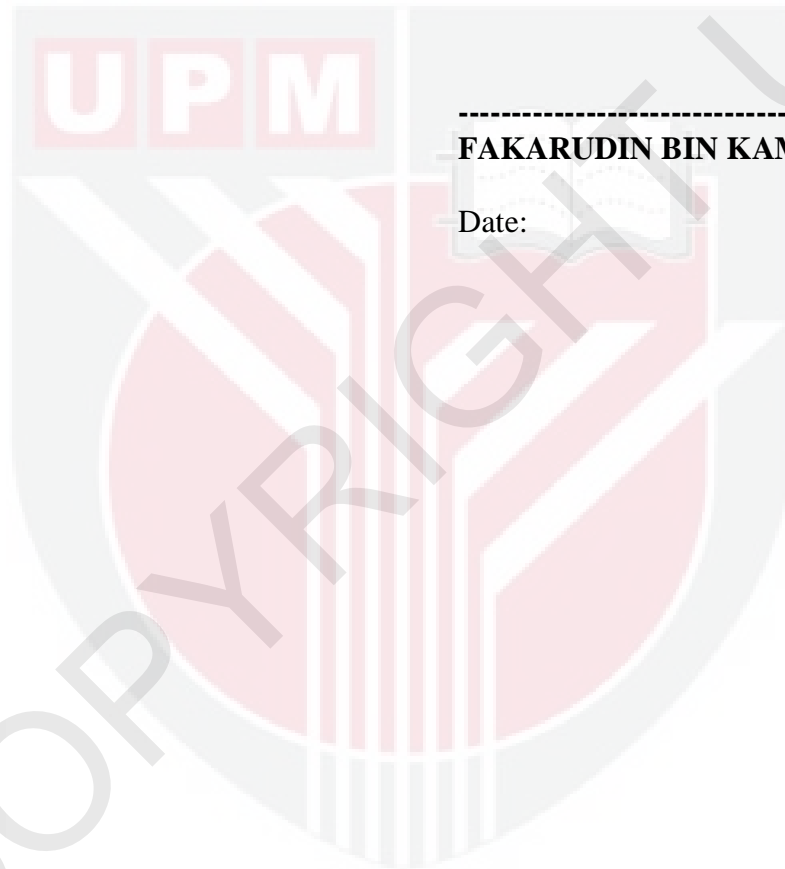Universiti Putra Malaysia
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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or any other institutions.

FAKARUDIN BIN KAMARUDIN

Date:

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LIST OF ABBREVIATIONS

AMU	Asset Management Unit
ATM	Automated Teller Machine
BCC	Banker, Charnes and Cooper
BDTD	Bank's Deposit over Total Deposit
BNM	Bank Negara Malaysia
CAE	Cost Allocative Efficiency
CAR	Capital-Assets Ratio
CCR	Charnes, Cooper and Rhodes
CE	Cost Efficiency
CEO	Chief Operating Officer
CRS	Constant Returns To Scale
CTE	Cost Technical Efficiency
CXE	Cost X-Efficiency
Danaharta	Pengurusan Danaharta Nasional Berhad
Danamodal	Danamodal Nasional Berhad
DEA	Data Envelopment Analysis
DFA	Distribution Free Approach
DMUs	Decision Making Units
DP	Dummy Post-Merger Period
DW	Durbin Watson
ETA	Equity to Total Assets
FDH	Free Disposal Hull
FEM	Fixed Effect Model
FDICIA	Federal Deposit Insurance Corporation Improvement Act of 1991
GDP	Gross Domestic Products
GLS	Generalized Least Square
HHI	Herfindahl-Hirschman Index of Market Concentration
IA	Information- Advantage
LLP	Loan Loss Provisions
LLRGL	Loan Loss Reserve To Gross Loan
LNTA	Logarithm of Total Assets
LP	Linear Programming Problem
M&As	Mergers and Acquisitions
MOU	Memorandum of Understanding
MRA	Multivariate Regression Analysis
MS	Market Share
NETCHGOFF	Net Chargeoffs
Non-MSA	Non-Metropolitan Statistical Areas
NPLs	Non-Performing Loans
NTA	Net Tangible Asset Basis

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OLS	Ordinary Least Square
OPCFROA	operating pre-tax cash flow return on assets
OREO	Real Estate Owned
OTE	Overall Technical Efficiency
PE	Profit Efficiency
PTE	Pure Technical Efficiency
RAE	Revenue Allocative Efficiency
RD	Relationship-Development
RE	Revenue Efficiency
REM	Random effect model
RMP	Relative Market Power
ROE	Return On Equity
RSS	Residual Sum of Squares
RTE	Revenue Technical Efficiency
RXE	Revenue X-Efficiency
SFA	Stochastic Frontier Approach
SIE	Scale Inefficiency
SP	Structure-Performance
TFA	Thick Frontier Approach
VRS	Variable Returns to Scale
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter covers the background of the study, problem statement, objectives, research questions, significance and scope of study. The main objective of this chapter is to provide a general description of the effects of bank mergers and acquisitions on the Malaysian banking sector towards efficiency concepts. The chapter also discusses the determinants or factors that are responsible in producing efficient results in terms of revenue efficiency following the merger.

1.2 Background of the Study

The globalisation era has changed the structure of the Malaysian commercial banking sector through greater deregulation and liberalisation of the sector. In reaction to that, the Malaysian banking authority, Bank Negara Malaysia (BNM), has promoted financial institutions to join a 'forced merger' scheme so that they can become more efficient and competitive. Among the changes that have occurred are the substantial reform of bank infrastructure by the government, high level of capital market participation, strengthening of companies' profitability, improvement in bank lending practices and increase in the quality of assets. The forced mega-mergers were enforced by BNM as a result of three main factors: competition from foreign banks, a large number of domestic commercial banks and financial crisis in Asia. Competition from the foreign banks becomes the main reason for the implementation of forced

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mergers because under the World Trade Organization (WTO) agreement, foreign banks are not restricted to enter the local market (Chong et al., 2006), creating competitions with the local banks.

Malaysia's acceptance of foreign banks via the World Trade Organization (WTO) in 1990s has resulted in an improved efficiency and competition among the local commercial banks. For example, today, products based on Islamic principles which are offered by foreign banks are also now in competition with other conventional products. Such competition has resulted in banks having to focus more on financial efficiency and to render high quality services to the customers (Desa, 2007).

The objective of the banking system under the second phase of Malaysian Financial Sector Master plan is to improve the economy through gradual deregulation and liberalisation policy. Since the private sectors depend on banking institutions for economic growth, the foundation and capabilities of the banking institutions should be robust. Thus, both domestic and foreign banks play very important roles to achieve the objectives of the Malaysian Financial Sector Master plan. Deregulation and liberalisation policy provides benefits to both foreign and local banks. The stable Malaysian economic environment has encouraged foreign banks to invest locally and thereby increases capital inflow from the foreign banks to the local ones. In addition, foreign banks transfer their technologies and skills (Sufian, 2007 and Desa, 2007) that can benefit the local banks.

Despite the benefits, foreign banks have also become a threat to the domestic commercial banks. Upon realising this, the Malaysian central bank, Bank Negara

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Malaysia (BNM), has stepped forward to merge and acquire domestic banks in order to encourage them to increase their capability. The act was seen as a move for local banks to cope with competition from foreign banks (Chong et al., 2006). The following table summarises the number of commercial banks between 1980 and 2010.

Table 1.1: Number of Domestic and Foreign Commercial Banks in Malaysia

COMMERCIAL BANKS	1980	1990	1997	1999	2001	2003	2005	2007	2009	2010
Domestic	21	22	22	21	10	10	10	9	9	9
Foreign	17	16	13	13	13	13	13	13	13	14
TOTAL	**38**	**38**	**35**	**34**	**23**	**23**	**23**	**22**	**22**	**23**

Source: Bank Negara Malaysia Annual Report between 1980 and 2010

Table 1.1 shows that between 1980 and 2009, the total number of commercial banks in Malaysia is reduced from 38 to 22. Between 1997 and 2010, there was a drastic drop in the number of domestic banks; i.e., from 22 in 1997 to 9 in 2010.

The number of foreign banks has also decreased; i.e., from 16 in 1990 to 13 in 1997. The number of domestic banks remains at 9 from 2001 to 2010 while the number of foreign banks remains at 13 from 1997 to 2009.

Other than the great competition from foreign banks, the implementation of forced mega-merger of domestic commercial banks in Malaysia was also influenced by two other factors. They are over-banked numbers and financial crisis (Chong et al., 2006 and Ahmad et al., 2007). According to Chong et al. (2006) and Ahmad et al. (2007),

the over-banked number of domestic commercial banks for a small economy had influenced the decision by the Malaysian central bank to implement the mergers and acquisition programme. Such act (M&As) was hoped to result in bigger, stronger, and more efficient domestic commercial banks in Malaysia.

With 58 domestic financial institutions, Chong et al. (2006) asserted that the Malaysia's banking system was considered by the government as being "over-bank" and was fragmented. As stated, the forced merger scheme was seen as a means to create larger and stronger domestic banks with the hope that they would be able to withstand competition with foreign banks. This is especially true when the financial market is liberalised in the future under the WTO agreement. In addition, Ahmad et al. (2007) reported that a merger plan was fundamentally desirable because for a small economy country like Malaysia, it has too many banks. Policymakers have shown that a very high banking density (total population divided by the total number of bank branches) in the small economy will reduce its power and inefficiency to compete with its rivals.

In 1997, Malaysia and other Asian countries were hit with financial crisis which had resulted in an economic downturn. The economic downfall had inevitably played a major role in contributing the forced mega-mergers in the Malaysian banking sector. The crisis had caused the increase of non-performing loans (NPLs) among the financial institutions, merchant banks and finance companies in Malaysia, and also in most parts of Asia. At the height of the crisis, NPLs were reported to increase from 6% of net loans to 22%, while the provision of NPLs decreased from 66% to 42%. The government had established *Pengurusan Danaharta Nasional Berhad* (Danaharta) and *Danamodal Nasional Berhad* (Danamodal) in 1998 to deal with the

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situation of the rising NPLs and recapitalisation in Malaysian banking sector, as well as to act as a catalyst to rationalise the sector (Majid, 1999 and Desa, 2007).

Danaharta was given the authority by the government to facilitate the takeover of NPLs from the selling banks. It injected additional funds to ensure that viable loans could operate efficiently. Only the unviable loans were transferred into Asset Management Unit (AMU) for rehabilitation and disposition. Danaharta was given the responsibility to manage RM39.3 billion in non-performing loans which was about 13% of gross domestic products (GDP) in June 1999. Other than Danaharta, Danamodal also played a part to complement in strengthening the banking sector. It had two objectives: the first was to recapitalise the banks that were faced with difficulties in meeting their capital adequacy by providing them with interim finance, and the second objective was to guide the financial institutions to consolidate and rationalise via mergers. Danamodal had injected RM7.1 billion (about 2.4% of GDP) in 10 financial institutions (5 commercial banks, 3 finance companies and 2 merchant banks). Both Danaharta and Danamodal had indeed succeeded in reducing the burdens of NPLs of the financial institutions. The NPL ratio had been reduced to 15.3% as recorded at the end of 2000, while provisioning rose to 53.8% of bad debt (Majid, 1999 and Desa, 2007).

It can be seen that the merger of the financial institutions had made them more efficient in facing challenges in deregulation, liberalisation and information technology development. Finally, by 14th February 2000, 10 anchor banks were established as a result of M&A programme.

1.3   Efficiencies of Bank Mergers and Acquisitions

The expected outcome of the banks that are involved in mega-mergers is that the banks would be more efficient compared to when they were during the pre-merger period (Akhavein et al., 1997 and Cornett et al. 2006). A study by Berger et al. (1993b) suggests that if banks are efficient, they could expect improved profitability, better prices and better service quality for consumers and that greater amounts of funds would be intermediated. Furthermore, if some of the efficiency savings were applied towards improving capital buffers that could absorb risks, the banks would become stronger to withstand greater financial shocks.

In other parts of the world, studies of bank M&As had focused preliminary on cost, profit, or cost and profit efficiency. The studies of bank M&As that focused primarily on cost efficiency analysis looked at a firm's minimisation of costs reflected on how to produce the same amount of output (Berger and Mester, 1997 and Ariff and Can, 2008). Cost efficiency is the product of technical and allocative efficiency (cost X-efficiency). Technical efficiency measures the proportional reduction in input usage that can be attained if the bank operates on the efficient frontier, or if the bank produces maximum outputs based on a limited set of inputs. The allocative efficiency measures the proportional reduction in costs if the bank chooses the right mix of inputs to be used (Isik and Hassan, 2002).

A study by Akhavein et al. (1997) found that the total output of the consolidated banks changed after M&As. Whether the cost changes are greater or less than revenue changes would not be determined from cost analysis alone. Thus, the

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improvement or drop in cost efficiency does not imply that the bank has become more or less profitable and efficient. In this regard, the problem could be solved by examining the profit efficiency concept. According to a survey done by Berger and Humphrey (1997), the research on revenue and profit efficiency has been scarcer, with the majority of research focused mainly on cost efficiency. This can be seen in most of the studies in the 1990s which had concentrated primarily on the estimation of cost efficiency (Srinivasin, 1992; Linder and Crane, 1992; Shaffer, 1993; Berger and Humphrey, 1992; Rhoades, 1993; Pilloff, 1996 and Resti 1997).

A study by Akhavein et al. (1997) was the first study which argued that profit efficiency analysis is more appropriate in the evaluation of mergers than cost efficiency. Profit efficiency is a widely accepted concept of cost efficiency because it considers the effect of the choice of vector of production on costs and revenues. It refers to the firm's maximisation of profit by giving an amount of inputs and outputs and a level of their prices (Ariff and Can, 2008). The result of their study was supported by Berger and Mester (2003) and Maudos and Pastor (2003), where they found that profit efficiency offered more useful information of management efficiency. As stated earlier, profit efficiency provides a final or overall result on bank efficiency. However, it can only determine the efficiency of the bank, but it is unable to identify in detail which side (cost and revenue) of the efficiency concept that can contribute to a higher profit efficiency.

Several other studies investigated the efficiency of bank M&As by taking into account the combination of both cost and profit efficiency (Berger and Mester, 1997; Rogers, 1998, Lozano, 1997; Vander-Vennet, 2001; Huizinga et al., 2001; Al-

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Sharkas et al., 2008 and Ariff and Can 2008). The researchers found that the levels of cost efficiency are higher than the levels of profit efficiency. Even though the levels of the cost and profit efficiency are different, the M&As have improved the overall efficiency of banks. Furthermore, these findings (cost efficiency level are more than profit efficiency level) are consistent with the studies that examined the bank's cost and profit efficiency without the M&As event (Chu and Lim, 1998; Maudos et al., 2002; Maudos and Pastor, 2003 and Yildirim and Philippatos, 2007). The different levels between cost and profit efficiency on banks are due to the efficiency of the revenue side (Maudos et al., 2002; Ariff and Can, 2008; Bader et al., 2008).

There have been limited studies that focus on revenue efficiency of the banking sectors with the event of M&As (Akhavein et al. 1997). English et al. (1993) and Al-Sharkas et al. (2008) suggested that to maximise the banks' revenue efficiencies, the banks should be both technically and allocatively efficient (revenue X-efficiency). With technical efficiency, a bank can produce the maximum output using limited inputs, and allocative efficiency shows enhanced revenue if a bank chooses the right mix of outputs to produce.

In Malaysia, a study by Sufian and Habibullah (2009) revealed that the levels of cost efficiency improved during the post-merger period compared to the pre-merger period. Another study reported that the levels of profit efficiency increased in the post-merger period relative to pre-merger period (Sufian, 2009). Thus, both studies showed that the M&As improved the cost and profit efficiency of the Malaysian banking sectors. Another study on local banking sectors was done by Khatib and Mathews (2000) and Okuda and Hashimoto (2004). Its focused was not on the effect

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of M&As on revenue and profit efficiency in the Malaysian banking sector, but on the productivity and cost efficiency without the effect of M&As.

Studies on bank efficiency which ignore the revenue side have been criticised (Bader et al., 2008). It is mainly because most of the studies have only revealed the levels of cost efficiency which are higher than the profit efficiency, but they have not identified the causes. Ariff and Can (2008) found that the inefficient revenue affected the difference between cost and profit efficiency, but they did not investigate further on the revenue efficiency and on the reasons for such an occurrence. A study which investigated on the causes of inefficiency was done by Maudos et al. (2002), Rogers (1998) and Berger et al. (1993a) who found that revenue inefficiency was caused either by mispricing of outputs or giving wrong choice of output.

The general concept of efficiency covers three components; namely, cost, revenue and profit efficiency (Adongo et al., 2005 and Bader et al., 2008). Figure 1.1 summarises the organisation chart of these efficiencies. Evidence on bank efficiency could be produced by discovering these three types of efficiency concept. However, few studies have examined the comprehensive efficiency that consists of these three components. Most previous studies have mainly focused on the efficiency of cost, profit or both (cost and profit efficiency combined) (Bader et al., 2008).
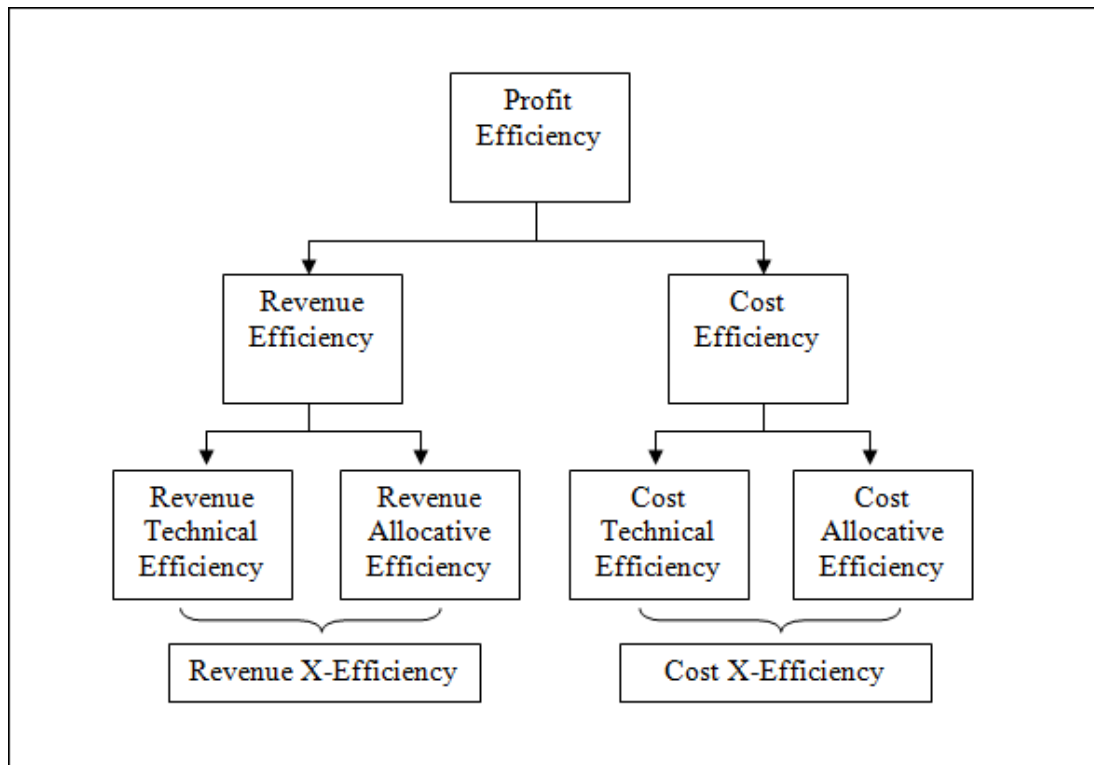
Figure 1.1: Organisation Chart of Revenue Efficiency, Cost Efficiency and Profit Efficiency

Since most studies ignored the improvement of revenue efficiency in the event of M&As in the banking sector, this study extends the work of Bader et al. (2008), which had examine the cost, revenue and profit efficiency of conventional and Islamic Banks. The extension would cover the examination on the effects of the M&As event on revenue efficiency over the pre-merger and post-merger periods in Malaysian banking sector.

1.4   Problem Statement

The main motive of the M&As is to maximise the shareholders' value or wealth through maximising the profit (Chong et al., 2006). In general, bank's profit is used to give shareholders a good return on their investment. More reinvestments can be made from the profits in order to expand businesses, improve technology, have versatile range of products and services that can be offered to customers and training staff. Should a bank failed to generate profits, it would not be able to fulfil its obligation and will lose potential opportunities.

In order to achieve an optimum profit, banks should be efficient. An efficient bank is likely to expect improvement in profits, better prices and better services quality for consumer and greater amount of funds intermediated (Berger et al., 1993b). The profit efficiency considers the minimisation of cost and maximisation of revenue and represents the most vital parts that influence the profitability of the bank. Developed countries such as Europe, U.S., Singapore, Hong Kong and Taiwan implemented the voluntary M&As ("more mature") to their banking sectors in order to increase efficiency. The move was followed by developing countries such as Philippines, South Korea, Thailand, Indonesia and Malaysia which implemented the forced M&As ("less mature'). Voluntary or market driven M&As is defined as a process in which two or more banks merge to become one entity without any government intervention. On the other hand, forced or government-guided M&As refers to the mergers of a firm that is insolvent or in danger of insolvency, and it is initiated by the government or the authority (Crouzille et al. 2008 and Hawkins and Mihaljek's, 2001).

The voluntary and forced M&As scheme have shown improvement in bank's profit efficiency (Sufian, 2009 and Ayadi and Pujals, 2005). Other studies (Bader et al., 2008 and Ariff and Can, 2008) which looked at the cost and profit efficiency in bank M&As have shown that the improvement of profit efficiency was not at the optimum levels. By going through M&As, bank's cost efficiency was shown to be at a higher level rather than at a profit efficiency level. Most of the previous studies claimed that the merged banks were able to minimise the cost through higher cost efficiency, but they were not able to maximise the profit via higher profit efficiency as a result of revenue inefficiency. In fact, the results on the profit efficiency levels were contaminated by the revenue inefficiency side (Akhavein et al. 1997).

Therefore, it can be seen that the main problem that contributes to the lower profit efficiency comes from revenue inefficiency. A bank may experience revenue inefficiency when it produces too few outputs for the given inputs. It could also be if it responds poorly to relative prices and produces too little of a high-priced output and too much of a low-priced output. Findings on previous studies on developed and developing countries which practiced voluntary and forced M&As showed that the level of the profit was lower than the level of cost efficiency due to revenue inefficiency. The result is supported by another study by Ariff and Can, 2008 and Houston et al., 2001. Thus, instead of focusing on the effect of bank M&As on profit efficiency alone, it is better to compare it with cost efficiency as well in order to identify the existence of revenue efficiency.

The present study also seeks to discover the determinants that are responsible in producing efficient results in terms of revenue efficiency following the merger.

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Among the bank internal determinants are bank size, asset quality, capitalisation, market power, liquidity and management quality. These factors are said to increase the level of the revenue efficiency when the level of the revenue inefficiency is reduced. However, the results were inconclusive. This is due to discrepancies in other studies which showed that higher revenue efficiency could be generated from mergers between large and small banks via a number of branches (Huizinga et al., 2001: Al-Sharkas et al., 2008). Also, asset quality may incur higher cost in order to produce higher quality products. This is in contrast with the motive of revenue efficiency (DeYoung and Nolle, 1996). Meanwhile, the large capitalisation leads to ambiguity on the profitability of banks (Chong, 2008 and Delis et al., 2008). Furthermore, the large market power occurs as a result of a combination of the firms which leads to a decrease in competition and which in turn, may increase profit by raising loan rates and lowering deposits rates (Graeve et al., 2007 and Oladepo, 2010). Liquidity and management quality also give a mixed finding on the profit efficiency in voluntary and forced M&As (Molyneux and Thornton, 1992; Pana et al., 2010 and Sufian, 2009). Macroeconomic or external determinants such as gross domestic product (GDP) and inflation (INFL) could also influence the revenue efficiency, but results of the studies were mixed during the post-merger period (Sufian and Chong, 2008 and Kosmidou, 2008).

To restate, this study will analyse the effects of forced M&As on the Malaysian banking sector on revenue efficiency and it will look at the determinants that influence revenue efficiency, particularly during the post-merger period.

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1.5   Objectives of the Study

There are two main objectives of this study:

i.   To examine the effects of M&As on the Malaysian banking sectors in terms of revenue efficiency during the pre-merger and post-merger periods.

ii.   To analyse the bank specific determinants of revenue efficiency in the Malaysian banking sectors particularly during the post-merger period.

1.6   Research Questions

i.   Does the revenue efficiency improve in the Malaysian banking sector under the M&As scheme programme for both pre-merger and post-merger periods?

ii.   Does bank size, asset quality, capitalisation, market power, liquidity and management quality have a significant influence on revenue efficiency in the Malaysian banking sector particularly during the post-merger period?

1.7   Significance of the study

The findings of this study will add to the current knowledge on the effects of M&A on revenue efficiency in the Malaysian banking sector. Even though there are many studies in Malaysian banking sector had examine the bank M&As, they did not focus on the revenue efficiency concept since mostly look into the cost and profit efficiency. Since numerous studies have examined the effects of M&As on cost and profit efficiency to banking sector under the voluntary scheme, this study attempts to fill the gap on revenue efficiency in the Malaysian banking sector under the forced

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merger scheme. It examines the banks' revenue efficiency both before and after the merger periods. The results will clarify which period is more revenue efficient.

This study also attempts to identify the internal determinants which are bank specific determinants on revenue efficiency in Malaysian banking sector particularly during the post-merger period. The external determinants which are macroeconomic determinants will also be taken into account, but they will only serve as additional control variables. By recognising the determinants, the factors that have the most influence on revenue efficiency on Malaysian banking sector emphasising on the post-merger period can be further examined. Since revenue efficiency contributes to bank efficiency and increases in profit efficiency of banks, it is important to identify their determinants. In essence, the determinants of revenue efficiency could be used as a guide in future bank activities of M&As.

1.8   Scope of the study

The present study examines the effects of M&As on Malaysian banking sector on revenue efficiency. The data gathered are from the two years preceding the year of the merger, and the eight years after the merger (-2,8) form. The entire period was from 1995 to 2009, but the study includes data only from 1995 to 1996 and later from 2002 to 2009. This is because the years of financial crisis (1997 to 1999) during merger period (2000) and cooling period (2001) are excluded to avoid possible biases. The periods are divided into two event windows namely 1995 to 1996, referred to as pre-merger period, and 2002 to 2009, referred to as post-merger period.

Data were collected during the year of mega-merger 2000 (Sufian, 2009), the time in which registered M&As took place in the Malaysian banking sector. The sample data come from a total of 34 commercial banks, including the control group of banks (14 domestic commercial banks involved with M&As, and 20 domestic and foreign commercial banks not involved with M&As in Malaysia). In order to maintain homogeneity, only commercial banks that make commercial loans and accept deposits from the public are included in the analysis (Sufian, 2007). Finance companies, Investment Banks and Islamic banks are excluded from the sample. During all periods, the mean revenue efficiency scores during the pre and post-merger periods are compared. To allow efficiency and inefficiency to vary over time, the efficiency frontiers are constructed for each year by solving the liner programming problems rather than by constructing a single multi-year frontier (Sufian, 2009). The level of revenue efficiency that effects bank M&As are measured using the Data Envelopment Analysis (DEA) method by applying the intermediation approach in the first stage. The data are tested by parametric (t-test) and non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests.

As stated, other than addressing the effects of the M&As on the Malaysian banking sector on revenue efficiency, this study also seeks to discover the determinants of revenue efficiency in the Malaysian banking sector particularly during the post-merger period. Six main bank specific determinants are examined in this study; namely, size of bank, asset quality, capitalisation, market share, liquidity and management quality. In addition, two external determinants are included to serve as control variables. They are gross domestic product and inflation. To identify the significant relationship between revenue efficiency and those potential determinants

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under the second stage, this study uses the Multivariate Regression Analysis (MRA). This stage applies the Generalized Least Square (GLS) method which consists of Fixed Effect Model (FEM) and Random Effect Model (REM) tested by Hausman's test. To obtain robust results, all potential determinants interacted with variable of dummy in the post-merger period.

Figure 1.2 describes the research framework of revenue efficiency effect of M&As and determinants of revenue efficiency in the Malaysian banking sector during the post-merger period.
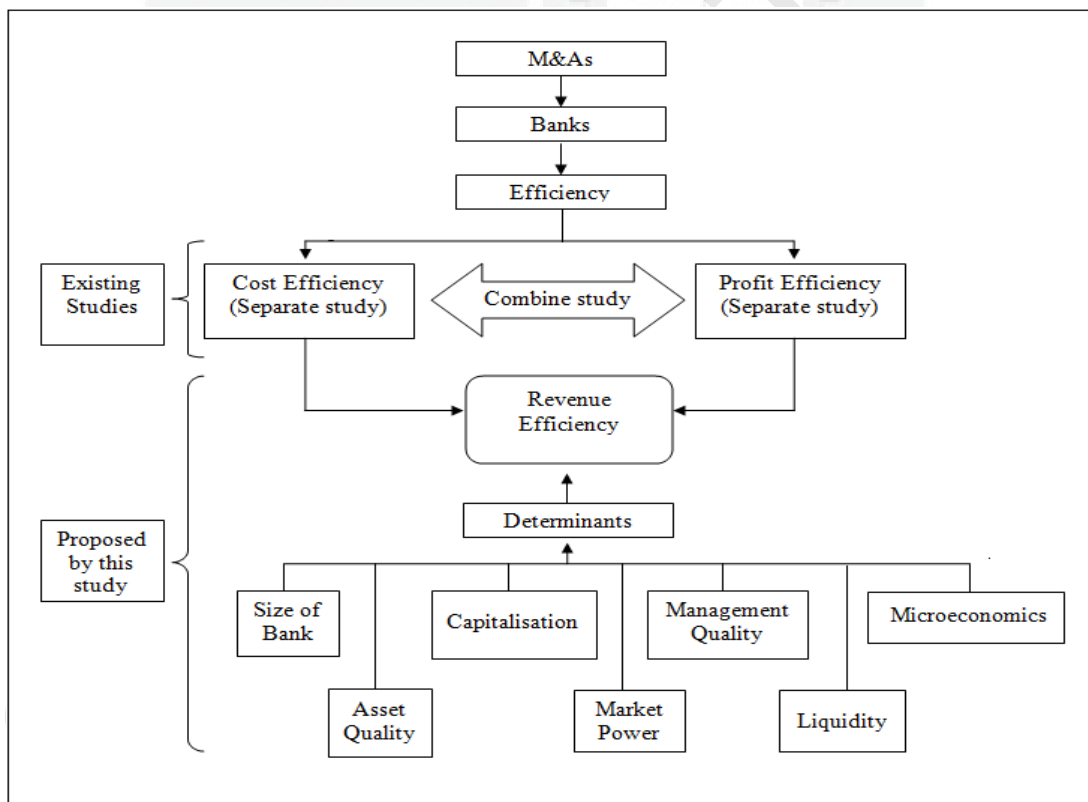
Figure 1.2: Research Framework of Revenue Efficiency Effect of Bank M&As and Determinants of Revenue Efficiency in Malaysian Banking Sector during Post-Merger Period.

CHAPTER 2

BANK MERGERS AND ACQUISITIONS

IN MALAYSIA: MOTIVES AND OVERVIEW

2.1   Introduction

This chapter looks at an overview of bank M&As in Malaysia which discloses the history, implementation, banks and responsible authorities involved in M&As and the impact of bank M&As. It also discusses the various motives of bank M&As which include the share holder wealth, increasing market power and risk diversification, bank efficiency, cost, revenue and profit efficiency.

2.2   Motives of Bank Mergers and Acquisitions

In recent years, banks worldwide tend to pursue involvement in mergers and acquisitions (M&As) process to gain benefits from it. The benefits are clearly stated in the motives of bank M&As itself.   The major motive is to maximise the shareholder value or wealth through maximising the profit (e.g. Ahmad et al., 2007; Sufian, 2004; Chong et al., 2006; Megginson et al., 2007). According to Focarelli et al. (2002) who investigated the motives and results of each type of deal separately between M&As, the mergers seek to improve income from services although the increase is offset by higher staff cost.   A theoretical explanation for mergers was offered by Milbourn et al. (1999) who stated that when banks are uncertain about

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what skills to be required in the future, they were advised to merge to allow them to diversify the activities, gain profit and acquire new skills.

Berger et al (1999) reported that the accomplishment of bank M&As will increase a bank's efficiency, market power and risk diversification. In addition, managers may obtain their own self-interest by decreasing their largely undiversified employment risks (Treynor and Black, 1976) and gaining higher growth or empire building (Berger et al., 1999) and thus, may get the pleasure of extra perks. According to Humphrey and Vale (2004), improvements in bank efficiency could be expected from banking mergers. Brewer (2009) stated that efficiency gains may rise due to an increased synergy between firms. The increase in gains may be achieved through increased economies of scale or scope (X-efficiency).

According to Bradley et al. (1988), Hawawini and Swary (1990), Berger and Humphrey (1992), DeYoung and Whalen (1994) and Amihud and Miller (1998), M&As may improve efficiency particularly when weak, poorly managed banks are acquired by stronger, competently managed banks. This is in line with the efficiency improvement hypothesis. Focarelli and Panetta (2001) stated that large and efficient Europe banks tend to acquire smaller and less efficient banks. Shaffer (1994) reported that when more efficient banks merge with less efficient banks, larger cost efficiency gains are possible. Berger and Humphrey (1992) found that merger is more cost efficient as it could contribute to the post-merger gain by restoring its inefficient targets to similar profitability. Besides that, Peristiani (1997) discovered that the acquired banks are more profitable than the target banks in U.S.A and Europe. Driving inefficient banks (cutting of redundant operating cost including

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unproductive managers) from the market could increase the efficiency in the newly formed banking organisation and benefit the economy (DeYoung and Whalen, 1994).

Nevertheless, findings on the economies of scale with regards to the acquisitions are mixed. Numerous authors (Akhavein et al. (1997), Peristiani (1995), Berger and Humphrey (1992), Rhoades (1993), Rhoades (1998), Byod and Graham (1997), Delong (2001) and Berger and Humphrey (1997) found no significant improvement in cost efficiency from the U.S. banks mergers and if gains were recorded, they were found to be either small or insignificant. Moreover, the economies of scale and scope for large European banks were reported without proper evidence by the Group of Ten (2001). Nevertheless, Focarelli and Panetta (2001) provided convincing evidence to show that the bank mergers could indeed benefit in the long run (Italian consumers).

The literature review on bank M&As show that revenue and profit can be improved by improving the revenue or profit scale, scope, or X-efficiency (Akhavein et al., 1997). In fact, revenue efficiencies appear to provide a similar type of opportunity for improvement from mergers as cost efficiency. Several studies have found that the M&As would improve both cost and profit efficiency even though the levels of the cost and profit efficiency are different due to the inefficiency from the revenue side (Huizinga et al., 2001; Al-Sharkas et al., 2008 and Ariff and Can 2008).

In Malaysia, the main objective of the forced merger scheme is to develop stronger and bigger domestic banks that are capable to compete with foreign banks when the financial market is liberalised under the World Trade Organization (WTO)

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agreement in the future (Ahmad et al., 2007; Chong et al., 2006 and Shanmugam and Nair, 2003). In addition, the density of the domestic financial institutions (too many banks) or "over-banked" for a small economy was another factor considered for the merger. Besides that, as a result of Asian financial crisis in 1997/1998, BNM took a substantial measure to promote the forced merging of domestic banking institutions to minimise the systematic risks on the Malaysian banking sectors as a whole.

M&As were also promoted by the BNM because larger and better-capitalised banking groups were more efficient and competitive and therefore they would be able to face the challenges of the liberalised market place. The processes of M&As outlined by BNM are as follows:

1. The need to structure the mergers in such a way that would maximise the synergy from the mergers in order to improve the efficiency and profitability of the proposed banking groups;

2. The need to ensure minimal disturbance on banking services in the provision following the rationalisation of employees and branches;

3. The need to minimise post-integration (after merger) costs that may otherwise affect the viability of the merged entity; and

4. The need to ensure that each banking group is of a sufficient size where each banking group is to have a minimum shareholder's funds of RM2 billion and asset base of at least RM25 billion upon completion of the merger programme.

(BNM Press Release, 14 February 2000, Shanmugam and Nair, 2003)

Through M&As, the banking industry was said to be more competitive and efficient due to the integration of the entire banking sector. The strong banking fundamental and lower costs associated with it would promote the best M&As practiced than if the merge was to be implemented within the crisis time.

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According to Focarelli et al. (2002), Altunbas and Ibanez (2004) and Azofra et al. (2008), the wave of mergers in banking industry throughout the world started in the United States in the eighties and reached Europe in the nineties. During that period, the mega mergers of the banks became a very famous method to improve and resolve the problems faced by the banking industry. However, only the scale and scope efficiency were widely looked during the initial stage of the M&As. Nowadays, the efficiency of the banks have improved with identifications of all the potential and the concept of the efficiency.

2.3   Overview of Bank Mergers and Acquisitions in Malaysia

Recently, more and more countries including Malaysia are moving towards consolidating their banking system. In fact, in Malaysia the process of bank mergers started in earnest during the mid-1980s due to the economic recession (The Star, Malaysia, 11 August 1999).

In the late 1980s and early 1990s, the Malaysian banking authority (Bank Negara Malaysia, 1999) introduced a two-tier banking system (1994) as an incentive to promote mergers of small domestic banks with the large domestic banks. Unfortunately, the move was unsuccessful in getting the desired results because only a few mergers among the Malaysian financial institutions took place to take advantage of it. During the earlier part of the 1990s, there were only three institutions that merged: DCB Finance with Kwong Yik Finance, DCB Bank Bhd with Kwong Yik Bank Bhd, and Chung Khiaw Bank (Malaysia) Bhd with United Overseas Bank (Malaysia) Bhd. Both DCB Bank Bhd and Kwong Yik Bank Bhd were granted the tier-1 institutions status. While the smaller banks with the tier-2 statuses had

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increased their capital to graduate to tier-1 status. Several tier-2 banks had also lent aggressively in order to secure sufficient return on their capital (Sufian, 2007).

However, the two-tier banking system was abolished in April 1999 as a result of great losses during the Asian financial crisis. This had motivated many banks to react by expanding aggressively. At the height of the Asian financial crisis in 1997 to 1998, the smaller and weaker institutions were left with little choice, but to seek merger partners. The financial crisis had left most of the finance companies to become insolvent. To alleviate this problem, the government encouraged the smaller finance companies with high level of capital deficiencies and non-performing loans to merge with the larger bank holding companies. In January 1998, six large finance companies acquired small and medium finance companies after being promoted by the government (BNM, 1998). Other than that, two finance companies were acquired by two banking groups (MBF Finance Bhd acquired by Bank of Commerce (M) Bhd and ACF Holdings Bhd acquired by Affin Holding Bhd) while the other 14 finance companies (including the foreign-owned institutions) were absorbed by the commercial banks within their group (Ahmad, 2007).

The success of merging the finance companies had encouraged the government to promote the mergers for the whole banking sector. Subsequently, on 29 July 1999, Bank Negara Malaysia (BNM), the Malaysian central bank, announced the forced mergers scheme to 58 financial institutions (consisted of 21 commercial banks, 25 finance companies and 12 merchant banks) into six core banking groups or known as anchor banks (Chong et al., 2006). Appendix A (Table A1) summarises the

information on the initial six acquiring and their targets banks that were proposed by the Malaysian central bank on 29 July 1999 under the forced bank merger scheme.

Following the July 1999 announcement, BNM further announced the appointment of six anchor banking groups on 6 August 1999. The six anchor banks were Multi-Purpose Bank Bhd, Bumiputra-Commerce Bank Bhd, Perwira Affin Bank Bhd, Malayan Banking Group, Public Bank Bhd and Southern Bank Bhd. By the end of September 1999, all the financial institutions were instructed to sign the Memorandum of Understanding (MOU) to merge and to complete the sale and purchase agreement.

During the government's initial approach, the idea was poorly received by a majority of the bank's shareholders as there were serious provocations by all the target banks (Chong et al. (2006), Ahmad (2007) and Ahmad and Ling (2000). The main objections were on the selection of the anchor banks in which BNM did not give explanation on how they chose the six anchor banks, and also on the compulsory completion date set by BNM. In addition, Chin and Jomo (2001) reported that the mergers were viewed as politically motivated, particularly as the government handpicked the original six acquirers and their potential target[1]. There were cases in which a few very small banks were selected to acquire banks that were larger than their size. Two examples were Multi-Purpose Bank (which acquired RHB Bank Bhd and Phileo Allied Bank (Malaysia) Bhd) and Perwira Affin Bank (which acquired AmBank Bhd). Such an act led to accusations of unfairness on the part of BNM.

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[1] Maybank (government-linked); Multi-purposed Bank Bhd (controlled by associates of ex-Finance Minister Daim Zainuddin); Bumiputra-Commerce Bank Bhd (government-linked and operated by an associate of Daim); Perwira Affin Bank Bhd (controlled by the Armed Forces Cooperative); Public Bank Bhd (controlled by entrepreneur Teh Hong Piow); and Southern Bank Bhd (controlled by the family of casino owner Lim Goh Tong

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Another problem was that the size of some of the new banking groups was not that much larger after the merger. For example, Public Bank Bhd and Southern Bank Bhd were successful in mergers, but they still remained smaller than the pre-merger size of the largest bank in Malaysia (Malayan Banking Bhd). Besides that, BNM also set the valuation guidelines for the purchase price of the target banks. The non-listed institutions valuation was based on the net tangible asset basis (NTA) and the three months (29 April to 29 July 1999) given to the target banks to negotiate for favourable prices was considered as too little time. Furthermore, the capabilities of the anchor banks especially the smaller anchor banks to acquire them were also questionable because funding the acquisition was not an easy task. For example, Multi-Purpose Bank Bhd. had taken over the institutions whose combined assets were approximately more than 12 times than its own. Perwira Affin Bank Bhd was approximately 4 times more than its own.

On 6 October 1999 and 13 October 1999, the then Malaysian Prime Minister, Tun Dr. Mahathir Mohamad, advised the government to revise the forced merger scheme. The banks should be given more freedom to form any number of groups of their own choice partners and given more time to complete the merger process. As a result, BNM officially announced the new merger scheme on 20 October 1999 and the banks then had until 31 January 2000 to submit their merger proposal to find their own merger partner. Finally, on 14 February 2000, after all financial institutions submitted their proposals at the end of January 2000, BNM confirmed the new 10 anchor banks: Malayan Banking Bhd, RHB Bank Bhd, Public Bank Bhd, Bumiputra-commerce Bank Bhd, Southern Bank Bhd, Hong Leong Bank Bhd, Multi-Purpose Bank Bhd, Perwira Affin Bank Bhd, Ambank (M) Bhd and Eon Bank Bhd.

Appendix B (Table B1) summarises the final ten acquirers and targets approved by BNM (under the revised merger) on 14 February 2000.

After the mega mergers took place in Malaysia in 2000, several authors had taken initiatives to examine the impact of M&As on commercial banking sector. Among the studies were those by Krishnasamy et al. (2003), Sufian (2004), Chong et al. (2006), Sufian (2007), Ahmad et al (2007), Ismail and Rahim (2009), Sufian and Habibullah (2009) and Sufian (2009). It was found that in general, there was an improved efficiency on the commercial banks in Malaysia that were involved with the M&As.

CHAPTER 3

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

3.1   Introduction

This chapter discusses the definition of M&As, theories on M&As and efficiency. It discloses the evolution of studies on bank efficiency based on a number of previous studies. The literature review discusses the bank M&As and revenue efficiency, as well as the determinants of revenue efficiency, both specific and macroeconomic, particularly during the post-merger period.

3.2   Definition of Merger and Acquisition

In general, M&A refers to a combination of two entities to become one company. In M&As, the terms 'acquirer' and 'acquired' (target) are used to describe the parties involved in the M&As where the 'acquirer' is the firm that takes over the other firm, and the 'acquired' is the firm that is being acquired.

According to Megginson et al. (2007), the terminology used by the corporate control to indicate the M&As is magnanimous. For instance, the popular press frequently uses the term "takeover" to conjure up images of an unwelcome bidder commandeering the control of a corporation through the techniques of high finance and the means of great sums of money. However, "takeover" simply refers to any transaction in which the

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control of one entity is taken over by another. Thus, a friendly merger negotiated between the boards of directors and shareholders of two independent corporations is a takeover, as in a successful entrepreneur selling out her enterprise to a corporation.

Because the terms 'merger' and 'acquisition' are often uttered as if they share the same meaning and used as though they are synonymous, they can sometimes be confusing. A purchase is called an acquisition when one company takes over another and establishes itself clearly as the new owner. From a legal point of view, the target company ceases to exist as the buyer "swallows" the business and the buyer's stock continues to be traded. In short, an acquisition means a "transfer of ownership".

On the other hand, in the pure sense of the term, a merger happens when two firms, often of about the same size, agree to go forward as a single new company rather than to remain as separately owned and operated company. This kind of action is more precisely referred to as a "merger of equals". Both companies' stocks are surrendered and a new company stock is issued in its place.

In practice, however, actual mergers of equals do not happen very often. Usually, one company will buy another, and as part of the deal's terms, it simply allows the acquired firm to proclaim that the action is a merger of equals even if it is technically, an acquisition. Being bought out often carries negative connotations; therefore, by describing the deal as a merger, deal makers and top managers try to make the takeover as being regarded as a normal activity that carries neutral connotation.

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A purchase deal will also be called a merger when both CEOs agree that joining together is in the best interest of both of their companies. Nevertheless, when the deal is unfriendly by which the target firm is reluctant to be purchased by the acquirer, then this situation is always defined as an acquisition.

Whether a purchase is considered a merger or an acquisition really depends on whether the purchase is made on a friendly or hostile manner and on how it is announced. In other words, the real difference lies in how the purchase is communicated to and received by the target company's board of directors, employees and shareholders. Harwood (2005) stated that it is quite normal for M&A deal communications to take place in a so called 'confidentiality bubble' whereby information flows are restricted due to confidentiality in agreements.

3.3   Theories on Mergers and Acquisitions

Berkovich and Narayan (1993) proposed three theories on M&As; namely, synergy or efficiency, agency and hubris. These theories are explained based on the gains of the M&As to the target, acquirer and combined firms (total gains).

As for the motives of M&As, the existing empirical evidence is unable to clearly distinguish among the different motives because most of them look at the average gains as the motives for the M&As (for example, Malatesta, 1983; Roll, 1986; or Bradley et al., 1988). The three theories suggested by Berkovich and Narayan (1993) describe the three major motives of the M&As. The theories are described in Table 3.1 below:

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Table 3.1: M&A Theories

Theory	Target gains	Acquirer Gains	Total Gains
Synergy/Efficiency	+ (positive)	+ (positive)	+ (positive)
Hubris	+ (positive)	- (negative)	0 (zero)
Agency problem	+ (positive)	- (negative)	- (negative)

Source: Berkovitch and Narayanan (1993) and Jaaman (2007)

The theories of the 'synergy or efficiency' in M&As encourage the maximising of shareholders' wealth for both the target and acquirer firms to produce positive total gains. While the 'hubris' indicates mistakes by the acquirer's managers to acquire the target even though there is no synergy, resulting in the same or static total gains. The last category of M&A theories is 'agency problem' comprising theories in which the total value is decreased as a result of the mistakes made by the management who put their own preferences above the welfare of the firm (Berkovich and Narayan, 1993 and Jaaman, 2007).

The current study adopts only the efficiency theories since the objective of this research is to identify the revenue efficiency of the bank M&As in Malaysia.

3.4   Theories Related to the Mergers and Acquisitions Study

Efficiency theories focus on fully utilising the scarce resources in order to produce quality production or services without any wastage from the view of economics perspective. The existence of the efficiency could improve the performance of the firm due to the improvement in the reduction cost, profitability and overall operation (Copeland and Weston, 1988).

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In this regards, the operation of the firm should be efficient in order to ensure a maximum profit with a minimum costs of the firm's productions. This operational efficiency would keep firms to always make the right decision in production to gain a high profit. For example, the firm will not make any transaction if the cost of the transaction is higher than the projected benefit. Inefficiency could deteriorate the performance of the firm due to imprudent management by managers when setting their goals. Therefore, managers play important roles to ensure all operations are well managed for the benefits of the firms.

The efficiency theories could also be used to assess the efficiency in the firms that are involved in the M&As. Copeland and Weston (1988) stated that the merger efficiency could be defined as welfare gains deriving from the combination or consolidation of the separate economic entities. Besides that, Weston et al. (1990) expressed the idea that the efficiency theories are the most optimistic theories about the potential of M&As for social benefits. It is the basic concept of M&As to maximise the shareholder value or wealth. Thus, the synergies are created with the combination between acquiring and acquired firms to justify M&As.

According to Bradley et al (1988), the synergy is achieved through the M&A when the values of the firms are more than the sum of the firm that operates individually due to an increased efficiency. In general, synergy refers to a situation in which two plus two equals five (2 + 2 = 5).

Because of the benefits that can be gained through synergy, the acquiring firm is eager to pay a higher premium in order to acquire the target firm. The premium paid by the acquiring firm will be offset by the synergistic gains received due to the improvement in the acquiring firm, such as performance improvement.

The efficiency theories could be categorised into six: differential managerial efficiency, inefficiency management, operating synergy, financial synergy, pure diversification and information and signalling (Jaaman, 2007). All these efficiency theories are summarised in Table 3.1.

3.4.1   Differential Managerial Efficiency

Weston et al. (2001) defines differential efficiency theory (also known as managerial synergy) as efficiency gained from the combination of management teams of unequal managerial capabilities. For example, the expanding scope of banks via consolidation could benefit the bank's shareholders when the environment is sufficiently uncertain (Milbourn et al., 1999). That is, when a bank faces sufficient strategic skills uncertainty arising from a scarcity of knowledge about its own future skills and the skills that will be needed to compete effectively in a particular market in the future. If there is an expansion of scope, the bank's shareholders will benefit. The principal advantage of expanded scope is that the bank gains a first-mover advantage in a new market and learns about the match of its skills to compete effectively in that market. This theory can be simplified by a simple merger situation. For example, firm X is more efficient in

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management than firm Y. When firm X acquires firm Y, the efficiency of the firm Y is raised up to the efficiency of firm X due to the influence of the efficiency of firm X.

Poorly performing banks typically have a relatively low market to book a value of equity, making them comparatively cheap to acquire a per dollar of assets or deposits basis. This value of the acquired part of the consolidated bank can potentially be increased by applying the managerial policies and procedures of the more efficient acquiring bank to it (Akhavein et al., 1997).

Thus, the differential theory hypothesis summarises that the firm with the excess capacity in efficiency managerial resources could utilise the excess into the inefficient acquired firm in order to improve its inefficiency. A merger is another way in which synergy could be produced.

3.4.2 Inefficient Management

Manne (1965) refers to inefficiency theory as being the result of incompetent or inefficient managers to perform, and that almost anyone can do better than the current management. Through an effective mechanism of M&As, inefficiency in managerial can be improved. For example, Benston et al. (1992) found that the acquisition price premium in bank mergers was positively related to acquiring bank efficiency, and was negatively related to target bank efficiency. This suggests that the market for corporate control of banks expected efficient managers to be able to improve the performance of targets previously run by inefficient managers.

According to Copeland and Weston (1988), the inefficiency management theory is based on several assumptions. First, the need for M&As to replace inefficiency managers because the shareholders of the target firms are unable to replace their own managers. Second, the theory assumes that the target firms should operate as subsidiary if the sole motive for M&As is to replace the inefficient managers.

Hence, the inefficient management theory is viewed as the substitute of the inefficient managers (target) to the more efficient managers from the acquirer firms, directly after the M&As.

3.4.3 Financial Synergy

The financial synergy refers to the combination of the firm with the large opportunities project, but with paucity of free cash flow, and also a firm with excess of free cash flow but with limited projects offered. Thus, financial synergy allows a complementary between the integration firms in order for them to be involved in the investment from the high return projects without any difficulty of funding from the availability of free cash flow.

The financial synergies could provide powerful incentives for conglomerate mergers with different line of businesses (Jaaman, 2007). For example, firm A with agricultural nature of business may obtain fewer projects but has a large amount of free cash flow, can merge with firm B with computer technology nature of business in excess of profitable project but has limited free cash flow. When both of these firms combine, they

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could complement each other's needs to become more efficient. The existence of conglomerate mergers firms is rational because the merger provides an efficient allocation of capital from low to high marginal return. This is possible as a result of the availability of free cash flow to finance the potential projects (Weston et al. (1990), Weston (1970) and Williamson (1970).

Since the combination of the firms allows companies to complement each other and they now have a stable cash flow, the merged firms could reduce the risk of possible failure or bankruptcy. Another positive result of the merger is that borrowing capacity also increases due to the secure cash flow. The combined firms can also enjoy tax benefits as their capacity of borrowing increases.

3.4.4 Diversification Motive

The general motive of the diversification is to reduce risk and to stabilise the earnings of the acquirer firms by purchasing another firm which is more efficient and profitable. Multidivisional firms create a level of management concerned with the coordination of specialisation divisions; thus, they are inherently more efficient and more profitable than if they would to carry out their businesses individually (Chandler, 1977). Weston (1970) stated that diversified firms allocate resources more efficiently because they create a larger internal capital market whereby the resource allocation is more efficient in internal rather than in external capital market.

The benefits of diversification also arise from combining businesses with imperfect correlated earnings streams. This coinsurance effect gives diversified firms greater debt capacity than single-line businesses of similar size (Lewellen, 1971). Increasing interest of tax shield is a way to increase debt capacity. Thus, diversified firms are predicted to have higher leverage and lower tax payments than those firms that operate separately. Gaughan (2002) found that the coinsurance derives combined earnings stream to be less volatile.

In addition, the managers' burden with the responsibility to achieve the goal of the firms could be reduced through diversification. The burden becomes the risk to managers if they fail to implement their roles to meet the target objectives of the firms and to maximise the shareholder wealth. Hence, the risk could be reduced through diversifying multiple firms. This could also improve the performance of the company.

3.4.5 Informational and Signalling

Certain information and signal of a firm could be very meaningful in describing the overall performance of the firm. According to Jaaman (2007), signalling may involve M&A in several ways. The repurchase of share (share-buy-back) where the management holds a significant portion of the shares indicates that the information which the firms share is undervalued. As a result, there is a potential for that company to generate more profitability and growth in the future. If the share is overvalued, the acquirer firm proposes a common share to purchase other firms. When the tender offer is received by

the target, the firm may improve its performance and value due to the capability of the acquirer firms.

Acharya (1988) stated that banks can signal favourable information by merging with those banks with larger capital ratios. It is an indication of a positive correlation between capital and earnings, and a positive relationship between capital structure dissimilarities and performances.

3.4.6 Operational Synergy

The operational synergy allows the combined firms to enjoy an efficient operation, a greater income, or both. Revenue improvement (higher profit) and cost reduction are among the benefits that M&As have to offer. For example, Akhavein et al. (1997) found that the merged banks experienced an average increase in profit efficiency rank relative to other large banks. Besides that, Rhoades (1993) stated that the horizontal bank mergers would permit the reduction costs through consolidation of back office and administrative function, and also through the closure of overlapping office.

Gaughan (2002) claimed that synergetic gains can be realised from M&As. First, the firms should work out with the substantial and strategic plans before merger to ascertain their capability to compete with other rivals in similar industry. Second, the improvement of the performance in M&As firms can be achieved via the enhancement of the revenue and the reduction of costs. The increased revenue can be achieved by the large production, while the reduction in cost can be achieved via exploiting the

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economies of scale after the M&As. Reduction in cost is the main source of the operating synergy in M&As (Jaaman, 2007). Huizinga et al. (2001) also found that the economies of scale are often invoked by consolidating banks as one of the main motivations behind mergers. Furthermore, economies of scale allow for more cost efficient and profit to be gained by the combined firms. Basically, economies of scale refer to the reduction of the cost per unit or average cost of the input due to the large production. Copeland and Weston (1988) defined economies of scale as a reduction in cost of equipment, labour and overhead due to the large number of units of output produced; hence, provides an increase in returns. Economies of scope refer to the consolidation of the inputs in order to offer wider services and cheaper-to-produce products than what they could offer if they were in separate individual firms. The economies of scope view more on the efficiency of broader range of services, while the economies of scale view more on the reduction of cost per unit due to the large productions or outputs.

Table 3.2: Theories of Efficiency

Theory	Definition
Differential managerial efficiency	Suggests efficiency gains from the combination of management teams of unequal managerial capabilities (Watson et al., 2001)
Inefficiency Management	Substitute of the inefficient managers (target) to the more efficient managers from the acquirer firms directly after the M&As (Manne, 1965; Benston et al., 1992; Copeland & Weston 1988)
Financial synergy	Combination of firms with large opportunities project but lack of free cash flow & firm with excess of free cash flow but limited projects offered (Weston, 1990; Weston 1970 and William, 1970)
Diversification motive	Reduces risk & stabilises the earning of the acquirer firms through purchase of another firm that is more efficient and profitable (Chandler, 1977 & Weston, 1970)
Informational & signalling	Particular information & signal could be very meaningful in describing the overall performance of the firms (Acharye, 1988).
Operational synergy	Allows the combined firms to enjoy efficient operation (economies of scale), greater income, or both (Akhavein et al., 1997)

Source: Jaaman (2007)

3.5 Evolution of Studies on Bank Efficiency

3.5.1 Cost Efficiency

Cost efficiency means that a firm is able to minimise the costs of inputs while producing the same amount of outputs sold at certain prices (Berger and Mester, 1997 and Ariff and Can, 2008). Berger and Humphrey (1997) claimed that most of the previous studies focused on the cost efficiency (such as Srinivasin, 1992; Linder and Crane, 1992; Savage, 1991; Shaffer, 1993; Berger and Humphrey, 1992; Rhoades, 1993; Pilloff, 1996 and Resti, 1997) and suggested that research on the revenue and profit efficiency has been scarce. Most ignored the revenue and profit side on the efficiency of the banks

(Akhavein et al., 1997 and Bader et al., 2008). Only nine out of 130 studies on efficiency of financial institutions reviewed, had analysed profit efficiency. Basically, profit maximisation requires a firm to choose an input and output bundle such that the output bundle generates the maximum revenue possible from the corresponding input bundle. At the same time, the input bundle chosen produces the corresponding output bundle at the lowest cost. Thus, cost efficiency only focuses on minimising the cost unit, regardless of the revenue gains. Hence, revenue efficiency should not be ignored because it is required in order to ensure the maximisation of revenue to attain maximum profit.

Cost efficiency is the product of technical efficiency and allocative efficiency (cost X-efficiency) that shows the ability of a bank to provide services without wasting resources (Rogers, 1998; Isik and Hassan, 2002 and Ariff and Can, 2008). There are at least three reasons for focusing on cost efficiency to indicate banking performance (Fries and Taci, 2005). First, the greater cost efficiency may be associated with the changes of constraints and incentives in banking associated with institutional reforms and structural by the government with the efficient public services. Second, the efficiency gains reduce the resources associated with operation of payment systems or reduce the utilisation of resources and with intermediation of savings into investments. Finally, cost efficiency may be associated with other dimensions of bank performance that contribute to overall development.

However, a study by Andogo et al. (2005) and Akhavein et al. (1997) suggested that cost efficiency may not sufficient to describe the overall performance of the bank's financial

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performance. The reason is that cost efficiency only considers on how to minimise the cost, but it does not take into account the revenue gained from the provision of higher quality services. Also, cost efficiency only evaluates the performance holding output quantities statistically fixed at their observed levels, but it does not consider the optimally efficient levels involving a different scale and mix of outputs. Thus, the bank is considered cost efficient at the current output which may or may not be cost efficient at optimal outputs. In this regard, the problem could be solved by examining the profit efficiency concept.

3.5.2 Profit Efficiency

Profit efficiency is also a firm's maximisation of profit since it takes into account both the cost and revenue effects on the changes in output scale and scope. Profit efficiency measures how close a bank comes to producing the maximum profit, given an amount of inputs and outputs and a level of their prices (Akhavein et al. 1997; Akhigbe and McNulty, 2003 and Ariff and Can, 2008). Thus, the profit efficiency provides a complete description on the economic goal of a bank that requires banks to reduce the cost and increase the revenue. Furthermore, according to Berger and Mester (2003) and Maudos and Pastor (2003), profit efficiency offers more useful information on management efficiency. Moreover, Andogo et al. (2005) posited that profit efficiency occurs only if the costs rise from producing the additional or higher quality services, but revenue increase should be higher than cost increase. A study by Maudos et al. (2002) proposed that beside requiring that goods and services be produced at a minimum cost, it is also demanding the maximising of revenues in order to suite the objective of the profit

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maximising. In fact, the evidence available now shows that there are higher levels of revenue and profit inefficiency than cost inefficiency. The wrong choice of output or the mispricing of output may cause inefficiencies on the revenue side.

A study by Berger and Mester (1999) showed that evaluating separately on the cost and revenue efficiency does not capture the goals of banks to maximise their profit. A profit efficiency concept overcomes this kind of shortfall. Its main goal is to maximise profit by minimising cost and maximising revenue from various inputs and outputs. Profit efficiency could be divided into two types: standard profit efficiency and alternative profit efficiency. A study by Ariff and Can (2008) showed that standard profit efficiency assumes the existence of perfect competition in both input and output factors. It means that the bank is a price-taker in which it has no market power to determine the output price. While the alternative profit efficiency assumes the existence of imperfect competition where the bank is the price-setter in which it has market power in setting the output prices.

3.5.3   Combining Cost and Profit Efficiency

Recent studies which combine both cost and profit efficiency have discovered that the different levels between cost and profit efficiency are caused by the inefficiency from the revenue side (such as: Berger et al., 1993b; Chu and Lim, 1998; Rogers, 1998; Maudos et al., 2002; Berger and Mester, 2003; Maudos and Pastor, 2003; Yildirim and Philippatos, 2007; Ariff and Can, 2008 and Bader et al., 2008).

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Lozano's (1997) study looked at profit efficiency in Spanish savings banks between 1986 and 1991, a period in which the Spanish banking industry saw considerable deregulation. He stated that profit function (measured profit efficiency) allowed the identification of the levels of cost, revenue and profit efficiency. A more complete picture of the effects of deregulations was obtained from a profit function which reflects the joint impact of revenue, as well as the cost effects of deregulations. The results of his study showed profit inefficiency as being at the average of 72% of potential profits, while cost inefficiency as being at the average of 26% of potential profits. This comparison implied that revenue inefficiencies (setting inefficient output prices) appear to have a larger effect on potential profits than cost inefficiencies (overusing inputs) for Spanish savings banks.

Berger and Mester (1997) found that profit efficiency is not positively correlated with cost efficiency, suggesting the possibility that cost and revenue inefficiencies may be negatively correlated. This result indicates that a bank with higher costs may compensate apparent inefficiencies by achieving higher revenues than its competitors, either by benefiting from greater market power in pricing, or by using a different composition of its vector of production. Thus, a measurement of cost inefficiency may be affected by the composition of output so that an output vector of higher quality could be more costly, but not necessarily inefficient. To capture the productive specialisation, the estimation of a frontier profit function is required. This allows for higher revenues received by banks which produce differentiated or higher quality outputs to compensate for the higher costs incurred.

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Rogers (1998) showed that the level of the cost efficiency was higher than profit efficiency in the commercial banks in the U.S. from 1991 to 1995. The results showed the ranking between revenue and profit efficiencies were positively correlated, implying that banks which are ranked highly according to revenue efficiency are also ranked highly according to profit efficiency. In fact, those banks with high revenues also have high profits relative to the efficient frontier. However, for cost efficiency, the result showed a negative correlation between revenue and profit efficiency. It indicated that banks with low costs (high cost efficiency) also had low revenues and profits relative to the efficiency frontier. Thus, implicitly revenue efficiency could influence the improvement of the profit efficiency. However, if banks are to make higher revenue, they should consider on the costs because if they increase the revenue (produce quality services), they also increase the costs (cost inefficiency). Hence, revenue inefficiency could reduce the efficiency on the profit frontier. For example, banks with higher cost efficiency would not be able to produce higher quality of services and this will lead to a lower profit efficiency.

Consistent results by Maudos et al. (2002) showed most studies have concentrated on cost efficiency, disregarding possible inefficiencies on the revenue side. Nevertheless, studies that have analysed cost and profit efficiencies using frontier profit functions have shown the existence of higher levels of efficiency in costs than in profits. Using alternative techniques of analysis for both cost and profit efficiencies in a sample of 10 countries of the European Union from the period of 1993 to 1996, similar findings were obtained; that is, cost efficiency levels are higher than profit efficiency levels. The results of the studies also suggest that high levels of efficiency in costs and lower levels

in profits verified the importance of inefficiencies on the revenue side of banking activity. Thus, the results support the importance of inefficiencies on the revenue side, either due to the wrong choice of output, or to the mispricing of output.

Bader et al. (2008) said that a bank could be cost efficient if it is able to create a relatively high volume of income generating assets and liabilities for a given level of capital. A revenue and profit efficient bank would produce a high volume of income from its services and intermediation operations with the given level of inputs. In the study, they measured the cost, revenue and profit efficiency of 43 Islamic and 37 conventional banks between 1990 and 2005 in 21 countries via DEA. The three efficiency concepts were used as the basis to measure and compare these three aspects of efficiency of banks. For the measure of cost efficiency on the overall of banks in the sample, they discovered that banks actually utilised 91.8% of the resources to produce the same level of output and that only 8.9% ([1-0.918]/0.918) of inputs (cost inefficient) was wasted. Nevertheless, on the average, banks are more efficient in using their resources (cost efficiency) than their capability in generating revenues and profits (revenue and profit efficiency).

For revenue efficiency, the average bank could only generate 81.1% of the revenues it was estimated to produce. Thus, the remaining 23.3% indicated revenue inefficiency, meaning that the average bank lost an opportunity to receive 23.3% more revenue, given the same amount of resources. Apparently, the highest level of the inefficiency on the revenue side depends on the profits. For the profit efficiency, on the average, bank earns 87.2% of what was available, and lost the opportunity to make 14.7% (profit inefficient)

more profits using the same level of inputs. Thus, the study concluded that revenue inefficiency may influence the levels of cost and profit efficiency, and this finding is consistent with the study by Ariff and Can (2008).

Another study by Al-Sharkas et al (2007) showed that the profit efficiency level is lower than cost efficiency level for both merged and non-merged banks. This is because the banks manage the costs relatively efficiently, but they have significant inefficiencies (revenue side) in their profit generation. This finding is consistent with that of Berger and Mester, (1997) and Rogers (1998). However, the profit efficiency in merged banks (67.4%) is more efficient than non-merged banks (52.5%). A similar study by Huizinga et al (2001) showed that M&As may also improve the level of cost and profit efficiency beside benefit from the size increased. They claimed that the average profit efficiency is considerably lower than the average cost efficiency level due to the less efficient revenue. This finding is consistent with the results that were found by Ayadi and Pujals (2005); Vander Vennet (2001) for European banks and Berger and Mester (1997) for U.S. banks.

Srairi (2009) claimed that a higher loan activity (output or revenue) increases the profit efficiency of banks, but it has negative impact on cost efficiency. He stated that banks with higher loans-to-assets ratios take more risk and are more profit efficient. Thus, the credit risk is significantly and positively related to profit efficiency levels. The result indicated that banks with higher ratio of loans to assets are less cost efficient because the expenses associated with loans are fairly substantial. Thus, the result of their study is in contrast with the majority of other studies where cost efficiency levels are found to be

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lower than profit efficiency levels. In their study on the Gulf banks' cost and profit efficiency, they found that the profit efficiency levels (71%) are higher than the cost efficiency levels (56%). This shows that banks in these countries are more efficient (revenue is efficient) at generating profit than at controlling costs. The high demand of financial services and the dominant position of commercial banks in the Gulf region Bank have gained higher monopoly power and are less pressured to decrease costs and to restructure their activities.

3.5.4 Revenue Efficiency

As can be seen, revenue efficiency could influence the level of cost and profit efficiency and could play an important role to ensure the profitability of the banks. Bader et al. (2008) mentioned that there are three main efficiency concepts (revenue, cost and profit efficiencies). Since the present study focuses on the revenue efficiency on the effect of bank M&As, the first concept, the revenue efficiency, will be thoroughly explored and analysed, while the cost and profit efficiencies will only be covered slightly. Basically, revenue efficiency measures how effectively a bank sells its output, whereas cost efficiency measures how cheaply a bank produces its outputs (Rogers, 1998). The revenue efficiency score would be different for the two firms or banks even with the same cost, input and output bundles due to the different revenues produced. Rogers (1998) also suggested that non-traditional activities (non-interest income) should be included as an output in an examination of bank efficiency. However, when non-traditional activities were included as a type of output, the opposite result was found in which the revenue efficiency resulted as the mean efficiency declined. Thus, non-

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traditional output and revenue efficiency indicate a negative correlation, and non-traditional output should shift out the frontier so that the spread of residuals is increased. The result showed that revenue efficiency is not significant. This suggests that omitting non-traditional outputs would understate cost and profit efficiency.

Another study by Andogo et al (2005) on revenue efficiency looked at how maximum revenue can be obtained by producing the output bundle efficiently. When banks charge higher prices for higher quality service, the revenue efficiency could take place. Basically, lower or higher revenue produced could be influenced by the effectiveness of marketing strategies and the quality of product, whereas the revenue inefficiency is reflected by the improper choice of inputs and outputs quantities and mispricing of outputs (Maudos et al., 2003 and Rogers, 1998).

A study by DeYoung and Nolle (1996) investigated the extent to which technical inefficiency contributed to the low profitability of foreign-owned U.S. banks between 1985 and 1990. They discovered that the main scarcity of the revenue efficiency is that it did not take into account the increased costs of producing higher quality services, and it focused only on one side of the overall financial picture of a bank. Previous cost-based efficiency studies on foreign-owned U.S. banks might have over-stated inefficiency in those banks that provided high quality services. In fact, they showed that the higher input inefficiency (cost inefficiency) contributed to less profit-efficiency in foreign-owned banks compared to U.S.-owned banks (consistent with Chang et al., 1995; Nolle, 1995 and Elyasiani and Mehdian, 1993). The foreign-owned U.S. banks employed greater amount of costly variable inputs where foreign-owned banks relied on expensive

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purchased funds financing than did U.S.-owned banks. Thus, foreign-owned U.S. banks used higher cost in order to produce a quality service, but due to the inefficiency in cost (technical inefficiency), the higher cost failed to be offset by the revenue yield.

A study by English et al. (1993) showed that to maximise the revenues efficiency, banks should be both technically efficient (operating on the production possibilities frontier) and allocatively efficient (producing the revenue maximising mix of outputs). The study looked at whether individual banks operated efficiently in terms of technical and allocative efficiency. They focused on the output efficiency instead of on the input technical and allocative efficiency like most of the earlier studies. Thus, their main focus was on the revenue rather than on the cost side. Their finding showed that on the average, banks could increase outputs dramatically if they eliminated technical inefficiency. Since the output should be increased, they suggested the use of shadow prices of outputs for individual banks in the identification of allocative efficiency. Shadow price is the maximum price that a management is willing to pay for any extra unit of a given limited resources. For example, if 60 hours is normally required in producing the outputs, the shadow price would be the additional 10 hours that a manager is willing to pay based on the return that he is able to obtain from the extra hour required. Hence, they argued that on the average, banks are allocatively inefficient because the mixed of outputs is not revenue maximising, given the observed relative price. Leibenstein (1966) and Isik and Hassan (2002) attempted to redefine technical and allocative efficiency on the cost efficiency. The technical efficiency measures the proportional reduction in input usage that can be attained if the bank operates on the efficient frontier, or the effectiveness of the limited set of inputs is used to produce

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maximum outputs. On the other hand, the allocative efficiency measures the proportional reduction in costs if the bank chooses the right mix of inputs to be used. The revenue efficiency views the allocative efficiency as a means to measure the output allocative efficiency. There will be an increase in revenue if the bank chooses the right mix of outputs to be produced (English et al., 1993 and Al-Sharkas et al., 2008).

Bader et al. (2008) discovered that many studies (such as Berger and Mester, 1997; Rogers, 1998; Lozano, 1997; Vennet, 2001; Huzinga et al., 2001; Al-Sharkas et al., 2008 and Ariff and Can, 2008) did not address the revenue efficiency by itself when they considered it as reflected by the profit efficiency. These studies preferred to evaluate the efficiency of the banks by examining those banks that used the profit efficiency concept rather than the revenue efficiency. A study by Hassan (2005) discovered that although revenue efficiency measures nearly the same thing, profit efficiency is conceptually superior to revenue efficiency in reflecting the goal of the production units. In such a way, the addition of the revenue efficiency could be redundant. In fact, most of the studies found that the revenue and profit efficiencies were treated as one concept although there are different concepts (Baumol, 1958 and Amihud et al., 1979). Basically, the main difference is that profits are the net income after all expenses, while the revenue is the income before deducting the expenses.

In conclusion, revenue is defined as how effectively a bank sells its outputs. Maximum revenue is obtained as a result of producing the output bundle efficiently (Rogers, 1998 and Andogo et al., 2005). In fact, revenue efficiency is decomposed of technical and allocative efficiency which are related to managerial factors and is regularly associated

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with regulatory factors (Isik and Hassan, 2002). Hence, in order to ascertain the revenue efficiency, banks should focus on both technical efficiency (managerial operating on the production possibilities) and allocative efficiency (bank producing the revenue maximizing mix of outputs based on the certain regulation) (English et al., 1993). However, banks face a dilemma in determining the revenue efficiency because in order to increase the revenue, banks should produce quality outputs or services than require a higher or expensive cost (De Young and Nolle, 1996). An increase in the cost would contribute to the cost being inefficient. However, cost inefficiency may possibly be compensated by higher or extra revenue obtained due to the quality services produced (Berger and Mester, 1997). Another way to improve the revenue efficiency proposed by several studies is for banks to produce higher quality services and charge higher prices and struggle to avoid any improper choice of inputs and outputs quantities and mispricing of outputs (Andogo et al., 2005, Maudos et al., 2003 and Rogers, 1998). The revenue inefficiency could be well identified via the profit function because this function combines both the cost and revenue efficiency to evaluate the profit efficiency (Lozano, 1997 and Akhevein et al., 1997). Ideally, the levels of profit efficiency are less than cost efficiency. Overall, the profit efficiency shows the profitability of the banks and could be the best method for the stockholders to measure the performance of the banks. Thus, the indicators that show a higher cost efficiency compared to profit efficiency mean that the banks are not fully efficient. The revenue efficiency would totally affect the efficiency of the profit even though the cost efficiency is high. In essence, the revenue efficiency would be the major factor that influences the efficiency on the profit efficiency.

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3.6   Literature Reviews

3.6.1   Bank Mergers and Acquisitions and Revenue Efficiency

Berger and Humphrey, 1997; Akhavein et al., 1997 and Bader et al., 2008 stated that there have been limited studies done on revenue efficiency of banks. If the studies were narrowed down into the revenue efficiency on the bank M&As, there are more paucity studies that looked into the event of M&As. Previous studies mostly measured the revenue efficiency of banks without this event. Only a few studies on the revenue efficiency of banks M&As generated a conclusive result and was less definitive on the impact of the revenue efficiency to the M&As. However, to evaluate the effects of M&As in banking sector in terms of revenue efficiency, the researcher could also base the findings on the profit efficiency since there is a positive correlation between profit and revenue efficiency (Roger, 1998).

Cornett et al. (2006) investigated the operating performance around commercial bank mergers. They found that after the event of merger, both revenue enhancement (revenue efficiency) and cost reduction (cost efficiency) activities generated a performance improvement. Finally, they expressed that along with these increases in accounting-based operating performance, the merged banks also experienced abnormal long-run stock return. In addition, they suggested that a major reason for banks to decide to expand geographically via a merger was related to the exploitation of potential cost and revenue synergies from merging. In recent years, a merger wave among banks has occurred, including some mega-mergers among large banks, driven by the desire of banks to achieve greater cost and revenue synergies. They also suggested that the

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revenue synergies (revenue increases/revenue efficient) argument to consist of three dimensions. First, revenue may enhance due to acquiring a bank in a growing market. For example, the 2000 merger of J.P Morgan and Chase Manhattan to form J.P Morgan Chase was estimated to enjoy the cost savings. The success of the merger was pinned on revenue growth. Second, the acquiring bank's revenue stream may become more stable if the asset and liability portfolio of the target institution exhibits different credit, interest rate, and liquidity risk characteristics from the acquirer. Third, expanding into markets that are less than fully competitive offers an opportunity for revenue enhancement. In conclusion, bank mergers improve the revenue efficiency rather than cost efficiency where the revenue enhancement opportunities appear to be most profitable in those mergers that offer the greatest opportunity for cost cutting activities such as activity of focusing and geographically focusing mergers.

Most closely related to Cornett et al (2006) study is that by Houston et al. (2001) who explored on analysts' estimates of projected cost savings and revenue enhancements (revenue efficiency) associated with bank mergers. However, they showed a different finding where the analysts' estimation of increase in combined bank value associated with a merger was due mainly to estimated cost savings, rather than projected revenue enhancements. In this study, they focused on the sub sample of 41 mergers which included managerial projections. They found that the primary source of management's expected merger-related gains was cost savings. Revenue enhancements were far less important due to their valuation of estimated revenue gains which accounted for an average of only 7% (the median is zero) of the total valuation gains implied by management's estimates.

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Ayadi and Pujals (2005) argued that M&As allow for the resulting banks to obtain efficiency gains through cost synergies, revenue synergies, exchange of best practices and/or risk diversification. They maintained that cost synergy result from an improved organisation of banking production, a better scale and/ or a better combination of production factors (a study similar to Cornett et al. 2006). Revenue synergy on the other hand, is a result of a well combination of production factors. To enhance the revenue gain by getting benefits from product complementarities, improvements are needed in the organisation. Moreover, revenue synergies may also be obtained by the harmonies of product ranges, the existing complementarities between activities, cross-selling and the generalisation of a 'multi-distribution channel' approach to the various segments of customers. However, the revenue synergies are more difficult to obtain compared to cost synergies because they depend not only on the managers' decisions, but also on the customers' behaviour. The researchers also said that revenue efficiency could be improved through the merger process itself by simply raising prices as market power expanded. Revenue may rise due to the merged institution restructuring its assets mix.

Pilloff (1996) study looked at whether accounting and market data yield consistent implications regarding the gains achieved. His study was based on a sample of 48 bank mergers between 1982 and 1991. He suggested that the greatest potential for cost reductions is offered by higher abnormal returns from the mergers (measured by geographic overlap and per-merger cost measures). He also found that industry-adjusted profitability of the merged banks did not change, where the total expenses to assets increased and this contributed to the increase in revenue in the five-year period around

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the merger. Thus, the merger of banks offers a higher abnormal return and also enhances the revenues.

A study by Akhavein et al. (1997) discovered that merged banks experienced a statistically significant 16% point average increase in profit efficiency rank relative to other large banks. The improvement in the profit efficiency was contributed mostly by the increase in revenues, including a shift in outputs from securities to loans, a higher-valued product. The greatest improvement was experienced by the banks which were least efficient prior to merger. Moreover, they found that most of the banks that were involved in M&As might event improve in revenue and profit efficiency due to the improvement in revenue or profit scale, scope, or X-efficiency. But the study highlighted that the limited literature on these kinds of efficiencies would contribute to an inconclusive result. Furthermore, revenue efficiencies offer a similar type of opportunity for improvement from mergers as cost efficiency. There has been no investigation as to whether this potential has been realised in the actual mergers.

Berger et al (1996) suggested that revenue can be more than double if output doubles (scale economies), or revenue may increase by producing two products jointly rather than individually (scope economies) and if large firms or joint production firms could charge higher prices for their services. The scale and scope economies would benefit the banks that are involved with M&As. These kinds of scale and scope economies could occur if the customers prefer services that can only be provided by the large banks. Besides that, the 'one –stop shopping' as an additional convenience and variety services could also result in scale and scope economies. The banks that provide the extra services

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may be reflected in higher revenues due to the customer preferences, provided that these banks have the market power to extract some of this consumer surplus.

It can be inferred that the revenue efficiency is most significant in those mergers that also experience reduced cost (Cornett et al. 2006). The revenue efficiency opportunities appear to be most profitable in those mergers that offer the greatest opportunity for cost cutting activities such as activity focusing and geographically focusing mergers. Moreover, revenue efficiency does not only depend on managers' decision but also on the customers' behaviour. Thus, revenue efficiency may be enhanced by raising prices as market power is expanded, or it might be enhanced when the merged institution restructures its assets mix (Ayadi and Pujals, 2005). Bank mergers also allow a higher abnormal return besides enhancing the revenue efficiency (Pilloff, 1996). Due to the improved revenue and profit scale, scope or X-efficiency, most of the banks that are involved in M&As event may improve in revenue and profit efficiency (Akhavein et al. 1997). The advantage of scale (output produce double) and scope (jointly produce) economies is that they benefit from bank M&As which improve their revenue efficiency (Berger et al., 1996). Thus, the additional services of 'one-stop shopping' could result in the scale and scope of economies that provide convenience to the customers and directly improves the revenue efficiency. Overall, the event of M&As in banking industry would improve the revenue efficiency which in turn, directly improves the profit efficiency.

As seen from previous studies, M&As led to the improvement on bank's profit efficiency via improving the revenue efficiency during the post-merger period. However, all the banks that were studied were under the voluntary M&As scheme where

most of the studies were conducted in developed countries. There have been limited studies that focussed on the forced bank M&As. The existing studies have not included the Malaysian banking sector that experienced the forced M&As scheme. Therefore, the gap is filled in areas where previous studies had not identified if the revenue efficiency could also be improved under the forced M&As in order to increase the level of the profit efficiency. Previous findings on voluntary M&As in revenue efficiency will guide in the understanding and classification of forced M&As in the Malaysian banking sectors on revenue efficiency improvement.

3.6.2 Determinants of Revenue Efficiency during Post-Merger Period.

The bank efficiency could be influenced by the internal and external determinants (Sufian and Chong, 2008; Athanasoglou et al., 2008 and Delis et al., 2008). The internal determinants focus on bank-specific features and are mainly influenced by a bank's management decisions and policy objective. While the external determinants, the macroeconomic characteristics, are not related to bank management but reflect the economic and legal environment that affect the operation and performance of financial institutions.

3.6.2.1 Bank Specific Determinants

3.6.2.1.1   Size of Bank

De Young et al. (2004) argued that small banks and large banks have a different focus and a different business model. Bader et al. (2008) did a study on 21 countries which

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applied non-parametric frontier analysis, DEA. They compared the cost, revenue and profit efficiency of 43 Islamic and 37 conventional banks between 1990 and 2005. Their finding suggested that larger banks are more efficient than smaller banks because the larger the size of the banks, the more efficient their cost is and the better their revenue and profit are. These are true for both conventional and Islamic Banks. However, the large conventional banks slightly outperformed the large Islamic banks in the three efficiency measures. The observed higher revenue efficiency scores in large banks could be attributed to their competitive advantage over capital, experience, market share and higher public confidence compared to their smaller counterparts. Thus, they concluded that the large banks are more revenue efficient than small banks due to the substantial advantage that large banks have. With this regards, the size of banks could affect the efficiency of bank performances.

Another study was done by Akhigbe and McNulty (2005) who compared the profit efficiency of small (under $100 million in total assets), medium (between $100 million and &1 billion) and large (over &1 billion) commercial banks for the period of 1995 to 2001. They examined the sources of profit efficiency for each bank size. They discovered that the large banks were more profit efficient than small banks. In fact, the difference between small and large bank was more than 10 basis points, which was economically significant. Nonetheless, the small banks could achieve high profit efficiency in several ways: by improving on revenue efficiency by generating high fee income, having more of their assets in loans as opposed to securities, operating in a concentrated market, and operating in low default rates. Since large banks use more

leverage from the financial capital, their profit efficiency could be high due to the higher revenue efficiency.

That larger banks are more efficient than smaller banks was consistent with the findings by Berger et al. (1993a). They compared inefficiencies for banks in small, medium and large size as having total assets of up to $100 million, between $100 and $1 billion and above $1 billion, respectively. The result obtained suggested that the large firms are considerably more efficient from both the technical and allocative (for cost and revenue efficiency) perspectives than are small and medium firms. Large banks (over $1 billion in assets) tend to be closer to their optimal netput points (vector of variables outputs minus inputs), given the prices they face and their fixed netputs the core deposit (deposite less than $100 000) and physical capital. Moreover, large banks are more focused on their goal of profit maximisation and because of this, they put efforts to maximise their revenue efficiency. They could estimate their output returns and input costs more accurately and may be better able to fulfil their production plans than other banks. Generally, large banks may suffer slight scale diseconomies from the studies of cost function, but the efficiency from the output side (revenue efficiency) counter-balances the result.

A study on the small and large bank mergers was also conducted by Al-Sharkas et al. (2008). Using the SFA method, it was found that bank mergers in general produce an increased cost and are profit efficient. The revenue efficiency increases more in the large bank mergers although cost efficiency reduces because large banks utilise more cost in order to improve quality of services (Berger and Mester, 1997). Moreover, they

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discovered that the mergers of large banks recorded higher improvements in profit efficiency rather than small bank mergers because the higher costs were compensated by the higher revenue received via quality services. Thus, their study indicated that the large bank mergers have better opportunities in improving revenue efficiency than small bank mergers.

A study by Cornett et al. (2006) also discovered that large bank mergers produced greater performance gains than small bank mergers. They defined a large bank merger as one in which the book value of the bidder bank assets at year end before the merger is greater than, or equal to $1 billion, while small bank mergers are those in which the bidder bank has a book value of assets less than $1 billion. They also investigated the bank median and industry match-adjusted operating pre-tax cash flow return on assets (OPCFROA) for large and small bank mergers (OPCFROA represents income before taxes and extraordinary items plus interest on subordinate notes and debentures as a percent of the book value of assets as of the end of the year). The result showed that both bank groups' OPCFROAs were significantly larger than the industry after the merger. However, the large banks' post merger performance improvements were significantly better than those for small banks. Thus, large banks appeared to be better able to capitalise on revenue enhancement and have better cost cutting opportunities after a merger compared to small banks.

Furthermore, Akhavein et al. (1997) in his study on controlled for equity capital found a similar result which showed that large banks (assets over $1 billion) have better profit efficiency as a result of mergers. The merged banks tended to shift their portfolios from

securities to loans for a given level of equity. This indicated more risky outputs and might lead to higher revenue efficiency. The merged banks could reflect the benefits of the diversification and as a result, the merged banks were able to better manage the increased portfolio risk (higher loan quality) with the same amount of equity capital.

Several studies on medium sized banks indicated that they showed more revenue efficient than the large sized banks. For example, a comparative study on bank size was done by Ariff and Can (2008) who divided the banks into three sizes: large (assets are larger than US$ 30 billion), medium (assets are between US$ 10 to US$ 30 billion) and small (assets are less than US$ 10 billion). They found that medium banks were most efficient on cost and profit, followed by small banks. The large size banks were found to be the lowest in terms of efficiency. Another study which examined the effect of banks size on the cost and profit efficiency improvement was done by Maudos et al. (2002). The size of each bank was measured by total assets. They grouped the sizes of banks into medium, large and huge bank. The result showed that the medium sized banks exhibited the highest levels of efficiency in costs and profit efficiency rather than the large and huge banks. Delis et al. (2008) identified the most important question underlying a bank policy - which bank size optimises bank efficiency. During the past few years, banks tried to strengthen their position in the domestic market and acquired a larger size, partly through M&As. That could allow them to exploit economies of scale and have easier access to international financial markets. Thus, the size of the bank is one of the internal factors that contributed to the efficiency of the banks. However, for banks that have become extremely large, the effect of size could be negative due to bureaucratic and other reasons. The study suggested that the size-efficiency relationship

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may be expected to be non-linear. They used the banks' real assets (logarithm) and square to capture this possible non-linear relationship.

Small sized bank can also have more revenue and be profit efficient compared to the large and medium bank size. Berger and Mester (1997) asserted that the small banks may have a comparative advantage in developing and using the "soft" information often associated with small business lending. In terms of profit efficiency (standard and alternative), the small banks showed the greatest level of efficiency. Both cost and profit efficiency results implied that as banks grow larger, they are equally able to control costs, but in the revenue side it becomes harder for them to create efficiency. A similar result was also found by Sufian (2009) in which they discovered that the sizes of banks are negatively related to the efficiency of banks in Malaysia. It is statistically significant at 1% level in the baseline and in the random effect model (REM) regression models. The negative coefficient indicates that large size banks tend to exhibit lower profit efficiency levels, while the smaller size banks tend to generate higher profit efficiency.

The theory of information- advantage (IA) hypothesis suggests that small banks have access to better credit information than large banks; for example, on the daily data on firm cash flows which is available through monitoring checking accounts (Nakamura, 1993a, Mester et al., 1998). In addition, because the senior management is closer to the loan officer and the commercial loan customer, the problem between the bank and the loan officer at small banks could be lowered and asymmetric information problems can be avoided (Nakamura, 1993b and McNulty et al., 2001). The IA hypothesis also expresses the idea that the small banks are more profit efficient than large banks, and

small banks are also more revenue efficient compared to large banks. Another theory which is the theory of the structure-performance (SP) hypothesis also proposed that smaller banks could enjoy a more revenue and profit efficiency rather than the larger banks (MSA). This is consistent with the study by Hannan (1991). In addition, the relationship-development (RD) hypothesis suggests that the greater revenue and profit efficiency at small banks is because of less competitive market. According to Boot (2000), banks develop close relationships with borrower and over time the proximity between bank and borrower has been shown to facilitate monitoring and screening and overcome problems of asymmetric information.

Huizinga et al. (2001) compared merging banks with their non-merging peers and discovered that large merging banks revealed a lower than average degree of profit efficiency, while small merging banks exhibited a higher level of profit efficiency than their peer groups. Indirectly, the revenue efficiency also improved in the small merging banks rather than in large merging banks.   However, no clear support was found for either the relative profit efficiency or for the low profit efficiency hypothesis. The relative profit efficiency hypothesis states that mergers will be more successful when the ex ante difference in efficiency between the acquiring and acquired bank is larger. While the low profit efficiency hypothesis predicts larger efficiency gains when either or both of the acquiring and acquired banks are inefficient.

In conclusion, previous studies have discovered information on revenue efficiency on the small, medium and large bank size involved in M&As event. Quite a number of studies found that the small banks (no M&As event) are more revenue efficient rather

than other banks size (such as Berger and Mester, 1997; Mester et al., 1998; Hannan, 1991; Boot, 2000). Other studies found that the large and medium banks have higher revenue efficiency (for example: Bader et al., 2008; Akhigbe and McNulty, 2005; Berger et al., 1993a and Maudos et al., 2002). In the event where most of the large bank mergers produce higher revenue efficiency rather than medium and small bank merger, various reasons were given (Al-Sharkas et al., 2008; Cornett et al, 2006 and Akhavein et al, 1997). Basically, studies that found that the revenue efficiency improve or higher in the small bank mergers have been few (Huizinga et al., 2001). Thus, the M&As reflect more on the larger bank size which has the ability to contribute to huge capital and higher assets, which in turn, allows them to produce quality services, to capitalise on revenue enhancement, to have more leverage from financial capital and become more efficient from both technical and allocative perspectives.

In Malaysia, the effects of bank size towards revenue efficiency in M&As is still largely unexplored. Even though Sufian (2009) discovered the profit efficiency had a negative relationship with the size of bank, there is still a gap on the revenue efficiency effect. All voluntary M&As show that the size of banks have a positive relationship with revenue efficiency. The information on bank size and its relationship with revenue efficiency on the forced M&As in the Malaysian banking sectors is yet to be discovered. It is hoped that the present study will provide better understanding and information pertaining to the issue.

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3.6.2.1.2   **Asset Quality**

Berger and Mester (1997) suggested that when comparing one bank's efficiency to another, the comparison should be made between banks producing the same output quality. However, since banking data are not comprehensive in capturing the heterogeneity in bank output, the differences in quality are likely to be unmeasured. The differences could be for example, in the size of commercial loans which can vary, risk, repayment schedule, type of collateral, transparency of information, covenants to be enforced, etc. The differences are likely to affect the bank loan origination, financing expenses and ongoing monitoring and control. Unmeasured differences in product quality may be incorrectly measured as differences in cost inefficiency. Thus, the result on the revenue and profit efficiency could not be accurately produced. Banks may receive higher revenues by charging higher prices than just offset for their extra costs if output markets are competitive (higher quality output), and customers are willing to pay (Andogo et al, 2005). These banks survive in competitive equilibrium since the higher interest rates or fees received by the higher quality providers are enough to cover their extra production costs.

Most of the studies suggest that quality output may increase the revenue of the banks. However, to produce a higher quality of output, banks are required to sacrifice a higher cost (cost inefficiency), but the cost will be compensated due to the higher revenue (Fan and Shaffer, 2004). The output quality would also be represented by quality loan because quality of output is based on loan. Nakamura (1993b) stated that a higher quality loan portfolio (output quality) could be enjoyed by the small banks because they

have portfolios of small business loans. This portfolio could give a higher quality loan portfolio because small banks have massive flexibility in responding to small business loan requests that may not quite meet bank guidelines. In addition, small business borrowers may avoid damaging the lending relationship because they have more incentives to repay their loans on time.

However, McNulty et al. (2001) in their study on Florida banks from 1986 to 1996 found no systematic evidence that loan quality is greater with small banks. They measured loan quality in four ways; namely, nonperforming loans (NPLs), other real estate owned (OREO), loan loss provisions (LLP) and net chargeoffs (NETCHGOFF), defined as chargeoffs less recoveries. The results showed that LLP and NETCHGOFF were lower at small banks in non-metropolitan statistical areas (non-MSA), but higher on the measurement on NPL and OREO. Both LLP and NETCHGOFF were lower in counties with lower levels of unemployment. In addition, both equations also indicated that loan quality was significantly higher (LLP and NETCHOFF are lower) after the implementation of passage of the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) in 1991. The high ratio of NPL and OREO indicated lower quality of loan in the small banks. Thus, the result showed inconclusive agreement on the loan quality on the small banks.

Ismail et al. (2009) investigated post merger operating performance for 35 publicly listed bank mergers in European banks that were completed between 1992 and 1997. They found that the loan quality (output quality) improved after the merger since the evidence on improved loan quality was obvious due to the significant estimate of -0.47%

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(decreased) for the abnormal industry-adjusted post merger performance in the 'Loan Loss Reserve to Gross Loans' (LLRGL) ratio. This finding was also consistent with the study by Kosmidou (2008). The results indicated that banks had undergone restructuring process after the merger. This process might have started by the loans portfolio being 'cleaned up', resulting in a write-off of large parts of the bad debts in the loans portfolio. Indirectly, this in turn may affect the bank's capital standing and its market exposure. The results showed that the bank's capitalisation was reduced after the bank merger. It could possibly be due to the customer loans which increased faster than the equity figure. Thus, a higher quality loan produced may attract more customers and improve the revenue efficiency when banks are merged.

Wang (2003) found that merged banks which supply the same quantity of services that are now of better quality and incur higher cost indicate the difference between the cost and profit efficiency. In particular, merged banks hold a higher proportion of loans in their asset portfolios where loans offer a higher rate of return than securities. But the demand for more servicing may cause a higher labour cost. The study also suggested a higher mark up for the revenue to increase. Needless to say, regulators would block mergers that might increase market power, and merging banks always claim that revenues are increased by expanding the scope and raising the quality of the product mix. Two examples of quality are "one-stop shopping" and "up market".

The consistent result was also reported by Cornett et al. (2006) who examined the improvement of revenue and cost efficiency in commercial bank mergers in Chicago from 1990 to 2000. They found that the performance of the bank mergers improved and

the large bank mergers enjoyed a greater improvement from the benefit of the big bank mergers rather than small bank mergers. Furthermore, they discovered that the enhancement of revenue and reduction of cost activities improved the performance of the bank mergers. In addition, they claimed that the revenue enhancement opportunities appeared to be most profitable in those mergers that offered the greatest opportunity for cost cutting activities such as activity focusing and geographically focusing mergers. Consequently, the asset quality indicator (measure changes in the bank's loan quality) that represented one of the bank performance indicators shows a decrease in the mean industry-adjusted allowance for loan losses to loans (allowance for loan losses as a percent of total loans and leases) and loan loss provision to loans (loan loss provision as a percent of total loans and losses) for banks around merger. Thus, while loans can increase relative to equity, banks do so without an increase in nonperforming loans. A decrease on both ratios represents a higher loan quality due to the reduced nonperforming loans.

Cornett and Tehranian (1992) discovered that there was no change in loan quality for the U.S. bank mergers. To identify the sources of the post merger improvements in cash flow performance, a credit quality indicator was used. The quality of the bank's loans appeared not to have changed as a result of the merger since there was no significant change in the banks' mean charge-offs to loans in relation to the industry (from credit quality indicator). They concluded that the merged banks improved their lending capacity without diluting the quality of their loans due to the increase in the merged banks' loans to equity ratio. That is, each dollar of equity is being used to attract more dollars of loans equal in quality to those held before the merger.

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Focarelli et al. (2002) differentiated between merger and acquisition in banks in order to examine the motives and results of each type of deal in Italian commercial banks from 1985 to 1996. In summary, mergers apparently reflect a strategy of increasing the reach of the active bank's service, while acquisitions aim at increasing the value of the passive bank by improving the quality of its loan portfolio. In the acquisition of banks, the aim of the active (acquiring) banks is to improve the quality of the portfolio of the passive (acquired) banks by decreasing credit risks such as reducing bad loans, and in the long run, loans to small firms. The findings are consistent with the hypothesis that expanding revenues from financial services is a strategic objective for mergers. Improving the quality of the loan portfolio of the passive bank is central for acquisitions.

In summary, the asset quality of bank represents one of the factors that contribute to the improvement of the revenue efficiency in the bank M&As. A study by Berger and Mester, 1997 and Andogo et al. 2005 discovered that the result on the revenue and profit efficiency could not be produced accurately due to the unmeasured differences in product or incorrectly measured output quality. Fan and Shaffer (2004), McNulty (2001) and Nakamura (1993b) showed that output quality would also be represented by quality loan and systematic evidence that loan quality is greater at small banks. For the merged banks, the revenue efficiency is higher due to the higher proportion of loans in asset portfolio and write-off of large parts of the bad debt in the loan portfolio which may contribute to the higher loan quality resulted by the reduction in LLRGL ratio and customer (Ismail et al., 2009 and Wang, 2003). The event of M&As may reduce the ratio of loss reserve to gross loan ratio (LLRGL) that increases the asset quality of banks

and contributes to the higher profitability via revenue efficiency (Cornett et al., 2006; Cornett and Tehranian, 1992; Kosmidou, 2008).

Nonetheless, in Malaysian case, the factor of asset quality towards revenue efficiency in bank M&As is still unknown. Most of the previous studies discovered that LLRGL reduced and contributed to the higher asset quality and higher revenue due to the event of M&As. Besides, all studies were conducted under voluntary M&As that are contradictory with M&As' practice in Malaysia. The limited findings on the bank M&As in Malaysia have prompted this study to be undertaken. The results on prior work on asset quality in bank M&As could serve as a guide for the present study.

3.6.2.1.3   Capitalisation

In general, the capital adequacy has long been evaluated by capital ratio to identify the soundness and safety of banks. Bourke (1989) noticed a significant positive relationship between capital adequacy and profitability. It is generally believed that the well-capitalised banks would face a lower cost of financial distress and such an advantage will then be translated into high profitability. Thus, in this study the assumption is that the higher the capital ratio is, the more profitable a bank will be.

Sufian and Chong (2008) and Delis et al. (2008) argued that although leverage (capitalisation) has been demonstrated to be important in explaining the performance of financial institutions, its impact on bank profitability is ambiguous. According to a conventional wisdom in banking (Berger, 1995), a higher capital-assets ratio (CAR) is

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associated with a lower after-tax return. A higher capital ratio tends to reduce the risk on equity and therefore, lowers the equilibrium on expected return on equity (ROE) as required by investors. However, a different finding was discovered on the U.S. banks in the mid-to-late 1980s where the CAR and ROE showed a positive relationship. They suggested that the result produced could be due to the higher capital, followed by higher earnings primarily through reduced interest rates on uninsured purchased funds. These findings were strongest for banks with low capital and high portfolio risk which decreased their portfolio risks, as well as increased their capital positions relative to what they otherwise would have been. Similarly, the studies by Angbazo (1997) also concluded that banks which are well-capitalised are more profitable than the others in the U.S. Indeed, most studies that used capital ratios as an explanatory variable of bank profitability (Bourke, 1989) observed a positive relationship. However, Molyneux (1993) argued that the higher levels of equity would decrease the cost of capital, leading to a positive impact on revenue enhancement, as well as profitability.

The positive relationship between the capital ratio and profitability is not limited to the U.S. banking industry. Molyneux and Thornton (1992) who investigated the banking profitability across eighteen European countries from 1986 to 1989 also discovered that the capital ratio affected banks' performance positively although such relationship was restricted to just the state-owned banks. Another study by Demirguc-Kunt and Huizinga (1999) concluded that foreign banks had higher profitability rates compared to domestic banks in developing countries, while the opposite was true in developed countries. In fact, their study was a more comprehensive study which examined the determinants of banking performance for 80 countries, both developed and developing, between 1988

and 1995. The overall result showed that their study supported a positive relationship between the capital ratio and financial performance.

Profit and revenue represent the prerequisite for the future growth (Goddard et al., 2004). According to them, the banks that maintain a high capital-assets ratio tend to grow slowly and the growth is linked to macroeconomic conditions. Hence, banks that maintain high capital-assets or liquidity ratios tend to record relatively low revenue and profitability rate. The banks with high capital-assets ratio could signify that a bank is operating over-cautiously and ignoring potentially profitable diversifications or other opportunities.

Athanasoglou et al. (2008) suggested that capital is better modelled as endogenous determinant of bank profitability as higher profit may lead to an increase in capital. Their study found the coefficient of the capital variable as positive and was highly significant, reflecting the sound financial condition of Greek banks. The sound capital position of bank enables it to pursue business opportunities more effectively and have more time and flexibility to deal with problems arising from unexpected losses; thus, achieving increase profitability. Mester (1993 and 1996) also argued that the inefficiencies are always inversely correlated with financial capital. This is quite predictable since banks with low inefficiency will tend to have more profits as they are able to retain more earnings as capital.

Casu and Girardone (2004) examined the cost and profit efficiency and productivity change of Italian financial conglomerates during the 1990s. The results seemed to

indicate that the Italian banking groups have benefited from a consistent improvement in profit efficiency due to the capital adequacy. It showed that the banks with high adequacy of equity capital were more profit efficient although there was no clear increase in cost efficiency.

According to Carvallo and Kasman (2005), the capitalisation ratio should be positively correlated with efficiency on the ground that banks with high efficiency will have higher profit and hence, will be able to retain more earnings as capital. On the other hand, usually an inverse relationship exists between inefficiency and average capital ratio because less equity implies higher risk taken at greater leverage.

A study by Abreu and Mendes (2002) examined the determinants of bank's interest margins and profitability for some European countries in the last decade. The researchers summarised that the well-capitalised banks (for example, banks with higher equity/ assets) face lower expected bankruptcy costs and thus lower findings costs and higher interest margins on assets. In general, this advantage 'translates' into better profitability ratios.

David et al. (2000) found that proximity to insolvency strongly affects the likelihood that a bank will be acquired. This indicates that the less efficient bank may be a target bank due to the lower capitalisation. Thus, through the merger event with the higher capitalisation from the acquirer banks, the efficiency of the target banks will be higher. They concluded that capitalisation would be a significant determinant to the efficiency of the bank merger.

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Valkonov and Kleimeier (2007) found that U.S. targets were better capitalised than their acquirers and non-acquired peers and that U.S. bank maintained higher capital levels compared to European banks in investigating the role of regulatory capital in bank M&As. This study was based on the sample of 105 U.S. and European bank mergers from 1997 to 2003. To avoid regulatory scrutiny, U.S. banks strategically raised their capital levels. More value was created for targets with high excess capital and in M&As, involving targets with considerably higher excess-capital ratios than their acquirers. Therefore, their study supported the excess regulator capital hypothesis.

Several studies examined the bank M&As by using accounting data to determine what drives bank M&As and whether consolidation leads to changes in cost, revenue or profit efficiency (Valkonov and Kleimeier, 2007). Of particular interest are those studies that estimate which banks are likely to engage in merger activity and to what extent bank capital is a determining factor. Regarding the role of capital, the evidence is mixed. Hannan and Rhoades (1987), Moore (1996) and Wheelock and Wilson (2004) discovered that banks with low capital are relatively more attractive as acquisition targets. A study by Hannan and Rhoades (1987) argued that higher capitalised banks require a large payment which makes them less attractive targets. Nevertheless, Wheelock and Wilson (2004) suggested that lower capitalised banks have higher probability of becoming insolvent and are thus, more likely to exit the industry by being acquired.

Conversely, O'keefe (1996), Akhigbe et al. (2004) and Louis (2004) stated that target banks' equity capitalisation rates are higher than those of their acquirers', but are lower

than those of their non-acquired peers. Nevertheless, only a study by Akhigbe et al. (2004) was able to confirm that the equity capitalisation rate of a bank positively affects the probability of it being acquired. Hence, they asserted that the high capital targets are attractive as they could easily absorb the losses and that they do not require capital injections.

Both studies by Valkonov and Kleimeier (2007) and Hannan and Pilloff (2004) examined the role of regulatory bank capital in M&As. The researchers tested what they called the excess regulatory capital hypothesis. Under this hypothesis, a bank with levels of regulatory capital in excess of the required minimum is more likely to become an acquirer than a bank which the regulatory capital level is binding. However, they failed to find a significant relationship between the regulatory capital level of a bank and subsequent merger activity in testing the excess regulatory capital hypothesis. Therefore, they concluded that the level of regulatory bank capital is not a significant determinant of merger activity. Valkonov and Kleimeier (2007) claimed that their findings might not be of general relevance because the analyses were made on small sample size. In addition, the study did not address the question of whether banks that engaged in M&As as either acquirers or as targets have higher or lower capitals than those that did not engage in M&As.

The study thus concluded that in the event of M&As, the focus will be on the acquirers and targets banks. Hannan and Rhoades (1987), Moore (1997) and Wheelock and Wilson (2000) discovered that banks with low capital are relatively more attractive as acquisition targets. In contrast, O'keefe (1996), Akhigbe et al. (2004) and Louis (2004)

stated that target banks' equity capitalisation rates are higher than those of their acquirers, but are lower than those of their non-acquired peers. The study by David (2000) asserted that the efficiency of the target banks will be higher due to the higher capitalisation from the acquirer banks and this makes capitalisation as one of the significant determinants in the efficiency of the bank merger. In other words, the event of M&As lead to the large capital of bank due to the combination of the large capitals from the acquirer with the target banks. Valkonov and Kleimeier (2007) argued that more value is created for targets with high excess capital and in M&As it involve targets with considerably higher excess-capital ratios than their acquirers.

The M&As event contribute to a large capital of banks and lead to a higher revenue efficiency for several reasons. The well-capitalised or large capital of banks would increase their revenue and also their profits due to the lower expected costs of financial distress, lower expected bankruptcy costs, lower risk of portfolio and such an advantage will then be translated into high profitability (Bourke, 1989). Berger (1995) suggested a positive relationship between capital-asset ratio (CAR) and return on equity (ROE) because higher capital is followed by higher earnings primarily through reduced interest rates on uninsured purchased fund. Besides that, other previous studies also discovered similar findings where the well-capitalised banks are more profitable (Molyneux and Thornton, 1992; Angbazo, 1997; Demirguc-Kunt and Huizinga, 1999; Abreu and Mendes, 2002; Casu and Girardone, 2004; Carvallo and Kasman, 2005; Athanasoglou et al., 2008). However, a higher capital asset ratio tends to record relatively low revenue and profit because the bank is 'operating over-cautiously and ignoring potential profitable diversification or other opportunities' (Goddard et al, 2004).

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In Malaysia, there have been limited studies conducted on the determinant of capitalisation to the revenue efficiency in bank M&As. As such, more studies are needed to reach more conclusive results regarding bank M&As in Malaysia. It is hoped that the findings of this study will help to fill the gap and improve the understanding on the forced bank M&As implemented here.

3.6.2.1.4   Market Power

Group of Ten (2001) found that market power was among the most important motivations within the country and within segment mergers in the financial sector. Market power implies that an increase in market share will also show an increase in the bank concentration. Carletti et al. (2007) asserted that the mergers affect market power and contribute to the high bank concentration and therefore, change both loan rates and market shares in imperfectly competitive loan market. Graeve et al. (2007) discovered that a bank with a large capital buffer or large market share will have the tendency to charge high loan mark-ups and adjust less than complete to changing market conditions. In fact, they defined the market power is proxied by market share which they calculated for each of the loan and deposit products separately. According to the conventional wisdom, market share could be defined as portion of the total market that could be serviced by a firm.

Peria and Mody (2004) stated that bank market share is the ratio of each bank's loans to total system loans. A study by Athanasoglou et al. (2008) and Demirguc-Kunt et al. (2004) indicated the bank's assets are divided by the total commercial bank assets in the

economy to measure the market share of bank. In fact, other studies (for example, Pasiouras and Zopounidis, 2008 and Corvoisier and Gropp, 2002) also found that the market share is defined in terms of total assets, total loans and total deposit.

Oladepo's (2010) study showed that merger-related gains may also stem from increased market power. Deals among banks with substantial geographic overlap reduce the number of firms in markets in which both organisations compete. The market share of the surviving organisation in these markets gave the effect of in-market mergers. Moreover, these changes in the market structure make the affected markets more vulnerable to reduce competition. The surviving organisation may enable it to earn higher profits by raising loan rates and lowering deposit rates due to the increased in market power.

Amel et al (2004) found that the desire to preserve loss margins by increasing market share and attracting new customers is often fulfilled by way of M&As which could allow the financial institutions to increase their size rapidly and to improve their knowledge of new products and markets. Thus, the event of M&As might assist the financial institutions to diversify their portfolio or increase their market share.

Moore (1996) stated that market share could influence the probability of acquisition through several channels. In banking market where only banks with substantial market share could compete effectively, a bank with small share is likely to be acquired due to the assets of the acquired bank which would become more valuable after a merger with the large bank. Regulatory concerns about potential anticompetitive effects could reduce

the probability of acquisitions for banks with high market share. The study discovered that the market share is statistically significant and is negatively related with the probability of acquisitions both in market and out of market acquisitions.

This is consistent with the relative market power (RMP) hypothesis advanced by Berger (1995) which stated that a bank with a large market share in a certain product market may be able to set interest rates less competitively for that particular product. Thus, only firms with well-differentiated products and large market share are able to exercise the market power and earn non-competitive profits. In their study, they used the Herfindahl-Hirschman Index of market concentration (HHI) and the bank's market share (MS) to measure market power or efficiency. A positive effect of the market share variable on the loan mark-up, and a negative effect of the market share variable on the deposit spread would thus support the relative market power hypothesis. The alternative hypothesis is that banks' pricing decisions are driven by the degree of their operational efficiency. The rationale is that efficient banks have the large market share in the respective market and this allows banks to charge high loan rates and pay low deposit rates.

Pasiouras et al. (2008) and Rezitis (2006) stated that the bank's market share has a positive effect on efficiency. The effect of market share becomes even more significant when combined with the insignificant effect of market concentration, as measured by the HHI, since it provides an indirect indication in support of the efficient structure hypothesis. Basically, a market share refers to each share for the bank in the banking

sectors, while a bank market concentration refers to the market power in several dominants banks in the banking sectors.

In fact, the market concentration is the market concentration ratio used as a measure of market dominating power within an industry or among companies (Majid and Sufian, 2006). In addition, market concentration is based on the idea that the behaviour of a market is dominated by a small number of large banks. Thus, the concentration will look into the average of the largest market share of the bank in the banking sector. The motive of the bank market share and concentration is similar in order to evaluate the market power. Nevertheless, the bank concentration will focus on the average of the larger bank market share in banking sector. They discovered that the bank M&As lead to the sharply decrease number of banks and in the increase market concentration. Since additional bank mergers are currently in progress, it is expected that market concentration in the Malaysian banking industry will be higher in the future.

Demirguc-Kunt et al. (2004) also indicated that the bank with large market share may exert market power to enjoy a higher net interest margin. Note that this is different from concentration. Concentration is not computed at the bank level, but it is a national characteristic. Clearly, there is a relationship. For example, in the case of a country with a single bank, market share and concentration will be both equal to one. Nevertheless, there could be concentrated banking systems in which many banks do not have much market share.

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In summary, the event of M&As could contribute to an increase of market power among the large banks and leads to a higher revenue efficiency. The large market power is a result of large market share through M&As (Group of Ten, 2001 and Carletti et al., 2007). Banks with a large market share will have the tendency to charge high loan mark-ups and pay low deposit rates. This supports relative market power hypothesis (Berger, 1995; Carletti et al., 2007; Graeve et al., 2007) which stated that a bank with a large market share in a certain product market may be able to set less competitive interest rates for that particular product. Oladepo (2010) and Demirguc-Kunt et al. (2004) also suggested that the large market power of banks reduces the number of the rivals and this contributes to the higher monopoly power of bank. A higher monopoly power allows banks to enjoy a higher net interest margin.

In Malaysia however, the factor of market power towards revenue efficiency in bank M&As is still unexplored. All voluntary M&As show that the higher market power has a positive relationship with revenue efficiency. More studies need to be carried out in Malaysia in order to ascertain market power in forced bank M&As. Hence, the objective of this study is to provide the information and fill in the gap.

3.6.2.1.5 Liquidity

Banks create liquidity on both the asset and liabilities side of their balance sheets by transforming maturities of balance sheet items (Boyd and Prescott, 1986 and Kashyap et al., 2002). Deep and Schafner (2004) and Berger and Bouwman (2007) investigated the banks' role as liquidity creators and the bank's main characteristics based on cross

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sectional variation on liquidity creation. While it is shown that most industry liquidity is created by the recently merged institutions, it is less clear as to what extent mergers affects banks' ability to create liquidity.

Allen and Gale (1998) suggested that the assets prices can fall below their fundamental value in adverse sates of the world, giving rise to 'cash in the market' (or fire sale) pricing. During banking crises, the surviving banks that do have enough liquidity could make extra profits from purchasing assets at fire sale prices. The potential gains from acquisitions at fire sales could be large even if crises arrive infrequently. Thus, the banks should take advantage of fire sales because this will give them incentives to hold liquid assets in the event that they survive the crisis.

Hadlock et al. (1999) stated that the regulatory barriers make hostile takeover difficult to accomplish. The incentives of managers and directors of potential acquisition targets might also affect the probability of being acquired. Thus, the regulators employed capital adequacy, management performance, asset quality, banks earnings and liquidity as measurements to evaluate the banks' performance. In fact, the bank that experience low liquidity, low profit or owe large amounts of risky assets are more likely to fail than other banks.

According to Kashyap et al. (2002), the synergy between demand deposits and loan commitments, rather than loans, is a form of liquidity provision performed by banks. They stated that since banks often lend through commitments, their lending and deposit taking may be two appearances of one primitive function, which is the provision of

liquidity on demand. Thus, there will be synergies between the two activities to the extent that both require banks to hold large balance of liquid assets where if deposit withdrawals and commitment takedowns are imperfectly correlated, the two activities could share the costs of the liquid asset stockpile. The role of banks may be described as reallocation of liquidity risk that is unavoidably created by the liquidity needs of borrowers and investors. The liquidity remains with the banks due to the mismatch between such needs that could not be diversified (Allen and Santomero, 1998).

Pana et al. (2010) provided the evidence that changes in the assets, liabilities and off-balance sheet positions around the merger allow the merged banks to create more liquidity. They documented a positive impact of the merger activity on bank liquidity creation using 189 commercial bank mergers between 1997 and 2004. Consistent with the deposit insurance hypothesis, they found that banks with higher levels of deposit insurance created higher levels of liquidity around the merger. Moreover, they documented that equity capital and degree of revenue diversification have limited impact on the liquidity creation around mergers.

In short, most of the existing studies have identified some of the determinants of bank liquidity creation. Bryant (1980) and Diamond and Dybvig (1983) stated that the deposit insurance protects banks from run and facilitates liquidity transformation. Nevertheless, the effect might be limited to small banks only, as "too big to fail" banks might choose a lower level of protection through deposit insurance; thus, a reduced level of liquidity transformation is achieved (Boyd and Gertler, 1994). A study by Diamond and Rajan (2000, 2001) and Gorton and Winton (2000) argued that banks are able to generate

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different levels of liquidity by simply changing the funding mix on the liability side. Berger and Bouwman (2007) developed four measures of liquidity creation and presented two alternative hypotheses related to the impact of equity capital on liquidity creation. The first hypothesis is 'financial fragility-crowding out' which indicates that higher capital reduces liquidity creation based on the set of studies by Diamond and Rajan (2000, 2001) and Gorton and Winton (2000). The second hypothesis is 'risk absorption' which posits that higher capital ratios increases liquidity creation based on the set of studies by Diamond and Dybvig (1983), Allen and Santomero (1998) and Allen and Gale (2004).

Although the liquidity creation has been researched extensively, it is only recently that theoretical studies address the impact of bank mergers on aggregate and individual banks' liquidity. A study by Carletti et al. (2007) examined the impact of the bank merger on the interbank market liquidity fluctuations, reserve holdings and loan rates. The aggregate liquidity improved with the increase in reserve holdings. Based on the model, the merger of two banks that experienced uncorrelated liquidity shocks on deposits created an internal money market that resulted in lower interbank borrowing costs for the two institutions and thus, produced higher level of reserve holdings. However, it also may lead to a diversification of liquidity risk which calls for a lower level of reserve holdings.

Sufian (2009) examined the impact of the forced mergers and acquisitions on the profit efficiency of the Malaysian banking sectors. In the final stage of this study, the author investigated the determinants of the bank efficiency. There were several determinants of

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bank efficiency identified and tested to ascertain the one that has the most significant impact on the bank profitability. One of the determinants is liquidity that is measured by total loans over total assets. The bank loans are expected to be the main source of revenue and are expected to affect performance positively. Nevertheless, the expected change of the economy may significantly influence the loan performance relationship. Only a small percentage of loans would default during a strong economy, while during a weak economy the banks may be adversely affected. Thus, during the favourable economic condition, banks should capitalise and insulate themselves. However, in this study, a contradictory finding was seen where the liquidity showed a negative relationship with the profit efficiency in the bank M&As. This indicated that the higher the liquidity is, the lower profitability of the banks is although it is not at significant level.

To conclude, most of the previous studies have identified that liquidity is a signal of bank's capability to fulfil their customers' day to day cash needs and respond to sudden cash withdrawals (Boyd and Prescott, 1986; Kashyap et al., 2002 and Sufian, 2009). A higher bank's liquidity could lead to a higher revenue improvement. M&As allow the merged banks to produce more liquidity from the changes in the assets, liabilities and off-balance sheet positions (Pana et al., 2010; Diamond and Rajan, 2000; Diamond and Rajan, 2001 and Gorton and Winton, 2000).

Generally, voluntary M&As practised by developed countries have shown that liquidity has a positive relationship with profit efficiency. This will provide more understanding on the forced M&As in Malaysian banking sectors especially on bank's liquidity and its

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effect on the revenue efficiency improvement. In fact, the relationship between liquidity and revenue efficiency in bank M&As is still unexplored in the Malaysian case. Hence, one of the main purposes of this study is to explore more on this subject.

3.6.2.1.6 Management Quality

The findings from studies done prior to merger showed that target banks performed badly compared to acquire banks. This finding is consistent with the efficient management hypothesis discovered by Roll (1986), which states that acquiring bank seeks to replace badly performing target banks management with more skilled executives (inefficiency management theory). Berger et al., (1999) and Berger (1997) also suggested that better managerial efficiency (management quality) tends to improve after bank M&As. They stated that consolidation appears to increase profit efficiency and assists to diversify the portfolio risks of the participants. It may improve the local real economies where these consolidations take place. Even though there was little or no cost efficiency improvement following M&As, consolidation involving previously inefficient firms appeared to improve both on cost and profit efficiency. The M&A event itself may have "woken up" management (management quality) to see the need for improvement.

Berger (1995) and Athanasoglou et al. (2008) provided evidence that superior management managed to raise profits and market shares since the way the banking institution is managed is a prerequisite for achieving profitability and stability of a bank. A quality management increases revenue. Another important determinant of profitability is bank expenses and it is closely related to the notion of efficient management

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(Athanasoglou et al., 2008). Studies by Brouke (1989) and Molyneux and Thornton (1992) showed a positive relationship between better quality management and profitability.

According to DeYoung (1998), numerous factors have been linked to banking X-inefficiency, but the conventional wisdom holds that management quality is the predominant cause of X-inefficiency in banks. The results of his study support the conventional belief that management quality is reflected by cost efficiency. Unit costs at poorly managed banks averaged about 29% higher than unit costs at well-managed banks. Well-managed banks used their resources more efficiently than poorly managed banks, producing higher amounts of loans and fees per dollar of assets and operating fewer branches per dollar of deposits.

On the other hand, Montinola and Moreno (2001) suggested that if management quality is low and managerial monitoring is imperfect, some workers will not fully utilise their efforts and simply "free ride" on good workers. Such an incident might cause some good workers to reduce their effort. Although from time to time good workers are hired, it is feared that their good effort will eventually drop down to the pre-existing level. There may also be instances in which when workers who do not work as hard as the existing employees are hired, they will drag down the performance of the current workers. The situation may drop the level of efficiency and the profitability of the firms is adversely affected. The management quality is also low if the board of directors do not provide honest and effective leadership and are more concerned with securing credit facilities for themselves.

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Pilloff (1996) discovered that the primary reason for the synergy is performance improvement after the merger. One of the ways to achieve this is by transferring management skills from superior firms to the less superior ones. If the management of the acquiring institution is superior to that of the target, then higher levels of performance may be attained. A large single entity will be produced from the merger event and this contributes to a better management team that could increase the level of the firm's revenue (inefficiency management theory).

Beitel et al. (2004) analysed the success of M&As in European banking transactions from the viewpoint of target shareholders, bidder shareholders and the combined entity of bidder and target. They found that the bidding banks tended to be more successful when they took over qualitatively better managed targets. It shows that a better management quality from the target banks could improve the profit efficiency for the entire entities when they are involved with M&As.

A study on efficiency of the bank M&As in Malaysia by Said et al. (2008) suggested that bank's performance is affected by the management of the bank. They found that the coefficient of the cost inefficiency was negative and was significant at the 5% level, suggesting that as the level of inefficiency of management increases, the return on equity (ROE) of banks decreases. The inefficiency of the management will be reflected in a relatively high amount of expenses incurred by the banks which gives a negative impact on the whole profitability of banks.

Sufian (2009) and Sufian and Habibullah (2009) found that non-interest expenses over total assets (NIE/TA) consistently exhibited negative relationship with bank efficiency and were statistically significant at the 10% level or better. Their finding was in accordance with the bad management hypotheses of Berger and DeYoung (1997). Low measure of cost efficiency is a signal of poor senior management practices applied to input-usage and day-to-day operations. Obviously, efficient cost management is a prerequisite for the improved efficiency of the Malaysian banking system. The high elasticity of cost efficiency to this variable denotes that banks have much to gain if they improve their managerial practices.

In conclusion, the high management quality may increase the profit and reduce the cost of the banks as a result of M&As. The management quality could be achieved by good management skills of managers in managing all the bank's expenses. Banks may transfer their management skills from the superior to the less superior firm. If the management of the acquirer is superior rather than the target, then higher levels of performance may be attained by improving the quality of management. Therefore, firm's revenue could increase after the M&As, indicating a positive relationship between better quality management and profitability (Molyneux and Thornton, 1992; Pilloff, 1996; Berger et al., 1999, Berger, 1997). A good quality of bank management skills strive to manage the bank's expenses that represent a very important determinant of profitability which is closely related to the notion of efficient management (Athanasoglou et al., 2008). Low measure of cost efficiency is a signal of poor senior management practices that clearly indicate that the efficient cost management is a prerequisite for the bank efficiency's improvement (Sufian, 2009 and Sufian and Habibullah, 2009).

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Nevertheless, in the Malaysian case, the factor of management quality on revenue efficiency in bank M&As is largely unexplored. Albeit Sufian (2009) and Sufian and Habibullah (2009) discovered that the profit efficiency had a negative relationship with management quality at significant level, but there was still a gap on the revenue efficiency result. All voluntary M&As practised by developed countries show that the management quality has a positive relationship with profit efficiency. This piece of information may be useful in guiding the understanding on the forced M&As in Malaysian banking sectors pertaining to the quality of bank's management to the revenue efficiency improvement. Since limited studies are unable to confirm whether or not management quality in forced bank M&As leads to the improvement revenue efficiency, this study hopes to add findings that may contribute towards the confirmation.

3.6.2.2 Macroeconomic Determinants

3.6.2.2.1   Gross Domestic Product

Sufian and Chong (2008) and Kosmidou (2008) stated that the gross domestic product (GDP) is among the most commonly used macroeconomic indicator for measuring an economy's total economic activity. The GDP growth is calculated as the annual change of the GDP used as a measure of the macroeconomic conditions. Factors related to the supply and demand for loans and deposits could be influenced by GDP growth. The reducing bank returns could be due to the GDP growth which slows down particularly during recessions where credit quality deteriorates and defaults increase. The results

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indicate that the growth of gross domestic product (GDP) has a significant and positive impact on return on average assets (ROAA) or bank performance.

Pasiouras and Kosmidou (2007) found that GDP growth on domestic banks ROAA is consistent with the result of Kosmidou et al. (2005) and Hassan and Bashir (2003) among others, and provided further support to the argument of positive association between economic growth and financial sector performance. However, Demirguc-Kunt and Huizinga (1999) discovered that banks in countries with a more competitive banking sector where banking assets constitute a large portion of the GDP, have smaller margins and are less profitable. Demirguc-Kunt and Huizinga (2001) and Bikker and Hu (2002) used the annual growth rate of GDP to identify the relationship between GDP annual growth and bank profitability.

3.6.2.2.2   Inflation

Revell (1979) discussed the issue of the relationship between bank profitability and inflation. He noted that the effect of inflation on bank profitability depends on whether bank's wages and other operating expenses increase at a faster rate than inflation. The question is on how mature an economy is for future inflation to be precisely estimated and for banks to accordingly manage their operating costs. According to Perry (1992), the effect of inflation on bank performance depends on whether the inflation is anticipated or unanticipated. Anticipated inflation could be defined as the rate of inflation which most people think will exist at some time in the future. On the other hand, unanticipated inflation could be defined as the rate of inflation which has not been

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predicted by economists and which therefore comes as a surprise to business people, governments and workers. In the former (anticipated inflation), the interest rates are adjusted accordingly to gain revenues which increase faster than costs, and gives a positive impact on profitability. The opposite results are shown in the latter (unanticipated inflation).

Naceur (2003) suggested that inflation rates are generally associated with high loan interest rates and therefore contributed to high income. Nevertheless, if inflation is unanticipated and banks are sluggish in adjusting their interest rates, then there is a possibility that bank's costs may increase faster than bank's revenues and hence, adversely affects bank profitability. Staikouras and Wood (2003), Sufian and Chong (2008) and Kosmidou (2008) pointed out that inflation may have direct effects on the increase in the price of labour and indirect effects on changes in interest rates and asset prices on the profitability of banks. They found that inflation is negatively related to banks' profitability, implying that during the period under study, inflation was unexpected and resulted in a faster increase in costs than revenues. A consistent result was also discovered by Flamini et al. (2009) where lower inflation boosts credit expansion and bank profitability. The result found by Kosmidou (2008) is consistent with the result of Abreu and Mendes (2001) where inflation has a significant negative impact.

Others studies (Molyneux and Thornton, 1992; Demirguc-Kunt and Huizinga, 1999; Pasiouras and Kosmidou, 2007 and Sufian, 2009) have shown a positive relationship between either inflation or long-term interest rate and profitability.

CHAPTER 4

DATA AND METHODOLOGY

4.1   Introduction

This chapter consists of several sections. A discussion on data collection procedure begins the chapter and it covers the sources and the selections of data. Next, it discusses the approaches in bank's roles, followed by the elaboration on the methods of measurements which consist of Data Envelopment Analysis (DEA) in the first stage of analysis and Multivariate Regression Analysis (MRA) and Generalized Least Square (GLS) in the second stage of analysis. The chapter ends with descriptions of all the economic issues and explanations on hypotheses development.

4.2   Data Collection

4.2.1 Sources of Data

The present study gathers data from all Malaysian commercial banks from 1995 to 2009. The primary source for financial data is obtained from the BankScope database produced by the Bureau van Dijk which provides the banks' balance sheets and income statements. Bankscope database contains specific data on 25,800 banks world-wide, including commercial banks in Malaysia. Furthermore, BankScope database presents the original currencies' data of the specific countries and provides the option to convert the data to any other currencies. The data are updated monthly. Ringgit Malaysia is used in this study since the study involves commercial banks in

Malaysia. The information on the merger programme for the commercial banks in Malaysia was provided by Bank Negara Annual Report.

4.2.2   Data Selection

Data are analysed from those banks which are registered under the M&As in the Malaysian banking sector during the year of mega-merger 2000 (Sufian, 2009 and Sufian and Habibullah, 2009). The analyses look at data two years preceding the year of the merger and eight years after the merger (-2,8). This event window was inspired by Rhoades (1998) who suggested that the three-year time period is optimal because about half of any efficiency gains should be realised within three years (-3,3). This fact is almost unanimously agreed among the experts interviewed. In fact, the overall period was also covered by Sufian (2009) where he investigated the impact of M&As on bank profit efficiency in Malaysian commercial banks. The entire period starts from 1995 to 2009, but only 10 years is covered in this study (1995 to 1996 and 2002 to 2009) because the years of financial crisis (1997 to 1999) during merger period (2000) and cooling period (2001) are excluded to avoid any possible biases. The periods are divided into two event windows: 1995 to 1996, referred to as pre-merger period, and 2002 to 2009, considered as post-merger period.

The actual domestic commercial banks that were affected with the mega-merger in year 2000 were only 14 banks (7 acquirers and 7 targets) and were indicated as seven cases of mega M&As. To be included in the sample, both the acquiring and the target banks must not have been involved in any other merger prior to the year of merger

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period of the year 2000. To show a wide representation of the Malaysian banking sector, data were collected from 34 commercial banks in total, including several banks that served as the control groups. This is listed on Table 4.1 (14 domestic commercial banks were involved with M&As and 20 domestic and foreign commercial banks were not involved with M&As in Malaysia). In order to maintain the homogeneity, only commercial banks that make commercial loans and accept deposits from the public are included in the analyses (Sufian, 2007). Finance companies, Investment Banks and Islamic banks are excluded from the sample.

Table 4.1: List of Malaysian Domestic Commercial Bank during the Year 2000

Banks Involved with M&As			
Acquirer		**Target**	
No	**Bank**	**No**	**Bank**
1	Affin Bank Bhd	2	BSN Commercial Bank Bhd
3	Alliance Bank Bhd	4	Sabah Bank Bhd
5	EON Bank Bhd	6	Oriental Bank Bhd
7	Hong Leong Bank Bhd	8	Wah Tat Bank Bhd
9	Maybank Bhd	10	Pacific Bank Bhd
11	Public Bank Bhd	12	Hock Hua Bank Bhd
13	Southern Bank Bhd	14	Ban Hin Lee Bank Bhd
Banks Not Involved with M&As			
No	**Bank**		
15	ABN AMRO Bank Bhd		
16	Arab-Malaysian Bank Bhd		
17	Bangkok Bank Bhd		
18	Bank of America Malaysia Bhd		
19	Bank of China Bhd		
20	Bank of Nova Scotia Bhd		
21	Bank of Tokyo Mitsubishi Bhd		
22	Bank Utama Bhd		
23	Bumiputra Commerce Bank Bhd		
24	Chase Manhattan Bank Bhd		
25	Citibank Bhd		
26	Deutsche Bank Bhd		
27	HSBC Bank Malaysia Bhd		
28	International Bank Malaysia Bhd		
29	OCBC Bank Bhd		
30	Overseas Union Bank Bhd		
31	Phileo Allied Bank Bhd		
32	RHB Bank Bhd		
33	Standard Chartered Bank Bhd		
34	United Overseas Bank Bhd		

4.3   Approaches of Bank's Roles

The definition and measurement of bank's inputs and outputs in the banking function remains arguable among researchers (Sufian, 2007). To determine what constitutes inputs and outputs of banks, one should first decide on the nature of banking technology (bank's approaches). There are two main approaches that are widely used in the banking theory literature; namely, production and intermediation approaches (Sealey and Lindley, 1977). The first approach is the production approach which assumes that financial institutions serve as producers of services for account holders; that is, they should perform transactions on deposit accounts and process documents such as loans. Previous studies that adopted this approach are Ferrier & Lovell (1990), Fried et al. (1993) and DeYoung (1997). The second approach is the intermediation approach which is a preferred approach among researchers to apply in the first stage of DEA analysis. This approach views that banks basically act as financial intermediaries whose primary role is to obtain funds from savers in exchange for their liabilities, and the banks in turn will provide loans to others for profit making (Chu and Lim, 1998). The present study views the banks as intermediary and it will apply intermediation approach as well.

The intermediation approach is also known as an asset approach whereby the financial firms are assumed to act as an intermediary between the savers and borrowers. Banks are seen as purchasing labour, materials and deposits funds that produce outputs of loans and investments. The inputs include interest expense, non-interest expense, deposits, other purchased capital, number of staff (full time

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equivalent), physical capital (fixed assets and equipment), demographics and competition. The potential outputs are measured as the dollar value of the bank's earning assets where the costs include both the interest and operating expenses (Berger et al., 1987). Under this approach, the bank's outputs are found on the asset side of the balance sheet and deposits are seen as inputs. Avkiran (1999) suggested that potential outputs include net interest income, non-interest income, consumer loans, housing loans, commercial loans and investments. Previous banking efficiency studies that had adopted this approach are, among others, Charnes et al. (1990), Bhattacharya et al. (1997) and Sathye (2001) and Sufian (2009). They also applied different accounting standards. Thus, the results of the efficiency scores will be affected and may vary depending on the selection of variables for each of the banks efficiency. Thus, the DEA method requires bank inputs and outputs whose choice is always an arbitrary issue (Ariff and Can, 2008 and Berger and Humphrey, 1997).

4.4   Method of Measurement

4.4.1   First Stage

There are two different frontier analysis methods which focus in measuring the bank efficiency; namely, the non-parametric and parametric methods (Berger and Humphrey, 1997). The most commonly employed non-parametric approaches are the Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH), while for the parametric approaches are Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA), and Distribution Free Approach (DFA). According to Murillo-Zamorano (2004), the choice of estimation approach has attracted debate since no method is strictly preferable over the other. The study by Berger and Humphrey

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(1997) on 130 frontier efficiency studies of financial institutions in 21 countries found that the number of applications of the two approaches was very close (69 applied non-parametric and 60 adopted parametric, and some used more than one methods). The selection of inputs and outputs is different based on one's assumption on the banks approach; that is, if they act as intermediation or as production units. Each approach would produce different results. These two approaches commonly produce about 80% average efficiency score. On a negative side, both approaches often rank the same set of institutions very differently, resulting in the inconsistent ranks.

This study will apply the DEA methods following the method previously used by different authors on studies conducted in Malaysia (Sufian and Majid, 2006; Sufian, 2004, Sufian, 2007, Sufian and Habibullah 2009).

4.4.1.1   Data Envelopment Analysis (DEA)

The first stage uses the non-parametric Data Envelopment Analysis (DEA) frontier analysis method, also known as mathematical programming approach. It constructs the frontier of the observed input-output ratios by linear programming techniques. The linear substitution is possible between observed input combinations on an isoquant (the same quantity of output is produced while changing the quantities of two or more inputs) that was assumed by DEA. Charnes et al. (1978) were the first to introduce the term DEA to measure the efficiency of each DMU, obtained as a maximum of a ratio of weighted outputs to weighted inputs. The more the output produced from given inputs, the more efficient is the production. Sherman and Gold

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(1985) were the first to apply DEA method to banking sectors. According to Bader et al. (2008), the DEA technique is extensively used in many recent banking efficiency studies (Drake et al., 2006 and Sufian and Habibullah, 2009). Nevertheless, it was Farrell (1957) who originally developed this non-parametric efficiency approach.

There are six reasons why this study adopts DEA method (Sufian, 2007 and 2004). Firstly, each DMU is assigned a single efficiency score that allows ranking amongst the DMUs in the sample. Secondly, DEA highlights the areas of improvement for each single DMU such as either the input has been excessively used, or output has been under produced by the DMU (so they could improve on efficiency). Thirdly, there is a possibility of making inferences on the DMU's general profile. DEA allows the comparison between the production performances of each DMU to a set of efficient DMUs (called reference set). Thus, the owner of the DMUs may be interested to know which DMU frequently appears in this set. A DMU that appears more than others in this set is called the global leader. Apparently, DMU owner may obtain a huge benefit from this information especially in positioning its entity in the market. Fourthly, several studies suggest that DEA does not require a preconceived structure or specific functional form to be imposed on the data in identifying and determining the efficient frontier, error and inefficiency structures of the DMUs (Bauer et al., 1998; Evanoff and Israelvich, 1991; Grifell-Tatje and Lovell, 1997). Fifthly, DEA does not need for standardisation and this allows the researchers to choose any kind of input and output of managerial interest (arbitrary), regardless of the different measurement units (Ariff and Can, 2008; Avkiran, 1999; Berger and Humphrey, 1997). Finally, DEA is suitable with small sample. Even though the

sample includes all banks in Malaysia, the total number of the banks is relatively small.

This study employs estimates efficiency under the assumption of variable returns to scale (VRS). The VRS model was proposed by Banker, Charnes and Cooper (1984). The BCC model (VRS) extended the CCR model that was proposed by Charnes, Cooper and Rhodes (1978).

The CCR model presupposes that there is no significant relationship between the scale of operations and efficiency by assuming constant return to scale (CRS) and it delivers the overall technical efficiency (OTE). The CRS assumption is only justifiable when all DMUs are operating at an optimal scale. However, firms or DMUs in practice might face either economies or diseconomies of scale. Thus, if one makes the CRS assumption when not all DMUs are operating at the optimal scale, the computed measures of OE will be contaminated with scale inefficiency (SIE).

Banker, Charnes, and Cooper (1984) extended the CCR model by relaxing the CRS assumption. The resulting BCC model was used to assess the efficiency of DMUs characterised by VRS. The VRS assumption provides the measurement of pure technical efficiency (PTE), measuring the efficiency of the DMU's managerial. The PTE measures the efficiency of the DMU's pure managerial without being contaminated by scale. Therefore, VRS results may provide more reliable information on the DMU's efficiency rather than the CRS (Coelli et al., 1998 and Sufian, 2004).

OTE scores obtained from a CRS DEA can be divided into two components, one due to SIE and one due to the pure technical inefficiency (PTIE). This may be completed by conducting both a CRS and a VRS DEA upon the same data. If there is a different in two TE scores of DMU, it indicates that the DMU has SIE and the SIE could be measured from the difference between the PTE score and TE score (Coelli *et al*., 1998). In the Figure 1.3, under CRS the input-orientated technical inefficiency of the point B is the distance BBc, meanwhile under VRS the technical inefficiency would only be BBv. Therefore, the scale inefficiency cause due to the differences between BcBv.

Although the SE measure will provide information concerning the degree of inefficiency resulting from the failure to operate with CRS, it cannot provide the information as to whether a DMU is operating in an area of increasing returns to scale (IRS) or decreasing returns to scale (DRS). This may be determined by running an addition DEA problem with non-increasing returns to scale (NIRS) imposed.

Therefore, the nature of the scale inefficiencies, due to either IRS or DRS could be determined by the difference between the NIRS TE and VRS TE score if the VRS TE @ PTE ≠ NIRS TE, then DMU is operating at IRS (point B) and if the VRS TE @ PTE = NIRS TE, then DMU is operating at DRS (point D) in Figure 1.3.

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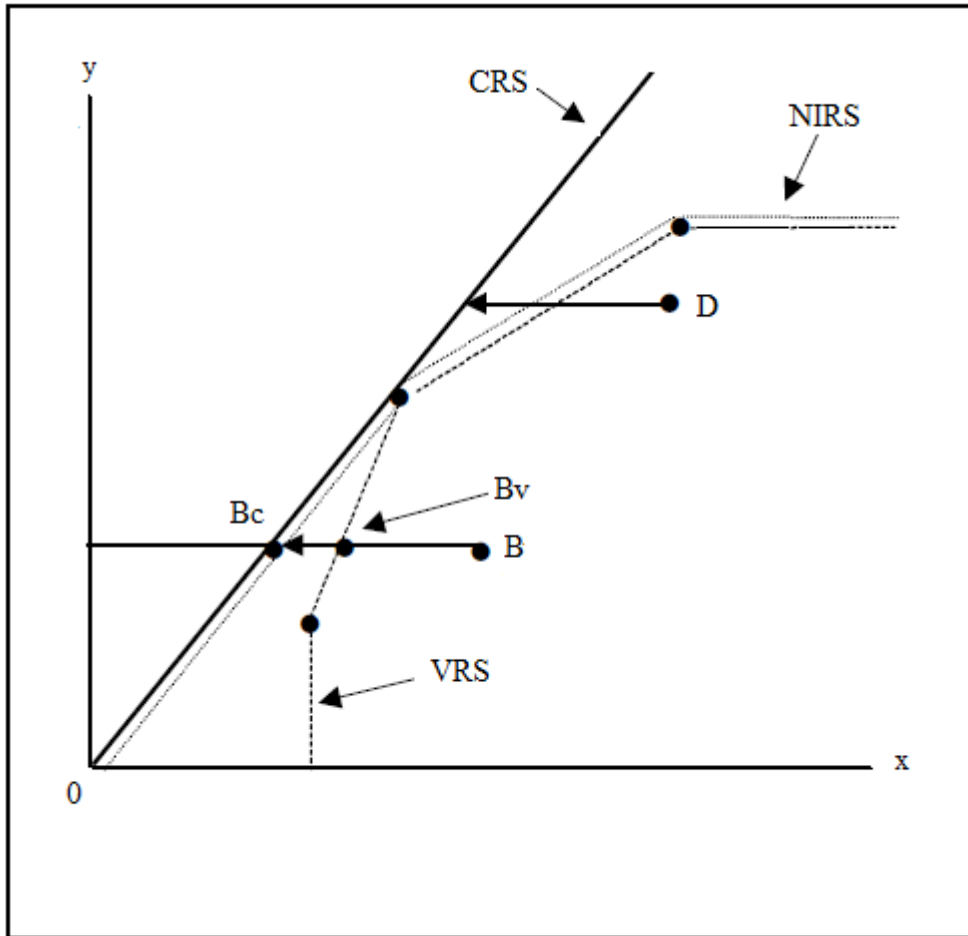
Figure 1.3: Calculation of Scale Economies in DEA

Farrell (1957) stated that technical efficiency reflects the ability of a firm to obtain maximum output from a given set of inputs. One of the simplest and easiest ways to measure efficiency is:

$$\text{Efficiency} = \frac{output}{input} \qquad (4.1)$$

This could be done easily if a firm produces only one output by using one input. Nevertheless, firms normally produce multiple outputs by using various inputs and this method can become inadequate.

Consequently, Farrell (1957) developed the measurement of relative efficiency which involves multiple, possibly incommensurate inputs and outputs. This technique aims to define a frontier of most efficient DMUs and to measure how far the frontiers are in order to determine the efficiency of units. The relative efficiency could be measured as:

$$\text{Efficiency} \ = \ \frac{weighted \ \ sum \ of \ outputs}{weighted \ \ sum \ of \ inputs} \tag{4.2}$$

Thus, this efficiency measure could be written by using usual equations as (Bader et al., 2008):

$$\text{Efficiency of unit j} \ = \ \frac{u_1 \, y_{1j} + u_2 \, y_{2j} + ...}{v_1 x_{1j} + v_2 x_{2j} + ...} \tag{4.3}$$

where:

u_1 is the weight given to output 1

y_{1j} is the amount of output 1 from unit j

v_1 is the weight given to input 1

x_{1j} is the amount of input 1 to unit j

This function can be applied mostly when common set of weights for the DMUs is applicable in comparing efficiency between DMUs. However, in practice, to find and agree on a common set of weights that could be used might be difficult for DMUs. In fact, it might be difficult to attach value to each output and input because each DMU might have its own criteria to emphasise outputs and inputs. The difficulty in seeking a common weight to determine the relative efficiency is recognised by Charnes et al. (1978). They documented the importance of different units which value inputs and outputs differently. DMU could use different weight. Therefore, they suggested that

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each unit be allowed to adopt a set of weights that shows the favourable light in comparison to the other units. Thus, in order to solve this problem, they suggested that DEA use units that can properly value inputs or outputs differently. DEA allows each DMU to choose its own set of appropriate weights so that its own efficiency rating is maximised.

Thus, to maximise efficiency of unit j is subject to the efficiency of all units being less than or equal to 1. This can be measured as (Bader et al., 2008):

$$\text{Maximise efficiency of unit j} = \frac{\sum_r u_r y_{rj}}{\sum_i v_i x_{ij}} \qquad (4.4)$$

$$\text{Subject to} \quad \frac{\sum_r u_r y_{rj}}{\sum_i v_i x_{ij}} \leq 1 \quad \text{for each unit j}$$

$$u_r \geq \varepsilon$$

$$v_i \geq \varepsilon$$

However, this represents the fractional linear of DEA model (Bader et al., 2008). The linear programming could be used to solve this model by converting it to linear form. To achieve it, the denominator has to be set equal to constant, and the numerator has to be maximised. Therefore, the resulting linear programme can be written as (Bader et al., 2008):

Maximise efficiency of unit j = $\sum\limits_{r=1}^{s} u_r\, y_{rj}$

Subject to $\quad \sum\limits_{i=1}^{m} v_i\, x_{ij} = 1$

$$\sum\limits_{i=1}^{m} v_i\, x_{ij} - \sum\limits_{r=1}^{s} u_r\, y_{rj} \;\leq 1 \quad j = 1,2,\dots n \tag{4.5}$$

$$u_r \;\geq\; \varepsilon \quad r = 1,2,\dots s$$

$$v_i \;\geq\; \varepsilon \quad i = 1,2,\dots m$$

where:

v_i is the weight assigned to input i
x_{ij} is the level of input i used by unit j
u_r is the weight assigned to output r
y_{rj} is the level of output r produced by unit j
ε is a small number (of order of 10^{-6}) that ensures neither input nor output is given zero weight.

In fact, if the value of efficiency of unit j is equal to 1 then DMU will be considered as efficient in the sense that no other unit or combination of units could produce more, along with at least one output dimension without worsening other output levels or utilising higher input levels. In other word, DMU is fully utilising the input to produce the maximum output. However, if the value is less than 1, DMU is considered as relatively inefficient. Hence, this model is used to find the combination of input and output weights that could maximise the efficiency rating of the DMU.

Since the concept of DEA is to measure the efficiency of the DMU, this study will apply this method in revenue efficiency. A short description of the DEA method is explained here for a better picture (Coelli et al., 1998; Sufian, 2009 and Bader et al., 2008). Assume the data of *A* as being inputs and *B* as being outputs for each *N* bank. For the *i-th* bank these are represented by the vectors of x_i and y_i, respectively. The

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$A \times N$ input matrix – X, and the $B \times N$ output matrix – Y, represent the data for all N banks. To measure the efficiency for each bank, all outputs over all inputs in form of ratios are calculated as $u'y_i / v'x_i$ where u is a $B \times 1$ vector of output weights and v is a $A \times 1$ vector of input weights. To select the optimal weight, the following mathematical programming is adopted:

$$
\begin{aligned}
\max{}_{u,v} \quad & (u'y_i / v'x_i), t \\
subject\, to \quad & u'y_j / v'x_j \leq 1, \qquad j = 1,2,\ldots,N \\
& u, v \geq 0.
\end{aligned} \qquad (4.6)
$$

However, according to Coelli et al. (1998), Sufian (2009) Bader et al. (2008) the ratio formulation has one problem with this particular ratio formulation. That is, it has an infinite number of solutions where, if $(u*, v*)$ is a solution, then $(\alpha u*, \alpha v*)$ is another solution, etc. Therefore, to avoid this, one could impose the constraint $v'x_i = 1$, which leads to:

$$
\begin{aligned}
\max{}_{\mu,v} \quad & (\mu' y_i), \\
subject\ to \quad & v'x_i = 1 \\
& \mu'y_j - v'x_j \leq 0, \qquad j = 1,2,\ldots,N \\
& \mu, v \geq 0,
\end{aligned} \qquad (4.7)
$$

The changing of notation from (u,v) to (μ,v) is used to reflect transformation that is of a different linear programming problem (LP). Hence, one could derive an equivalent envelopment form using the dual form of the above problem as:

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$$\max_{\theta, \lambda} \theta,$$

$$\text{subject to} \quad y_i + Y\lambda \geq 0,$$
$$\theta x_i - X\lambda \geq 0, \quad (4.8)$$
$$\lambda \geq 0,$$

where

θ is a scalar representing the value of the efficiency score for the *i-th* DMU which will range between 0 and 1.

λ is a $N \times 1$ vector of constant.

This envelopment form involves fewer constraints than the multiplier form $(A + B < N + 1)$, and therefore, is generally the preferred form to solve efficiency (Coelli et al., 1998). Thus, the DEA Excel Solver developed by Zhu (2009) under the VRS model is adopted in order to solve the revenue efficiency and also cost and profit efficiency. Table 4.2 presents the revenue, cost and profit efficiency models.

Table 4.2: Revenue Efficiency, Cost Efficiency and Profit Efficiency Models

Frontier Type	Revenue Efficiency	Cost Efficiency	Profit Efficiency
VRS	$\max \sum_{r=1}^{s} q_r^o \tilde{y}_{ro}$ subject to $\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{io} \quad i=1,2,...,m$ $\sum_{j=1}^{n} \lambda_j y_{rj} \geq \tilde{y}_{ro} \quad r=1,2,...,s$ $\lambda_j, \tilde{y}_{ro} \geq 0$ $\sum_{j=1}^{n} \lambda_j = 1$ (4.9)	$\min \sum_{i=1}^{m} p_i^o \tilde{x}_{io}$ subject to $\sum_{j=1}^{n} \lambda_j x_{ij} \leq \tilde{x}_{io} \quad i=1,2,...,m$ $\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{ro} \quad r=1,2,...,s$ $\lambda_j, \tilde{x}_{io} \geq 0$ $\sum_{j=1}^{n} \lambda_j = 1$ (4.10)	$\max \sum_{r=1}^{s} q_r^o \tilde{y}_{ro} - \sum_{i=1}^{m} p_i^o \tilde{x}_{io}$ subject to $\sum_{j=1}^{n} \lambda_j x_{ij} \leq \tilde{x}_{io} \quad i=1,2,...,m$ $\sum_{j=1}^{n} \lambda_j y_{rj} \geq \tilde{y}_{ro} \quad r=1,2,...,s$ $\tilde{x}_{io} \leq x_{io}, \tilde{y}_{ro} \geq y_{ro}$ $\lambda_j \geq 0$ $\sum_{j=1}^{n} \lambda_j = 1$ (4.11)

Source: Zhu (2009)

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Where

s is output observation

m is input observation

r is s^{th} output

i is m^{th} input

q_r^o is unit price of the output r of DMU_0 (DMU_0 represents one of the n DMUs)

p_i^o is unit price of the input i of DMU_0

$\tilde{y}_{ro}$ is r^{th} output that maximise revenue for DMU_0

$\tilde{x}_{io}$ is i^{th} input that minimise cost for DMU_0

y_{ro} is r^{th} output for DMU_0

x_{io} is i^{th} input for DMU_0

n is DMU observation

j is n^{th} DMU

λ_j is non-negative scalars

y_{rj} is s^{th} output for n^{th} DMU

x_{ij} is m^{th} input for n^{th} DMU

$\tilde{y}_{ro}^*$ is > 0

$\tilde{x}_{io}^*$ is > 0

The data of input and output price may vary from one DMU to another. The models in Table 4.2 are used to calculate revenue efficiency, cost efficiency and profit efficiency of DMU_0 in Table 4.3.

Table 4.3: Revenue Efficiency, Cost Efficiency and Profit Efficiency of DMU_0

Revenue	Cost	Profit
$\dfrac{\sum\limits_{r=1}^{s} q_r^o \, y_{ro}}{\sum\limits_{r=1}^{s} q_r^o \, \tilde{y}_{ro}^*}$	$\dfrac{\sum\limits_{i=1}^{m} p_i^o \, \tilde{x}_{io}^*}{\sum\limits_{i=1}^{m} p_i^o \, x_{io}}$	$\dfrac{\sum\limits_{r=1}^{s} q_r^o \, y_{ro} - \sum\limits_{i=1}^{m} p_i^o \, x_{io}}{\sum\limits_{r=1}^{s} q_r^o \, \tilde{y}_{ro}^* - \sum\limits_{i=1}^{m} p_i^o \, \tilde{x}_{io}^*}$

As a result, revenue efficiency, cost efficiency and profit efficiency scores are within the range of 0 and 1.

By calculating these three efficiencies concepts (revenue, cost and profit), we could observe the effects of the bank M&As on these efficiency levels and more robust results could be obtained. Nevertheless, the revenue efficiency concept will be given more focus in this study rather than the other efficiencies concepts (cost and profit) as its focus is on the effect of the bank M&As on the revenue efficiency.

The study hypothesises that the revenue efficiency levels differ between the pre merger and the post merger period. The study also estimates that the revenue efficiency in post-merger period will be higher compared to the pre-merger period due to the advantages that are brought by M&As event. The effect of the bank M&As will contribute in providing the greatest opportunity for cost cutting activities, such as activity focusing and geographically focusing mergers. Moreover, bank mergers also allow a higher abnormal return besides enhancing the revenue efficiency (Pilloff, 1996). Furthermore, due to the improvement of revenue and profit scale, scope or X-efficiency, most of the banks that are involved in M&As event may improve in revenue and profit efficiency (Akhavein et al. 1997). The advantages of scale (output produce double) and scope (jointly produce) economies that banks benefit from the M&As may improve the revenue efficiency (Berger et al., 1996). Thus, the additional services of 'one-stop shopping' could result in the scale and scope of economies that provide convenience to the customers, and directly improves the revenue efficiency.

4.4.1.2   Variables in the First Stage of Analysis

The collection or selection of the bank inputs and outputs could be difficult in the evaluation of the bank efficiency to be used in the first stage of DEA analysis. Bader et al. (2008) stated explicitly that there is 'no perfect approach' in the selection of the bank inputs and outputs (Berger and Humphrey, 1997). Berger and Humphrey (1997) also found that there are some restrictions on the type of variables since there is a need for comparable data and to minimise possible biases due to different accounting practices in the collection of the variables. In fact, they stated that even in the same country, different banks might apply different accounting standards. The results of the efficiency scores for each study on the bank efficiency will be affected due to the selection of variables. Thus, the DEA method requires bank inputs and outputs as the choice is always an arbitrary issue (Ariff and Can, 2008 and Berger and Humphrey, 1997). Appendix C (Table C1) summarises the data used to construct the efficiency frontiers.

According to Cooper et al. (2002), there is a rule required to be complied with in order to select the number of inputs and outputs. A rough rule of thumb which could provide guidance is as follows:

$n \geq \max \{m \times s, 3(m+s)\}$

Where:

n	is a number of DMUs
m	is a number of inputs
s	is a number of outputs

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4.4.1.2.1   Input Variables

Because this study uses the intermediation approach, three inputs and outputs variables were chosen. The overall selection of the variable of banks' input and output was based on Ariff and Can (2008) and other major studies on the efficiency of the banks involved with the event of the M&As (Sufian and Habibulah, 2009; Altunbas, 2001; Bader et al., 2008; Isik and Hassan, 2002; and Hassan, 2005). The three input vector variables consist of x_1: Deposits (measured by deposits and other funds), x_2: labour (measured by personnel expense) and x_3: physical capital (measured by book value of fixed assets). The input prices consist of w_1: price of loanable funds (measured by interest paid/ deposits), w_2: price of labour (measured by personnel expenses/ labour) and w_3: price of physical capital (measured by other operating expenses/ physical capital).

4.4.1.2.2   Output Variables

The three output vector variables are y_1: loans (measured by net loans and interbank lending), y_2: investment (measured by short-term, long term and entrusted investment or securities); and y_3: off-balance sheet items (measured by value of the off-balance sheet activities). Meanwhile, three output prices consist of r_1: Price of loans (interest from loans/ loans), r_2: price of investment (other operating incomes/ securities) and r_3: price of off-balance sheet items (net fees and commissions/ off-balance sheet items).

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Table 4.4: Variables of Outputs, Input, Outputs and Input Price

Variable	Symbol	Variable Name	Definition
Outputs	y_1	Loans	Net loans and interbank lending
	y_2	Investment	Short-term, long term and entrusted investment or securities
	y_3	Off-balance sheet items	Value of the off-balance sheet activities (nominal values)
Inputs	x_1	Deposits	Total deposits, money market and short term funding
	x_2	Labour	Personnel expenses
	x_3	Physical capital	Book value of fixed assets
Output Prices	r_1	Price of loans	Interest income on loans and other interest income/ loans
	r_2	Price of investment	Other operating income/ investment
	r_3	Price of off-balance sheet items	Net fees and commissions/ off-balance sheet items
Input Prices	w_1	Price of deposits	Total interest expenses/ deposits
	w_2	Price of Labour	Personnel expenses/ total assets
	w_3	Price of physical capital	Other operating expenses/ fixed assets

4.4.1.3 Tests on DEA

For all periods, the mean revenue efficiency scores for both pre and post-merger periods were compared. This may shed some light on the sources of inefficiency of the Malaysian banking system in general. To allow efficiency and inefficiency to vary over time, the efficiency frontiers were constructed each year by solving the liner programming problems rather than by constructing a single multi-year frontier (Sufian, 2009 and Sufian and Habibullah, 2009). The revenue efficiency of the bank M&As were measured using the Data Envelopment Analysis (DEA) method by

applying the intermediation approach in the first stage (refer equation 4.9) and the data were tested by parametric (t-test) and non-parametric (Mann-Whitney [Wilcoxon]) and Kruskal-Wallis tests.

4.4.2 Second Stage:

4.4.2.1 Multivariate Regression Analysis (MRA)

The other main purpose of this study is to identify the potential bank specific determinants and additional control variables (macroeconomic) that influence the revenue efficiency of the Malaysian banking sector during post-merger period. Most previous studies have used a multivariate regression model in order to focus on the relationship between bank efficiency and explanatory variables to identify the determinants of the efficiency (such as, Maudos et al., 2002 and, Sufian and Habibullah, 2009).

To examine the relationship between the efficiency of the Malaysian banks and explanatory variables, the standard regression model is used and it could be defined as follows for observation (bank) i (Coelli et al., 1998, Khan and Lewbel, 2007 and Asimakopoulos et al., 2008)

$$y_{it} = \beta\, x_{it} + \varepsilon_{it} \qquad\qquad i = 1,...,N, \qquad\qquad (4.12)$$

Where:

y_{it} is the efficiency (total, technical or allocative, as per case) of bank i at time t

x_{it} is the matrix of the explanatory variables (determinant)

β is the vector of coefficients

ε_{it} is a random error term representing statistical noise

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i	is a number of bank
t	is a year
N	is a number of observations in the data set

By using the revenue efficiency scores as dependent variable, this study extends equation (4.12) and estimates the following model:

$$\theta_{jt} = \alpha_t + \beta_{jt}(LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt}$$
$$+ LNGDP_{jt} + INFL_{jt} + DP_{jt} + LNTA_{jt}*DP_{jt} + LLRGL_{jt}*DP_{jt} +$$
$$+ ETA_{jt}*DP_{jt} + BDTD_{jt}*DP_{jt} + LOANSTA_{jt}*DP_{jt} + NIETA_{jt}*DP_{jt} +$$
$$+ LNGDP_{jt}*DP_{jt} + INFL_{jt}*DP_{jt}) + \varepsilon_{jt}$$

Where:

θ_{jt}	is the revenue efficiency of the j-th bank in the period t obtained from the DEA Model.
LNTA	is a log of total assets (size of bank)
LLRGL	is a loan loss reserve to gross loan (asset quality)
ETA	is equity to total assets (capitalisation)
BDTD	is a bank's deposit over total deposit (market power)
LOANSTA	is a total loan over total assets (liquidity)
NIETA	is a non-interest expense over total assets (management quality)
LNGDP	is a log of gross domestic product (gross domestic product)
INFL	is a customer prices index (inflation)
DP	is a dummy post-merger period
LNTA*DP	is an interaction bank size and dummy post-merger
LLRGL*DP	is an interaction asset quality and dummy post-merger
ETA*DP	is an interaction capitalisation and dummy post-merger period
BDTD*DP	is an interaction market power and dummy post-merger period
LOANSTA*DP	is an interaction liquidity and dummy post-merger period
NIETA*DP	is an interaction management quality and dummy post-merger period
LNGDP*DP	is an interaction gross domestic product and dummy post-merger period
INFL*DP	is an interaction inflation and dummy post-merger period
j	is a number of bank
t	is a year
α	is a constant term
β	is the vector of coefficients
ε_{jt}	is a normally distributed disturbance term

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This study will run the result according to the step-wise or separately models rather than on simultaneous models in order to avoid the multicollinearity problems. Therefore, the proposed model contains eleven models that are used to examine the relationship between the revenue efficiency of the Malaysian banks and determinants variables.

4.4.2.2 MRA Models

4.4.2.2.1 Model 1 (baseline model):

$$\theta_{jt} = \alpha_t + \beta_{jt}(\ LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt}\ ) + \varepsilon_{jt}$$

Model 1 represents a baseline model without any interactions from other variables. The equations are based on 34 banks and 10 years of observations during the period of 1995-2009 (excluding 1997-2001). The regression model developed is to examine the relationship between banks' revenue efficiency and explanatory variables which are bank specific determinant variables (independent variables). The determinant variables included in the second stage multivariate regression models are LNTA (logarithm of total assets), LLRGL (loan loss reserve to gross loan), ETA (Equity to total assets), BDTD (bank's deposit over total deposit), LOANSTA (total loans over total assets) and NIETA (non-interest expense over total assets).

4.4.2.2.2 Model 2 (Include macroeconomic variables):

$$\theta_{jt} = \alpha_t + \beta_{jt}(\ LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} \\ + LNGDP_{jt} + INFL_{jt}\ ) + \varepsilon_{jt}$$

To examine the relationship between macroeconomics and bank's revenue efficiency, Model 2 adds the macroeconomic variables, namely gross domestic product (LNGDP) and inflation (INFL) in the regression model, while the variables in Model 1 remain the same.

4.4.2.2.3 Model 3 (Include dummy variable):

$$\theta_{jt} = \alpha_t + \beta_{jt}(LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} + LNGDP_{jt} + INFL_{jt} + DP_{jt}) + \varepsilon_{jt}$$

To examine the relationship between the post-merger period and revenue efficiency, a binary dummy variable DP is included in the regression Model 3, while the other six variables and two additional control variables in Model 2 remain.

4.4.2.2.4 Model 4 (Include LNTA*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt}[LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} + LNGDP_{jt} + INFL_{jt} + (LNTA_{jt} * DP_{jt})] + \varepsilon_{jt}$$

Model 4 uses the additional interaction variable of LNTA*DP to examine the relationship between bank size during post-merger period and bank's revenue efficiency.

4.4.2.2.5   Model 5 (Include LLRGL*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt}[\ LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} \\ + LNGDP_{jt} + INFL_{jt} + (\ LLRGL_{jt} * DP_{jt}\ )] + \varepsilon_{jt}$$

Model 5 uses the additional interaction variable of LLRGL*DP to examine the relationship between bank's asset quality during post-merger period and bank's revenue efficiency.

4.4.2.2.6   Model 6 (Include ETA*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt}[\ LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} \\ + LNGDP_{jt} + INFL_{jt} + (\ ETA_{jt} * DP_{jt}\ )] + \varepsilon_{jt}$$

Model 6 uses the additional interaction variable of ETA*DP to examine the relationship between bank's capitalisation during post-merger period and bank's revenue efficiency.

4.4.2.2.7   Model 7 (Include BDTD*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt}[\ LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} \\ + LNGDP_{jt} + INFL_{jt} + (\ BDTD_{jt} * DP_{jt}\ )] + \varepsilon_{jt}$$

Model 7 uses the additional interaction variable of BDTD*DP to examine the relationship between bank's market power during post-merger period and bank's revenue efficiency.

4.4.2.2.8   Model 8 (Include LOANSTA*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt} [LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} + LNGDP_{jt} + INFL_{jt} + (LOANSTA_{jt} * DP_{jt})] + \varepsilon_{jt}$$

Model 8 uses the additional interaction variable of LOANSTA*DP to examine the relationship between bank's liability during post-merger period and bank's revenue efficiency.

4.4.2.2.9   Model 9 (Include NIETA*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt} [LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} + LNGDP_{jt} + INFL_{jt} + (NIETA_{jt} * DP_{jt})] + \varepsilon_{jt}$$

Model 9 uses the additional interaction variable of NIETA*DP to examine the relationship between bank's management quality during post-merger period and bank's revenue efficiency.

4.4.2.2.10   Model 10 (Include LNGDP*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt} [LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} + LNGDP_{jt} + INFL_{jt} + (LNGDP_{jt} * DP_{jt})] + \varepsilon_{jt}$$

Model 10 uses the additional interaction variable of LNGDP*DP to examine the relationship between gross domestic product during post-merger period and bank's revenue efficiency.

4.4.2.2.11 Model 11 (Include INFL*DP):

$$\theta_{jt} = \alpha_t + \beta_{jt}[\ LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt}$$
$$+ LNGDP_{jt} + INFL_{jt} + (\ INFL_{jt} * DP_{jt}\ )] + \varepsilon_{jt}$$

Model 11 uses the additional interaction variable of LNGDP*DP to examine the relationship between inflation during post-merger period and bank's revenue efficiency.

4.4.2.3 Variables Description Used in MRA Models

4.4.2.3.1 Size of Bank

The first specific determinant of bank is its size proxied by logarithm of total asset LNTA and the coefficient is expected to be positive. This positive coefficient of size indicates positive relationship between size of banks and revenue efficiency where the larger the size of banks, the higher the revenue efficiency. This regression outcome may suggest that the large bank size is able to become more efficient due to the benefits obtained such as increasing in revenue, service quality and higher leverage from financial capital (Akhavein et al,1997; Sufian, 2009; and Sufian and Habibullah, 2009).

4.4.2.3.2 Asset Quality

The second specific determinant of bank is its asset quality proxied by loan loss reserve over gross loan (LLRGL) and is predicted to have negative coefficient (Sufian, 2009; and Sufian and Habibullah, 2009). Kosmidou (2008) showed that the

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ratio of loan loss reserves to gross loans (LLRGL) indicates how much of the total portfolio has been provided for, but not charged off, and is used as a measure of bank's asset quality. The similar measurement was also used by Ismail et al., (2009), Cornett et al. (2006), McNulty et al. (2001) and Miller and Noulas (1997). The coefficient is expected to be negative because bad loans (non-performing loans) could reduce the bank's efficiency level. A better quality asset is described as having lower non-performing loans or ratio of LLRGL (Ismail et al., 2009 and Wang, 2003). In this direction, Miller and Noulas (1997) asserted that the greater financial institutions exposure to high risk loans, the higher the accumulation of unpaid loans, and this lowers the profitability. Therefore, the asset quality will be better if the coefficient is lower. A lower coefficient contributes to a higher asset quality which can increase the revenue of the banks.

4.4.2.3.3   Capitalisation

The third specific determinant of bank is capitalisation, represented by earning over total assets (ETA) and this coefficient is expected to be positive (Abreu and Mendes, 2001; Casu and Girardone, 2004; Carvallo and Kasman, 2005; Athanasoglou et al., 2008 and Sufian, 2009). The positive coefficient of capitalisation signifies the positive relationship between capitalisation and revenue efficiency where the larger the capitalisation of the banks, the higher the revenue efficiency. The regression result may show that the well- capitalised banks would increase banks' revenue and profitability due to the lower expected costs of financial distress, lower expected bankruptcy costs, and lower risk of portfolio and such advantages will then be

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translated into high profitability (Bourke, 1989; Berger, 1995; Angbazo, 1997 and Demirguc-Kunt and Huizinga, 1999).

4.4.2.3.4 Market Power

The forth specific determinant of bank is market power proxied by bank's deposit over total deposit (BDTD) and this coefficient is expected to show positive sign (Group of Ten, 2001; Carletti et al., 2007 and Graeve et al., 2007). In this regard, the positive coefficient of market power shows the positive relationship between market power and revenue efficiency where the larger market power, the higher the revenue efficiency. The regression outcome suggests that the large market power contributes to the high bank concentration and therefore, changes both loan rates and market shares in imperfectly competitive loan markets and this will contribute to the tendency for banks to charge high loan mark-ups (Carletti et al., 2007 and Graeve et al., 2007).

4.4.2.3.5 Liquidity

A total loan over total assets (LOANSTA) is the proxy for the liquidity variable that is applied in this study as being the fifth bank specific determinant. LOANSTA is used to control the bank specific lending intensity. Bank loans are assumed to be the main source of revenue and are expected to affect performance positively. Nevertheless, the coefficient could also be negative which indicates a negative relationship between liquidity and revenue efficiency because loan-performance relationship depends significantly on the expected change of the economy. While in a

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strong economy, only a small percentage of loans will default (lower percentage of unpaid loans). On the other hand, banks may be depressingly affected during a weak economy as borrowers are likely to default on their loans. Preferably, banks should capitalise on favourable economic environments and shield themselves during adverse conditions (Sufian, 2009a; Sufian, 2009 and Sufian and Habibullah, 2009).

4.4.2.3.6   Management Quality

The variable of management quality is proxied by non-interest expense over total assets (NIETA) as being the last bank specific determinant in this study. NIETA is applied to provide the information on variation in operating costs across the financial system. It reflects employment, total amount of wages and salaries, as well as the cost of running branch office facilities. The lower or higher cost represents a good management quality. Bourke (1989) argued that reduced expenses tend to improve the profitability of the financial institutions. Therefore, a higher ratio of NIETA is assumed to affect performance negatively because efficient banks are expected to operate at lower costs. Moreover, the wages expenses (reduce labour) could be reduced due to the usage of the new technology such as automated teller machines (ATMs) and other automated means of delivering services. Nevertheless, Molyneux and Thornton (1992) showed a contradictory finding in which they observed a positive relationship, suggesting that higher profits earned by banks that are more efficient may be appropriated in the form of higher payroll expenditures paid to more productive human capital. Therefore, the expected coefficient could be negative and may have positive relationship with revenue efficiency. Among studies that employed the similar variables are Berger (1997), Berger and DeYoung (1997),

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Berger et al. (1999), Athanasoglou et al. (2008), Sufian (2009a), Sufian (2009) and Sufian and Habibullah (2009).

4.4.2.3.7   Macroeconomics

According to Athanasoglou et al. (2008), the macroeconomic variables are important to be included into the estimation as control variables because they can deal with the bank efficiency sufficiently. Although studies such as Short (1979), Bourke (1989) and Demirguc-Kunt and Huizinga (2000) showed that it is possible to conduct a meaningful analysis of bank profitability with the bank specific variables, some issues are not dealt with sufficiently because there is no investigation of the effect of the macroeconomic environment.

Therefore, this study will also include the macroeconomic variables in the estimation models. The first macroeconomic variable that is included in this study is gross domestic product (GDP). Sufian (2009), Sufian and Chong (2008) and Kosmidou (2008) measured GDP by natural logarithm of gross domestic product (LNGDP). They suggested that the coefficient of the LNGDP is expected to be positive with the bank efficiency which shows that higher LNGDP leads to the higher revenue efficiency.

The second variable is inflation (INFL). Flamini et al. (2009) measured the INFL based on the current period of customer prices index (CPI) growth rate. Inflation may have direct effects such as an increase in the price of labour, and indirect effects such as changes in interest rates and asset prices on bank performance (Staikouras and

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Wood, 2003). Abreu and Mandes (2001) and Sufian and Chong (2008) suggested that inflation is negatively related to bank's profitability, implying that the higher inflation will contribute to the lower profit. However, Sufian (2009) found that the inflation has positive effects on bank's profit efficiency. Perry (1992) suggested that the effects of inflation on bank performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in faster increase of bank revenues than costs and subsequently gives positive impact on bank performance. In the unanticipated case, banks may be slow in adjusting their interest rates, resulting in a faster increase of bank costs than revenue; consequently, gives negative effects on bank performance.

4.4.2.3.8 Dummy Variables

The dummy post-mergers periods is introduced in the regression model in order to capture the determinants of revenue efficiency in the Malaysian banking sector during the post-merger period. DP is a binary variable that takes a value of 1 for post-merger years, and it is 0 otherwise. As expected, this coefficient is to be in positive sign which indicates that the banking sector has been relatively more revenue efficient during the-post merger periods. The same dummy variables are also used by Sufian and Habibullah (2009), Sufian (2009) and Cornett et al. (2006).

4.4.2.3.9 Interaction Variables

All the determinant variables in this study interact against the dummy post merger period variable (DP) in order to identify the specific determinants of the specific post

merger period of the banking sector. The other six models used in this study include the new six interaction variables namely, LNTA*DP, LLRGL*DP, ETA*DP, BDTD*DP, LOANSTA*DP*and NIETA*DP. In addition, two models on interaction between LNGDP*DP and INFL*DP are also adopted.

LNTA*DP variable is expected to have positive coefficient that indicates positive relationship between size of banks during the post-merger period and revenue efficiency. The positive relationship suggests that the larger the size of banks during the post-merger period, the higher the revenue efficiency in the banking sector, as a result of the M&As (Al-Sharkas et al. 2008; Cornett et al. 2006; Berger and Mester, 1997; Akhavein et al. 1997).

The coefficient of (LLRGL*DP) in this interaction variable is expected to be negative because bad loans (non-performing loans) could reduce the bank's efficiency level during the specific post merger period. Therefore, the asset quality during post-merger period will be better if the coefficient is lower. This could contribute to the higher asset quality and increase the revenue to the banking sector after the M&As (Kosmidou, 2008; Cornett et al., 2006; Cornett and Tehranian, 1992).

The interaction variable of ETA*DP is expected to have positive coefficient that indicates positive relationship between capitalisation of bank during the post-merger period and revenue efficiency. The positive relationship suggests that larger capitalisation of the banks during the post-merger period will increase the revenue

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efficiency of the banking sector after the M&As (Valkonov and Kleimeier, 2007 and David et al. 2000)

Next, the coefficient of interaction variable BDTD*DP is expected to have positive coefficient that indicates positive relationship between market power of bank during the post-merger period and revenue efficiency. The positive relationship explains that larger market power of the banks during the post-merger period will increase the revenue efficiency of the banking sector after the M&As (Carletti et al., 2007; Graeve et al., 2007; Berger, 1995)

The coefficient of interaction variable LOANSTA*DP is expected to have positive or negative coefficient that indicates positive or negative relationship between market power of bank during the post-merger period and revenue efficiency. The positive relationship explains that higher liquidity of the banks during the post-merger period will increase the revenue efficiency of the banking sector as a result of the M&As. The negative relationship indicates that the higher liquidity of the banks during the post-merger period will reduce the revenue efficiency of the banking sector as a result of the M&As (Pana et al., 2010; Diamond and Rajan, 2000; Diamond and Rajan, 2001).

Coefficient of NIETA*DP variable is expected to be negative or positive because efficient banks are expected to operate at lower or higher costs that represent good quality management. The negative or positive coefficient indicates negative or positive relationship between the banks' cost management during the post-merger period and revenue efficiency. Thus, lower expenses of banks during post-merger

period will lead to higher revenue efficiency in the banking sector as a result of the M&As (Sufian, 2009a; Sufian, 2009; Molyneux and Thornton, 1992; Pilloff, 1996; Berger et al., 1999, Berger, 1997).

The coefficient of LNGDP*DP variable is expected to be positive with the bank efficiency. It shows that higher LNGDP leads to higher revenue efficiency during the post-merger period. On the other hand, the coefficient of interaction variable INFL*DP is expected to be positive or negative with the bank efficiency which indicates that higher or lower inflation leads to higher or lower bank's revenue efficiency during post-merger period.

All these interaction of variables will run separately in eight different models to avoid dummy trap (Gujarati, 2002). Thus, six empirical models (Models 4, 5, 6, 7, 8, 9) proposed for this study serve to identify the potential bank specific determinants and two models proposed are to identify the macroeconomics determinants to the bank's revenue efficiency (Models 10 and 11) in the second stage of analysis.

4.4.2.4   Estimation Method

4.4.2.4.1   Panel Data Regression Model

This study uses panel data regression to test the developed model under this second stage because several advantages could be attained from regression that runs independently cross sectional or time series regression. Gujarati (2002) mentioned three kinds of advantages in using panel regression. Firstly, panel data make the data more informative with variability, reduce collinearity among the variables, are

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efficient and give more degree of freedoms to the data. Secondly, panel data could construct better detection and measurement of effects that simply could not be observed in pure cross-sectional or pure time series data. Thirdly, panel data provide the data to be available into several thousand units and this can minimise the bias that might result if individuals or firms level data are divided into broad aggregates.

Gujarati (2002) pointed out several advantages to using panel data that show several estimation and inference problems. Since such data involve both cross-section and time dimensions, problems that plague cross-sectional and time series data (such as heteroscedasticity and autocorrelation) need to be addressed. There exist some additional problems such as cross-correlation in individual units at the same point in time. So, several estimation techniques are used to address one or more of these problems. The two most prominent ones are the fixed effects model (FEM) and random effects model (REM). In FEM, the intercept in the regression model is allowed to differ among individuals in recognition to the fact that each individual or cross-sectional unit may have some special characteristics of its own. Meanwhile, REM assumed that the intercept of an individual unit is a random drawing from a much larger population with a constant mean value. If it is assumed that the error component ε_{jt} and X's regressors are uncorrelated, REM may be more suitable, whereas if ε_{jt} and X's are correlated, FEM may be appropriate.

Hausman test can be used to differentiate between FEM and REM. The null hypothesis underlying the Hausman test is that the FEM and REM estimators do not differ significantly. The test statistics developed by Hausman has an asymptotic Chi-Square (X^2) distribution. If null hypothesis is rejected (at 1% to 5% significant levels

only), the FEM may be more appropriate to be used compared to the REM. But, if null hypothesis is failed to reject or is significant at only 10%, the REM is more suitable to be used.

4.4.2.4.2   Generalized Least Square (GLS)

The Generalized Least Square (GLS) is used in this study rather than the Ordinary Least Square (OLS) as method of estimation to estimate the panel data regression formed. The decision is made following Gujarati's (2002) suggestion that GLS may overcome the heteroscedasticity, resulted from utilising financial data with differences in sizes. Due to the fact that the sample employed in this study consists of small and large banks, differences in sizes of the observations are expected to be observed.

The usual practice of econometrics modelling assumes that error is constant over all time periods and locations due to the existence of homoscedascity. Nevertheless, problems could arise which lead to heteroscedasticity issues as variance of the error term produced from regression tend not to be constant, which is caused by variations of sizes in the observation. Therefore, the estimates of the dependent variable will be less predictable (Gujarati, 2002).

Using OLS estimation will solve the problem since it adopts the minimising sum of residual squares condition. The OLS allows all errors to receive equal importance no matter how close or how wide the individual error spread is from the sample regression function. On the other hand, GLS minimises the weighted sum of residual

squares. In GLS estimation, the weight consigned to each error term is relative to its variance of the error term. Error term that comes from a population with large variance of error term will get relatively large weight in minimising residual sum of squares (RSS). Consequently, if a problem of non constant error arises, GLS is able to produce estimators in BLUE version because it accounts for such a problem by assigning appropriate weight to different error terms, which in turn, produces the ideal constant variable (Gujarati, 2002).

4.5 The Econometric Issues

All the problems such as data stationary normality, multicollinearity, heteroscedasticity, and autocorrelation need to be identified in panel estimations techniques before estimating the developed models. The next sections will clarify the nature of these problems, ways to identify them, and the proposed remedies.

4.5.1 Data Normality Test

The data of determinants of banks revenue efficiency are tested for stationary normality. Data skewness, the value of the kurtosis and the value of the Jarque Bera are observed. For instance, data are considered to be normally distributed if the kurtosis and skewness value is around ± 2 and ± 1.96 (Garson, 2004) and Jarque Bera value should not be significant (Gujarati, 2002). An efficient estimator, unbiased and consistent sample data could be obtained from sample data that are normally distributed.

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4.5.2 Multicollinearity Test

When multicollinearity exists, two or more independent variables are related to each other and overlapping of the data would arise which may contribute to one or more variables being neglected. The results that show an overstatement of the standard error, for example, the standard error, tends to be larger (leading to small t-value) and a high R^2 can be seen from the presence of multicollinearity. Gujarati (2002) asserted that in detecting the multicollinearity problem in regression model, the problem could be considered as serious if the pair-wise or zero-order correlation coefficient between two regression is in excess of 0.8. However, dropping one of the collinear variables can solve the problem.

4.5.3 Heteroscedasticity Test

The heteroscedasticity problem is when variance of the error term from regression tends not to be constant, which is caused by variations of sizes in observation. Consequently, the estimates of the dependent variable become less predictable (Gujarati, 2002). Therefore, it is required to be tested since serious heteroscedasticity may result in the estimator using White General Heteroscedasticity to test this problem. According to Gujarati, (2002), GLS regression, along with the White's heteroscedasticity, is a consistent standard error technique, which is available in most statistical and econometric software. Problems could be solved if the heteroscedasticity is detected.

4.5.4 Auto Correlation Test

The error term corresponding to different periods is related to each other, leading to the existence of auto correlation (Durbin and Watson, 1951). A classical assumption in the econometric estimation is where the error term which corresponds to different periods unrelated to each other will be violated with the presence of auto correlation. The common test for this problem is Durbin Watson (DW) statistics. Newey-West method will solve the problem detected by providing the standard errors of estimation that are corrected for auto correlation (Gujarati, 2002).

4.6   Hypothesis Development

4.6.1   Revenue Efficiency during the Pre-merger and Post merger Period

The revenue efficiency is most significant in those mergers that also experience reduced cost (Cornett et al. 2006). The revenue efficiency opportunities appear to be most profitable in those mergers that offer the greatest opportunity for cost cutting activities such as activity focusing and geographically focusing mergers. Moreover, revenue efficiency not only depends on managers' decision but also on the customers' behaviour. Thus, revenue efficiency may be enhanced by raising prices as market power is expanded, or it might be enhanced when the merged institution restructures its assets mix (Ayadi and Pujals, 2005). Moreover, bank mergers also allow a higher abnormal return besides enhancing the revenue efficiency (Pilloff, 1996). Furthermore, due to the improving of revenue and profit scale, scope or X-efficiency, most of the banks that are involved in M&As event may improve in revenue and profit efficiency (Akhavein et al. 1997). The advantages of scale

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(output produce double) and scope (jointly produce) economies gained from bank M&As may improve their revenue efficiency (Berger et al., 1996). Thus, the additional services of 'one-stop shopping' could result in the scale and scope of economies that provide the convenience to the customers and directly improves the revenue efficiency. Overall, the event of M&As in banking industry would improve the revenue efficiency, which in turn, improves the profit efficiency.

Thus this study could be hypothesised as:

H1: Revenue efficiency is significantly different between pre-merger and post-merger period in banking sector.

4.6.2 Determinants of Revenue Efficiency during Post-Merger Period
4.6.2.1 Bank Size

The next hypothesis will be on the determinants of revenue efficiency in bank M&As. Previous studies have discovered information on the revenue efficiency on the small, medium and large bank sizes involved in M&As event. Quite a number of studies found that the small banks (no M&As event) are more revenue efficient rather than other banks size (Berger and Mester, 1997; Mester et al., 1998; Hannan, 1991; Boot, 2000). A small number of studies found that the large and medium banks are higher in revenue efficiency (Bader et al., 2008; Akhigbe and McNulty, 2005; Berger et al., 1993a and Maudos et al., 2002). The opposite result was found in the banks involved in M&As scheme where most of the large bank mergers produced a higher revenue efficiency rather than medium and small bank merger. This could be due to various reasons (Al-Sharkas et al., 2008; Cornett et al, 2006 and Akhavein et

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al,1997). Studies that found that the revenue efficiency improved or higher in the small bank mergers have been few (Huizinga et al., 2001). The M&As lead to the large bank size which contributes to huge capital and higher assets that allow bank to produce quality services, to capitalise on revenue enhancement, have more leverage from financial capital and be more efficient from both technical and allocative perspectives. These results could enhance the revenue efficiency in the large bank after mergers.

Thus, this study hypothesises:

H2: Bank size has a significant influence on the revenue efficiency during post-merger period.

4.6.2.2 Asset Quality

Asset quality of bank represents one of the factors that contributes to the improvement of the revenue efficiency in the bank M&As. A study by Berger and Mester, 1997 and Andogo et al. 2005 discovered that the result on the revenue and profit efficiency could not be accurately produced due to the unmeasured differences in product, or incorrectly measured output quality. Fan and Shaffer (2004), McNulty (2001) and Nakamura (1993b) showed that output quality would also be represented by quality loan and systematic evidence in which loan quality is greater at small banks. For the merged banks, the revenue efficiency is higher due to the higher proportion of loans in asset portfolio and write-off of large parts of the bad debt in the loan portfolio which may contribute to the higher loan quality resulted by the reduction in LLRGL ratio and customer (Ismail et al., 2009 and Wang, 2003).

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Several studies have discovered that the event of M&As may reduce the ratio of loss reserve to gross loan ratio (LLRGL) that increases the asset quality of banks and contributes to the higher profitability via revenue efficiency (Cornett et al., 2006; Cornett and Tehranian, 1992; Kosmidou, 2008).

Thus, this study hypothesises:

H3: Asset quality of bank has a significant influence on the revenue efficiency during post-merger period.

4.6.2.3 Capitalisation

M&As event may contribute to the large capital of banks and lead to the higher revenue efficiency for several reasons (Valkonov and Kleimeier, 2007 and David et al. 2000). The well-capitalised or large capital of banks would increase their revenue and also their profitability due to the lower risk of portfolio, lower expected bankruptcy costs and lower expected costs of financial distress (Bourke, 1989). Moreover, Berger (1995) suggested a positive relationship between capital-asset ratio (CAR) and return on equity (ROE) because higher capital is followed by higher earnings primarily through reduced interest rates on uninsured purchased fund. Besides that, other previous studies have also discovered similar findings where the well-capitalised banks are more profitable (Molyneux and Thornton, 1992; Angbazo, 1997; Demirguc-Kunt and Huizinga, 1999; Abreu and Mendes, 2002; Casu and Girardone, 2004; Carvallo and Kasman, 2005; Athanasoglou et al., 2008). However, a higher capital asset ratio tends to record relatively low revenue and profit because the bank is operating over-cautiously and ignoring potential profitable diversification or other opportunities (Goddard et al, 2004).

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Thus, this study hypothesises:

H4: Capitalisation of bank has a significant influence on the revenue efficiency during post-merger period.

4.6.2.4 Market Power

The event of M&As could contribute to the large of bank's market power which leads to a higher revenue efficiency. The large market power is a result of the large market share through M&As (Group of Ten, 2001 and Carletti et al., 2007). Therefore, banks with a large market share will have the tendency to charge high loan mark-ups and pay low deposit rates. This supports relative market power hypothesis (Berger, 1995; Carletti et al., 2007; Graeve et al., 2007). The relative market power hypothesis stated that a bank with a large market share in a certain product market may be able to set interest rates less competitively for that particular product. Besides, Oladepo (2010) and Demirguc-Kunt et al. (2004) also suggested that the large market power of banks reduces the number of the rivals that contribute to the higher monopoly power of bank. Therefore, the monopoly power could also offer banks to enjoy a higher net interest margin.

Thus, this study hypothesises:

H5: Market power of bank has a significant influence on the revenue efficiency during post-merger period.

4.6.2.5 Liquidity

Most of the previous studies have identified that liquidity is a signal of banks' capability to fulfil their customers' day-to-day cash needs and respond to sudden cash withdrawals (Boyd and Prescott, 1986; Kashyap et al., 2002 and Sufian, 2009). A higher bank's liquidity could lead to a higher revenue improvement. M&As allow the merged banks to produce more liquidity from the changes in the assets, liabilities and off-balance sheet positions (Pana et al., 2010; Diamond and Rajan, 2000; Diamond and Rajan, 2001 and Gorton and Winton, 2000).

Thus, this study hypothesises:

H6: Liquidity of bank has a significant influence on the revenue efficiency during post-merger period.

4.6.2.6 Management Quality

The high management quality may increase the profit and reduce the cost of the banks due to the M&As. A quality management could be achieved by good management skills of managers who can minimise the bank's expenses. However, other studies suggest that higher expenses of banks represent a good management quality. Banks may transfer their management skills from the superior firm to the less superior firm if the superior firm has complimentary skills to the target firm. Therefore, firm's revenue could increase due to the M&As, indicating a positive relationship between better quality management and profitability (Sufian, 2009a;

Sufian, 2009; Molyneux and Thornton, 1992; Pilloff, 1996; Berger et al., 1999, Berger, 1997).

Thus, this study hypothesises:

H7: Management quality of bank has a significant influence on the revenue efficiency during post-merger period.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter presents the findings of the research. It begins with the analyses of the results and tests of Data Envelopment Analysis (DEA) in terms of revenue, cost and profit efficiency in the Malaysian banking sector during the pre and post-merger period. All efficiency concepts were measured using the Data Envelopment Analysis (DEA) method by applying the intermediation approach with variable return to scale (VRS). All the results were tested by parametric (t-test) and non-parametric (Mann-Whitney [Wilcoxon]) and Kruskal-Wallis tests. Only the revenue efficiency results are emphasised in the discussion as it relates to the objective of this study. Next, the discussion covers the econometric issues that exist in the second stage of analysis such as stationary normality of the data, multicollinearity, heteroscedasticity and autocorrelation tests. A thorough discussion on econometric will be done. Then the analyses on the results from the multivariate regression analysis (MRA) models using the Generalized Least Square (GLS) will follow. MRA method was used in order to identify the determinants on revenue efficiency in Malaysian banking sectors during the post-merger period. Finally, the analyses will cover all the stated hypotheses based on the results obtained.

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5.2   Results and Tests of DEA

Before proceeding with the discussion of DEA results, this study first tested the rule of thumb on the selection of inputs and outputs variables suggested by Cooper et al. (2002). Since the total number of DMUs (34 banks) in this study is more than the number of inputs and outputs variables (3 x 3 @ 3[3+3]), the selections of variables are valid as they comply with the rule of thumb and allow for the efficiencies of DMUs to be measured.

Next, by calculating all the three efficiencies concepts (revenue, cost and profit), we are able to observe the effects of the bank M&As on these efficiencies levels and obtain more robust results. As this study focuses on the effects of the bank M&As on the revenue efficiency, the analysis will be more on the revenue efficiency concept than the other efficiencies concepts (cost and profit). Table 5.1 illustrates the revenue efficiency estimates together with the two other efficiency concepts (cost and profit) during the pre-merger and post-merger period.

5.2.1   Malaysian Banking Sector during Pre-Merger Period

Table 5.1 shows the mean for cost efficiency, revenue efficiency and profit efficiency as being 83%, 79.7% and 69.5%, respectively, during the pre-merger period (1995-1996). The results suggest that these banks have slacked (inefficient) by not fully producing the outputs efficiently when using the same input (revenue inefficiency) and by not fully using the inputs efficiently to produce the same outputs (cost inefficiency). Banks are said to have slacked if they fail to fully minimise the

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cost and maximise the revenue (profit inefficiency). The levels of cost inefficiency, revenue inefficiency and profit inefficiency are shown as 17%, 20.3% and 30.5%, respectively.

For the cost efficiency, the result means that the average bank utilised only 83% of the resources or inputs to produce the same level of output during the pre-merger period. In other words, on the average, the Malaysian banking sector has wasted 17% of its inputs, or it could have saved 17% of its inputs to produce the same level of outputs. If the Malaysian banking sector had fully utilised its inputs, it could have saved on costs during the pre-merger period.

Nevertheless, it was noted that on the average, the Malaysian banking sector was more efficient during the pre-merger period in utilising its inputs (cost efficiency) compared to its ability in generating revenues and profits. For revenue efficiency, the average bank could only generate 79.7% of the revenues, less than what it was initially expected to generate. Hence, revenue is lost by 20.3%, meaning that the average bank lost an opportunity to receive 20.3% more revenue given the same amount of resources, or it could have produced 20.3% of its outputs given the same level of inputs.

Obviously, the inefficiency is on the revenue side, followed by the profits. Similarly, the average bank could earn 69.5% of what was available, and lost the opportunity to make 30.5% more profits from the same level of inputs.

Even though the cost efficiency was reportedly highest during the pre-merger period, the revenue efficiency was found to be lower, and this led to higher revenue inefficiency. When both efficiencies concepts (revenue and cost efficiency) were compared, the higher revenue inefficiency was seen to have contributed to the higher profit inefficiency.

5.2.2 Malaysian Banking Sector during the Post-Merger Period

During the post-merger period (2002-2009), the Malaysian banking sector had exhibited mean cost efficiency, revenue efficiency and profit efficiency of 91.4%, 80.7% and 88.8%, respectively. The levels of cost inefficiency, revenue inefficiency and profit inefficiency were 8.6%, 19.3% and 11.2%, respectively (refer to Table 5.1).

As for the cost efficiency, the result means that the average bank had utilised only 91.4% of the resources or inputs in order to produce the same level of output during the post-merger period. Another way of interpreting it is that, on the average, the Malaysian banking sector had wasted 8.6% of its inputs, or it could have saved 8.6% of its inputs to produce the same level of outputs. Therefore, there was substantial room for significant cost savings for these banks had they employed their inputs efficiently.

However, similar findings were noted in which on the average, the Malaysian banking sector was also found to be more cost efficient during the post-merger. It had managed to utilise its inputs to generate revenues and profits. For revenue

efficiency, the average bank could only generate 80.7% of the revenues than it was expected to generate. Hence, there was a slack of 19.3%, meaning that the average bank lost an opportunity to receive 19.3% more revenue, giving the same amount of resources, or it had to produce 19.3% of its outputs with the same level of inputs.

Noticeably, the highest level of inefficiency is on the revenue side, followed by the profits. Similarly, the average bank could earn 88.8% of what was available, and lost the opportunity to make 11.2% more profits when utilising the same level of inputs.

As a conclusion, all the efficiencies concepts in Malaysian banking sector has improved after the M&As. The results from all the efficiencies are very useful in make a comparison between revenue efficiency and the other two efficiencies which are cost and profit efficiency. Cost efficiency improved from 83% during pre-merger to 91.4% during post-merger period, revenue efficiency improved from 79.7% to 80.7% and profit efficiency rose from 69.5% to 88.8%. The results also showed that the level of cost efficiency is higher than that of profit efficiency due to the lower revenue efficiency level or higher inefficiency from the revenue side.

Therefore, the improvement of the revenue efficiency on Malaysian banking sector should be given more concentration since it could contribute to lower profit efficiency of the bank. The improvement of revenue efficiency during pre-merger and post-merger periods was determined by performing by a series of parametric (t-test) and non-parametric (Mann-Whitney [Wilcoxon]) and Kruskal-Wallis tests.

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Table 5.1: Cost, Revenue and Profit Efficiency during Pre and Post Merger Period

BANK	Pre-merger (1995-1996)			Post-merger (2002-2009)		
	CE	RE	PE	CE	RE	PE
ABN AMBRO Bank	0.767	0.801	0.492	0.801	0.583	0.739
Affin Bank	1.000	1.000	1.000	0.859	0.734	0.776
Alliance Bank Malaysia	0.847	0.774	0.540	0.863	0.729	0.705
AmBank (M) Bhd	1.000	1.000	1.000	0.857	0.726	1.000
Ban Hin Lee Bank	0.674	0.755	0.489	-	-	-
Bangkok Bank	1.000	0.820	1.000	0.878	0.739	0.905
Bank of America Malaysia	0.739	0.575	0.616	0.919	0.939	0.923
Bank of China	0.970	0.892	0.899	-	-	-
Bank of Nova Scotia	1.000	1.000	1.000	1.000	0.842	1.000
Bank of Tokyo-Mitsubishi	1.000	0.911	1.000	0.979	0.805	1.000
Bank Utama	0.751	0.741	0.714	1.000	1.000	1.000
BSN Commercial Bank	0.853	0.634	0.371	0.890	0.925	0.760
Bumiputra Commerce Bank	0.996	0.991	1.000	1.000	1.000	1.000
Chase Manhattan Bank	1.000	1.000	1.000	0.727	0.377	0.543
Citibank	0.885	0.856	0.872	0.970	0.899	0.981
Deutsche Bank	0.749	0.757	0.501	1.000	0.592	1.000
EON Bank	0.790	0.861	0.600	0.920	0.720	0.749
Hock Hua Bank	0.742	0.746	0.537	-	-	-
Hong Leong Bank	0.793	0.763	0.502	0.858	0.913	0.894
HSBC Bank Malaysia	0.880	0.962	0.877	0.812	0.779	0.737
International Bank Malaysia	0.569	0.516	0.296	-	-	-
Maybank	1.000	1.000	1.000	1.000	1.000	1.000
OCBC Bank	0.938	0.912	0.860	0.969	0.865	1.000
Oriental Bank	0.755	0.807	0.548	-	-	-
Overseas Union Bank	0.965	0.922	0.898	-	-	-
Pacific Bank	0.764	0.819	0.582	-	-	-
Phileo Allied Bank	0.647	0.367	1.000	-	-	-
Public Bank	0.636	0.709	0.424	0.853	0.838	0.811
RHB Bank	1.000	1.000	1.000	0.949	0.898	0.951
Sabah Bank	0.672	0.683	0.418	-	-	-
Southern Bank	0.703	0.773	0.519	0.866	0.834	0.821
Standard Chartered Bank	0.837	0.795	0.730	0.999	0.988	1.000

United Overseas Bank	0.855	0.551	0.382	0.940	0.848	0.959
Wah Tat Bank	0.650	0.582	0.318	-	-	-
MEAN FOR ALL BANKS	**0.830**	**0.797**	**0.695**	**0.914**	**0.807**	**0.888**

5.2.3 Robustness Test

Table 5.2 explains the robust result from the parametric and non-parametric tests. The results of cost and profit efficiency from the parametric t-test show that the Malaysian banking sector exhibited a higher mean during post-merger period (0.914>0.830 and 0.888>0.695) and significantly different. The results from the parametric t-test were further confirmed by non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests. Therefore, this indicated that the cost and profit efficiency on Malaysian banking sector improved during post-merger period. Coakes and Steed (2003) suggested that the Mann-Whitney (Wilcoxon) is a relevant test for two independent samples coming from populations having the same distribution. The most relevant reason is that the data violate the stringent assumptions of the independent group's t-test, so it was decided that Mann-Whitney tests should be used.

However, an interesting result was obtained regarding the revenue efficiency during pre-merger and post-merger period in the Malaysian banking sector. The result from parametric t-test exhibited revenue efficiency as higher during post-merger period compared to pre-merger periods (0.807>0.797), but statistically, it was not significantly different. This indicated that the revenue efficiency on Malaysian banking sector did not improve during post-merger period.

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Nevertheless, both the non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests suggested that the result was statistically significant but only at 10% level. This indicated the Malaysian banking sector exhibited higher revenue efficiency during post-merger period but only at the small range due its significant level at only 10%. Since the significant level is low, this study concluded that the revenue efficiency on Malaysian banking sector did not improve during post-merger period.

Table 5.2: Summary of Parametric and Non-Parametric Tests on Pre and Post-Merger Period

	Test groups					
	Parametric test		Non-parametric test			
Individual tests	t-test		Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test	
Hypothesis			MedianPre-merger = MedianPost-merger			
Test statistics	$t(Prb>t)$		$z(Prb>z)$		$X^2 (Prb > X^2)$	
	Mean	t	Mean Rank	Z	Mean Rank	X^2
Cost Efficiency						
Pre-merger	0.830	4.033***	91.35	– 4.423***	91.35	19.56***
Post-merger	0.914		134.43		134.43	
Revenue Efficiency						
Pre-merger	0.797	0.271	109.68	– 1.809*	109.68	3.273*
Post-merger	0.807		127.81		127.81	
Profit Efficiency						
Pre-merger	0.695	5.736***	87.25	– 5.491***	87.25	30.153***
Post-merger	0.888		135.91		135.91	

***, **, * indicates significance levels at 0.01, 0.05, and 0.10, respectively

To verify the difference between the merged and unmerged banks or control banks, this study again performed a series of parametric (t-test) and non-parametric (Mann-Whitney [Wilcoxon]) and Kruskal Wallis test. The results are presented in Table 5.3.

The results of cost and profit efficiency from the parametric t-test showed that the Malaysian banking sector exhibited a lower mean merged bank (0.851<0.912 and 0.731<0.888) and significantly different. The results from the parametric t-test were further confirmed by non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests.

It is interesting to note that the results obtained from the revenue efficiency between the merged and unmerged banks seemed to suggest that the merged banks were relatively more revenue efficient (0.808>0.802), but the difference was not statistically significant under parametric t-test. However, the result was similar through non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests since the significant only at 10% level. Since the results from parametric and non-parametric tests showed the same findings, this study concluded that the revenue efficiency on Malaysian banking sector did not improve in merged bank.

Table 5.3: Summary of Parametric and Non-Parametric Tests on Unmerged and Merged Bank

	Test groups					
	Parametric test		Non-parametric test			
Individual tests	t-test		Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test	
Hypothesis			MedianPre-merger = MedianPost-merger			
Test statistics	$t(Prb>t)$		$z(Prb>z)$		$X^2 (Prb > X^2)$	
	Mean	t	Mean Rank	z	Mean Rank	X^2
Cost Efficiency						
Unmerged bank	0.912	-3.065***	138.120	-5.048***	138.120	25.487***
Merged bank	0.851		91.830		91.830	
Revenue Efficiency						
Unmerged bank	0.802	0.165	128.630	-1.828*	128.630	3.342*
Merged bank	0.808		111.380		111.380	

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Profit Efficiency

Unmerged bank	0.888	– 4.902***	138.740	5.777***	138.740	33.375***
Merged bank	0.731		90.540		90.540	

*** , ** , * indicates significance levels at 0.01, 0.05, and 0.10, respectively

5.3   The Economic Issues

All the econometric issues regarding the stationary normality, multicollinearity, heteroscedasticity and autocorrelation problems need to be identified before estimating the proposed models and discussing the regression results on determinants of revenue efficiency.

5.3.1   Result of Normality Test

The results on the stationary individual normality test of determinants of revenue efficiency are exhibited in Appendix D (Table D1). According to the results, the data normality distributions vary. Based on the skewness range, only three variables are not normally distributed; namely, LLRGL, BDTD, and NIETA because the value of the variables' skewness are not in the range of ±1.96. Meanwhile, the value of kurtosis reported that only two variables are normally distributed (LNTA, LNGDP) because the values of the variables' kurtosis are around the range ±2. Nevertheless, the value of Jarque-Bera statistics reveals that all the determinants' variables are not normally distributed since all variables are statistically significant.

This study also tests the group normality to ascertain whether the data are normally distributed or not as a whole. Appendix D (Table D2) exhibits the group normality test statistics of determinants of revenue efficiency. The results revealed that the

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group value of skewness is -0.767, which indicates that the data are normal since the value is in the range of ± 1.96. Nevertheless, the values of Kurtosis and Jarque-Bera are not normally distributed because the Kurtosis's value is not in the range of ± 2 and the value of Jarque-Bera is statistically significant at 1% level. Therefore, according to Gujarati (2002), the use of GLS method is more suitable and is expected to produce better results.

5.3.2   Result of Multicollinearity Test

Serious multicollinearity problems exist in the simultaneously models exhibited in Appendix E (Table E1). Therefore, this study used the step-wise or separately models in order to reduce the serious multicollinearity problems between the proposed variables. Overall, Appendix E (Tables E2 until E12) showed that all the absolute values of Person's correlation coefficients are relatively low and are less than 0.8. This indicates that majority of the proposed determinants' variables are not faced with the serious multicollinearity problems for all proposed models (Gujarati, 2002). Therefore, the analysis could continue with the selected variables.

However, the serious multicollinearity problems exist in models 3,4,7 and 10 as shown in Appendix E (Tables E4, E5, E8 and E11). Gross domestic product (LNGDP) is found to be highly correlated with dummy post-merger period (DP) in Model 3. Gross domestic product (LNGDP) is found to be highly correlated with size during post merger period (LNTA*DP) in Model 4. Meanwhile, in Model 7 market power (BDTD) is highly correlated with market power during post-merger period (BDTD*DP). Finally, gross domestic product (LNGDP) is highly correlated with

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gross domestic product during post-merger period (LNGDP*DP) in Model 10. Therefore, according to Gujarati (2002), when faced with severe multicollinearity, one of the "simplest" things to do is to drop one of the collinear variables. Therefore, variable of gross domestic product (LNGDP) was dropped from Model 3, 4 10 and variable of market power (BDTD) was dropped from Model 7.

5.3.3   Result of Heteroscedasticity Test

Appendix F (Table F1) exhibits the results of the White General Heteroscedasticity test. The results of F-test for all models (model 1 to 11) reject the null hypothesis of no heteroscedasticity problem, suggesting that the error variance is not constant. Therefore, by applying the GLS regression along with the White's Heteroscedasticity Consistent Standard Errors technique, the heteroscedasticity problem in this study was solved (Gujarati, 2002).

5.3.4   Result of Autocorrelations Test

This study used the Durbin-Watson (DW) to test the autocorrelation problems. Appendix G (Table G1) shows the results of the autocorrelation test which suggest that the entire proposed model has no serial correlation because the value of the DW statistic is around 2 (Gujarati, 2002).

5.4   Results and Tests of GLS

In essence, when the result from the 1st stage identified that the revenue efficiency on Malaysian banking sector did not improve during post-merger period, the study proceeded with the second stage which is to identify the determinants that could improve the revenue efficiency in Malaysian banking sector during the post-merger period. There are eleven models of multivariate regression analysis (MRA) utilised separately under this stage. Model 1 which is a baseline model consists of all six basic proposed bank specific determinants variables: size of bank (LNTA), assets quality (LLRGL), capitalisation (ETA), market power (BDTD), liquidity (LOANSTA) and management quality (NIETA). Model 2 adds the macroeconomic control variables which are gross domestic product (GDP) and inflation (INFL) in estimation regression, and maintains the bank specific variables. Model 3 includes a binary dummy variable (DP) in the regression to examine the relationship between revenue efficiency and the post-merger period, while the other variables in Model 2 remain.

Meanwhile, Model 4 to Model 11 represent the focused models adopted to identify the potential determinants on revenue efficiency in Malaysian banking sectors during the post-merger period. These models (Model 4 to Model 11) retain all the bank specific and macroeconomic variables and include the additional interaction variables which are LNTA*DP, LLRGL*DP, ETA*DP, BDTD*DP, LOANSTA*DP, NIETA*DP, LNGDP*DP and INFL*DP. The interaction of all variables against the dummy post-merger period (DP) produces a specific result on the determinants that

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contribute to the higher revenue efficiency over the post-merger period in Malaysian banking sector.

5.4.1   Determinants of Revenue Efficiency

Appendix H (Table H1) exhibits the multivariate regression analysis (MRA) for all models focusing on the relationship between revenue efficiency of the banks and the explanatory variables using the fixed effect model (FEM). Appendix I (Table I1) shows that the MRA use the random effect model (REM). The results are different for both FEM and REM. Therefore, Hausman test was used in order to decide which estimation technique is more appropriate between FEM and REM. Appendix J (Table J1) shows the Hausman test on FEM and REM. The test suggests that Models 2, 3, 5, 6, 7, 8 and 9, 10 and 11 are appropriate with the REM because the chi square (X^2) is not significant at 5% levels and the other models are suitable with FEM as it is significant at 1% for the chi square.

Finally, Table 5.4 shows the MRA models on the relationship between revenue efficiency and explanatory variables using FEM and REM and all explanations will based on this table. This table produced the results on the potential determinants on the revenue efficiency for the overall of pre-merger and post-merger periods (1995-2009). Next, the determinants on revenue efficiency particularly during post-merger period are produced in Model 4 to 11 with the interaction variables of DP. The equations are based on 245 bank year observation during the period of 1995 to 2009.

Table 5.4: Multivariate Regression Analysis Models under Fixed Effect Model and Random Effect Model

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
CONSTANT	0.724*	0.803	0.566**	1.562**	0.960	2.188**	1.322**	2.099**	1.00*	0.554*	2.949***
Std. Error	0.406	0.582	0.284	0.699	0.622	1.071	0.611	1.041	0.584	0.286	1.113
Determinants Variables											
LNTA	-0.108	0.054	-0.007	–0.309**	0.055	0.052	0.085*	0.040	0.053	-0.004	0.039
Std. Error	0.082	0.061	0.057	0.123	0.061	0.055	0.049	0.056	0.060	0.058	0.061
LLRGL	–0.013***	–0.017***	–0.016***	–0.018**	–0.020***	–0.018***	–0.017***	–0.019***	–0.019***	–0.016***	–0.020***
Std. Error	0.005	0.004	0.004	0.008	0.006	0.004	0.005	0.004	0.004	0.004	0.004
ETA	0.337**	0.253**	0.172	0.224	0.254**	0.121	0.286**	0.227**	0.205*	0.178	0.212*
Std. Error	0.138	0.110	0.110	0.140	0.110	0.121	0.120	0.102	0.111	0.110	0.111
BDTD	3.816***	1.040**	1.388***	4.60***	1.027*	0.988**		1.088**	0.981*	1.368***	1.089**
Std. Error	1.258	0.526	0.509	1.251	0.525	0.492		0.506	0.522	0.511	0.528
LOANSTA	0.002	0.002	0.002**	0.002	0.002	0.002	0.001	0.000	0.002*	0.002**	0.002
Std. Error	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
NIETA	0.070	0.280	0.423	0.082	0.284	0.308	0.314	0.373	0.293	0.412	0.359
Std. Error	0.421	0.304	0.303	0.286	0.304	0.237	0.295	0.241	0.302	0.304	0.305
Macroeconomic Variables											
LNGDP		-0.084			-0.116	-0.324	–0.200*	-0.298	-0.126		–0.441**
Std. Error		0.125			0.133	0.201	0.112	0.190	0.125		0.202
INFL		–0.021**	–0.019**	-0.012	–0.019*	-0.013	–0.018*	-0.013	-0.009	–0.019**	–0.062***
Std. Error		0.010	0.011	0.018	0.011	0.014	0.010	0.014	0.011	0.011	0.021
DP			0.045								
Std. Error			0.051								
Interaction Variables											
LNTA*DP				0.034***							
Std. Error				0.011							
LLRGL*DP					0.005						
Std. Error					0.007						
ETA*DP						0.125*					
Std. Error						0.073					
BDTD*DP							0.953**				
Std. Error							0.368				

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
LOANSTA*DP								0.001*			
Std. Error								0.001			
NIETA*DP									6.900***		
Std. Error									2.532		
LNGDP*DP										0.007	
Std. Error										0.009	
INFL*DP											0.053**
Std. Error											0.024
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**	**Model 11**
R²	0.362	0.193	0.194	0.382	0.196	0.205	0.189	0.199	0.219	0.193	0.210
Adj R²	0.241	0.166	0.166	0.257	0.165	0.175	0.162	0.168	0.189	0.166	0.179
Durbin Watson	2.140	1.828	1.832	2.180	1.827	1.848	1.845	1.871	1.906	1.830	1.901
F-statistic	2.983***	7.058***	7.084***	3.06***	6.347***	6.750***	6.897***	6.468***	7.313***	7.056***	6.920***
Est. tech	FEM	REM	REM	FEM	REM	REM	REM	REM	REM	REM	REM

***, **, * indicates significance levels at 0.01, 0.05, and 0.10, respectively

5.4.2 Bank Specific Variables

Table 5.4 presents the results of baseline model (Model 1) on the determinants of revenue efficiency without macroeconomic control variables, dummy variables and any interaction. This model represents the relationship between revenue efficiency and all possible bank specific determinants throughout the pre-merger and post-merger periods between 1995 and 2009. The results show that the relationship between revenue efficiency and three determinants namely asset quality (LLRGL), capitalization (ETA) and market power (BDTD) is significantly negative and positive in Model 1 and is also consistent in all models. However, the impact of size (LNTA) on the revenue efficiency is only significant in Model 4 and 7, and the liquidity (LOANSTA) is only significant in Model 3, 9 and 10. The management quality (NIETA) is totally insignificant in all models in the estimation regression. Therefore, these three determinants (LNTA, LOANSTA and NIETA) are considered as relatively insignificant in influencing the revenue efficiency in the Malaysian banking sector.

The first significant determinant is LLRGL proxy of asset quality. The coefficient LLRGL reveals a negative relationship and is statistically significant at 1% level (except in Model 4 where it is significant at 5% level). Similar results are applied to all models, indicating that the lower ratio of LLRGL increase the asset quality and lead to higher revenue efficiency. The result indicates that during the period of study (1995 to 2009), the Malaysian banking sector was able to manage and reduce the number of the NPLs. It was aided with the establishment of *Pengurusan Danaharta Nasional Berhad* (Danaharta) and *Danamodal Nasional Berhad* (Danamodal) in

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1998. These entities were set up with the purpose of dealing with the situation of the rising NPLs and recapitalisation of Malaysian banking sector, as well as acting as a catalyst to rationalise the sector. Danaharta had managed RM39.9 billion of NPLs, meanwhile Danamodal had injected RM7.1 billion in the financial institution in reducing the burden of NPLs of the financial institutions. As a result, the asset quality was enhanced due to the reduced NPLs which had increased the revenue of the banking sector. The result is consistent with previous studies such as those by Sufian, (2009), Sufian and Habibullah (2009), Kosmidou (2008) and Cornett et al., (2006) which further support the argument that lower LLRGL banks face higher asset quality and this contributes to higher efficiency.

A second significant determinant is capitalisation proxied by ETA. All models (except Model 3,4,6 and 10) also show significant and positive sign on the coefficient of ETA, suggesting that the larger capitalisation of bank will contribute to the higher revenue efficiency. This is because the large or higher capitalisation could reduce all the risk of bankruptcy and increase the revenue of the bank (Bourke, 1989; Berger, 1995; Angbazo, 1997 and Demirguc-Kunt and Huizinga, 1999). In addition, the positive effect of capital in revenue efficiency shows that by having more capital, bank could easily extend loans and reap higher revenue and profits (Ramlall, 2009).

Finally, the findings suggest that the level of market power (BDTD) is statistically significant and positive, suggesting that the higher market power will contribute to the higher revenue efficiency. The finding is consistent with Pasiouras et al. (2008) and Rezitis (2006) that stated that the bank's market share has a positive effect on efficiency. During the period under study, higher market power had contributed to

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the high bank concentration and therefore, changed both loan rates and market shares in imperfectly competitive loan market. This contributed to the tendency for banks to charge high loan mark-ups (Carletti et al., 2007 and Graeve et al., 2007).

As a conclusion, asset quality, capitalisation and market power represent the significant determinants that lead to the higher revenue efficiency during the pre and post-merger period in the Malaysian banking sector.

5.4.3 Macroeconomic Variables

Model 2 includes the macroeconomic variables as additional control variables in the estimation regression. The result shows the gross domestic product (LNGDP) as being relatively insignificant. While comparing the overall models, only model 7 and 11 suggest that gross domestic product (LNGDP) exhibits significant and negative relationship with bank revenue efficiency from 1995 through 2009. Therefore, gross domestic product insignificantly influences the revenue efficiency based on the overall models. Findings by Sufian and Chong (2008), Kosmidou (2008) and Kosmidou et al. (2005) however, were different with the findings of this research, providing support to the argument that GDP has a significant and positive relationship with bank efficiency. The results may be contra with this study because their studies did not specifically focus on the bank revenue efficiency.

Finally the inflation (INFL) coefficient shows significant and negative relationship with bank revenue efficiency between 1995 and 2009 in all models (except Model 4, 6, 8 and 9). The negative sign states that the lower inflation will lead to the higher

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revenue efficiency of the bank, and this result is also consistent with previous studies such as those by Kosmidou (2008) and Abreu and Mendes (2001). In Malaysian case, the negative relationship with bank revenue efficiency implies that during the period under study, the levels of inflation were unanticipated. Perry (1992) pointed out that the effect of inflation on bank performance depends on whether the inflation is anticipated or unanticipated. To restate, anticipated inflation could be defined as the rate of inflation which most people think will exist at some time in the future. In the anticipated case, the interest rates are adjusted accordingly, resulting in revenues to increase faster than costs; subsequently, gives positive impact on bank performance. On the other hand, unanticipated inflation could be defined as the rate of inflation which has not been predicted by economists and which therefore comes as a surprise to business people, governments and workers. In the unanticipated case, banks may be slow in adjusting their interest rates, resulting in a faster increase of bank costs than revenues; consequently, gives negative effects on bank performance. Therefore, consumers have more capabilities to demand for financial services due to the lower interest rates offered by banks.

As a conclusion, inflation represents a significant determinant that leads to the higher revenue efficiency during the pre and post-merger period in the Malaysian banking sector.

5.4.4 Dummy Post-Merger Variable

The coefficient of DP is relatively insignificant (Model 3) in explaining the revenue efficiency. The results from previous studies indicate that the post-merger period did

not influence the revenue efficiency in the Malaysian banking sector (Ariff and Can, 2008; AL-Sharkas et al., 2007; Ayadi and Pujls, 2005; Huizinga et al., 2001 and Akhavein et al., 1997). They discovered that the M&As led to the improvement of the cost and profit efficiency in the banking sectors. Nevertheless, the level of the cost efficiency is higher instead of the level of profit efficiency which could be due to the revenue inefficiency where banks had managed the costs relatively efficiently, but they had significant inefficiencies (revenue side) in their profit generation.

5.4.5   Robust Test during Post-Merger Period

In essence, asset quality, capitalisation, market power, and inflation represent the determinants that influence the higher revenue efficiency of Malaysian banking sector. However, the second objective of this study is to identify the bank specific determinants of revenue efficiency in Malaysian banking sector, particularly during the post-merger period. It proceeded with robustness test by allowing all the bank specific determinants to interact and by adding control variables (macroeconomic) against the dummy post-merger variable (DP). New six interaction variables LNTA*DP, LLRGL*DP, ETA*DP, BDTD*DP, LOANSTA*DP* and NIETA*DP were included in Model 4 to Model 9. In addition, the two macroeconomic variables (LNGDP*DP and INFL*DP in model 10 and 11) had also interacted against DP. Therefore, for these models the discussion will focus on the results of the new variables added to the baseline specification (Model 1).

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5.4.5.1 Size of Bank

Although the effect of size is insignificant for revenue efficiency of the Malaysian banking sector, the result changed when this study included the interaction variable of LNTA*DP in Model 4. The result shows that the coefficient of LNTA*DP is significantly positive at 1% level, indicating that the higher the size of bank, the higher the revenue efficiency is for the Malaysian banking sector during post-merger period.

5.4.5.2 Asset Quality

The effect of asset quality (LLRGL) on the revenue efficiency of the Malaysian banking sector is significant at 5% level in all models (except Model 4 which is significant at 5% level). Nevertheless, it should be mentioned that the asset quality is insignificant for revenue efficiency when this study considers the interaction against DP (LLRGL*DP) in Model 5.

5.4.5.3 Capitalisation

All models (except Model 3,4,6 and 10) show a significant and positive sign on the coefficient of ETA suggesting that the larger capitalisation of bank will contribute to the higher revenue efficiency. Furthermore, when this study proceeded with the robustness test in Model 6 that made the ETA interact against dummy post-merger variable (ETA*DP), the result remained significant but only at 10% level and it showed positive sign.

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5.4.5.4   Market Power

The effect of market power (BDTD) to the revenue efficiency on the Malaysian banking sector is significantly positive in all models. This indicates that market power can influence revenue efficiency where a higher market power can lead to a higher revenue efficiency. Furthermore, the variable of market power during post-merger period (BDTD*DP) also shows a significant level at 5% and it is positive with revenue efficiency as shown in Model 7.

5.4.5.5   Liquidity

In all models, liquidity (LOANSTA) was not a significant determinant which influences the revenue efficiency in Malaysian banking sector. Nevertheless, when the interaction variable (LOANSTA*DP) was included in Model 8, the result changed to be significant but only at 10% level and showed positive sign.

5.4.5.6   Management Quality

The management quality (NIETA) did not significantly influence revenue efficiency in all models. However, this determinant changed to significantly positive at 1 % level after the robustness test was executed which included the interaction DP variable (NIETA*DP) in regression Model 9.

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5.4.5.7   Macroeconomic

Based on the overall models, growth domestic product (LNGDP) is relatively insignificant in influencing the revenue efficiency in the Malaysian banking sector. However, when this study proceeded with the robustness test in Model 10 that made LNGDP interact against a dummy post-merger variable (LNGDP*DP), the result remained insignificant. This is an indication that the growth domestic product is not a determinant that can influence revenue efficiency in the Malaysian banking sector even during the post-merger period. This finding contradicted earlier finding by Sufian and Habibullah (2009a).

Inflation (INFL) coefficient shows significant and negative relationship with bank revenue efficiency over the years of 1995 to 2009 in all models (except Model 4, 6, 8 and 9). Furthermore, after the interaction of variable (INFL*DP) in Model 11, the coefficient remains significant but shows positive sign. Therefore, inflation represents a macroeconomic determinant that influences the revenue efficiency in the Malaysian banking sector since the coefficient of variable shows a significant level for all periods including the post-merger period. However, during the entire period, the negative relationship with bank revenue efficiency implied that during the period under studies, the levels of inflation were unanticipated. During the post-merger period, the positive sign showed that inflation was anticipated. This indicated that during the post-merger period, the interest rates were adjusted accordingly, resulting in revenues to increase faster than costs; subsequently, giving positive impact on bank performances. Banks will charge a higher interest rate and obtain higher revenue.   Other studies (Molyneux and Thornton, 1992; Demirguc-Kunt and

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Huizinga, 1999; Pasiouras and Kosmidou, 2007 and Sufian, 2009) have also shown a positive relationship between either inflation or long-term interest rate and profitability.

5.5 Hypothesis Analysis

5.5.1 Hypothesis 1

The result of this study fails to reject null hypothesis 1 (H1 not supported) because the results from pre-merger and post-merger periods show that they are not statistically different using the parametric t-test and non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests. This study also fails to support the operational synergy theory because the merged banks may not be able to enjoy an efficient operation, greater income or both due to the higher cost involved in running the event of M&As. This indicates that the revenue efficiency on Malaysian banking sector did not improve during the post-merger period. The findings are consistent with several studies such as Ariff and Can (2008), AL-Sharkas et al. (2007) Huizinga et al. (2001) and Akhavein et al. (1997). They discovered that M&As did not improve the bank's revenue efficiency since the level of cost efficiency was higher than profit efficiency. Although cost and profit efficiency were improved, banks may still face with the revenue inefficiency as a result of producing a small number of outputs, producing too much or little of cheaper or expensive outputs and selling outputs inefficiently.

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5.5.2 Hypothesis 2

This study rejects null hypothesis 2 (H2 supported) since the results show that bank size has significant influence on revenue efficiency during the post-merger period. The result shows (Model 4) that the coefficient of LNTA*DP is significantly positive at 1% level, indicating that the larger the size of bank, the higher revenue efficiency is for the Malaysian banking sector during post-merger period. In addition, the financial synergy theory is also supported in this study which might be due to the higher assets and large number of branches provided by acquirer banks. The result is also consistent with Al-Sharkas et al., (2008), Cornett et al. (2006) and Akhavein et al. (1997), providing support to the argument that big banks involved in M&As scheme produced a higher revenue efficiency compared to the medium and small banks. The mergers of large banks recorded higher improvements in profit efficiency rather than small bank mergers because the higher costs are compensated by the higher revenue received via quality services. Besides, large banks appear to be better able to capitalise on revenue enhancement and to have better cost cutting opportunities after a merger compared to small banks.

5.5.3 Hypothesis 3

This study fails to reject null hypothesis 3 (H3 not supported) since the results show that asset quality of bank has no significant influence on the revenue efficiency during post-merger period. This study fails to support the differential managerial theory because the merged banks might fails to produce an innovation, quality and attractive products due to the limited skills. The findings (Model 5) suggest that the

asset quality during post-merger period (LLRGL*DP) was insignificant, indicating that the asset quality did not influence the revenue efficiency of during the post-merger period. However, this finding was found to contradict with the previous studies such as those by Ismail et al., 2009, Cornett et al., 2006; Cornett and Tehranian, 1992; and Kosmidou, 2008. Ismail et al., 2009 found that the loan quality (output quality) had improved after the merger since the evidence on improved loan quality is obvious due to the significant estimate of -0.47% (decreased) for the abnormal industry-adjusted post merger performance in the 'Loan Loss Reserve to Gross Loans' (LLRGL) ratio.

5.5.4 Hypothesis 4

This study fails to reject null hypothesis 4 (H4 not supported) since the results show capitalisation of bank insignificantly influences the revenue efficiency during post-merger period. The result of capitalisation during post-merger period (ETA*DP) was significantly positive but only at 10% level and showed positive sign in Model 6. The theory of financial synergy is also not supported in this study which could be because the merged banks that fail to make a potential investments due to limited capital. This indicates that larger capital did not contribute to the higher revenue efficiency in the Malaysian banking sector during the post-merger period. Most of the previous studies such as Casu and Girardone (2004), Carvallo and Kasman (2005) Athanasoglou et al. (2008) showed contradictory result where the well-capitalised banks were found to lead to the higher profitability.

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5.5.5 Hypothesis 5

This study rejects null hypothesis 5 (H5 supported) since the results show market power of bank has a significant influence on the revenue efficiency during post-merger period. The result of market power during post-merger period (BDTD*DP) was significant at 5% level and was positive with revenue efficiency in Model 7. This study supports the informational and signalling theory which could be because the merged banks convey a picture of supremacy to the public. This result was also similar with findings from previous studies where the event of M&As increased the market power of large banks and led to higher revenue efficiency. The large market power is a result of the large market share through M&As (Group of Ten, 2001 and Carletti et al., 2007). Banks with a large market share will have the tendency to charge high loan mark-ups and pay low deposit rates This supports relative market power hypothesis (Berger, 1995; Carletti et al., 2007; Graeve et al., 2007) which states that a bank with a large market share in a certain product market may be able to set interest rates less competitively for that particular product. Besides, Oladepo (2010) and Demirguc-Kunt et al. (2004) also suggest that the large market power of banks reduces the number of the rivals which in turn contributes to the higher monopoly power of bank. A higher monopoly power allows banks to enjoy a higher net interest margin.

5.5.6 Hypothesis 6

This study fails to reject null hypothesis 6 (H6 not supported) since it shows that liquidity of bank has insignificantly influence the revenue efficiency during the post-

merger period. The result of liquidity during post-merger period (LOANSTA*DP) was statistically significant but only at 10% level and showed positive sign with revenue efficiency in Model 8. This study also fails to supports the financial synergy theory because merged banks might lack of inputs to produce more output due to the shortage of liquidity. This indicated that the larger liquidity did not contribute to the higher revenue efficiency in the Malaysian banking sector during the post-merger period. However, several studies found an opposite result on liquidity and its influence on efficiency during the post-merger period (Pana et al., 2010, Diamond and Rajan, 2000, Diamond and Rajan, 2001 and Gorton and Winton, 2000) .

5.5.7 Hypothesis 7

This study rejects null hypothesis 7 (H7 supported) since the management quality of bank shows a significant influence on the revenue efficiency during post-merger period. The result of management quality during post-merger period (NIETA*DP) was significantly positive at 1 % level with revenue efficiency in Model 9. The inefficient management theory is relevant in this study because merged banks may transfer their superior management skills to the less superior bank. The positive coefficient indicates that the higher costs used by management led to the higher quality management and contributed to the higher revenue efficiency during the post-merger period. The study by Berger (1995) and Athanasoglou et al. (2008) provided the evidence that superior management were able to raise profits and market shares. The revenue could also increase when superior banks share their management skills with the less superior banks (Berkovitch et al., 1993 and Bader et al., 2008). According to Athanasoglou et al. (2008), bank expenses are also a very important

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determinant of profitability, closely related to the notion of efficient management. In fact, there has been an extensive literature based on the idea that an expenses-related variable should be included in the cost part of a standard microeconomic profit function. For example, the studies by Bourke (1989) and Molyneux and Thornton (1992) discovered a positive relationship between better quality management and profitability.

Table 5.5: Summary of Findings

	Hypotheses	Result
H1	Revenue efficiency is significantly different between pre-merger and post-merger period in banking sector.	Not Supported
H2	Bank size has a significant influence on the revenue efficiency during post-merger period.	Supported
H3	Asset quality of bank has a significant influence on the revenue efficiency during post-merger period.	Not Supported
H4	Capitalisation of bank has a significant influence on the revenue efficiency during post-merger period.	Not Supported
H5	Market power of bank has a significant influence on the revenue efficiency during post-merger period.	Supported
H6	Liquidity of bank has a significant influence on the revenue efficiency during post-merger period.	Not Supported
H7	Management quality of bank has a significant influence on the revenue efficiency during post-merger period.	Supported

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CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter provides the implications of the study, its limitations and suggestions for future research.

6.2 Conclusion

The study was carried out with the main purpose of identifying the effects that M&As had on the revenue efficiency in the Malaysian banking sector during the pre-merger and post-merger period. To ascertain the potential bank specific determinants that influence revenue efficiency during post-merger period was another of its major objective.

To recap, the majority of the researchers had focused more on the effects of M&As on cost and profit efficiency in banking sectors and only a few had looked at the effects of M&As on revenue efficiency. In addition, much of the prior work highlighted on the voluntary bank merger (market-driven) where the acquirers and targets were not urged to merge by the government, but they did it based on their own initiative (Berger et al., 1996 and Cornett et al., 2006). In the Malaysian context, bank M&As scheme took place out of order by the regulators; that is, based on a forced merger (Sufian and Habibullah, 2009 and Sufian, 2009).

The studies that have mostly covered cost efficiency included those by Pilloff, 1996 and Sufian and Habibullah, 2009, while the studies that have their main focus on profit, or cost and profit efficiency included those by Ariff and Can, 2008 and Sufian, 2009).

Most studies focused more on the improvement in M&As but they have ignored the revenue efficiency side when in fact, it should be looked into in depth. It is because profit efficiency is the efficiency concept that provides a more favourable picture of banks M&As due to the consideration of the choice of production vector on costs and revenues (e.g. Al-Sharkas et al., 2008; and Akavein et al., 1997).

Although profit maximisation is the ultimate reason in bank M&As in order to maximise shareholder's wealth (e.g. Ahmad et al., 2007 and Chong et al., 2006), the revenue efficiency factor should not be undermined. In fact, empirical evidence has shown that profit inefficiency is quantitatively more important than cost inefficiency. Besides, information on revenue efficiency found in previous mergers could be used to assist regulators in making decisions about future mergers that will maximise the profitability and efficiency of the overall banking sector (Cornett et al., 2006).

Recent studies that have combined both cost and profit efficiency discovered that the different levels between cost and profit efficiency are caused by the inefficiencies on the revenue side (Ariff and Can, 2008 and Bader et al., 2008). Thus, revenue efficiency influences profit efficiency, which is the main objective of the M&As (Berger and Mester, 2003).

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Since there have been a lack of research that looked at the improvement of revenue efficiency in the event of M&As in the banking sector, this study was carried up with the intention to add knowledge to this particular area. It adopts and extends the work of Bader et al. (2008), which had examined the cost, revenue and profit efficiency of conventional and Islamic Banks. Their finding suggested that the cost efficiency was higher rather than profit efficiency due to the lower revenue efficiency in conventional and Islamic banks. They also found that there were no significant difference in the overall efficiency results between conventional and Islamic banks. The present study has specifically attempted to examine the effects of the M&A event on revenue efficiency in the Malaysian banking sector, before and after the merger.

The data gathered focused on the two years preceding the year of the merger, and eight years after the merger (-2,8). Although the entire mergers took place starting in 1995 and ended in 2009, the study had decided to exclude the years during recession (1997 to 1999) as well as the cooling year period (2001). This was to safeguard the validity of the study and minimise possible biases which might otherwise interfere with the results. In total, only 10 years were covered in this study (1995 to 1996 and 2002 to 2009). The periods were divided into two event windows; the pre-merger period (1995 to 1996), and the post-merger period (2002 to 2009).

The data collected included the year 2000 in which mega-merger took place in Malaysia (Sufian, 2009). The sample consisted of 34 commercial banks in total which included the control group (14 domestic commercial banks involved with M&As and 20 domestic and foreign commercial banks not involved in M&As in

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Malaysia). Analyses of data were done only on commercial banks that made commercial loans and accepted deposits from the public. Finance companies, Investment Banks and Islamic banks were excluded from the sample. The main purpose for doing so was to maintain the homogeneity among the banks (Sufian, 2007). The analysis compared the mean revenue efficiency, both during the pre and the post-merger periods. To allow efficiency and inefficiency to vary over time, the efficiency frontiers were constructed each year by solving the linear programming problems rather than by constructing a single multi-year frontier (Sufian, 2009). Data Envelopment Analysis (DEA) method was applied to measure the level of revenue efficiency as a result of M&As. The data were tested by parametric (t-test) and non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests.

The analyses have shown that Malaysian banking sector exhibited a mean cost efficiency, revenue efficiency and profit efficiency of 83%, 79.7% and 69.5%, respectively, during the pre-merger period, and 91.4%, 80.7% and 88.8%, respectively, during the post-merger period. In essence, all the efficiency concepts have improved due to the event of M&As. However, the profit efficiency is lower than cost efficiency due to the higher revenue inefficiency or lower revenue efficiency. Therefore, it can be said that revenue efficiency could influence the level of the profit efficiency on the Malaysian banking sector.

An interesting result was obtained regarding the revenue efficiency during pre-merger and post-merger period in Malaysian banking sector through the robust test. Albeit result from parametric t-test exhibited revenue efficiency as higher during post-merger period compared to pre-merger periods (0.807>0.797), but statistically,

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it was not significantly different. Furthermore, Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests also produced similar results. It can be concluded that the revenue efficiency in the Malaysian banking sector did not improve during post-merger period.

Other than addressing the effects of the M&As on the Malaysian banking sector in revenue efficiency, this study had also focused on examining the determinants of revenue efficiency particularly during the post-merger period. Since the DEA result showed that the revenue efficiency in Malaysian banking sector did not improve during post-merger period, this study moved on to the second stage which was to identify the determinants that could improve the revenue efficiency during the post-merger period.

The six bank specific determinants that were examined were the size of bank, asset quality, capitalisation, market share, liquidity and management quality. Gross domestic product and inflation were two external determinants included to serve as additional control variables. To identify the significant relationship between revenue efficiency and those potential determinants under the second stage, the study used the Multivariate Regression Analysis (MRA). This stage applied the Generalized Least Square (GLS) method consisted of Fixed Effect Model (FEM) and Random Effect Model (REM) tested by Hausman test. To obtain robust result, all potential determinants interacted with dummy variables during the post-merger period.

It was found that the three bank specific determinants that influenced the revenue efficiency of the Malaysian banking sector during the post-merger period were the

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size of bank, market power, and management quality. The improvement of the revenue efficiency in Malaysian banking sector during post-merger period was also influenced by the inflation macroeconomic variable which was the additional control variable (external).

6.3   Implications of the study

In view of the increasing competition resulting from the deregulation and liberalisation in the banking sector, the continued success of the Malaysian financial sector depends on its efficiency and competitiveness (Sufian, 2009). This study has discovered that the revenue efficiency in Malaysian banking sector did not improve during post-merger period, and it has also discovered the potential determinants that have influenced the improvement of the revenue efficiency in the Malaysian banking sector during the post-merger period. This information could be useful to several parties and may have several implications for regulators, bankers, investors and academicians.

These findings might suggest that regulators or the decision makers in the government review the effects of M&As on the revenue efficiency of the Malaysian banking sector. This consideration is vital because revenue efficiency is the most important efficiency concept as lower profit efficiency can be identified from it (Akhavein et al. 1997). The regulators can find ways and make decisions to further improve the revenue efficiency in Malaysian banks in order to increase the profitability of the banks. The efficiency improvement in banking system is essential to the Malaysian economics especially for the private sectors which depend on

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banking institutions for economic growth. Based on this study, Malaysian has taken a wise action to improve the efficiency of the banks through the forced mega-merger of domestic commercial banks. The decision to take this action was influenced by the foreign bank competition, over-banked number and Asian financial crisis.

The forced merger scheme needs to be reviewed since there is no improvement on the banks' revenue efficiency. Even though the result shows that the effect of M&As could not improve the revenue efficiency in the Malaysian banking sector, regulators might be able to identify the potential determinants that might help. The study has identified the size of bank, market power and management quality as the three bank specific determinants that have influenced the revenue efficiency during the post-merger period. The information could be used to improve revenue efficiency in the Malaysian banking sector.

Although the theory of M&A states that mergers may lead to an increase in the efficiency, the results obtained in this study contradicts with this theory. Therefore, based on the information found thus far with regard to M&As, the policy maker may revised the existing documentation guidelines and come up with a new proposal to improve the effect bank M&As on revenue efficiency in Malaysian banking sector. The acquirers and targets banks need to better able understand the underlying concepts of M&As and to have informed judgement about the determinants before they decide to proceed with the event of M&As. The Bank Negara Malaysia as government representative may also introduce the voluntary merger scheme rather than the forced merger scheme to encourage the banks to decide on their own acquirers or targets in order to improve the revenue efficiency.

The result could also provide better information and guidance to the banking sector itself. As the main player in improving Malaysian banking revenue efficiency, banks need to have better understanding of the effects of the M&As on their performance. For the M&As future undertaking, banks need to consider all the potential determinants that can improve the revenue efficiency since the main motive of bank M&As is to maximise the shareholder value or wealth through maximising the profit. The acquirer banks are required to identify the potential target banks before they decide to involve with merger.

Since the result shows that the large size of bank, market power and management quality during post-merger period had improved the banks' revenue efficiency, the acquirer banks can be recommended to merge with the target banks that can fulfil all the criteria for the potential bank specific determinants. It was seen that the mergers of large banks recorded higher improvements in profit efficiency rather than small bank mergers because the higher costs are compensated by the higher revenue received via quality services (Al-Sharkas et al., 2008 and Cornett et al., 2006). Banks with a large market share will have the tendency to charge high loan mark-ups and pay low deposit rates (Berger, 1995; Carletti et al., 2007; Graeve et al., 2007). Larger banks have also improved in their quality of management which in turn, improved their revenue efficiency (Berkovitch et al., 1993 and Bader et al., 2008).

Furthermore, the results of the study may have some implications for investors whose main desire is to reap higher profit from their investments. In so doing, they concentrate mostly on the potential profitability of the firms or banks before investing. However, in Malaysia, the investors should not rely only on the profit side

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because the profit is the final result after cost and revenue. Based on the results of this study, the revenue efficiency is the main factor that leads to the higher or lower banks' profitability. Investors may evaluate the performance of the banks involved with M&As through the results of revenue efficiency. Investors are able to identify the future performance of the bank's revenue efficiency if all the potential determinants to improve revenue are taken seriously by the banks. Therefore, the findings of this study may help the investors to plan and strategise their investment portfolio performance. A wise decision making that investors make today will determine their level of expected return in the future

The final implication is for the academicians who wish to take up new research in this area to fill the gap of existing studies and add on more knowledge pertaining to this area. Most previous studies have revealed an improvement in cost and profit efficiency in banking sectors as a result of the M&As, while this study has discovered that the revenue efficiency in Malaysian banking sector did not improve during post-merger period in contrast to the finding of the present study. Therefore, this research provides additional knowledge on the importance of investigating the effects of the M&As on the banking revenue efficiency instead of merely concentrating on cost and profit efficiency. Other than that, even though the M&As were not statistically significant in contributing to the improvement of the revenue efficiency, this study had managed to identify the bank specific determinants that can enhance the revenue efficiency in the Malaysian banking sectors. With this information, future studies might investigate further on the revenue efficiency side and further identify the revenue efficiency's potential determinants to add or complement the current body of the literature on the bank efficiency in M&As event.

6.4   Limitations and Suggestions for Future Research

This section presents possible limitations of the study and suggestions for future research. In this research, the first limitation is on its approach. As mentioned, the two main approaches widely used in banking are production and intermediation approaches (Sealey and Lindley, 1977). Each approach produces different results. The study had adopted an intermediation approach. Therefore, for future research, this study recommends the use of both approaches in investigating the effects of M&As on the revenue efficiency in the Malaysian banking sectors.

The second limitation is with regards to the differences in the total number of years selected for study between the pre-merger (1995 to 1996) and the post-merger (2002 to 2009). As can be seen, the pre-merger period only covered two years as opposed to eight years for the post-merger period. One reason for pre-merger data to start in 1995 was because the data prior to that was not available for the study. Future research may suggest that to overcome this limited data, the study could include the data for 1997 to 2001 as well. It should be mentioned that data during the periods of 1997 through 2001 are unstable, and this could produce biases in the results. However, such biases could be solved by including the dummy crisis period, dummy during merger period and dummy cooling period variables when running the regression.

The final limitation lies on the study's constraints from considering the revenue efficiency's results of each bank that were involved with M&As (both the acquirer and target banks). Since the objective of the study is to examine the effect of M&As

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on the overall Malaysian banking sector, the results on each acquirer and target banks that were involved with M&As were not discussed. Therefore, it is suggested that future study look at a more specific bank's M&As and the overall Malaysian banking sector for more details and robust results.

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TABLE A1: INITIAL SIX ACQUIRERS AND TARGETS BANKS PROPOSED BY BANK NEGARA MALAYSIA ON 29TH JULY 1999 UNDER FORCED MERGER SCHEME

No	Acquirers	Group of Banking Institution	
		Subsidiaries	Targets
1	Alliance Bank Malaysia Bhd[1]		Sabah Bank Bhd
			International Bank Malaysia Bhd
			Bolton Finance Bhd
			Sabah Finance Bhd
			Bumiputra Merchant Bankers Bhd
			Amanah Merchant Bank Bhd
			RHB bank Bhd
			RHB Sakura Merchat Bankers Bhd
			Sime Bank Bhd
			MBF Finance Bhd
			PhileoAllied Bank (Malaysia) Bhd
			Oriental Bank Bhd
2	Bumiputra-commece Bank Bhd	Bumiputra-Commerce Finance Bhd	Commercial Interntional Merchant Bankers Bhd
			Credit Corporation (Malaysia) Bhd
			Hong Leong Bank Bhd
			Hong Leong Finance Bhd
3	Malayan Banking Group	Mayban Finance Bhd Aseambankers Malaysia Bhd	The Pacific Bank Bhd
			Sime Finance Bhd
			Kewangan Bersatu Bhd
			EON Bank Bhd
			EON Finance Bhd
			Amanah Merchant Bank Bhd
			Delta Finance Bhd
			Malaysia International Merchant Bankers Bhd
4	Affin Bank Bhd[2]	Affin Finance Bhd Perwira Affin Merchant Bank Bhd	BSN Commercial Bank (Malaysia) Bhd
			BSN Finance Bhd
			BSN Merchant Bank Bhd

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[1] formerly known as Multi-Purpose Bank Bhd
[2] formerly known as Perwira Affin Bank Bhd

			Arab-Malaysian Bank Bhd
			Arab-Malaysian Finance Bhd
			Bank Utama (Malaysia) Bhd
5	Public Bank Bhd	Public Finance Bhd	Hock Hua Bank Bhd
			Sime Merchant Bankers Bhd
			Wah Tat Bank Bhd
			Interfinance Bhd
			Advance Finance Bhd
6	Southern Bank Bhd	Southern Finance Bhd Southern Investment Bank Bhd	Ban Hin Lee Bank Bhd
			Cempaka Finance Bhd
			Perdana Finance Bhd
			City Finance Bhd
			United Mrchant Finance Bhd
			Perdana Merchant Bankers Bhd
			Perkasa Finance Bhd

Sources:
1) Bank Negara Annual Report 1999
2) Ahmad (2007), Ahmad et al. (2007), Chong et al. (2006)

APPENDIX B

TABLE B1: FINAL TEN ACQUIRERS AND TARGETS BANKS PROPOSED BY BANK NEGARA MALAYSIA ON 14TH FEBRUARY 2000 UNDER REVISED MERGER SCHEME

No	Acquirers	Group of Banking Institution	
		Subsidiaries	Targets
1	Alliance Bank Malaysia Bhd		Sabah Bank Bhd
			International Bank Malaysia Bhd
			Bolton Finance Bhd
			Sabah Finance Bhd
			Bumiputra Merchant Bankers Bhd
			Amanah Merchant Bank Bhd
2	AmBank (M) Bhd	Arab-Malaysian Finance Bhd	MBF Finance Bhd
3	Bumiputra-commece Bank Bhd	Bumiputra-Commerce Finance Bhd	Commercial Interntional Merchant Bankers Bhd
			Bank Bumiputra
4	EON Bank Bhd	EON Finance Bhd	Oriental Bank Bhd
			City Finance Bhd
			Perkasa Finance Bhd
			Malaysian International Merchant Bankers Bhd
5	Hong Leong Bank Bhd	Hong Leong Finance Bhd	Wah Tat Bank Bhd
			Credit Corporation (Malaysia) Bhd
6	Malayan Banking Group	Mayban Finance Bhd Aseambankers Malaysia Bhd	PhileoAllied Bank Bhd
			The Pacific Bank Bhd
			Sime Finance Bhd
7	Affin Bank Bhd	Affin Finance Bhd Perwira affin Merchant Bank Bhd	BSN Commercial Bank Bhd
			BSN Finance Bhd
			Asia Commercial Finance Bhd
			BSN Merchant Bank Bhd
8	Public Bank Bhd	Public Finance Bhd	Hock Hua Bank Bhd
			Advance Finance Bhd
			Sime Merchant Bankers Bhd
9	RHB Bank Bhd	RHB Sakura Merchant Bankers Bhd	Bank Utama (Malaysia) Bhd
			Delta Finance Bhd
			Interfinance Bhd
10	Southern Bank Bhd	Southern Finance	Ban Hin Lee Bank Bhd

		Company Bhd/	Cempaka Finance Bhd
		Southern Investment Bank	Perdana Finance Bhd
		Bhd	United Merchant Finance Bhd
			Perdana Merchant Bankers Bhd

Sources:
1) Bank Negara Annual Report 2001
2) Ahmad (2007), Ahmad et al. (2007), Chong et al. (2006)

TABLE C1: DESCRIPTIVE STATISTICS FOR OUTPUTS, INPUTS, OUTPUTS PRICES AND INPUTS PRICES

Variables	Minimum (RM mil.)	Maximum (RM mil.)	Mean (RM mil.)	Std. Deviation (RM mil.)
y1	38.300	185,783.200	19,848.644	29,665.862
y2	39.700	61,677.500	5,758.159	8,673.051
y3	4.600	129,453.300	13,283.386	18,945.448
x1	190.100	243,132.000	27,953.100	41,139.726
x2	3.600	61,176.000	471.753	3,739.649
x3	0.700	1,420.000	226.940	331.046
r1	0.034	2.512	0.143	0.213
r2	0.001	1.194	0.360	0.472
r3	0.001	3.630	0.030	0.221
w1	0.005	0.130	0.034	0.016
w2	0.002	6.336	0.031	0.387
w3	-0.286	15.971	2.148	2.507

y1: Loans (net loans and interbank lending), y2: Investment (short-term, long term and entrusted investment or securities), y3: Off-balance sheet items (value of the off-balance sheet activities), x1: Deposits (total deposits, money market and short term funding), x2: Labour (personnel expenses), x3: Physical capital (interest income on loans and other interest income/ loans), r1: Price of loans (interest income on loans and others interest income/ loans), r2: Price of investment (other operating income/ investment), r3: Price of off-balance sheet items (net fees and commissions/ off-balance sheet items), w1: Price of deposits (total interest expenses/ deposits), w2: Price of labour (personnel expenses/ total assets) and w3: Price of physical capital (other operating expenses/ fixed assets).

APPENDIX D

TABLE D1: INDIVIDUAL NORMALITY TEST STATISTICS OF DETERMINANTS OF REVENUE EFFICIENCY

	RE	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL
Mean	0.804	4.094	4.377	0.981	0.041	53.287	0.024	5.637	2.653
Median	0.881	4.187	3.330	0.920	0.029	59.769	0.011	5.676	3.000
Maximum	1.000	5.492	35.570	1.776	0.293	87.862	0.630	5.871	5.441
Minimum	0.050	2.713	0.780	0.549	0.000	1.378	0.000	5.347	0.583
Std. Dev.	0.235	0.688	3.889	0.221	0.052	19.101	0.051	0.178	1.354
Skewness	-1.279	-0.128	4.205	1.148	2.354	-1.374	7.857	-0.431	0.309
Kurtosis	3.853	1.985	27.002	3.934	9.084	3.957	85.854	1.819	2.431
Jarque-Bera	74.271	11.187	6602.764	62.686	604.256	86.411	72598.250	21.816	7.196
Probability	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.027

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TABLE D2: GROUP NORMALITY TEST STATISTICS OF DETERMINANTS OF REVENUE EFFICIENCY

Series: Residuals	
Sample 2 497	
Observations 245	
Mean	5.41e-16
Median	0.026174
Maximum	0.440577
Minimum	-0.721128
Std. Dev.	0.207810
Skewness	-0.766735
Kurtosis	3.506452
Jarque-Bera	26.62356
Probability	0.000002
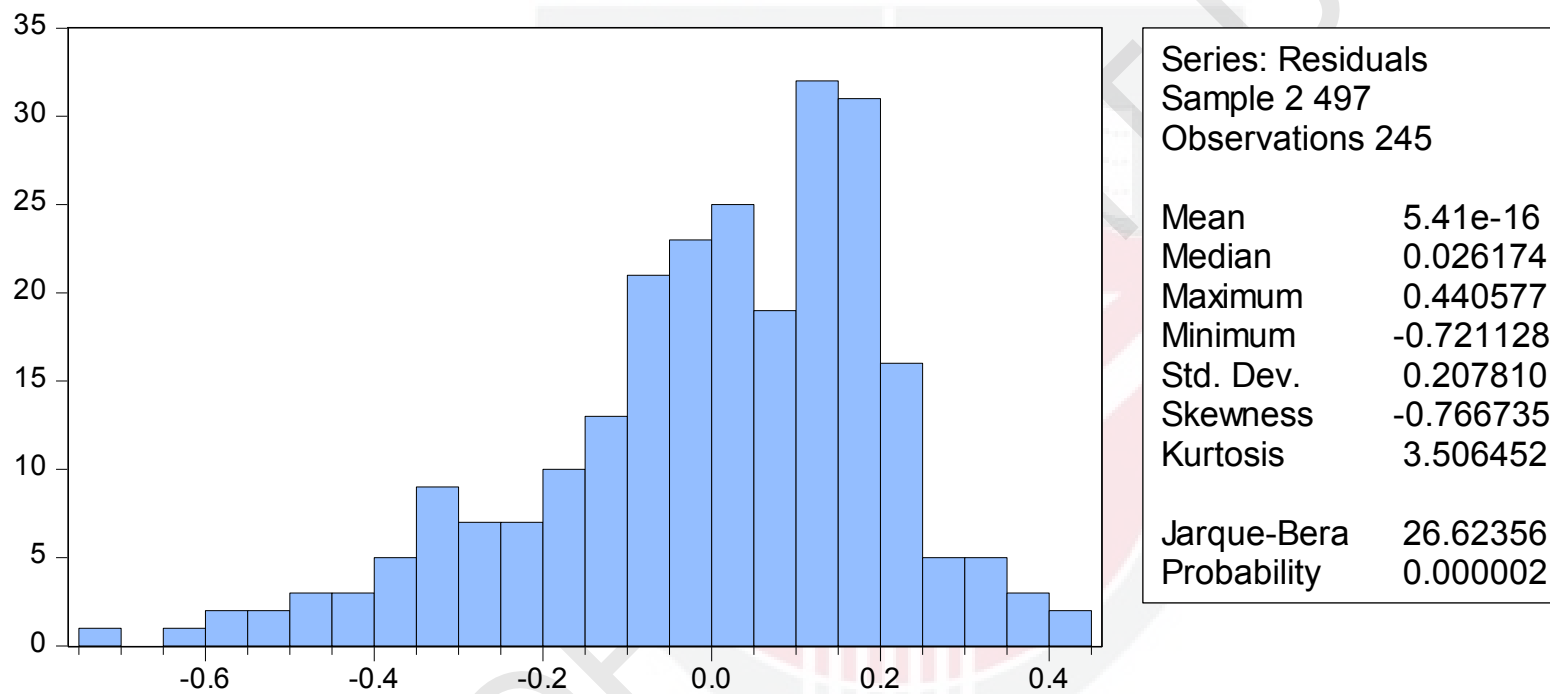
TABLE E1: PEARSON'S CORRELATION FOR SIMULTANEOUSLY MODELS

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	DP	LNTA*DP	LLRGL*DP	ETA*DP	BDTD*DP	LOANSTA*DP	NIETA*DP	LNGDP*DP	INFL*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.350**	.593**	.019	.015	.755**	.565**	-.069	.355**	.262**
		.065	.000	.000	.000	.002	.000	.215	.000	.000	.767	.820	.000	.000	.284	.000	.000
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.226**	.154*	.755**	.266**	.003	-.007	.379**	.217**	.028
			.000	.398	.000	.089	.379	.000	.000	.016	.000	.000	.968	.911	.000	.001	.668
ETA			1	-.376**	-.401**	-.050	.027	-.085	.095	-.142*	.199**	.493**	-.322**	-.163*	.316**	.091	.019
				.000	.000	.439	.675	.187	.138	.027	.002	.000	.000	.010	.000	.155	.765
BDTD				1	.262**	-.067	.110	-.037	.116	.312**	-.019	-.048	.831**	.292**	-.040	.117	.078
					.000	.295	.085	.561	.070	.000	.767	.452	.000	.000	.535	.069	.225
LOANSTA					1	.148*	-.275**	.038	-.266**	-.103	-.444**	-.400**	.211**	.362**	-.369**	-.268**	-.217**
						.020	.000	.553	.000	.109	.000	.000	.001	.000	.000	.000	.001
NIETA						1	-.481**	.147*	-.494**	-.484**	-.256**	-.430**	-.215**	-.407**	-.203**	-.496**	-.341**
							.000	.022	.000	.000	.000	.000	.001	.000	.001	.000	.000
LNGDP							1	-.117	.882**	.867**	.377**	.771**	.364**	.664**	.279**	.897**	.728**
								.067	.000	.000	.000	.000	.000	.000	.000	.000	.000
INFL								1	-.361**	-.328**	-.361**	-.349**	-.140*	-.322**	-.441**	-.347**	.488**
									.000	.000	.000	.000	.028	.000	.000	.000	.000
DP									1	.953**	.587**	.903**	.403**	.785**	.587**	.999**	.637**
										.000	.000	.000	.000	.000	.000	.000	.000
LNTA*DP										1	.495**	.755**	.599**	.850**	.464**	.955**	.621**
											.000	.000	.000	.000	.000	.000	.000
LLRGL*DP											1	.595**	.143*	.266**	.604**	.577**	.252**
												.000	.025	.000	.000	.000	.000
ETA*DP												1	.200**	.600**	.648**	.901**	.557**
													.002	.000	.000	.000	.000
BDTD*DP													1	.530**	.121	.403**	.261**
														.000	.058	.000	.000
LOANSTA*DP														1	.317**	.782**	.468**
															.000	.000	.000
NIETA*DP															1	.570**	.185**
																.000	.004
LNGDP*DP																1	.649**
																	.000
INFL*DP																	1

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

TABLE E2: PEARSON'S CORRELATION TEST MODEL 1

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA
LNTA	1	-.118	-.677**	.753**	.347**	-.196**
		.065	.000	.000	.000	.002
LLRGL		1	.229**	-.054	-.417**	-.109
			.000	.398	.000	.089
ETA			1	-.376**	-.401**	-.050
				.000	.000	.439
BDTD				1	.262**	-.067
					.000	.295
LOANSTA					1	.148*
						.020
NIETA						1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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TABLE E3: PEARSON'S CORRELATION TEST MODEL 2

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079
		.065	.000	.000	.000	.002	.000	.215
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**
			.000	.398	.000	.089	.379	.000
ETA			1	-.376**	-.401**	-.050	.027	-.085
				.000	.000	.439	.675	.187
BDTD				1	.262**	-.067	.110	-.037
					.000	.295	.085	.561
LOANSTA					1	.148*	-.275**	.038
						.020	.000	.553
NIETA						1	-.481**	.147*
							.000	.022
LNGDP							1	-.117
								.067
INFL								1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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TABLE E4: PEARSON'S CORRELATION TEST MODEL 3

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.350**
		.065	.000	.000	.000	.002	.000	.215	.000
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.226**
			.000	.398	.000	.089	.379	.000	.000
ETA			1	-.376**	-.401**	-.050	.027	-.085	.095
				.000	.000	.439	.675	.187	.138
BDTD				1	.262**	-.067	.110	-.037	.116
					.000	.295	.085	.561	.070
LOANSTA					1	.148*	-.275**	.038	-.266**
						.020	.000	.553	.000
NIETA						1	-.481**	.147*	-.494**
							.000	.022	.000
LNGDP							1	-.117	.882**
								.067	.000
INFL								1	-.361**
									.000
DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE E5: PEARSON'S CORRELATION TEST MODEL 4

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	LNTA*DP
LNTA	1	-.118	-.677[**]	.753[**]	.347[**]	-.196[**]	.385[**]	-.079	.593[**]
		.065	.000	.000	.000	.002	.000	.215	.000
LLRGL		1	.229[**]	-.054	-.417[**]	-.109	.056	-.223[**]	.154[*]
			.000	.398	.000	.089	.379	.000	.016
ETA			1	-.376[**]	-.401[**]	-.050	.027	-.085	-.142[*]
				.000	.000	.439	.675	.187	.027
BDTD				1	.262[**]	-.067	.110	-.037	.312[**]
					.000	.295	.085	.561	.000
LOANSTA					1	.148[*]	-.275[**]	.038	-.103
						.020	.000	.553	.109
NIETA						1	-.481[**]	.147[*]	-.484[**]
							.000	.022	.000
LNGDP							1	-.117	.867[**]
								.067	.000
INFL								1	-.328[**]
									.000
LNTA*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE E6: PEARSON'S CORRELATION TEST MODEL 5

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	LLRGL*DP
LNTA	1	-.118	-.677[**]	.753[**]	.347[**]	-.196[**]	.385[**]	-.079	.019
		.065	.000	.000	.000	.002	.000	.215	.767
LLRGL		1	.229[**]	-.054	-.417[**]	-.109	.056	-.223[**]	.755[**]
			.000	.398	.000	.089	.379	.000	.000
ETA			1	-.376[**]	-.401[**]	-.050	.027	-.085	.199[**]
				.000	.000	.439	.675	.187	.002
BDTD				1	.262[**]	-.067	.110	-.037	-.019
					.000	.295	.085	.561	.767
LOANSTA					1	.148[*]	-.275[**]	.038	-.444[**]
						.020	.000	.553	.000
NIETA						1	-.481[**]	.147[*]	-.256[**]
							.000	.022	.000
LNGDP							1	-.117	.377[**]
								.067	.000
INFL								1	-.361[**]
									.000
LLRGL*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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TABLE E7: PEARSON'S CORRELATION TEST MODEL 6

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	ETA*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.015
		.065	.000	.000	.000	.002	.000	.215	.820
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.266**
			.000	.398	.000	.089	.379	.000	.000
ETA			1	-.376**	-.401**	-.050	.027	-.085	.493**
				.000	.000	.439	.675	.187	.000
BDTD				1	.262**	-.067	.110	-.037	-.048
					.000	.295	.085	.561	.452
LOANSTA					1	.148*	-.275**	.038	-.400**
						.020	.000	.553	.000
NIETA						1	-.481**	.147*	-.430**
							.000	.022	.000
LNGDP							1	-.117	.771**
								.067	.000
INFL								1	-.349**
									.000
ETA*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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TABLE E8: PEARSON'S CORRELATION TEST MODEL 7

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	BDTD*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.755**
		.065	.000	.000	.000	.002	.000	.215	.000
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.003
			.000	.398	.000	.089	.379	.000	.968
ETA			1	-.376**	-.401**	-.050	.027	-.085	-.322**
				.000	.000	.439	.675	.187	.000
BDTD				1	.262**	-.067	.110	-.037	.831**
					.000	.295	.085	.561	.000
LOANSTA					1	.148*	-.275**	.038	.211**
						.020	.000	.553	.001
NIETA						1	-.481**	.147*	-.215**
							.000	.022	.001
LNGDP							1	-.117	.364**
								.067	.000
INFL								1	-.140*
									.028
BDTD*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE E9: PEARSON'S CORRELATION TEST MODEL 8

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	LOANSTA*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.565**
		.065	.000	.000	.000	.002	.000	.215	.000
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	-.007
			.000	.398	.000	.089	.379	.000	.911
ETA			1	-.376**	-.401**	-.050	.027	-.085	-.163*
				.000	.000	.439	.675	.187	.010
BDTD				1	.262**	-.067	.110	-.037	.292**
					.000	.295	.085	.561	.000
LOANSTA					1	.148*	-.275**	.038	.362**
						.020	.000	.553	.000
NIETA						1	-.481**	.147*	-.407**
							.000	.022	.000
LNGDP							1	-.117	.664**
								.067	.000
INFL								1	-.322**
									.000
LOANSTA*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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TABLE E10: PEARSON'S CORRELATION TEST MODEL 9

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	NIETA*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	-.069
		.065	.000	.000	.000	.002	.000	.215	.284
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.379**
			.000	.398	.000	.089	.379	.000	.000
ETA			1	-.376**	-.401**	-.050	.027	-.085	.316**
				.000	.000	.439	.675	.187	.000
BDTD				1	.262**	-.067	.110	-.037	-.040
					.000	.295	.085	.561	.535
LOANSTA					1	.148*	-.275**	.038	-.369**
						.020	.000	.553	.000
NIETA						1	-.481**	.147*	-.203**
							.000	.022	.001
LNGDP							1	-.117	.279**
								.067	.000
INFL								1	-.441**
									.000
NIETA*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE E11: PEARSON'S CORRELATION TEST MODEL 10

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	LNGDP*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.355**
		.065	.000	.000	.000	.002	.000	.215	.000
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.217**
			.000	.398	.000	.089	.379	.000	.001
ETA			1	-.376**	-.401**	-.050	.027	-.085	.091
				.000	.000	.439	.675	.187	.155
BDTD				1	.262**	-.067	.110	-.037	.117
					.000	.295	.085	.561	.069
LOANSTA					1	.148*	-.275**	.038	-.268**
						.020	.000	.553	.000
NIETA						1	-.481**	.147*	-.496**
							.000	.022	.000
LNGDP							1	-.117	.897**
								.067	.000
INFL								1	-.347**
									.000
LNGDP*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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TABLE E12: PEARSON'S CORRELATION TEST MODEL 11

	LNTA	LLRGL	ETA	BDTD	LOANSTA	NIETA	LNGDP	INFL	INFL*DP
LNTA	1	-.118	-.677**	.753**	.347**	-.196**	.385**	-.079	.262**
		.065	.000	.000	.000	.002	.000	.215	.000
LLRGL		1	.229**	-.054	-.417**	-.109	.056	-.223**	.028
			.000	.398	.000	.089	.379	.000	.668
ETA			1	-.376**	-.401**	-.050	.027	-.085	.019
				.000	.000	.439	.675	.187	.765
BDTD				1	.262**	-.067	.110	-.037	.078
					.000	.295	.085	.561	.225
LOANSTA					1	.148*	-.275**	.038	-.217**
						.020	.000	.553	.001
NIETA						1	-.481**	.147*	-.341**
							.000	.022	.000
LNGDP							1	-.117	.728**
								.067	.000
INFL								1	.488**
									.000
INFL*DP									1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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APPENDIX F

TABLE F1 : WHITE GENERAL HETEROSCEDASTICITY TEST

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Chi-Sq. Statistic (X^2)	81.754	129.125	146.310	143.289	140.890	145.372	134.425	141.589	143.788	146.082	146.124
F-statistic	4.025	5.065	5.474	5.202	4.997	5.388	4.489	5.055	5.246	5.453	5.457
P-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
H_0 (null-no heteroscedasticity problem)	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject

APPENDIX G

TABLE G1: AUTOCORRELATION TEST USING DURBIN-WATSON TEST

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Durbin Watson	2.140	1.828	1.832	2.180	1.827	1.848	1.845	1.871	1.906	1.830	1.901

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APPENDIX H

TABLE H1: MULTIVARIATE REGRESSION ANALYSIS MODELS UNDER FIXED EFFECT MODEL

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
CONSTANT	0.724*	0.513	1.307**	1.562**	0.540	0.762	1.982**	1.537	0.748	1.320**	1.742
Std. Error	0.406	0.807	0.520	0.699	0.852	1.209	0.832	1.156	0.822	0.534	1.254
Determinants Variables											
LNTA	-0.108	-0.200	–0.238**	–0.309**	-0.198	-0.198	0.023	-0.216	-0.161	–0.242**	-0.198
Std. Error	0.082	0.172	0.118	0.123	0.174	0.173	0.149	0.172	0.174	0.122	0.172
LLRGL	–0.013***	–0.015***	–0.018***	–0.018**	–0.016**	–0.016***	–0.015***	–0.018***	–0.017***	–0.017***	–0.018***
Std. Error	0.005	0.005	0.005	0.008	0.008	0.005	0.005	0.005	0.005	0.005	0.005
ETA	0.337**	0.280*	0.231	0.224	0.280*	0.251	0.319**	0.252	0.247	0.232	0.243
Std. Error	0.138	0.152	0.151	0.140	0.153	0.186	0.153	0.154	0.154	0.151	0.155
BDTD	3.817***	4.198***	4.331***	4.60***	4.195***	4.181***		4.266***	3.932***	4.345***	4.154***
Std. Error	1.258	1.406	1.294	1.251	1.410	1.411		1.406	1.415	1.301	1.405
LOANSTA	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.000	0.001	0.002	0.002
Std. Error	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
NIETA	0.070	0.026	0.091	0.082	0.033	0.046	0.125	0.143	0.098	0.081	0.134
Std. Error	0.421	0.436	0.418	0.286	0.442	0.443	0.439	0.445	0.437	0.418	0.443
Macroeconomic Variables											
LNGDP		0.122			0.115	0.077	-0.281	-0.041	0.055		-0.088
Std. Error		0.234			0.244	0.284	0.215	0.269	0.238		0.286
INFL		–0.019*	-0.013	-0.012	-0.018	-0.017	-0.012	-0.013	-0.012	-0.014	–0.045*
Std. Error		0.011	0.011	0.018	0.011	0.012	0.011	0.012	0.012	0.011	0.023
DP			0.100								
Std. Error			0.073								
Interaction Variables											
LNTA*DP				0.034***							
Std. Error				0.011							
LLRGL*DP					0.001						
Std. Error					0.009						
ETA*DP						0.025					
Std. Error						0.090					

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
BDTD*DP							1.445**				
Std. Error							0.649				
LOANSTA*DP								0.002			
Std. Error								0.001			
NIETA*DP									4.141		
Std. Error									2.908		
LNGDP*DP										0.017	
Std. Error										0.013	
INFL*DP											0.033
Std. Error											0.026
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**	**Model 11**
R²	0.362	0.372	0.376	0.382	0.372	0.372	0.360	0.376	0.378	0.376	0.377
Adj R²	0.241	0.245	0.251	0.257	0.241	0.241	0.230	0.247	0.248	0.250	0.247
Durbin Watson	2.140	2.118	2.154	2.180	2.118	2.123	2.112	2.159	2.168	2.151	2.165
F-statistic	2.983***	2.927***	2.989***	3.06***	2.843***	2.846***	2.780***	2.901***	2.920***	2.984***	2.905***

***, **, * indicates significance levels at 0.01, 0.05, and 0.10 respectively

APPENDIX I

TABLE I1: MULTIVARIATE REGRESSION ANALYSIS MODELS UNDER RANDOM EFFECT MODEL

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
CONSTANT	0.297	0.803	0.566**	0.584**	0.960	2.188**	1.322**	2.099**	1.00*	0.553578*	2.950***
Std. Error	0.243	0.582	0.284	0.295	0.622	1.071	0.611	1.041	0.584	0.286	1.113
Determinants Variables											
LNTA	0.040	0.054	-0.007	-0.013	0.055	0.052	0.085*	0.040	0.053	-0.004	0.039
Std. Error	0.043	0.061	0.057	0.062	0.061	0.055	0.049	0.056	0.060	0.058	0.061
LLRGL	–0.015***	–0.017***	–0.016***	–0.016***	–0.020***	–0.018***	–0.017***	–0.019***	–0.019***	–0.016***	–0.020***
Std. Error	0.004	0.004	0.004	0.004	0.006	0.004	0.005	0.004	0.004	0.004	0.004
ETA	0.247***	0.253**	0.172	0.180*	0.254**	0.121	0.286**	0.227**	0.205*	0.178	0.212*
Std. Error	0.095	0.110	0.110	0.106	0.110	0.121	0.120	0.102	0.111	0.110	0.111
BDTD	1.118**	1.040**	1.388***	1.37868***	1.027*	0.988**		1.088**	0.981*	1.368***	1.089**
Std. Error	0.461	0.526	0.509	0.505	0.525	0.492		0.506	0.522	0.511	0.528
LOANSTA	0.002**	0.002	0.002**	0.002**	0.002	0.002	0.001	0.000	0.002*	0.002**	0.002
Std. Error	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
NIETA	0.300	0.280	0.423	0.423	0.284	0.308	0.314	0.373	0.293	0.412	0.359
Std. Error	0.289	0.304	0.303	0.303	0.304	0.237	0.295	0.241	0.302	0.304	0.305
Macroeconomic Variables											
LNGDP		-0.084			-0.116	-0.324	–0.200*	-0.298	-0.126		–0.442**
Std. Error		0.125			0.133	0.201	0.112	0.190	0.125		0.202
INFL		–0.0213**	–0.019**	–0.019*	–0.019*	-0.013	–0.018*	-0.013	-0.009	–0.019**	–0.062***
Std. Error		0.010	0.011	0.011	0.011	0.014	0.010	0.014	0.011	0.011	0.021
DP			0.045								
Std. Error			0.051								
Interaction Variables											
LNTA*DP				0.011							
Std. Error				0.013							
LLRGL*DP					0.005						
Std. Error					0.007						
ETA*DP						0.125*					
Std. Error						0.073					

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
BDTD*DP							0.953**				
Std. Error							0.368				
LOANSTA*DP								0.001*			
Std. Error								0.001			
NIETA*DP									6.900***		
Std. Error									2.532		
LNGDP*DP										0.007	
Std. Error										0.009	
INFL*DP											0.053**
Std. Error											0.024
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**	**Model 11**
R²	0.179	0.193	0.194	0.193	0.196	0.205	0.189	0.199	0.219	0.193	0.210
Adj R²	0.158	0.166	0.166	0.166	0.165	0.175	0.162	0.168	0.189	0.166	0.179
Durbin Watson	1.808	1.828	1.832	1.833	1.827	1.848	1.845	1.871	1.906	1.830	1.901
F-statistic	8.649***	7.058***	7.084***	7.067***	6.347***	6.750***	6.897***	6.468***	7.313***	7.056***	6.920***

***, **, * indicates significance levels at 0.01, 0.05, and 0.10 respectively

APPENDIX J

APPENDIX TABLE J1: HAUSMAN TEST

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Chi-Sq. Stat (X²)	14.533***	13.736*	15.102*	17.061**	14.130	14.402	7.169	13.441	9.955	15.16*	11.213
Prob. X²	0.024	0.089	0.057	0.03	0.118	0.109	0.519	0.144	0.354	0.056	0.261
No. observation	245	245	245	245	245	245	245	245	245	245	245
Est. tech	FEM	REM	REM	FEM	REM	REM	REM	REM	REM	REM	REM

***, **, * indicates significance levels at 0.01, 0.05, and 0.10 respectively