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A COMPARABLE CROSS-SYSTEM BANK PRODUCTIVITY MEASURE :

EMPIRICAL EVIDENCE FROM THE MALAYSIAN DUAL BANKING SYSTEM

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This thesis is presented in fulfilment of the requirements for the degree of Doctor of Philosophy

Faculty of Business
Edith Cowan University

April 2005

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

This thesis seeks to fill a void in the banking performance literature by (1) proposing a cross-system bank productivity assessment methodology that can be applied to both conventional and Islamic banking and (2) implementing this methodology on a dual banking system to gauge the comparable productivity of Islamic and conventional banks relative to one another in a banking system that has experienced deregulation and consolidation.

The growing significance of Islamic banking cannot be overlooked as its growth in recent years has significantly outpaced conventional banking. This new banking duality trend profoundly impacts the relative competitiveness of both banking systems and this in turn, may significantly affect the allocation of scarce financial resources between conventional and Islamic banking. This necessitates comparable performance measurements of the two banking systems. Banks' productivity measures are excellent indicators of their competitiveness levels. Nevertheless, Islamic banking has attracted minimal attention largely due to the great difficulties in obtaining measures that are methodologically comparable.

Traditional bank productivity evaluation framework cannot be indiscriminately applied to Islamic banks because they operate on fundamentally distinct principles. Islamic banking conducts financial transactions in strict conformance to Islamic precepts that prohibit the receipt and payment of interest and speculative risk taking. Instead, Islamic banks mobilize surplus funds into financing productive investments and share in the profits and losses of a venture with the investors and the fund providers. Given the basic functions of financial intermediation of both systems which are fundamentally the same, it is argued that a cross-system comparable bank productivity measurement that adequately accounts for the unique characteristics of conventional and Islamic banking can be derived.

This study theoretically demonstrates that under the intermediation approach to productivity measurement, both systems may be placed on an equal footing, hence enabling the Malmquist Productivity Index (MPI) within the Data Envelopement Analysis (DEA) Framework to be viably employed as a comparable productivity measure of conventional and Islamic banks. Empirical evidence is then obtained by testing this model on data drawn from banks operating within the Malaysian dual

banking system benchmarked against Singaporean banks between 1996 and 2002 to capture the effects of the 1997-1998 financial crisis and the subsequent bank consolidation episode.

The empirical evidence obtained shows that Islamic banking operations (IBO) were more productive than conventional banking schemes (CBS) since 1997 due to the migration of funds that resulted from: (1) the Islamic banks' ability and willingness to offer higher rates of return compared to the relatively lower deposit rates available in conventional banks and (2) the growing scale inefficiencies among conventional banks that followed the financial crisis. IBO tend to operate at more efficient scale sizes than do conventional banks. Nevertheless, the IBO experienced technical regress on average compared to CBS as the majority of the IBO were Islamic banking schemes operated by conventional banks that were able to leverage on the technological investments and other competencies of their parent banks. Consistent with these findings, the study shows that full-fledged Islamic banks were the least productive banks and they exhibited strong performance similarities with conventional banks. Nevertheless, the findings suggest a prevalence of asset-liability imbalance among the IBO due to a unique and heightened risk profile of the IBO. Subsequently, Islamic banking schemes operated by foreign banks were found to be more productive due to the greater contributions from their off-balance sheet activities that partially offset the problems of asset-liability mix problems.

This study also concludes that foreign commercial banks had outperformed domestic commercial banks despite the restrictive regulation on branch and Automated Teller Machines (ATM) network expansion that was imposed on the former. Overall, the foreign conventional banks (FCB) were more efficient than the domestic conventional banks (DCB) and this difference was largely due to the FCB being more scale efficient than domestic banks following the onset of the financial crisis and the bank merger exercise that involve all DCB. The empirical findings showed inconclusive evidence as to the presence of post-merger gains among merged bank entities and the transmission of these gains to the public.

Both the theoretical and empirical results provide a viable dimension to the call for comparable performance measurement between conventional and Islamic banks.

DECLARATION

I certify that this thesis does not, to the best of my knowledge and belief:

(i) incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education.

(ii) contain any material previously published or written by another person except where due reference is made in the text; or

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CHAPTER 1:

INTRODUCTION

1.1: Changes within the Global Banking Industry in Transforming Banks' Role of Financial Intermediation.

The past two decades have witnessed revolutionary changes within the banking industry worldwide due to rapid financial deregulation, consolidation, technological advances and financial innovation. These forces profoundly impact upon the role of banks as financial intermediaries in pooling financial resources from surplus units and allocating them to deficit units for investment purposes that ultimately generate economic growth. Keen competition brought about by financial deregulation alongside rapid advances in information and communication technology ICT and development in finance theory have resulted in financial innovation with financial intermediaries, including banks, providing households and firms with new investment opportunities to earn higher returns and manage greater risks. Here, financial engineering takes place where financial intermediaries undertake a systematic approach in an attempt to develop better financial solutions to the specific problems of their customers taking into account the current state of technology, finance theory and regulation (Merton, 1995).

Although financial innovation is typically associated with the production of a new financial product or instrument, it may also involve an entirely new financial intermediary system. This is because, from a functional perspective, financial intermediation pools and optimally allocates scarce financial resources in an uncertain economic environment (Merton, 1995). Here, it is important to note that while the most efficient institutional structure for fulfilling the financial intermediary function may differ, the basic role of financial intermediation would remain the same. In other words, the functional notion of financial intermediation holds that existing institutions will not necessarily be preserved as competition and technological advancements drive institution

structures to change towards one with greater efficiency in performing the roles of financial intermediation (Merton, 1995).

Structural changes in financial intermediation institutions are apparent in the banking industry today. Cost reductions from technology advancements, progress in finance theory and enhanced competition induced by financial markets deregulation in the last decade have led to rapid financial engineering process and bank consolidation the world over. Financial engineering nevertheless has resulted in banks operating across geopolitical divisions to differ markedly from one another owing to differences in size, complexity, available technology, political, cultural and historical backgrounds, giving rise to a number of different “banking systems” that still perform the same financial intermediation function.

In this dynamic new banking environment, the competitiveness of a particular banking system not only depends on the banks’ overall operating efficiency but also on banks’ ability to carry out financial innovation as they respond to new technological changes. Hence, banks’ productivity measures are good indicators as to how competitive banks are as the industry continues to evolve. Since it is expected that relatively unproductive banks will lose their market shares and be replaced by more productive ones, the same conclusion can be made about a particular banking system vis a vis another. This is consistent with the functional financial intermediation view that institution structures are always changing towards those that are more efficient in performing the financial intermediation roles.

This process can now be readily observed in the global banking industry as Islamic banking is fast becoming a widely accepted alternative mode of banking to that provided by conventional banks. Against this backdrop, comparable banks’ productivity measures between Islamic and conventional banking can serve as ideal indicators determining the competitiveness as well

as the eventual dominance of either Islamic banking or conventional banking over the other with the passage of time.

1.2: Advent of Islamic Banking as the New Financial Intermediary System: Challenging Conventional Banking as an Alternative Banking Mode

1.2.1: Islamic Banking: Basic Theories and Principles

Most financial market participants, be they borrowers, lenders, investors, bank shareholders or regulators, are familiar with and engage/transact in conventional banking, whereby banks perform the financial intermediation process by charging interest on advances extended to borrowers and paying interest to compensate depositors for providing the source of funding with the objective of making a profit on the spread or margin in between. In many countries however, particularly in countries that have a sizable Muslim population, the banking public are now fast turning to Islamic banking as an alternative banking mode to conventional banking. Islamic banking is a form of modern banking in which the financial intermediation process is based on a number of Islamic legal and economic principles developed in the first centuries of Islam that uses risk-sharing methods instead of interest-based financing (van Schaik, 2001).

Islamic banking conforms strictly to the Sharia principles that set Islamic financing apart from conventional financing. There are three broad Sharia rules that govern Islamic banking. (1) The first and the most fundamental of which is the strict prohibition on riba or the practice of usury that has been loosely translated by Islamic scholars as the practice of charging and paying interest (Al-Deehani et al, 1999). (2) The second is the ban on financial involvement on economic activities considered sinful in Islam such as gambling and the production of liquor and pork. Finally, the third Sharia rule is the injunction to avoid gharar or the accumulation of wealth through excessive risk-taking that involves uncertainty (Al-Omar and Abdel-Haq, 1996).

Unlike the conventional banking system, Islamic banking embraces the concept that profits can only be earned by the acceptance of risk (Schoon et al, 2003). Therefore, instead of taking interest, Islamic banks mainly operate profit and loss sharing (PLS) financing contracts by directly engaging in investment projects with finance users where depositors are regarded as shareholders of the bank or a particular deal and they are not guaranteed a nominal value or a pre-determined rate of return on their deposits (Al-Omar and Abdel-Haq, 1996). In other words, there exists a partnership between Islamic banks and surplus units (depositors) on the one hand and with the deficit units (investors) on the other in managing financial resources to finance productive uses, and hence, the process is akin to an equity financing arrangement rather than one of debt financing (Lewis and Algaourd, 2001).

In all Islamic banking dealings, economic considerations are subordinated to moral considerations that serve the developmental interests of the community as a whole where profitability is not the sole criterion in evaluating the performance of a bank (Al Omar and Abdel-Haq, 1996). Because these concepts are fundamentally foreign to conventional banks, Islamic banking thus represents a unique financial engineering process that takes on a whole new efficient institution form that deviates from conventional banks, in that it has a different banker-customer relationship and hence provides an alternative mode of banking to conventional banking.

1.2.2: The Growth of Islamic Banking in Recent Decades

Profit sharing financial intermediation arrangements actually predate Islam. But it was not until the birth of Islam that interest-free financial intermediation based on profit-sharing principles were institutionalized across Muslim countries (Lewis and Algaourd, 2001). Nevertheless, Islamic banking centuries back was mostly organized around simple profit sharing arrangements and did not develop into a large scale financial intermediation system that was able to mobilize large sums of funds from the surplus units to

the deficit units. The prevalence of Islamic banking in Muslim countries began to fade as conventional banking took over following the colonial period. Nevertheless, Islamic banking was revived in the 60s and 70s following the resurgence of Islamic thoughts in the Muslim world at that time. Despite the experimental nature of its revival, Islamic banking has since expanded into more than 70 countries, most of which are Muslim countries in the Middle East and South Asia (Lewis and Algaourd, 2001). The size of funds mobilized by Islamic banking has not been extensively researched but is estimated among experts involved in the industry to be around US$200 billion in assets mobilized (Hassoune, 2002).

At the present most Muslim countries have some type of Islamic banking although the degrees of practice conformance vary between countries. Lewis and Algaourd (2001) identified two basic forms of expansion of modern Islamic banking. The first involves the process of converting the entire financial intermediation of a country from a conventional system to a full-fledged Islamic system. The only countries that had adopted such an approach are Pakistan, Iran and Sudan. The majority of other countries followed the second approach. In the second form, there are deliberate attempts by both the regulator and the market participants to establish Islamic banks to compete with conventional banks but essentially they maintain a mixed system where conventional banks and Islamic banks co-exist.

Islamic banking is now truly a worldwide industry and is no longer confined to full fledged Islamic banks in Muslim countries only. Surprisingly, much of the innovation in Islamic banking has been driven by non-Muslim financiers (Ariff, 2002). Banks such as Citibank, ANZ, ABN Amro, Goldman Sachs, HSBC and Deutsche Bank are actively involved in Islamic banking through their Islamic banking units or subsidiaries. Already, several large international banks have conveyed an interest in setting up separate Islamic-finance subsidiaries on large scale to target lucrative niches in Islamic mortgages and car finance and to compete with existing ones such as Citibank's Citi Islamic Bank, HSCC's

Amanah and USB's Noriba (Kaleem). Others including JP Morgan, Deutsche Bank and American Express, have started to introduce interest-free products to their customers (Haron and Ahmad). Even the Dow Jones has established stock market indices of sharia-compliant companies as non-Muslim multinational corporations ranging from General Motors to IBM and Daewoo have began to use interest-free funds and services (The Economist, 2003).

1.3: Competition and Challenges in Islamic Banking Operations

Despite the evident growth rates, Islamic banking, like any other financial intermediation system has its own critical and pressing issues. One interesting development in Islamic banking for instance, has been the dominance of international conventional banks, rather than Islamic banks, as they overtake Islamic banks as the main providers of Islamic finance products given greater outreach to growing demand for such products via their extensive branch networks (Ariff, 2002).

Because Islamic banking is still in its infancy, domestic Islamic banks continue to experience lack of risk analysis and management capability, lack of qualified professionals, lack of product diversification and service quality, cost ineffectiveness and non-maturity of secondary markets vis a vis their foreign conventional counterparts (Al Omar and Abdel-Haq, 1996). As Section 2 will explain, Islamic banking is particularly vulnerable to the heightened risk of equity funding, moral hazard and adverse selection, political pressures, reduced avenues for risk hedging and potential friction with the interests of central banks and regulators that oversee operations of authorized depository institutions. Arayssi (2003) for example found that inefficient decisions are often made when it comes to financing investments while Aggarwal and Yousef (2000) found a general lack of commitment from Muslim governments to fully develop Islamic financing options. The authors also found the high levels of information asymmetries in Islamic banking operations in developing countries. These factors would no doubt have significant impacts on the ability of Islamic banks to generate attractive returns.

At the same time, although Islamic banking is often argued as a form of ethical banking with priority assigned to moral considerations over that of profit, nevertheless, the growth of Islamic banking in international conventional banks has been mostly driven by the profit motive (Al Omar and Abdel-Haq, 1996). Despite the fact that many of the fully-fledged Islamic banks have been trying to fulfill the religious expectations of socio-economic growth, they usually end up losing market share to conventional banks that partake in Islamic banking with the sole objective of earning economic profits. In this regard, Islamic banks are often at a disadvantage compared to conventional banks because conventional banks are not prevented from adopting Islamic banking practice if it proves to be viably profitable (Al Omar and Abdel-Haq, 1996). By contrast, Islamic banks cannot issue all the financial instruments available to conventional banks.

With globalization, the biggest threats to Islamic banking would come mainly from foreign competition and takeovers because Islamic bank units are generally small with 2/3 of them having less than the critical banking minimum of $500 million worth of assets (Ariff, 2002). Given the rapid financial deregulation the world over in preparation for the full implementation of the GATS signatory agreement, internationalization of financial markets is inevitable and as the once highly segmented Islamic financial markets with considerable national differences become more integrated and standardized, Islamic banks are getting less isolated, the gap is expected to widen further in a dualistic banking market (Brown, 2003).

1.4: The Need for A Comparable Bank Productivity Evaluation Methodology

The complete rejection of the use of interest rates obviously poses the question of whether Islamic banking will continue to strengthen based on its profit and loss sharing framework and ultimately challenge conventional banking in providing an alternative financial intermediation system that offers not only higher returns on a more ethical basis but also make desirable

contributions towards developing society. This is further compounded by the fact that the very nature of Islamic banking exposes participating banks to greater risks than are typical of the conventional system; this risk would have significant bearings on their ability to generate adequate returns.

There is no doubt that Islamic banking has proven to be a viable modern banking mode based on its impressive track record but there is less certainty in Islamic banking's ability to compete with conventional banking in mobilizing financial resources on a much greater scale, given the unique risks and circumstances that participating banks face in successfully carrying out profit and loss sharing operations. After all Islamic banking has only a mere 20-year history as a modern banking system.

The continued process of financial deregulation, consolidation and integration worldwide would pose further questions about the sustainability of Islamic banking expansion. To be able to compete in this new competitive environment for instance, Islamic banks therefore must become competitive not only against other domestic Islamic and domestic conventional banks but also against foreign conventional banking that operates Islamic banking windows. A comparable bank performance evaluation framework in terms of productivity would enable one to effectively benchmark and rank both conventional and Islamic banks against one another. Ability to do so could reveal relative competitiveness of both banking systems within an increasingly "dualistic" banking industry. Empirical results from which would greatly assist decision makings by savers, borrowers, regulators, policy makers as well as the banks themselves.

To date, most available knowledge of bank productivity comes from the scrutiny of conventional banks in US and Europe. Islamic banks have attracted minimal attention so far mainly due to the difficulties in rendering productivity measures that are comparable. The very few studies that exist on

Islamic bank performance meanwhile have obtained their data inputs from the highly

regarded BankScope database. Due to the reporting of certain variables prohibited by the Sharia in these studies and the non-availability of BankScope's data selection and inclusion policy, the empirical findings derived are questionable. The conventional banking productivity assessment approach cannot be automatically applied to Islamic banking since the underlying principles and mechanisms behind each banking system are fundamentally different. Without due consideration to this factor; relative productivity results may be biased towards one over the other. This flaw may render the performance results incomparable and theoretically incorrect

These factors point to the need for a comparable bank productivity performance assessment between conventional and Islamic banks. A detailed analysis of the results would provide in-depth insights into roles that both Islamic banking and conventional banking will play in the coming years in mobilizing financial resources from deficit to surplus units on a global scale as the financial intermediation continues to become more dynamic.

1.5: The Aims of this Study

The main aims of this study are threefold.

First, to explore the different characteristics of Islamic banking and propose a viable comparable productivity measurement methodology that is applicable to both conventional banks and Islamic banks. To do so, this study argues that because the basic financial intermediation function remains identical in both systems, comparable variables for both conventional and Islamic banks can be obtained and hence a viable and comparable assessment methodology can be constructed. This new methodology would not only able to adequately capture the different characteristics of conventional and Islamic banking but also yield meaningful performance comparisons in an accurate and unbiased manner.

Second, to implement this methodology in order to assess the productivity changes (in terms of technical efficiency, scale efficiency and technical change) of conventional and Islamic banks in a selected dual banking system against a backdrop of rapid deregulation and globalization. In doing so, one can gauge how well conventional banks and Islamic banks respond to forces of bank consolidation, foreign competition and technology advancements relative to one another.

Third and finally, this study seeks to determine whether productivity gains, should there be any at all, that are the result from heightened competition from bank consolidation and changes in technology, are passed on to the public to enhance social welfare. Empirical findings in relation to this issue would help in answering whether the notion of "socially ethical banking" as proclaimed by both practitioners and Islamic scholars does indeed benefit the public or society relatively more than conventional banks when faced with the dynamics of deregulation.

1.6: Summary

Over the past 20 years, Islamic banking has risen to become an increasingly popular alternative system of financial intermediation that competes with conventional banking in both Muslim and non-Muslim economies alike. Islamic banking conducts financial transactions in strict conformance to Islamic precepts that prohibit the receipt and payment of interest and speculative risk taking. Instead, Islamic banks mobilize surplus funds into financing productive investments and share in the profits and losses of a venture with the investors and the fund providers. The growing significance of Islamic banking cannot be overlooked as its growth in recent years has significantly outpaced conventional banking. This new banking duality trend profoundly impacts the relative competitiveness of both banking systems and this in turn, may significantly affect the allocation of scarce financial resources between conventional and Islamic banking.

This necessitates comparable performance measurements of the two banking systems. Banks' productivity measures are excellent indicators of their competitiveness levels. Nevertheless, Islamic banking has attracted minimal attention largely due to the great difficulties in obtaining measures that are methodologically comparable. Traditional bank productivity evaluation frameworks cannot be indiscriminately applied to Islamic banks because they operate on fundamentally distinct principles and feature unique capital structures, assets, liabilities, cost of deposits and costs of capital.

This research proposes that a cross-system comparable productivity measurement methodology that adequately accounts for the unique characteristics of conventional and Islamic banking can be derived when based on the argument that the basic functions of financial intermediation of both systems remain essentially the same. In doing so, this research also contributes to a void in the banking performance literature by (1) proposing a cross-system bank productivity assessment methodology that can be applied to both conventional and Islamic banking and (2) implementing this methodology on a dual banking system to gauge the comparable productivity of Islamic and conventional banks relative to one another in a banking system that has experienced deregulation and consolidation.

CHAPTER 2:

CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

2.1: Definition of Islamic Banking, its Practices and Salient Features

Islamic banking is conceived to allow Muslims to transact in a system that is in line with their religious belief (BNM, 2003). It is practiced with strict compliance to the sharia or the set of divine rules or guidance derived from the Koran and sayings of the prophet that permeates all aspects of life in the Islamic faith (Al Omar and Abdel-Haq, 1996). In a nutshell, Islamic banking provides services to customers free from the giving and taking of interest and relies instead on profit and loss sharing principles. Perhaps, the most succinct definition of Islamic banking is provided by Schoon et al (2003) who terms Islamic banking as a form of financial intermediation governed by the concept that returns or profits can only earned by the equal acceptance of risk with the overriding goal of serving the interests of the community over that of personal wealth enrichment. Islamic banking was the primary facilitator of trade and economic transactions during the golden ages of Islam but was soon eclipsed by conventional banking guided by capitalism with the rise of the Western nations.

In Islamic banking, one of the most important precepts in Islam is the establishment of economic justice through the prohibition of unjustified enrichment by receiving monetary advantage in any business dealing without giving a just counter value (Al Omar and Abdel-Haq, 1996). Here, riba or roughly translated; the premium that must be paid by the borrower to the lender along with the principal amount as a condition for the loan or an extension in its maturity, represents an unjustified advantage. It is commonly agreed by Islamic scholars that the concept of riba applies on interest-bearing funds for consumption and investment purposes (Islamic Fiqh Academy, 1986)[1]. It is considered wrong and inequitable because whilst the earning of profit is uncertain, the payment of interest is predetermined and certain

[1] As cited in Al Omar and Abdel-Haq (1996).

therefore encouraging a form of financial exploitation (Al Omar and Abdel Haq, 1996).

The sharia also prohibited gharar or making profits by financing investment activities that entail uncertainty or speculative risks (The Economist, 2003; Al Omar and Abdel-Haq, 1996; Chapra, 2003). Instead, earning profits in Islamic banking is legitimized by engaging in economic venture with a lender-borrower relationship that is based on equitable risk-sharing between the finance or capital provider and the user (Al Omar and Abdel-Haq, 1996). Islamic banks earn profits from three principal activities: trading, leasing and direct financing in profit and loss sharing contracts (Al Omar and Abdel-Haq, 1996). The banks are allowed to devise instruments to earn profits in any of these three financing methods provided the structure and conditions conform to the rules stipulated in the sharia (Al Omar and Abdel-Haq, 1996).

2.2: Origins of Modern Islamic Banking

The practice of modern Islamic banking formally began in 1963 with a pioneering experiment in Egypt, which lasted only for 4 years until 1967. During that period, a total of nine banks were in operation serving more than 250, 000 depositors and they mobilized some 1.8 million Egyptian pounds (Al Omar and Abdel-Haq, 1996). However due to a variety of political factors, the movement was short lived when the banks were unable to attract the required substantial numbers of small depositors. The movement towards implementing Islamic banking was revived in the 70s, this time more professionally, with the establishment of the Islamic Development Bank that is regarded by many as the turning point for the growing acceptance, understanding and popularity of Islamic banking (Lewis and Algaourd, 2001). It must be noted that Islamic banking must be distinguished from interest-free banking because Islamic banking is required not only to avoid interest-based transactions but also to participate actively in achieving the goals and objectives of an economy.

Since then, there has been a steady expansion of Islamic banks in the 80s and 90s. Currently, Islamic banking is operating in over 60 countries with an asset base of approximately $166 billion (Hassan and Bashir, 2003). In many Muslim countries especially in the Middle East, Islamic banks are rapidly gaining market shares in their domestic economies (Hassan and Bashir, 2003). By some estimates, Islamic banking has been growing at 10% worldwide and about 15% in the Gulf which is much higher than the growth rate of conventional banking (Schoon et al, 2003). Already, Islamic banking has been able to mobilize some US$200 billion in assets (Hassoune, 2002)[2]. Zaher and Hassan (2001)[3] even made the bold prediction that Islamic banks are poised to control some 40-50% of all Islamic savings by 2009/2010. For this reason, conventional banks like Citigroup and HSBC have started operating Islamic windows in the Gulf (Useem, 2002).

2.3: The Dual Banking System

With the exceptions of Iran, Pakistan and Sudan that only allow Islamic banking to constitute the entire financial intermediation function, Islamic banking elsewhere co-exists with conventional banking to varying degrees and proportions. They compete with and complement each other in performing the roles of financial intermediation. There are some three categories where this banking dualism exists (Al Omar and Abdel-Haq, 1996):

Islamic banks operating in Muslim countries where they co-exist with interest-based banks (for example, Jordan, Egypt, Turkey and Malaysia)

Islamic banks in non-Muslim countries whose monetary authorities do not recognize their Islamic character (for example, the Al-Baraka International Bank in London and the Islamic Bank in Durban).

Islamic banks in non-Muslim countries whose monetary authorities recognize their Islamic character (for example, the Faisal International Bank in Copenhagen).

[2] As cited in Brown (2003).
[3] As cited in Brown (2003).

The dual banking system represents a special case whereby a government-regulated framework allows both conventional and Islamic banking systems to co-exist on an equal basis while competing and complementing each other at the same time. This is in contrast to most of the national banking systems cited above. In one of these forms of national banking system, Islamic banking is the overwhelming preferred mode of banking with conventional banking being merely tolerated: while in the other system, the financial intermediary system is dominated by conventional banking with negligible Islamic banking operating on the fringe. So far, there is only one country, Malaysia, which has a rather developed and rapidly evolving dual banking system (Yackop, 2003). It is therefore no surprise that the country has taken the lead in developing and championing dual banking as the preferred medium through which to promote Islamic banking in a faster manner and to enhance the competitiveness of the financial intermediation system.

2.4: The Fundamental Differences between Islamic Banking and Conventional Banking

2.4.1: Distinctive Bank-Customer Relationship

The nature of Islamic banking is similar to a partnership in which the depositors are regarded as shareholders of the banks and shareholders of a particular investment project undertaken. In this case, the relationship is one of direct participation and trading and not that of lender-borrower (Al Omar and Abdel-Haq, 1996). Islamic banks do not trade in debts as do conventional banks. Instead, as an alternative financial system, Islamic banks pool depositors' funds in investment accounts to provide temporary equity funds to finance productive projects (Al-Deehani et al, 1999).

In most cases, the bank acts as the agent or the mudarib and the depositor is the principal. Then, under a trustee management of investment accounts, depositors act as financiers by providing the funds while the bank acts as an entrepreneur by accepting the funds to undertake a venture or activity (Lewis

and Algaoud, 2001). However, neither the nominal value of invested capital nor a pre-determined rate of return on deposits is guaranteed. If the bank makes profits from investing the depositors' funds, then both the bank management and the depositors would be entitled to receive a certain share of these profits based on pre-agreed proportions. However if the investments incurred losses on the other hand, the depositors are expected to share in the losses as well. Thus, the investment account holders effectively become shareholders.

In fact depositing funds into investment accounts is often compared to investing in a mutual fund or investment trust. However despite the striking similarities, Islamic banking operations cannot be directly compared with a conventional equity-based system. This is because Islamic banks only accept deposits from the public rather than issuing and selling shares. Although depositors are entitled to share in the bank's net profit or loss, they have no voting rights and (unless it is musyaraka financing mode) cannot influence the bank's investment policy (Lewis and Algaoud, 2001). Furthermore, investment deposits can only be withdrawn on maturity and ideally on par value (Lewis and Algaoud, 2001). Because investment accounts cannot be traded, they have no market values. Thus, investment account holders are effectively non-voting shareholders.

2.4.2: Financial Reporting Priorities and Financial Structure

In providing financial accounting information, conventional banks place an emphasis on interest rate spreads, provisions for loan portfolios and maturities of liabilities. Islamic banks on the other hand focus on asset allocation and returns on investments and trade (Al Omar and Abdel-Haq, 1996).

The divergence of Islamic banking from conventional banking can be better reflected in a comparative analysis of the financial statements of Islamic and conventional banks. To illustrate some of these differences and their

corresponding weights, a financial comparative analysis between an Islamic bank and a conventional bank was done by Al Omar and Abdel-Haq (1996) and the results are replicated in Figure 2.1. From Figure 2.1, it is apparent that while Islamic banks are allowed to invest in trade transactions and real estate operations, conventional banks are not. On the asset side of conventional banks, loans represent a substantial proportion while they rarely exists in Islamic banks and even if they do, they will be very marginal and interest-free. The largest portion of Islamic banks' assets are made up of receivables in the form of murabahah and leasing transactions. In terms of the income statement of conventional banks, one would find that interest income and expenses constitute a major part of the statement. Again these are not applicable in the income statements of Islamic banks. Instead, they would be replaced by income from mudarabah, musyarakah, trade and leasing operations. Any profits gained from non-Sharia compliant activities will not be recognized. Furthermore, the profits of conventional banks are declared after deducting interest expenses payable to depositors, but in most Islamic banks the profits declared will be profits before deductions to pay the depositor's share of those profits (Al Omar and Abdel-Haq, 1996).

Deehani et al (1998) even argue that the concept of financial risks and modern capital structure theories are not directly applicable to Islamic banks. The paper demonstrated that both traditional school and Modogliani and Miller (MM) theories, which assume funds can only be raised through debt and equity, are inadequate in explaining the changes in the cost of capital and the determination of the market value of Islamic banks. Specifically, both the traditional and MM theories of capital structure assert that whilst the use of debt financing increases the market value of the bank, it also increases the variability of residual earnings available to shareholders since suppliers of debt are given first claim on the bank's assets and earnings. Debt therefore increases the risk of bankruptcy assumed by shareholders. Consequently, shareholders demand a higher rate of return on capital while suppliers of debts accept a lower cost of debt. In the case of Islamic banks, the authors reasoned that since the investment account funds mobilized by them are

neither guaranteed nor predetermined nor do they create financial risks to shareholders, and they demonstrated that an increase in the Islamic bank's market value do not alter its weighted average cost of capital which remains largely constant throughout. Islamic banks exhibit a great many differences due mainly to the Sharia requirements and their economic substance. One distinctive feature has been the under-capitalization of most Islamic banks (Al Omar and Abdel-Haq, 1996). There is also often huge liquidity in Islamic banks compared to conventional banks that is often attributed to the lack of sufficient liquidity instruments, the absence of suitable investments and products with adequate redemption facilities. These problems are compounded by the non-existence of developed secondary markets for Islamic instruments and the possible inability of Islamic banks to use the central bank as the lender of last resort. This is due to possible incompatibility between the two institutions (Al Omar and Abdel-Haq, 1996).

Islamic Banks		Conventional Banks	
Assets		Assets	
Liquid Assets	25	Liquid assets (including Treasury notes)	21
Receivables (Murabahah and others)	35	Investment and Deposits	23
Investments	24	Loans	52
Fixed and other assets	16	Fixed & other assets	4
Liabilities and Equity		Liabilities and Equity	
Current & Investment Accounts	78	Deposits	90
Deposits	14	Borrowing and other liabilities	0.5
Other Liabilities	2		
Depositors Share of Profits	2		
Shareholders' equity	4	Shareholders' equity	9

Figure 2.1: Comparison of the components of financial statements and their estimated weightings for Islamic and Conventional Banks (Al-Omar and Abdel-Haq, page 107)

2.5: The Need for a Comparable Bank Performance Measurement Methodology between Islamic Banking and Conventional Banking

2.5.1: Definition of Comparable Bank Productivity Measurement

The definition of "comparability" within a "comparable bank productivity assessment in a dual banking system", refers to a quality whereby users of bank performance information are able to discern and evaluate the similarities and differences between conventional and Islamic banks. Nevertheless they are able to juxtapose them in terms of productivity measurement on a level playing field. This is done without omitting relevant and reliable information items that may adversely affect the accuracy of the results. This subsequently, might impair the decision making about scarce financial resource allocation by the users of such information.

Furthermore, one must be able to compare the productivity aspects of conventional and Islamic banks at both the same time and across time as well as between banks of the same system at one time and across time. In this context as well, a comparable productivity analysis must embody the qualitative characteristics of relevance and reliability. Relevant and useful information should help users to predict and confirm performance outcomes and also be reliable in that the information should be sufficiently representative of the operation of the bank concerned without bias and undue gross errors. Hence, comparable bank productivity measures should assist users to accurately measure and meaningfully compare the performance of conventional and Islamic banks and this should ultimately lead to sound decisions on efficient scarce recourse allocation.

Banks that operate Islamic banking have attempted to follow international accounting and financial statement reporting standards in presenting financial

statement information to guide rational investment decisions and to achieve an acceptable level of transparency (Abdel Karim, 2004). Subsequently, performance analysis amongst these banks is usually conducted by utilizing data obtained from these "conventional-style" financial statements. Nevertheless, due to the fundamental differences of Islamic banking, some of the variables and classifications of assets, liabilities, revenues and expenses inherent in the conventional system cannot be readily applied to Islamic banking operations. Thus, the current financial reporting practice adopted by Islamic banks is likely to mislead decision makers. Banks in Islamic banking systems therefore require different interpretations to those made of information provided by their conventional counterparts, particularly in the areas of revenue recognition and profit-and-loss sharing with depositors.

Some of the critical needs for a comparable bank productivity measurement methodology are outlined below:

2.5.2: Providing Accurate Financial Reporting to Stakeholders

The need for a comparable performance measurement between conventional and Islamic banks is perhaps best conveyed by one of the objectives of the International Accounting Standards Committee (IASC). Namely to convey, in the public interest, high quality, transparent and comparable bank performance measurement information to help participants in the world's markets and other users of financial information to make economic decisions" (Abdel Karim, 2004). The many users of such information may include depositors, borrowers, national regulators, policy makers, international regulatory bodies performing review and oversight functions such as the Basel Committee where even conventional and Islamic banks consider themselves both foreign and domestic. This is because each of them has a stake in the consolidating world banking system that is increasingly exhibiting signs of dualism, during their course of their business or operations. For most of them, the importance of a comparable performance assessment stems from the relationship they have directly and indirectly with both conventional and Islamic banks and the relevance would be defined by these dimensions.

Banks play a vital role as financial intermediaries because they control large proportions of surplus financial resources and influence the degree and manner these resources are invested to generate economic growth. The public interest is best served if these scarce financial resources are efficiently allocated to entities that will utilize them in the best possible manner. This will have desirable macroeconomic effects by enhancing economic productivity and the standard of living at the lowest cost. Members of the community or the stakeholders, who make resource allocation decisions need to have informed reasons for their choices among alternative intermediation channels. For instance, investors and savers decide whether to invest in a particular bank that suits their preferences and have to decide who should manage their resources on their behalf. Borrowers decide where to obtain the most cost-effective financing from a bank and the regulatory bodies have to decide on how best to regulate the banks. The efficient allocation of resources therefore will be optimized if the stakeholders have appropriate bank performance measures to base their resource allocation decisions on. Bank performance measures capable of summarizing both financial and non-financial aspects of a bank in competitive relation to its peers within the industry would serve to assist stakeholders in their decisions. They need to predict and confirm the capacity of a bank or a banking system as being able to meet their objectives effectively and efficiently from its existing resource base and its likely future effectiveness in doing so with additional resources.

2.5.3: The Rapid Global Growth of Islamic Banking vis a vis Conventional Banking

The impressive growth of Islamic banking over the past two decades which overshadows the relatively lackluster performance of conventional banks warrants a thorough assessment of the comparable performances of both conventional and Islamic banks. It is of primary interest for stakeholders to do so as the rate of growth in Islamic banking continues to outpace the growth of conventional banks. This trend is likely to persist into the future given the

growing opposition against conventional interest-based banking systems in Muslim countries that is widely considered as a “bad moral” philosophy of capitalism that propagates a host of undesirables besides usury including speculation, volatility and inequality (Useem, 2002). After all, a majority of Muslims only accepted conventional banking practice under the principle of darura, or overriding necessity because, until recently, they have had little option of using an alternative banking system that conforms to their religious precepts (Useem, 2002). This development needs to be taken seriously by all parties since the popularity of Islamic banking may profoundly affect the efficient allocation of financial resources between conventional and Islamic banking systems. This view is shared by Zaher and Hassan (2001) that made bold predictions of Islamic banks poised to control some 40-50% of Muslim savings by 2009/2010 from an estimated global population of over 1 billion. It is well known, that a number of Muslim countries, such as Kuwait, Bahrain and Qatar are among the most resource-rich countries in the world. One only needs to contemplate the destabilizing effects induced by excess liquidity in the 1970’s, when the world financial system was flushed with petrodollars from the Middle East region, a consequence of the two oil crises of the decade, to see the potentially profound impact of the prediction made by Zaher and Hassan (2001) about the perils to the world banking industries and financial system. Furthermore, with an increasing number of Muslim minorities residing in developed countries, conventional banks would have to radically change their traditional operations if they want to continue to do financial business with Muslim communities (van Schaik, 2001).

Indeed, whilst Islamic banking was initially greeted with scepticism by developed economies in the recent past, it is now well received with great interest (Aziz, 2000). The current and potential size and scale of Islamic finance can no longer be ignored by conventional banks the world over. Hence, it is not surprising then that a number of international conventional banks in non-Muslim countries, that are readily equipped with extensive distribution networks at their disposal, amongst whom could be included; HSBC, Chase Manhattan, Citibank, ANZ Amro, Grindlays, Keinwort Benson,

Union Bank of Switzerland and Girozentrale of Austria, have all taken steps to be actively involved in Islamic finance. They do this by operating Islamic financing windows, to strategically position themselves accordingly in order to capture meaningful shares of the Islamic banking market (Mohammed Ali, 2002). In fact, it has been estimated that there are nearly 200 banks and financing institutions worldwide that operate Islamic banking/financing controlling some US$200 billion in assets (Mohammed Ali, 2002). With an average annual growth of about 10% worldwide and about 15% in the Gulf which is much higher than the growth rate of conventional banking (Schoon et al, 2003), Islamic banking appears to appeal to stakeholders much more in their efficient resource allocation decisions than conventional banks do. Even a number of major non-banking institutions such as General Motors, Daewoo and IBM have partly resorted to Islamic financing due to its attractive features.

In this regard, the ability to benchmark conventional and Islamic banks relative to one another by undertaking comparative bank performance analysis would greatly assist stakeholders including industry players to identify the relative superiority and competitive edges of both conventional and Islamic banks (Aziz, 2000). For instance, depositors or fund providers would be able to know which banks are operating more economically, efficiently and profitably by using the resources provided that better match their preferences in terms of amount, timing, risk and desirability of returns. These issues form the very reasons for the provision of resources so that future decisions about scarce resource allocation can be adjusted accordingly. On the other hand, regulatory bodies performing oversight functions and policy makers would be able to know which banks have been able to achieve the public interest of higher economic and standard of living growth much more effectively and efficiently so that suitable policies and regulatory frameworks can be devised to maximize the potential.

Benchmarking can also become a powerful managerial tool for identifying key features of the most efficient performers in the banking industry and relative

performance gaps. In doing so, both conventional and Islamic banks stand to benefit tremendously by discovering their own competitive positions within the banking industry relative to one another. They also become aware of possible avenues for improvement by setting standards and targets for measures of efficiency, effectiveness, innovation, research and development, productivity, product quality and diversification and customer service. These of course would be likely to enhance competition within the industry to the benefits of consumers and the public.

2.5.4: The Unique Risks of Islamic Banking

There is a pressing need to enhance the decision making of stakeholders in regards to the nature of unique risks and returns of Islamic banking. Islamic banking in nature is a mix of commercial banking and investment banking due to its reliance on investment operations that devote substantial resources towards the development of viable projects to ensure that depositors' interests are protected and yet achieve adequate rates of return (Al Omar and Abdel-Haq, 1996; Abdel Karim, 2004). Investment banking is mainly carried out by mobilizing funds in investment accounts which are often commingled with shareholders' funds.

2.5.4.1: Heightened Risk of Equity-like Funding

First, as Sundarajan and Errico (2002) point out, the profit and loss sharing financing mode raises several important considerations. Specifically, because PLS modes closely resemble equity financing, Islamic banks are vulnerable to the heightened risks usually borne by equity investors rather than debt holders. Meanwhile, projects to be funded by PLS financing tend to be principally selected based on their anticipated profitability rather than the credit-worthiness of the finance users (Al Omar and Abdel-Haq, 1996). Credit risks are therefore shifted to investment depositors.

In principle, the administration of PLS financing is far more complex than that of conventional banking. This applies to a number of areas from the determination of profit-loss ratios for different projects on case-by-case basis to the ongoing auditing of financed projects. In addition there are virtually countless numbers of ways of providing funds through combinations of permissible PLS contracts which depend on a bank's in-house sharia council. This results in the non-standardized nature of some Islamic financial products. These issues underscore the high degrees of operational risks in Islamic banking and highlight the importance of internal controls in the protection and maximization of values for both equity investors and investment account holders.

Figure 2.2 summarizes the type and magnitude of risks typically faced by Islamic banks relative to those of conventional banks. Asset management and credit analysis are crucial in managing risk in Islamic banking since Sharia guidelines on the use of derivative instruments to hedge risks are uncertain. However, these are relatively under-developed in Islamic banks due to their present infancy (Al Omar and Abdel-Haq, 1996). Generally, Islamic banks also experience a shortage of qualified professionals with the necessary R&D experience, expertise and institutional capacity to produce greater diversity of products and risks.

2.5.4.2: Incentive Problems: Moral Hazard and Adverse Selection

Lewis and Algaoud (2001) highlight three fundamental incentive problems that are inherent in Islamic banking financing: (1) the absence of collateral requirements, (2) the inability of banks to monitor and force entrepreneurs to conform with certain covenants or undertake certain post-contractual actions and, (3) the obligation of banks to bear expenditures incurred by entrepreneurs. These principal-agent issues often lead to the following circumstances:

Banks attract entrepreneurs with limited resources or wealth. In the case of an entrepreneur who is certain of the high profitability of an intended project the

option of paying fixed interest to a conventional bank would be more attractive than giving up a larger profit share with an Islamic bank (Al Omar and Abdel-Haq, 1996). Thus, when an Islamic bank competes with conventional banks over profitable projects, it is expected that the Islamic banks will be left financing less profitable projects (Brown, 2000).

There is a lack of incentives for entrepreneurs to put in the efforts necessary to maximize the successful outcome of a project and added incentives for the entrepreneurs to expend beyond the levels that are deemed necessary. As a result, the authors pointed out that Islamic banks often need to ration the supply of funds towards the mudaraba financing mode.

	Conventional Banking	Islamic Banking
Credit risk	A	A (High)
Maturity Mismatch	A	A (High)
Currency Risk	A	A
Interest Rate Risk	A	N/A
Risk of Trade and Investments	N/A	A
Liquidity Risk	A	A (High)

A: Applicable ***N/A: Not Applicable***

Figure 2.2: Risks faced by Conventional and Islamic Banks (Al-Omar and Abdel-Haq, 1996; pp 105)

According to Lewis and Algaoud (2001), these moral hazards problems are serious enough to put investment accounts depositors at a disadvantage. This follows because depositors in Islamic banking are almost akin to investors of mutual funds, and yet they are not entitled to voting rights and the regular receipt of information pertaining to the project's or company's management and activities. These would be available to a normal shareholder in proportion

to the company's paid up capital. Furthermore, investment account holders cannot buy or sell their shares/interests in a company or project under Islamic banking. This lack of control compels the depositors to constantly monitor the banks' performance (See Errico and Farahbaksh (1998)[4].).

On the other hand, according to some Islamic scholars, these incentive issues can be partially resolved by the "religious and moral appeal" of Islamic banking whereby truthfulness among Muslim business communities is paramount. In fact, the practice of Islamic ideologies embodied by Islamic banking will minimize such transaction costs because Muslim entrepreneurs will always behave in ethically sound ways. Nevertheless, such views are often less applicable in all circumstances for various reasons. First of all, the effectiveness of such religious values is only rigorous in financial systems that are fully Islamized. However, the case is quite different in mixed systems. Erol and El Bdor (1989)[5], Haron, Ahmad and Planisek (1994)[6], Gerrard and Cunningham (1997)[7] studied the factors that led to the growing popularity of Islamic banking and found that (1) religion did not appear to be the overriding factor leading people to accept Islamic banking, (2) people who used Islamic banking wanted their transactions to be processed as efficiently as possible, (3) Islamic banking customers were profit-oriented and expected Islamic banks to outperform conventional banks.

Given these circumstances it is expected that both investment account holders and shareholders would have added incentives to be informed of comparative performance measures because they can lose all their invested capital if particular ventures fail. For the same reason, the bulk of Islamic finance goes to funding trade financing and mark up arrangements where banks are assured of lower but more or less fixed returns that do not involve risk-sharing. Aggregate data compiled by the International Association of Islamic Banks (IAIB) indicated that PLS modes only account for some 25% of

[4] As cited in Lewis and Algaoud (2001).
[5] As cited in Lewis and Algaoud (2001).
[6] As cited in Lewis and Algaoud (2001).
[7] As cited in Lewis and Algaoud (2001).

banks' total assets with the remaining majority comprising of non-PLS financing modes (Sundarajan and Errico, 2002).

2.5.4.3: Political Influence over Islamic Banking Profitability

One of the more obvious issues to consider, has been the fact that in most countries, government borrowing constitutes a major if not the largest share of demand for Islamic funds. Unlike lending by conventional banks however, these borrowings are not often used for productive investments. In fact Lewis and Algaoud (2001) stressed that even those funds that are used to finance productive projects, often provide very low yields. Thus, the banks are often faced with difficulties in not only providing but also determining satisfactory returns on investment funds to be in a position to be able to compete with conventional banks. Without the certainty of satisfactory returns, IBO may not be able to attract longer-term funds to fund longer-term investment that provides higher and more satisfactory returns.

Logically, one critical question arises: Why would IBOs want to undertake funding of such government demands in the first place? Lewis and Algaoud (2001) explain that the very development of the Islamic banking concept into an alternative banking mode that permeates financial systems in many Islamic countries was very much government-led. Thus, the ability of IBOs to attract funds and expand their assets owes much of their success to the Islamisation programs initiated by many Muslim country governments. In some countries for example, Islamic banks are usually immune from asset seizure and exempted from taxation. Such guarantees are presumably taken to encourage investors to undertake ventures in cooperation with an Islamic bank and for savers to deposit their savings with Islamic banks. Therefore, the growth in Islamic banking has been politicized to some degree. Furthermore, one needs to be reminded that unlike conventional banking, Islamic banking emphasizes social development and solidarity as opposed to economic profitability. It is no surprise therefore that Islamic banks are often compelled to extend non-profitable investment funding to finance governments' endeavors especially

when such endeavors are regarded as necessary in enhancing the community and social developments.

Thus, the profitability of IBOs may be confounded by such political influence. Nevertheless, a comparative bank productivity analysis would enable stakeholders, especially depositors, to gauge the degrees of political influence over banks' profits and ultimately, the rates of return on investments. After all, Lewis and Algaoud (2001) maintain that while the religious factors have crucial roles, Islamic banking customers are nevertheless mostly profit-oriented. To this end, the authors cited that the most critical factors to sustain growth in Islamic banking are; (1) the ability to provide modern banking facilities supported by the latest technological advancements, and (2) the ability to offer rates of return comparable to those received by depositors in conventional banks.

2.5.4.4: Risks Arising from Non-PLS Financing

Non-PLS modes of financing may appear less risky, but they do in fact carry special risks that need to be recognized. In extending purchase with deferred delivery for example, the bank essentially agrees to buy a commodity on a future date against current payment and hold the commodity until it can be converted to cash. In this case, Islamic banks are exposed to both credit risk and commodity price risk (Sundarajan and Errico, 2002).

2.5.4.5: Limited Availability of Risk-Hedging Instruments

In addition to the many specific risks inherent to Islamic banks, there are a number of more general factors that make Islamic banking riskier and/or less profitable than conventional banking. To begin with, Islamic banks have fewer risk-hedging instruments and techniques available, since the prohibition of riba bars Islamic banks from being able to use conventional risk-hedging tools such as options, futures and forwards (Sundarajan and Errico, 2002). This is further compounded by the relatively undeveloped Islamic interbank and

money markets as well as the un-availability of suitable government securities based on PLS concepts. A consequence is that there are also limited access of lender-of-last-resort facilities from central banks (Sundarajan and Errico, 2002). In these circumstances, Islamic banks are deeply constrained in managing asset-liability mismatches and liquidity levels. As a result of these factors, Islamic banks have historically been forced to maintain comparatively larger proportions of reserve assets that either yield little or no returns, adversely affecting their competitiveness (Sundarajan and Errico, 2002).

2.5.4.6: Summary of Unique Risks in Islamic Banking

Islamic banking practices often translate into heightened risks for investment account holders, whose capital value and rates of return result from unrestricted investment account contracts where the banks returns are not guaranteed. This feature is coupled with an information asymmetry where banks manage depositors' funds at their own discretion, significantly increases the potential for moral hazard and present incentives for risk taking and operation without adequate capital. Apart from these issues, investment depositors in Islamic banks do not enjoy the same rights as equity investors do in Islamic banks and investors in conventional banks but they share the same risks (Sundarajan and Errico, 2002; Al-Deehani et al, 1999). Under these circumstances, corporate governance is difficult to exercise and the potential for undue risk-taking and moral hazard is increased.

Due to the lack of implied protection for investment depositors, who should therefore be entitled to receive disclosure of information about the banks' investment performances that better reflect the banks' true risks to enable comparisons not only between Islamic and conventional banks, but also among Islamic banks? This is consistent with the Islamic banking framework, where it is expected that depositors play more active roles in monitoring bank performance than would conventional depositors because neither capital value nor returns are fixed and guaranteed. Instead they hinge upon the performance of the investment funds. Such added monitoring would also help

ensure that the rates of return paid reflect a fair application of PLS principle to the bank's profit. By partly reducing the information asymmetry inherent in some contracts, investment account holders would be able to better assess the potential risks and rewards of their investments. Consequently, they should be able to make flexible decisions about the allocation of their economic resources, and decisions about whether to continue investing with the same Islamic bank, or to move their savings elsewhere to another Islamic bank or perhaps to conventional banks to protect their own interests based on their risk and return preferences. Furthermore, this would prevent, to some degree, unsound banks being able to attract depositors by promising unrealistic rates of return that may crowd out serious and well-managed banks (Sundarajan and Errico, 2002).

Moreover, information about comparable bank performance measures can provide the public and supervisory authorities and bodies with a better understanding of banks' strategies and the potential impact of their relevant risks. This places the regulatory bodies in a better position to consider unique regulatory frameworks that could be adapted to the uniqueness of Islamic banks in-order to exercise informed market discipline and effective prudential supervision and thus, reduce the systemic risks in the Islamic banking system that exist as part of a dual banking system.

2.5.5: To Ensured Sustained Future Growth in an Interdependent Environment

A general lack of understanding of the principles and operations of Islamic banking has made it very difficult for external parties such as the central bank, the investing public and other conventional banks that Islamic banks conduct dealings with, to adapt to the structures and interpretations of financial results presented by Islamic banks. This often weakens the credibility of Islamic banks since higher costs and premiums are incurred by Islamic banks when conducting business with their international conventional counterparts and they face high degrees of uncertainty (Abdel Karim, 2004).

The unfamiliarity of Islamic banking financial reporting among the investing public also make them more likely to discount Islamic banks' shares and profit sharing contracts, thereby depressing the values of these instruments and thus putting Islamic banks at a disadvantage (Abdel Karim, 2004). These are often compounded by the many different variants of Islamic banking whereby bankers and institutions may find themselves confused by the different rulings of the different sharia councils of each bank who follow different schools (Al Omar and Abdel-Haq, 1996; Abdel Karim, 2004). This has resulted in the lack of standardization that in many cases may even render the financial performance of Islamic banks non-comparable to each other. Thus, the non-transparent and non-comparability of financial reporting and performance assessment between conventional and Islamic banks make economic decisions by participants in the world's capital markets too cumbersome and this often hampers the ability of Islamic banks to attract sufficient funding, lucrative investment opportunities, shareholders' funds and the necessary qualified professional talents to maintain sustained growth relative to conventional banking.

Perhaps, the most pressing need for a comparable performance evaluation methodology stems from the potential conflicts between Islamic banks and central banks. There is a consensus among Muslim economists that Islamic banks should be supervised and that this supervision should encompass a material appraisal of the quality of management decisions especially with respect to the more risky PLS finance to protect clients who have invested their money in investment accounts against avoidable loses (Al Omar and Abdel-Haq, 1996). This is regarded as being necessary because even though Islamic banks form part of the banking system in many countries in which they operate, the lack of understanding and misunderstanding between central banks and Islamic banks can be acute, especially with regards to the protection of depositors, which is a priority of central banks that stands in contradiction with the concepts of Islamic banking (Al Omar and Abdel-Haq, 1996). The difficulty faced by central banks in adapting to the structures and

practices in Islamic banks could result in resentment and tension in their relationship making central banks less willing to support Islamic banking especially in non-Muslim countries.

The pressing need is to make Islamic banking financial and performance reporting comparable to conventional banking so as to improve the credibility of Islamic banking to inspire confidence in their users, and to enhance the competitiveness of the Islamic financial services sector. This requirement has always been acknowledged and shared by Islamic banks and has led to the establishment of AAOIFI in 1989 (Al Omar and Abdel-Haq, 1996). A non-governmental organization based in Bahrain, the AAOIFI was set up to harmonize Islamic and conventional banking financial statements so as to account for the differences between Islamic and conventional banking and to present information on these fairly in a way that can be understood by all interested parties. The AAOIFI accomplishes this by setting the financial reporting presentation and disclosure requirements using the same principles recommended by the International Financial Reporting Standards (IFRS). However, at the same time they cater to the specificities of Sharia contracts that may not have any parallels at all in conventional banking and try to be consistent with the nature of Islamic banking operations (Abdel Karim, 2004). It is the objective of this paper in the spirit of the AAOIFI to extend the application of comparable financial reporting to cover comparable performance evaluation of Islamic and conventional banks.

2.5.6: A Persistent Lack of Credible Empirical Research On a Viable Cross-System Bank Productivity Measurement in the Banking Literature

The need for viable cross-system measurements is further fuelled by the serious void of any credible empirical research on comparable performance between the two banking systems. Most of the previous studies of Islamic banks focused primarily on expounding the conceptual principles of interest-free financing. In fact, it has been recognized that the general lack of relevant and reliable data is seriously impeding any comprehensive analysis of cross-

system bank performance measurement. Much to our dismay however, most of the few empirical studies of Islamic banks' performance fail to account for these apparent and wide fundamental differences.

In what the author found as the only close contemporary study on cross-system bank performance analysis between Islamic and conventional banks, Hassan and Bashir (2003) examined the determinants of Islamic banking profitability worldwide between 1994-2001 by employing ratio and a regression model analysis that considers a variety of internal and external banking characteristics. The study subsequently compared the performance of both Islamic and conventional commercial banks based on the selected key ratios which were used to explain some unique performance characteristics of Islamic banks relative to conventional banks. Much of the data in this study was extracted from the BankScope database compiled by IBCA. The authors however applied ratios such as net interest margin and loan loss provisions over net interest revenue that do not apply to Islamic banking due to their riba characteristics. The methodology and the eventual results therefore cannot be interpreted with any confidence that they accurately reflect Islamic banking operations.

Similar suspicions can also be raised on a much related but more recent study by Kim Brown (2003) that seeks to implement a cross-country Islamic bank performance measurement for the period 1998-2001. The author adopted a combined approach of selected ratio analysis to provide annual analysis relating to bank size, structure, profitability and liquidity and Data Envelopment Analysis to analyze the cost efficiency of the banks. The main source of data was once again IBCA's BankScope database. Similar to the earlier study, Brown (2003) also reports dubious financial ratios such as net interest margins that are inconsistent with the operation of Islamic finance. Thus, the credibility of the findings may be questionable and can possibly be challenged.

It appears that in the wake of a serious lack of relevant and reliable bank performance data for Islamic banks, researchers have resorted to obtaining their inputs from the BankScope database. The BankScope database is a unique collection of micro-level banking information on some 11,000 banks worldwide. The directory provides not only standardized consolidated and unconsolidated financial statements across years, but also financial ratings, ownership data and extensive financial analysis functions derived from public financial reports and private rating service reports from Moody's, Standards and Poors, Fitchs and others. The BankScope database however does not cover the entire bank population in a country, but rather a supposedly representative sample (Bhattacharya, 2003). Nevertheless, its extensive data coverage has led to wide usage of data by leading financial institutions, regulatory authorities and central banks for cross-country studies and policy making purposes.

However as the reported findings by Hassan and Bashir (2003) and Brown (2003) suggest, the appropriateness of the data compiled by BankScope is questionable, at least in the Islamic banking context. More specifically, there are no clear indications provided on the sampling design used, data selection and inclusion policy and the extent of country-specific coverage in respect to different size variables. Therefore, heavy dependence on inputs from BankScope may result in findings and conclusions being haphazardly made, where the reliability, credibility and comparability may be challenged. In fact there are a number of studies that warn against the hasty and indiscriminate use of BankScope data for country-specific and cross-country studies. Bhattacharya (2003) for example found strong selectivity bias towards large banks in BankScope that renders the database sample somewhat unrepresentative of the actual financial market. This flaw would be much more pronounced by the potentially serious distorting of actual measurements in the context of a segmented banking industry. This conclusion is shared by De Brandt and Davis (1999)[8], Corvoisier and Gropp (2001)[9] and Ehrmann et al

[8] As cited in Bhattacharya (2003)
[9] As cited in Bhattacharya (2003)

(2001). Ehrmann et al (2001) observed that since small banks are not adequately covered, BankScope proves to be a poor instrument to investigate micro effects across banks but is capable of giving a fair description of likely macro effects. However, the authors recommended the use of comparable databases such as the Eurosystem datasets and complete data that reside at central banks to produce more stable and robust results

As explained above, Islamic banking and conventional differ fundamentally in both their principles and operations. In our view, the absence of adequate disclosure about BankScope's data selection and inclusion policy renders problematic any cross-system study that uses BankScope's data to attempt to perform a comparable performance analysis between conventional and Islamic banks. The results from such a comparison cannot be interpreted and applied with confidence. Given this, the authors opinioned that because no cross-system studies, to their knowledge, have ever relied on other more credible sources than BankScope; there is a definite void within the voluminous banking literature on cross-system comparable bank performance measurement in a dual banking industry. It is thus, the aim in this study to pioneer one.

2.6: The Conceptual Comparability Between Conventional and Islamic Banking

Given that both conventional and Islamic banks represent two different modes of banking each with its own distinctive bank-client relationship, a cursory glance at the apparent fundamental differences in banking principles and actual operations would suggest that it is not possible to compare directly the performance of conventional banks vis a vis Islamic banks and that any attempts to do so would result in skewed and inaccurate conclusions. This is not necessarily so.

Here, it is illustrated that an indirect comparable performance assessment between conventional and Islamic banks is viable. To this end, this study proposes a model that is based upon the functional perspective of financial intermediation that holds the notion that the financial intermediation roles of conventional banks and Islamic banks are essentially identical despite taking different efficient institutional forms and structures. To do so, this study follows the functional perspective to derive four comparable bank performance variables that are applicable to both conventional banks and Islamic banks alike. This bank performance evaluation technique can be effectively applied in other dual banking cases that involve the co-existence of conventional banks and Islamic banks.

To the knowledge of this study's author, the proposed model constitutes a novel contribution to both contemporary literature and empirical research on conventional and Islamic banking. It deviates away from standard approaches employed by previous studies that failed to give due consideration and recognition of the non-parallels in both banking systems. This inference alone renders the validity and intuitive interpretation of past findings questionable.

Instead of merely imposing the conventional banking performance evaluation model on Islamic banks, this study in contrast, builds a robust performance measurement model based on the underlying functional financial intermediation concept that recognizes the fact that for a variety of reasons perhaps due to the dynamics of institutional change driven by technological advancement, competition from banking and non-banking institutions as well as financial market regulation, the most efficient institutional structure for fulfilling financial intermediation may differ across institutions, time and geopolitical divisions but maintains that the basic functions of financial intermediation remain the same anywhere, past and present.

2.6.1: The Functions of Financial Intermediaries

The primary function of any financial intermediary is to facilitate the allocation and deployment of financial resources effectively and efficiently, spatially and temporarily in an uncertain economy (Merton, 1995). This formal definition is best illustrated graphically as shown in Figure 2.3. From Figure 2.3, it is easy to infer that a financial intermediary essentially acts as a conduit through which pooled small and scattered financial resources are channeled from saving surplus units to deficit units who plan to undertake sizable productive investments. In return, the deficit units compensate the financial intermediary for its intermediation role while the intermediary in turn compensates the surplus units for the surplus funds that are made available for the intermediary instead of being invested on some alternative assets or investment vehicles. Surplus units generally receive some minimum returns to compensate for any loss of purchasing power to inflation.

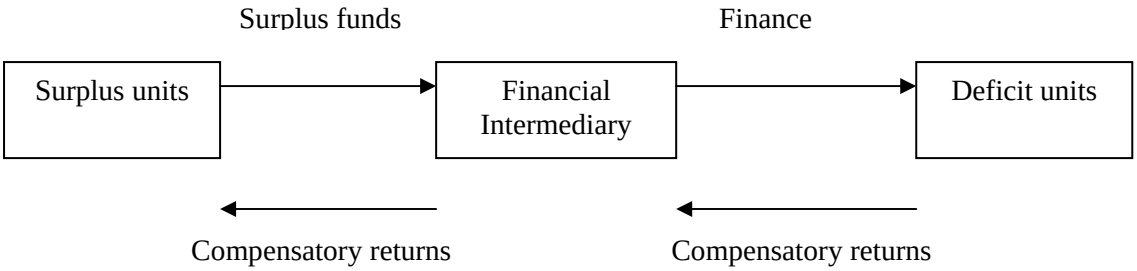


Figure 2.3: The Financial Intermediation Process

The role of financial intermediation however is neither passive nor simple. This is because both savers and investors desire or face different yields, risks, liquidity characteristics and time-pattern of returns (Viney, 2000). Given these conflicting preferences, it is most likely that the surplus and deficit units would be frustrated in meeting their goals. A financial intermediary however could align these different preferences simultaneously and profit from its efforts invested to do so.

Savings/Deposit Loans

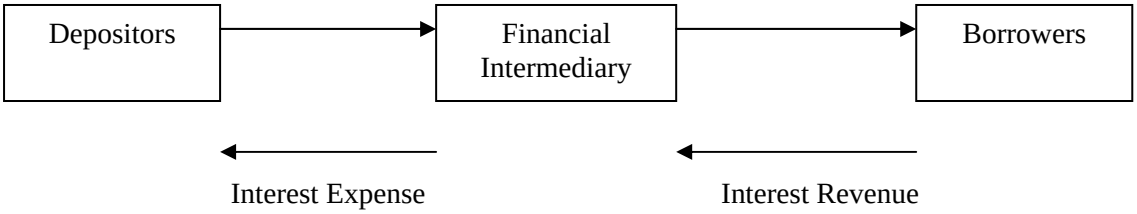


Figure 2.4: The Financial Intermediation Process in Conventional Banking

2.6.2: Conventional Banking Parameters

Applied to conventional banking as of the case of Figure 2.4, banks pool the depositors' savings and lend them to borrowers for either consumption or investment purposes. For its intermediary efforts, the bank charges higher interest on loans to earn interest revenue but compensates depositors with lower interest expense and earns the profits in between. Here, interest charged and paid by the bank are predetermined or at least made known at the time of contract and factors in the time value effects of money. The determination of interest is usually guided by market forces in the money markets but the interests charges imposed on the borrowers are heavily determined by the creditworthiness of the borrower and not the potential profitability of the investment projects. Payment of interest to the bank (except in the case of a loan default) and depositors is guaranteed regardless of the eventual return outcomes of the investment funded. Thus, the fixed returns of debt financing in conventional banking do not reflect the risks inherited by an investment because the depositors and the bank do not share in the profits as well as the losses of a particular investment. In the eyes of Islamic banking, this represents a form of economic injustice as the bank and depositors are at an advantage by making profits in advance that are divorced from the circumstances and crucial management of the investment and thus, putting the risk burdens on the borrower.

2.6.3: Islamic Banking Parameters

With some slight adjustments, the same financial intermediation framework more or less applies to Islamic banking as demonstrated by Figure 2.3.

Because Islamic banks invest funds instead of extending advances, it represents a form of commercial and investment banking. Due to this reason, Islamic banks pool together investment account savings from finance providers and deploy them as investment financing to fund investments taken by finance users. It is worth noting that owing to their nature, Islamic banks tend to finance profitable investments instead of consumption. In return the bank receives its share of profits if the venture is successful and shares them with the finance providers in fixed and predetermined proportions. The same process applies to loss sharing in the event that the investment generates negative returns. It should be noted that only the PLS sharing ratio is predetermined in advance. Whether the finance providers and the bank receive positive returns, depends entirely on the eventual success and profitability of the investment, it is not certain and predetermined (Chapra, 2003). The funding mode of Islamic banking therefore closely resembles that of equity financing as opposed to debt financing. The finance providers, the bank and the finance users all share the risks of a particular project (Chapra, 2003). Islamic scholars praise this economic justice because all parties earn their returns that correspond to equal risks assumed. Although many Islamic banks in general do pay surplus units simple interests to prevent the loss of purchasing power to inflation, compounding and time value of money effects are strictly prohibited (Al Omar and Abdel-Haq, 1996).

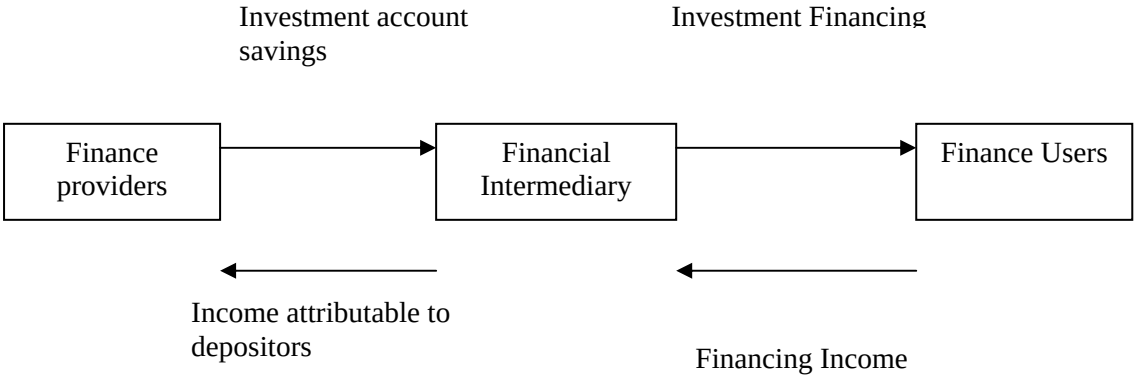


Figure 2.5: The Financial Intermediation Process in Islamic Banking

2.6.4: Derivation of Comparable Variables

It may apparent by now, which comparable variables can be used to compare the performance of conventional banks against that of Islamic banks without sacrificing the crucial consideration of unique elements within each banking system. This study proposes the derivation of comparable variables that are consistent with the use of accounting figures and bank financial statement analysis that are used by banks' stakeholders to guide their economic decision making on scarce economic resource allocation in regards to the banks. Careful scrutiny of Figures 2.3 to 2.5 would reveal that the elements of the upper financial flow belong to the balance sheet while those of the lower flow are disclosed in the income statement of a bank. Thus, conventional banks' savings and loans can be compared with investment account savings and investment financing in Islamic banks, while Islamic equivalents to conventional banks' interest revenue and interest expense are financing income and income attributable to depositors. These variables are both relevant and reliable. Hence, with the functional perspective of financial intermediation, it is viable to construct a bank performance assessment model that is applicable to conventional and Islamic banks by taking into account the specificities in both banking modes.

2.7: The Effects of Bank Mergers on Bank Productivity and Efficiency

2.7.1 Trends and Reasons for Bank Mergers and Acquisitions

No single analysis of a banking sector can ignore the effects of rapid bank consolidation as the banking sectors worldwide are becoming more integrated. The last fifteen years have seen an unprecedented number of bank mergers the world over (Focarelli and Paneta, 2002). The trend started off with merger deals in the US in the 1980s but more recently, mergers of European banks and banks from developing countries are slowly dominating the scene (Cybo-Ottine and Murgia, 2000). Bank mergers and acquisition may be seen as a collective response by banks to benefit from new business opportunities and fend off threats that have been created by changes in the regulatory environment and technological progress (Mendes and Rebelo,

1999). On the one hand, the active deregulation of financial markets worldwide have increasingly blurred the boundaries of industries, enterprises, regulations, language and geopolitical divisions. On the other hand, progress in communication technology lowers costs of communication allowing greater dissemination of information across geographical, political and social divisions. Thus, these two forces of technology and deregulation have enabled even physically distant bank and non-banking institutions to become active competitors in any market fueling the needs for existing banks to adopt proactive and defensive strategies to maintain market shares and create shareholder value. Bank mergers, be they market oriented or pre-arranged by regulators, are seen as the most effective means to create value in the new competitive environment.

2.7.2: Productivity Gains Arising of Bank Mergers: The Theoretical Perspective

Bank mergers can increase value by cost reduction and/or revenue enhancement (Houston et al., 2001). Cost reduction can be achieved by exploiting economies of scale, economies of scope, eliminating redundant and overlapping resources, consolidating common functions, selective redeployment of assets, transfer of asset control to better quality management and enhancing capacity to invest in new and sophisticated technology and distribution channels. Cost cutting potential has been found to be greater when banks have considerable geographic overlap with cost savings estimated to be up to 30% of the target's non-interest expense. Meanwhile, post-merger revenue enhancement can be derived from a number of possible sources. The most frequently cited motivations include the cross selling of bank services, the ability to raise interest on loans and fees and lower interest rates on deposits. Both cost reduction and revenue efficiencies represent the motivations behind most bank mergers, whether market guided or otherwise.

2.7.3: The Empirical Evidence and Debate Over Productivity Gains of Mergers

The existing literature seeking to determine whether bank consolidations produce efficiency gains as often claimed by bank managers and executives can be conveniently divided into three broad categories as expounded by Calomiris (1999). The first category involves cross-regime comparisons that contrast the performance of banks under regulatory regimes that permit and prohibit bank mergers. The second approach attempts to analyze the causes and likely advantages and benefits of bank consolidations. The third approach examines the consequences for individual bank performances following consolidations that often include event studies on stock price performance of the bidder and the target around the date of a merger. A merger is assumed to create value (either through cost reduction or/and revenue enhancement efficiencies) if the combined value of the bidder and the target increases on the announcement of the merger. The conclusions arrived by these studies groups differ significantly.

The first two categories often view mergers as the sources of enhanced efficiency and competition within the banking industry. Much academic literature on the subject suggests that there are vast potentials for bank cost efficiency improvements to be realized from bank mergers. Several studies indicate that many scale economies remain unexploited even for the largest banks in US (Berger and Mester, 1997; Berger and Humphrey, 1997) and in Europe (Allen and Rai, 1996; Molyneux et al, 1996; Vander Vennet, 2001). Berger et al. (1999) find that this was more particularly so in the 90s than in the 80s due to technological progress, regulatory changes and favorable low interest rate environment, conditions that are still present today. Meanwhile, there is conclusive evidence that banks exhibit substantial X-inefficiencies that range somewhere between 20-25% of total costs (Berger and Humphrey), suggesting that mergers may substantially improve cost efficiency in the event of a relatively efficient bank acquiring relatively less efficient ones.

Yet a majority of the studies within the third category conclude that these potential cost efficiency gains are seldom realized. Studies on US banks find

on average, little or no cost X-efficiency improvements (DeYoung 1997; Peristani 1997; Berger 1998). It is also noted that evidence from a number of studies support the premise that pre-consolidation efficiency may not necessarily be maintained (Berg 1992; Berger 1992; Pilloff 1996; Akhavein et al., 1997; Berger, 1998; Huizinga, 2001). These findings lend credence to Avkiran (1999a) who suggested bank mergers appear to be based on perceived economic and political gains rather than conclusive mathematical findings that can be substantiated. The academic literature on the value gains from bank mergers also creates a troubling paradox: empirical evidence from event studies find little wealth creation but reported instead little or no improvement on post-merger operating performance relative to their peers (Piloff, 1994; Houston and Ryngaert, 1994; Berger et al, 1999; Kwan and Eisenbeis, 1995) although Cybo-Ottone and Murgia (2000) found abnormal returns on average associated with large bank mergers in Europe that are consistent with a cost efficiency explanation of bank mergers. Cybo-Ottone and Murgia (2000) however ascribed the difference to different structures and regulation regimes between US and EU markets. This paradox in general has even led some researchers to conclude that the current wave of mergers reflect non-value maximizing motivations of bank managers such as channeling expenditures according to private preferences that destroy value for the acquiring shareholders (Ryan 1999; Gordon and Rosen, 1995).

2.7.4: Bank Mergers and Benefits to the Public

On the other hand, Akhavein et al (1997) and Berger (1988) found that US bank mergers from both the 80s and the 90s actually improved profit efficiency. Given the evidence that mergers often fail to upgrade cost efficiency, improved profit may be attributed to widespread use of increased market power. This is not surprising given that mass consolidations lead to higher market power and concentration and these heightened the possibility of anti-competitive pricing. Further as quoted from Akhavein et al. (1997), there are real concerns about the trade-off between possible gains in operating efficiency if there are any, with the possible efficiency losses from the exercise of greater market power in light of the frequent occurrence of

mega-mergers in the banking industry. Previous studies have generally concluded that consolidation leads to less competitive pricing and thus harms consumers. In a banking study by Prager and Hannan (1998)[10], the authors highlighted that bank mergers reduced deposit rates. Sapienza (2002)[11] meanwhile reports that loan rates increase when the target has a large local market share. Kahn et al. (2000) concluded that large in-market mergers lead to increased market power that manifested itself in rises in personal loan rates.

Thus, while merged entities may become more productive, there is no certainty that the gains will be passed on to consumers via lower prices, wider product range of improved quality and better services. This is because consolidation yields increased market power to the merged entities thus resulting in higher prices and less desirable product mix, quality and services (Focarelli and Panetta, 2002). For instance, while an in-market merger is expected to result in cost savings when redundant bank braches are closed down, such savings cannot be sustained over the long run unless the savings result from improved institutional efficiencies in the operations of the acquiring and target banks (Avkiran ,1999). If not, the public could end up paying for products and services at rates above competitive prices. Furthermore, many bank products are price inelastic particularly when in the case of the retail banking sector and localized markets. Customers may agree to pay more if there is little option or incentive in shifting to a new bank or if there is a general maneuver made by all banking groups in unison. The eventual outcome therefore rests on the magnitude of efficiency effects relative to the magnitude of market power effects. Avkiran (1999) best summarizes the scenario by stating the possibility of increased market penetration create monopoly power and as such, merged entities are less inclined to improve service at better prices. Therefore, there is a major debate about whether some form of unfavorable prices may be passed on to the consumers through increase in loan rates and/or decrease in deposit rates.

[10] As cited in Focarelli and Panetta (2002).
[11] As cited in Focarelli and Panetta (2002).

It is therefore an aim of the study to probe these issues in depth as this study seeks to implement a proposed comparable bank productivity measurement methodology on a suitable dual banking system case study.

2.8: Choice of Population under Study & Motivations of Study

2.8.1: The Malaysian Banking Sector: A Unique Case

In spite of the rapid rise of Islamic banking, it is noted that almost all economies that have Islamic banking operations belong to either one of the two extremes: (1) those with banks which operate in a banking system that has entirely converted to operate only pure Islamic banking and are supervised by religious bodies with conventional banking entirely prohibited (the only examples thus far are Sudan, Pakistan and Iran) and (2) those with Islamic banks occupying the fringe of an essentially conventional banking system with minimal presence (for examples Saudi Arabia and South Africa). In either case, a comparable productivity assessment and comparison between conventional and Islamic banking cannot be effectively and meaningfully implemented as one of the two banking systems is significantly underrepresented. Such situations are likely to yield results biased towards the dominant system and against the lesser system. The banking “dualism” in both cases is rather undeveloped or even often negligible.

The Malaysian banking sector however, presents a rare case where a not only developed but sophisticated dual banking system to be studied. Islamic banking in Malaysia is not only tolerated but also promoted by the government to compete as well as complement its existing conventional banking system. These two banking sectors provide an ideal framework for this study due to several reasons:

First, unlike any other financial system found elsewhere, the Malaysian banking sector is essentially a dual banking system where an Islamic banking system is operating parallel with a conventional banking system and buttressed by a comprehensive Islamic financial system that includes well-defined and accepted Islamic banking laws. It also boasts well developed Islamic money and capital markets as well as Islamic insurance.

Second, the inclusion of banks operating in the regional financial hub of Singapore provides ideal bank performance benchmarks for assessing relative competitiveness and productivity levels largely because both the Malaysian and Singaporean banking sectors exhibit high degrees of similarity and homogeneity. This is attributed to (1) the fact that both Malaysia and Singapore were once a single sovereign economy and share the same historical development before both parted in 1969, (2) the close geographic proximity and strong economic linkages between the two countries and (3) the heavy involvement of Singaporean banks' operation in the Malaysian banking sector.

Third, the Malaysian domestic banking sector is fragmented into banking operations under the conventional and Islamic banking systems. This enables the comparison of different banking systems within the same banking industry, taking into consideration the regional market structures.

Fourth, technological innovations and the effects of the 1998 Asian Financial Crisis have prompted a sudden wave of mergers imposed and supervised by the central bank. The merger exercise drastically reduced the number of banks in Malaysia from 54 to 23 banking institutions that comprise 10 domestic banking groups and 13 foreign banks in a time span of just 2 years. This, alongside with the continuing gradual deregulation of the financial system provides an ideal background to explore and gather evidence on the controversial issues pertaining to pre and post-merger efficiency and

productivity gains and the degree of transfer of these gains, if any at all, to the public and thus enhancing consumer welfare as applied to a developing country case with a partially deregulated banking sector. This scenario also presents an opportunity to gauge the ability and willingness of Islamic banking operations to enhance social welfare.

2.8.2: The Malaysian Dual Banking System

The Malaysian banking sector presents us a very unique case to be studied unlike any other found in the world. In spite its Middle Eastern origins, it is surprisingly in Malaysia, a multiracial and multireligious Muslim country, that Islamic banking development is most exciting. Its rapid growth fueled by active participation of many conventional and Islamic financial institutions from both developing and developed countries alike has been unparalleled and rarely rivaled elsewhere.

Malaysia stands in contrast to other markets with Islamic finance operations. Rather than having too few uncompetitive Islamic banks within an overwhelmingly conventional banking system or a completely Islamised banking system that lacks healthy competition, in Malaysia, there is the breadth and the scope of innovations necessary to become competitive. Malaysia has moreover chosen to implement the dual banking system to simultaneously develop both its conventional and Islamic banking systems. Within the Malaysian dual banking framework, conventional and Islamic banks are recognized and treated equally by the monetary authority, allowing them to co-exist while competing with and complementing each other (Al-Omar and Abdel-Haq, 1996). Unlike most other markets, opportunity and encouragement are given to all banking institutions, domestic and foreign, to practise Islamic banking if certain conditions are met (Al-Omar and Abdel-Haq, 1996). Currently almost all domestic Malaysian and foreign banks that operate within the Malaysian market carry out Islamic banking operations. It is

within this unique dual banking environment that both conventional and Islamic banks are equally competitive relative to one another in many aspects, presenting a rare opportunity whereby both can be effectively juxtaposed on a level playing field.

The 1993 launching of the Interest-free Banking Scheme made Malaysia the first country to implement the dual banking system. Under this framework, conventional banking institutions were able to provide Islamic banking services within their existing banking establishment in an arrangement known as the Islamic Banking Scheme (IBS) (Aziz, 2001a). The rationale being that the dual banking system is considered the most effective and efficient mode of increasing the number of institutions offering Islamic banking services at the lowest cost and within the shortest time frame. Malaysia's keenness to promote itself as a centre for Islamic banking and finance is seen by its comprehensive system with a new Islamic Financial Services Board to set standards and harmonize practices, and a centralized syariah council in Bank Negara. The Islamic Banking sector presently accounts for 8.9% of the banking sector's total assets as shown by Figure 2.6. With the launch of the Financial Sector Master Plan (FMSP) in March 2001, the BNM has set a target for Islamic banking to hold 20% of banking assets by 2010.

By the end of 2002, a total of 2 Islamic banks, 10 domestic commercial banks, 4 foreign commercial banks and 3 merchant banks participated in Islamic finance operations. This has been a tremendous improvement from the passive participation of only 3 banks back in 1993. The other core components of the Islamic financial system comprised the Islamic money market, the Islamic capital market and the takaful or insurance market (Aziz, 2003). The development of the Islamic money and capital markets is supposed to provide the banks avenues for liquidity and risk management as well as an alternative source of financing, and to create broader and diverse Islamic financial instruments for investors (Aziz, 2003). Complementing these three components is Islamic insurance or takaful, that provides the necessary

risk protection to its policy holders and to serve as an efficient mobilizer of long-term funds. Today, the Islamic money market has become an integral part of the Malaysian Islamic financial system, with transactions of more than RM2 billion a day and a broad spectrum of instruments, among which include the Government Investment Issues, Bank Negara Negotiable Notes, Islamic accepted bills and Islamic private debt securities (Aziz, 2003). New players such as money brokers have facilitated the development of this market. The Islamic capital market essentially comprises the equity market and the debt market. Phenomenal growth has been recorded in both these markets. In the debt market, the outstanding Islamic debt securities as at-end June 2003 were 45.5% (or RM68.2 billion) of the total outstanding private debt securities (Aziz, 2003). Meanwhile In the equity market, more than 80% of the counters in the Kuala Lumpur Stock Exchange are Shariah-compliant (Aziz, 2003). The takaful market has also shown impressive growth and the four takaful companies now offer a broad range of products in both family and general business which is comparable to the conventional counterparts.

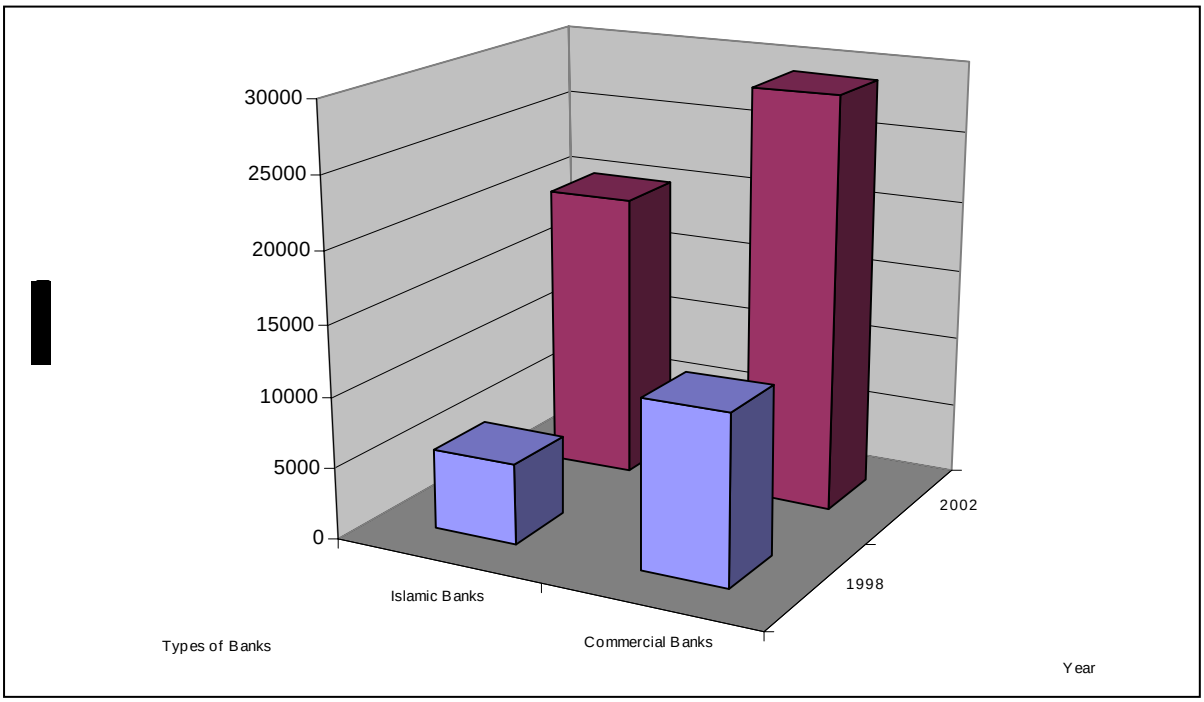


Figure 2.6: Market Share (total assets) within the Malaysian Dual Banking System in 1998 and 2002

Malaysia's initial plan to expand Islamic banking was an effort to turn Malaysia into the regional hub and leading center of Islamic banking with a large number of dynamic and proactive players providing a wide range of products and vibrant Islamic money and capital markets to help develop the SME sector, thus answering the governments' call to promote home ownership and other asset ownership (BNM, 1999). The need for an Islamic banking system become more relevant with the onset of the 1997-1998 financial crisis that saw excessive credit expansion in speculative financing that made the financial system vulnerable to a sudden short-term capital flight. In Islamic banking, the depositors bear the risk of an investment with no guarantee of a fixed return. As such, depositors have increased incentive to monitor their banks' operations and this instils market discipline on the banks to curb excessive short-term lending into financing speculative investments (Chapra, 2003).

2.8.2.1: The Trends and Performance of Participating Banks in Islamic Banking within the Malaysian Dual Banking System

Islamic banking has been on a progressive upward trend with annual growth of almost 49% between 1995 and 1999. From a virtually non-existent market share 10 years ago, Islamic banking has now captured more than 8% of banking assets and with continued expansion, that figure would reach 20% by 2010 (Aziz, 2003). It mobilized some RM 59 billion of assets, RM 48 billion in deposits and RM 30 billion of financing funds in 2002. There are now more than 2,200 branches of Islamic banks and IBS offering Islamic banking products and services. Surprisingly, Islamic banking in Malaysia turns out to be a popular alternative banking mode even among its non-Muslim populations and conventional banks operating under the IBS actually control about 70% of total Islamic banking assets in Malaysia. Overall, commercial bank IBS controls the largest marker segment of Islamic banking with a market share of 42.7% followed by Islamic banks at 29.8% (Aziz, 2003).

Foreign banks such as Chase Manhattan, Citibank, Australia and New Zealand Banking Group (ANZ), Amro and HSBC have also started offering Islamic financial products and even leading Malaysian banks. HSBC Amanah Finance that was set up in 1998 for instance, is now even marketing its products in North America and Europe and about 1/5 of its customers are non-Muslims (Ariff, 2002). Although there has been strong growth, the qualitative performance of Islamic banking services provided by domestic banks is less encouraging compared to those of foreign banks. Take for example the investment deposit return profile in domestic banks where 65.3% were concentrated on short-term investments with maturities ranging from 1 to 3 months (BNM, 1999). The lack of interest in long-term investments is due to the less-than-compensatory return rate against the perceived uncertain risk burden in domestic banks (BNM, 1999; BNM 2000). In addition, the exposure of domestic banks to the broad property sector was significant at 42.6% in 1999 of financing followed by the manufacturing sector at 9% in 1999 (BNM, 1999). This was mainly driven by rapid growth in house financing and the fixed-rate nature of Islamic banking which provided borrowers opportunity to lock in their cost over the long term.

Clearly Islamic banking of domestic banks is utilized mainly for financing low-value activities that are of short term in nature; domestic Islamic banking is also exposed to the risky property sector. Against this backdrop, it is evident that foreign banks have become more advanced in this new sector. With globalization looming ahead, the threats to Islamic banking are expected to come mainly from foreign competition and takeovers because Islamic bank units are generally small with 2/3 of them with less than the critical banking minimum of $500 million worth of assets (Ariff, 2002).

2.8.3: The Malaysian Bank Consolidation Exercise

Among the countries of South East Asia, Malaysia has made the most progress in restructuring its banking system following the 1997-1998 Asian financial crisis that profoundly impacted on the competitive structure of the

industry. The financial crisis left many Malaysian banking institutions reeling from substantial losses due to high levels of non-performing loans, NPL, which rapidly eroded their capital bases to the point where systemic bank failures were imminent. The crisis highlighted rampant weak internal and risk management controls over many years. Excessive speculative lending activities caused severe mismatching between risk profiles of bank portfolios vis a vis the minimum capital requirements. There was simply an overstatement of banks' capacity to absorb shocks (BNM, 1999). These were finally revealed during the crisis when banks with high lending exposures to unproductive activities found high NPL levels and capital deficiency in their books making the Malaysian banking sector back then particularly vulnerable to contagion effects.

BNM realized that a longer-term solution lay in the purchase of assets and assumption of liabilities of weaker banks as the only way the operations of these banks would not be interrupted. BNM also recognized that consolidation of the banks would enable them to reach critical size not only to build resilience against shocks but to build capacity as well to meet future challenges of deregulation and globalization. The sooner the industry consolidates, the more well-placed banks are to meet future challenges.

Subsequently in 1999, the Bank Negara Malaysia (BNM) Malaysia's central bank implemented a bank consolidation program to expand the capital base in building the resilience of domestic institutions after they recorded hefty losses and high NPL levels that were rapidly eroding the capital levels of weakened banks before the situations posed a systemic risk to the financial system. Banking institutions meanwhile were given the liberty to form their own merger groups and elect their own leader to lead the merger process. Approval was subsequently granted for the formation of 10 banking groups, each with a minimum shareholders' equity of RM 2 billion and an asset base of RM 25 billion (BNM, 1999). Over a period of only two years, BNM had forced the merger of 58 financial institutions comprising commercial banks, merchant

banks and finance companies into 10 domestic anchor bank groups with 13 foreign banks (see Figure 2.7). Despite resistance from 2 large commercial banks and a number of small but yet profitable institutions, the bank merger exercise was successful (Browers et al, 2003).

As a result, there were consolidation, rationalization of common functions and operations across member institutions in the group, outsourcing of non-core activities and leveraging on cross-selling of products and services within the groups (Aziz, 2002b). The consolidation enabled the banking groups to reap economies of scale and scope, asset synergies, increase operating efficiency, enhanced profitability and to address problems of capital deficiencies (BNM, 1999). To BNM, these are the developments that would build a strong, efficient and stable banking system that is able to mobilize and allocate funds effectively and efficiently that it had envisioned. This would not only act as a impetus for sustainable economy recovery but also as a proactive response to prepare the Malaysian banking industry towards an imminent heightened deregulation period. Domestic banks can no longer remain under protection as the financial sector is expected to gradually remove barriers of entry for foreign players under the ASEAN Framework Agreement on Services and the GAT on Trade and Services, which Malaysia has committed itself to (BNM, 1999).

2.8.3.1: Performance of Banking Groups following Mergers

Following the comprehensive merger exercise, the banking sector rebounded strongly evidenced by sharp turnaround of asset growth, pre-tax profits, increased loan activities and enhanced capital and reserves levels. Even during the period of slower economic growth in 2001 following a slowdown in the technology sector worldwide, the banking sector persevered and continued to record improved performance. In fact by 2002, profits in the banking continued to improve for the 3rd consecutive year since the financial crisis ended in 1999 when the mergers began (Aziz, 2002b).

This development further lent credence to BNM's initial decision to merge the banks. Because domestic banks have largely built their resilience, the focus now turns to gearing up of capacity building to enhance the domestic banking sector's ability to compete with foreign banks on a level playing field. There have been signs that a second wave of mergers might take place in the near future although the new consolidation process would be more market-based rather than one arranged by BNM. BNM welcomes such a development claiming that although size alone would be insufficient, being a large bank enables a bank to have enough critical mass and scale to invest in cutting edge technology, improve management systems and to attract the necessary talents required to compete against the best players (Aziz, 2002b). With these enhancements, it is expected that domestic banks would be able to better compete with foreign banks in a new range of products and services that have improved quality and convenience to suit increasingly sophisticated banking consumers.

The new focus seems to rest on technological progress in domestic banks because technology advancements especially in ICT have brought great changes in terms of creation of new products, educating consumers that are increasingly more sophisticated and aware, changing cost structures and transformation of the industry structure. Banks that are able to harness technology to aid decision making, facilitate risk management and enhance customer relationship will stand to gain and those that do not would lose their customers to better quality, greater variety and lower-cost products elsewhere. To this end, increased banking size would provide a better platform for banks to make new investments on new technology since such investments often entails high costs coupled with uncertain payoff that cannot be afforded by some domestic banks (Aziz, 2002b).

2.8.3.2: Reservations on Post-Merger Productivity Gains

Prima facie, the consolidation program seems to have succeeded in strengthening the banking industry and enhanced their productivity and

competitiveness by great measure. However, it must be noted that several other factors have played some crucial roles as well. Of importance is the consideration that while credit extension and approval rose strongly, it was largely due to demand side factors where there was strong demand for credit in response to the low interest rate environment that was also aided by a series of fiscal stimuli to revive the domestic economy (BNM 1999; BNM 2000). Next, the smooth success of the mergers and the subsequent turnaround in profits was only successful because significant amounts of distressed assets were removed from their balance sheets to Danaharta for recovery prior to any merger and during a subsequent period ranging from 12 to 18 months after any merger. Plus, there were Tier 1 capital injections by Danamodal specifically designed to ensure the initial success of the mergers. Next, the smooth success of the mergers and the subsequent turnaround in profits were only successful because significant amounts of distressed assets were removed from their balance sheets to Danaharta for recovery prior to any merger and during a subsequent period ranging from 12 to 18 months after any merger. Plus, there were Tier 1 capital injections by Danamodal specifically designed to ensure the initial success of the mergers.

The consolidated banks are now certainly larger than they were during the pre-crisis days, but the merged banks have yet to fully integrate and are not as profitable as they were before they merged. Employee-friendly regulations and unions have prevented banks from capturing efficiency gains resulting from the consolidation and most Malaysian banks are overstaffed (Browers et al, 2003).

These exogenous factors placed the banking sector in a better position to undertake financial intermediation more effectively and competitively. Thus, by large measures, the success of the mergers were attributed to these. It is not immediately clear however whether the weaknesses in bank management and operation have been solved and that they have become more competent instead. The consolidated banks are now certainly larger

than they were during the pre-crisis days, but the merged banks have yet to fully integrate and are not as profitable as they were before they merged. Employee-friendly regulations and unions have prevented banks from capturing efficiency gains resulting from the consolidation and most Malaysian banks are overstaffed (Browers et al, 2003). This scenario is further compounded by strongly, it was largely due to demand side factors where there was strong demand for credit in response to the low interest rate environment that was also aided by a series of fiscal stimulus spending to revive the domestic economy (BNM 1999; BNM 2000).

Furthermore, while gaps between domestic and foreign banks in terms of operational efficiency and productivity have narrowed, there are still many areas where domestic banks are evidently behind. As a striking example, the governor of BNM in 2002 revealed that bank productivity as measured by number of transactions per employee for domestic banks average around 5,000 compared to almost 11,000 for foreign banks (Aziz, 2002b). In terms of convenience to customers, some domestic banks still experience disruption in retail deposit and loan initiation systems and take longer to approve credit card applications. In the Malaysian banking sector, there are currently 13 foreign commercial banks that despite regulatory restriction on branching and the type of products and services that they are allowed to offer, they still manage to control 30% of total assets of commercial banks (BNM, 1999).

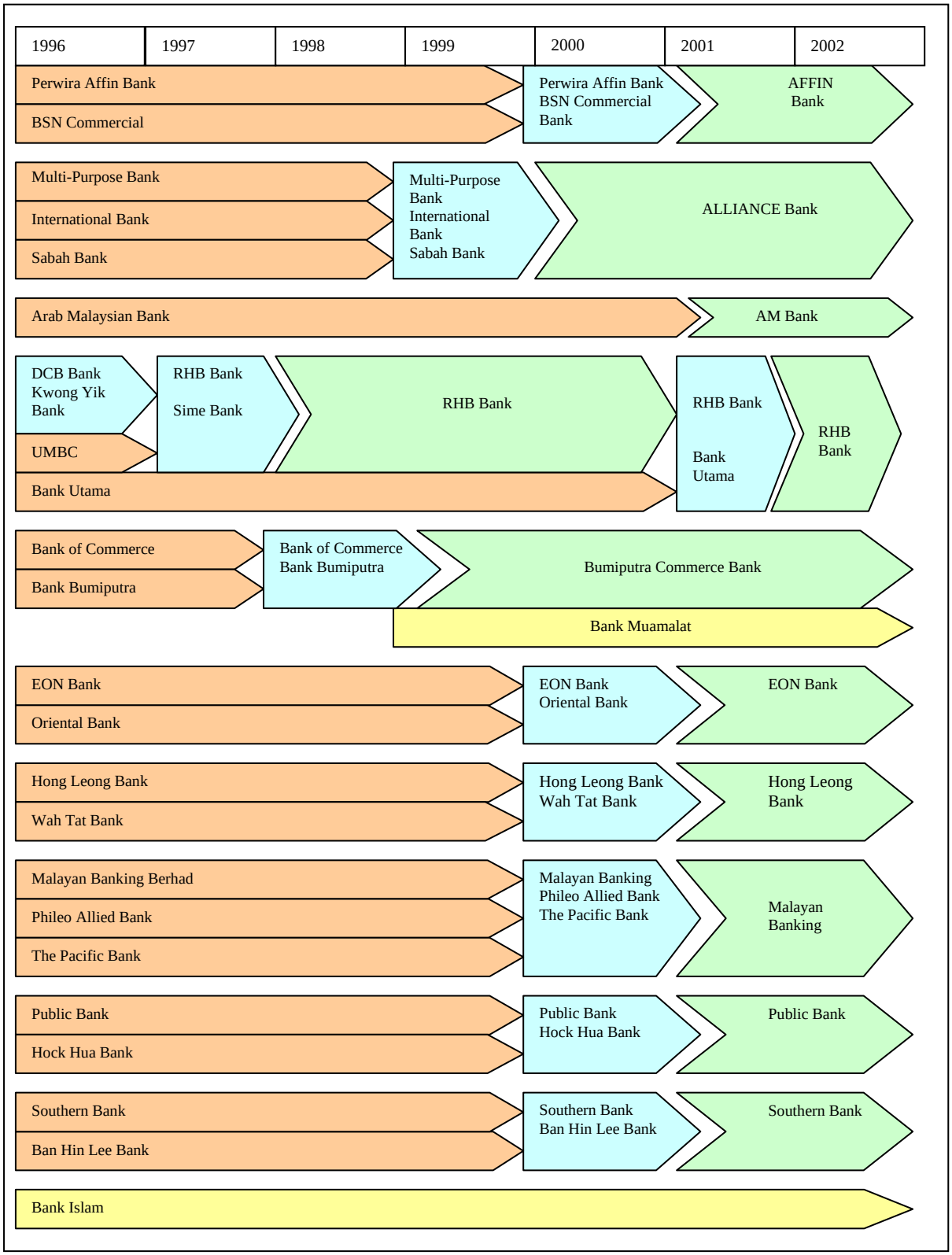
Malaysia has had a significant foreign banks presence since the 1880s and even though domestic banks have been able to catch up by expanding their capacities, foreign banks have so far been able to respond to changes in opportunities and threats faster. They proved to be more innovative by leveraging on the established and time tested R&D expertise and delivery mechanism of their parent banks (Aziz, 2002b). With much better capacity, they are also able to employ the best cutting edge and cost-cutting technology to continuously improve their productivity. As such, foreign banks pose great challenges to domestic banks. They even began to dominate certain banking

niches such as Islamic banking where domestic banks used to have a competitive advantage. Given that existing regulatory restrictions will be eventually phased out as banking deregulation picks up, the threat and challenges faced by domestic banks to even maintain their market share are expected to become more intense.

In general, there has been lack of evidence on increased benefits to the public following first round of bank mergers in Malaysia. For instance, as greater market share is associated as another benefit of bank mergers, figures from BNM[13] have indicated that the market share of commercial bank deposits with the top 5 foreign banks have increased from 18.58% during the 1998 pre-consolidation period, to 20.18% in 2002 at the expense of the consolidating domestic banks (RAM 2003). In another more subtle but more pervasive example, BNM has envisaged that with increased capacity and resilience from the mergers, domestic banks would have the competencies to serve and expand the rather riskier but crucial SME sector. Unfortunately, the domestic banking system, despite having build sufficient capacity from the mergers, is still ill-equipped to serve this potentially lucrative segment. There are still chronic problems such as lack of accessibility, responsiveness and willingness to extend financing into this sector coupled with high collateral demands (BNM, 1999). These cast some doubts whether productivity and efficiency gains were realized from the mergers and if they were realized, whether these gains have been passed on to benefit the public.

[13] Source BNM annual report 1998 and 2002

Figure 2.7: Major Mergers and Acquisitions in the Malaysian Banking System between 1996 and 2002



2.8.4: Singaporean Banks as Ideal Benchmarks

Finally the choice of inclusion of Singaporean banks in the study deserves special mention. Singapore has been one of Asia's most liberal banking markets amongst other international financial centres like Tokyo and Hong Kong. It is the regional financial hub for South East Asia. In contrast to Malaysia, the Monetary Authority of Singapore (MAS) implemented a 5-year plan in 1999 to liberalize the banking sector and remove regulatory barriers against foreign banks (Browers et al, 2003). The Singaporean market has thus changed from one of a cozy oligopoly into a cut-throat competitive and unpredictable market. The banking liberalization move has even prompted some of the most aggressive price wars seen in Asia. By 2001 for example, all banks were selling their mortgages with first year rates below cost (Browers et al, 2003).

There is no doubt that Singapore has been long regarded as the best in the region (well capitalized with relatively low NPL levels, it is no surprise that Singaporean banks successfully weathered the 1997 crisis). Driven by competitive forces and constant pressure from the MAS, Singapore banks initiated a consolidation wave that reduced 7 major domestic players into just 3 by 2001. The efficiency of Singapore's banks is expected to improve by great degrees given that MAS has already geared up efforts to promote Singapore as not only the regional but an international hub for wealth management, global processing and risk management competing against other competitors such as London, Zurich, Luxemburg, Bermuda and Hong Kong. In fact, Singapore has further succeeded in diverting considerable European funds traditionally destined for Hong Kong (Browers et al, 2003).

Therefore, Singaporean banks provide ideal benchmarks for conventional and Islamic banks in neighboring Malaysia against which to measure relative banking efficiency and productivity. This is enhanced by the fact that banking

operations in Singapore and Malaysia closely resemble one another (other than operating efficiency and productivity) considering that the two countries share the same history and culture. In fact, Singapore was part of Malaysia before opting for separate sovereignty some 4 decades ago. Furthermore, 2 of the 3 Singaporean banks have a significant presence in the Malaysian banking industry and even operate Islamic banking at higher efficiency levels than most Malaysian banks. Both banks have successful operations in Malaysia that run independently with little back-office or technology processing in common with Singapore (Bowers et al, 2003). They proved to be able create significant value by leveraging on scale and skills they have at home or elsewhere. Malaysia would continue to become a major expansion destination for Singaporean banks apart from the cultural similarity where consumers and corporations are relatively underserved by domestic Malaysian banks as they poised to enter the Chinese market.

2.9: Research Motivation

2.9.1 Comparable Productivity within the dual banking system

The principal interest of this study is to explore: what is the relative productivity of Malaysian banks (both conventional and Islamic) operating under the only known credible dual banking system compared to foreign banks and their Singaporean counterparts that also participate in Islamic banking in Malaysia?

By answering this question, pertinent information would be offered relating to issues such as:

Does conventional banking have productivity advantages over Islamic banking or vice versa? What are the relative productivity scores in terms of technical efficiency, scale efficiency and technological progress of conventional banks and Islamic banking units against one another?

Which banks are the most efficient banks of all and how can they be emulated?

How do domestic conventional and Islamic banks fare against foreign banks that provide the same set of services but somehow restricted by BNM regulations, in terms of bank productivity? Do Malaysian banks have a productivity advantage in Islamic banking compared to their foreign counterparts, in which they have been pioneers and have long been regarded as having superior competitive advantages.

There is a pressing need for such issues to be answered as a thorough comparative performance analysis would help in crucial decision making relating to the ability of domestic banks to meet the challenge of at the least, regional competition that comes with imminent financial liberalization. However, despite the urgent need for related findings that policy-makers can use with confidence at this crucial point, there is a general void in comparative bank productivity studies in banking industries such as Malaysia and Singapore, which can be characterized as an oligopoly[7].

2.9.2: Consolidation and productivity change

Has the consolidation in the Malaysian dual banking industry, in the aftermath of the financial crisis, improved productivity?

This represents an interesting issue to probe because the BNM believes that the mergers would help domestic banks to achieve critical mass to invest in technology to facilitate innovations, reap scale and scope economies, reduce costs and excess capacity as well as upgrade their risk management systems. These however, can only be achieved if the mergers result in better and more competent bank management. The positive outcomes observed so far can be attributed to exogenous factors that do not explain improved productivity in banks. Although the merged banking entities were able to catch up with foreign banks in common areas such as operating efficiency and

[7] The large banks in these countries lead in initiating changes, which are closely followed by other banks within the industry Operationally, the banks in an oligopoly market offer similar interest rates.The Stackelberg Model describes the type of competition in this market as intense because this market form does not only depend on the larger banks, but the recognition of their interdependence, the action of one bank will affect the actions of others and each oligopoly bank watches their rivals closely.

technological progress, foreign banks have been able to innovate more effectively and efficiently and even dominate niches once strategically controlled by domestic banks.

The productivity analysis proposed in this study provides additional insight into the changes in productivity of banks within the sample and can guide decisions relating to the second merger wave, by identifying the productivity track record of various banks. Hence it should help to determine if any benefits from synergies have been achieved as a result of the first wave of Malaysian bank mergers.

These issues also motivate the final research question: Are there any unequivocal indications that post-merger productivity gains, if there are any at all, benefit the public? This question about the degree of wealth transfer would be vital to probe how far Islamic banking in a dual banking system is committed to promote the greater interest and welfare of the community as opposed to private profitability since both practitioners and Islamic scholars have often claimed that Islamic banking is a form of “socially ethical banking” unlike conventional banking.

If the improvement in productivity results in improved quality of service and pricing to customers, it is reasonable to expect an increase in banks’ post-merger market share (Avkiran 1999). The extent to which productivity gains are passed on to the public following bank merger is proxied by the change in the merged entity’s market share (Rhoades, 1986) of deposits.

2.10: Research Questions

There is a general deficiency in the banking literature on bank performances under the dual banking system in the wake of the rising “banking dualism” worldwide combined with interesting deregulation and consolidation

developments in the post-crisis Malaysian banking sector. This has so far been the only developed dual banking system in the world. Banking efficiency and productivity studies present many avenues to address pertinent issues relating to (1) comparable productivity measurement in a dual banking system, (2) the effects of bank mergers and (3) the transfer of post-merger productivity gains to consumers. Following these, there are three key three principal research questions that form the motivation behind this study.

2.10.1: Research Question 1: What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?

First and foremost, the principal motivation of this study is to fill the void in the existing banking literature in regards to measuring relative productivity and operational efficiency between conventional and Islamic banking based on a credible comparable bank performance measurement methodology. To this end, this study also seeks to pioneer bank performance assessment within a dual banking system.

The choice of the Malaysian dual banking system permits this study to raise several subsequent critical questions that closely related to Research Question 1:

How productive and efficient are both conventional and Islamic banks relative to one another within a dual banking system environment? This allows one to gauge which banking system fares better given an equally competitive back-ground.

What are the core competencies, key strengths as well as weaknesses that are inherent within each banking system? Are they attributed to (1) better innovations and technological adoption, (2) managerial efficiency or (3) scale

and scope economies or some combination of these factors? Answers to these questions would yield great insights on the following issues:

Are banks innovative in general? Which banks are the most innovative and most effective in adopting the right production technology? To what extent does technical change prevail over time among different banking systems and groups?

How good are banks in general in their ability to control costs and generate revenues? Which banks have the most effective and efficient management in maximizing revenues and minimizing costs to maximize shareholders' wealth? To what extent do these x-efficiencies prevail over time among different banking systems and groups?

Are banks operating at the most productive scale size? Which banks are undersized or oversized? Which banks can enhance efficiency and productivity by scaling up or scaling down their operations?

What are the ways to improve or enhance operating productivity and efficiency levels for each banking unit/group?

2.10.2: Research Question 2: What are the Relative Productivity Scores between Domestic Commercial Banks and Foreign Commercial Banks?

The presence of active but regulated participation of foreign banks in Malaysia also enables this study to enrich a few existing studies including those that question the competitiveness of foreign banks and their ability to challenge domestic establishments despite often having to endure numerous regulatory restrictions. Bhattacharyya et al. (1997), Sathye (1998) and Isik (2002) found that foreign banks appear to experience the fastest efficiency growth vis a vis domestic institutions in India. In addition, Isik (2002) reported that foreign banks are much more innovative in terms of technological upgrades in the Turkish banking system whilst domestic banks are more adapt in imitating foreign banks. Thus, within the same framework developed in probing Research Question 1 above, this study also seeks to investigate how productive and efficient are foreign banks against domestic banks in a dual banking system and what are their key strengths and weaknesses? Insights

gained would be of great assistance to policy makers and domestic banks' management alike in the wake of rapid financial deregulation.

2.10.3: Research Question 3: What is the Evidence relating to whether Mergers Lead to Productivity Gains?

Thirdly, there is no consensus in the banking literature about the benefits of mergers to productivity of the merging entities, to the public or to the shareholders (Berger, and Humphrey, 1992; Pilloff 1996; Akhavein et al (1997)[1], Huizinga, 2001.). This scenario is even less clear in Malaysia and Singapore due to the difficulty of conducting empirical research on small sample sizes and the lack of data due to the strict regulatory restrictions on transparency. It is noted that with the steps recently undertaken by the authorities of both countries to embrace liberalization as a means to promote competition and efficiency, data unavailability has been a major limitation on gathering credible empirical evidence to substantiate or even to evaluate the success of the policies undertaken. On another hand, bank mergers appear to be based on perceived economic and political gains rather than conclusive mathematical findings (Avkiran 1999a).

While these may be due to the soft economic environment, the uncertain political climate and the fact that banks are still at the early stages of operating as merged entities, it is crucial to recognize and address the areas that may be improved on. The following research questions are developed to capture these concerns: Do bank mergers lead to productivity gains? This study attempts to make a novel contribution to the voluminous existing literature on the subject by answering the question from a distinctive point of view: Has the consolidation in the Malaysian dual banking industry, in the aftermath of the financial crisis, improved bank productivity of domestic banks, thus enhancing their competitiveness vis a vis foreign banks?

[1] As cited in Huizinga et al (2001)

2.10.4: Research Question 4: What is the Evidence of Public Benefits of Bank Mergers?

Finally, the public may not benefit from mergers, unless the cost savings that led to efficiency gains arising from improvement in institutional efficiency outweigh the exercise of market power in uncompetitive pricing. While in-market mergers are anticipated to result in cost savings when surrounding branches are closed down, this is not necessarily an indication of improved efficiency in the long-run as the public may not be gaining the benefit (Avkiran 1999). In fact, the public could be paying for services at prices in excess of competitive norms (Rhoades 1986) when the closure of a bank for example, requires forced additional travel to seek banking services. Since bank customers are known to 'vote with their feet',[12] the comparison of productivity changes and market share of deposits following mergers can yield valuable insights towards a discussion on the benefits of mergers being passed on to the public.

These issues motivate the fourth research question: Are there any concrete indications that post-merger productivity gains, if there are any at all, benefit the public in the form of more favourable rates (to both depositors and borrowers) and better product/service quality? This question about the degree of wealth transfer would also be vital to probing how far Islamic banking in a dual banking system is committed to promoting the greater interest and welfare of the community as opposed to private profitability in the face of enhanced market power since both practitioners and Islamic scholars have often claimed that Islamic banking is a form of "socially ethical banking" and more desirable than conventional banking.

[12] CEO of Citibank Malaysia's statement at the Malaysian Banking Summit 2003

2.11: Significance of Study

In reaching its stated objectives, this study attempts to make two important contributions to the existing literature on bank performance measurement.

First, this study aims to propose a credible basis to construct a viable comparable bank performance measurement framework that is applicable to both conventional and Islamic banks that accommodates unique characteristics of each system. It does this by acknowledging that despite the differences in principles and institution forms, Islamic and conventional banking operations are comparable on the basis of shared similarities in providing financial intermediation. The framework would enable researchers to evaluate banks' productivity performance between conventional and Islamic banks that operate on different principles on a level playing field. Empirical results would help fill the void in bank performance literature in regards to Islamic banks that has long been hampered by the absence of viable comparable methodologies and data unavailability. From this pioneering work also, one is able to discern the competitive advantages that conventional and Islamic banks have over one another and probe whether the rapid rise of Islamic banking is only a mere reflection of consumer interests to religious ideals that lacks productivity substance. If this perspective is true, then it may cast doubts over the potential ability of Islamic banks to effectively compete with conventional banks as an alternative financial intermediation mode on a sustainable basis.

Second, this study provides valuable insights about the effects of mergers on both productive (in terms of technical efficiency, scale efficiency and technical change) and social efficiencies in the dual banking system, an issue about which most studies have largely been silent. In particular, it is expected to

further contribute to the ongoing debate on whether bank mergers do in fact yield improved cost efficiencies as well as revenue efficiencies. Cost and revenue efficiencies are often used by bank management and regulators to justify any bank merger exercise citing that gains in both would enhance shareholders' value creation. However, as far as available empirical evidence is concerned, bank mergers appear to destroy shareholders' value and generate very little cost efficiency gains although there is strong evidence of revenue efficiencies. Not surprisingly, this trend has spawned some concerns about the possibility of prevalent anti-competitive practices resulting from increased market power and concentration for merged banks.

The principal objective of the Malaysian bank consolidation exercise and financial deregulation program is to enhance the resource base and competitiveness of domestic banks to compete head on with foreign commercial banks on equal playing fields once the local financial markets are fully liberalized. Just as in other nations, both the developed and the developing, financial liberalization is inevitable given the rapid pace of globalization and the eventual lifting of trade and economic barriers among industrialized and newly industrialized countries as required by the World Trade Organization (WTO) guidelines. From another perspective, financial deregulation and consolidation efforts are seen as necessary to boost competitiveness of banks to expand and grow. By benchmarking the consolidated Malaysian banking entities against multinational banks, empirical findings would contribute much to literature on how competitive have indigenous banks become relative to their counterparts as a result of well-intentioned deregulation and consolidation program, in the case of not only a transitional/developing economy but also in the context of a dual banking system.

Another novel contribution stemming from this study is the opportunity to gauge the extend to which Islamic banking lives up to its widely proclaimed reputation of being a "socially ethical form of banking" that champions the

noble virtues of protecting and developing social welfare and economic equity where private economic gains are not regarded as the most important priority. Many scholars maintain that this unique element is the crucial factor that sets Islamic banking apart from conventional banking that is widely regarded as sinful by Islamic religious councils.

This study also adds new dimensions, in that it approaches these issues by studying a case that not only involves a dual banking system but also a case of a developing economy with an oligopolistic banking sector. This stands in contrast to the bulk of bank performance studies that come from the scrutiny of deregulated and competitive US and European banking industries. It is also the authors' belief that this would be the first comparative bank productivity and efficiency study between Malaysia and Singapore that share close geographic proximity, strong cultural and economic links as well as a common banking sector history for many years. Such comparisons have been noted to be a key area requiring more research (Molyneux 1996)[2]. From the feedback obtained during the presentation of results from a pilot study, it is noted that there has been no previous significant attempt to investigate the productivity of Singaporean banks due to the small number of banks in the sector and the relative lack of transparency under the regulated environment. Furthermore, since there is a lack of research on the comparative bank productivity within the South East Asian region, this study is expected to not only provide an important reference point for policy-makers but also open avenues for future research.

[2] As cited in Huizinga et al (2001).

CHAPTER 3:
BANK PRODUCTIVITY

3.1: Introduction

This study attempts to fill the vacuum within the existing banking performance literature body by providing empirical evidence in relation to the comparable productivity measures of conventional banks against those of Islamic banks in a rapidly deregulating environment which is much characterized by active bank mergers and acquisitions. To achieve this end, this study first proposes the MPI as a comparable productivity measurement methodology that is capable of comparing the productivity of Islamic and conventional banks on a level playing field without ignoring the unique characteristics of both banking systems. This study then harnesses this cross-system approach to examine the relative productivity of Malaysian conventional and Islamic banks that operate under the only existing dual banking system by benchmarking them against Malaysian foreign banks and Singaporean conventional banks. The empirical evidence on relative productivity measures gathered would help shed light on the relative competitiveness of conventional banks and Islamic banks. This would also yield insights as to how well both banking systems respond to the effects of sweeping bank mergers as the banking industry continues to be deregulated.

Conceived by Sten Malmquist in 1953, the Malmquist Productivity Index (MPI) is a reliable measure of bank productivity and has made a large contribution to the relevant bank performance literature. This is because the MPI allows one to quantify the distinctive measurable sources from a single general productivity measure over time. In this context, the MPI first identifies productivity changes of a DMU between two periods and then distinguishes the sub components of a change in total productivity that are attributed to technical change (shifts in the production frontier as the production technology changes), relative technical efficiency (changes in management practices of

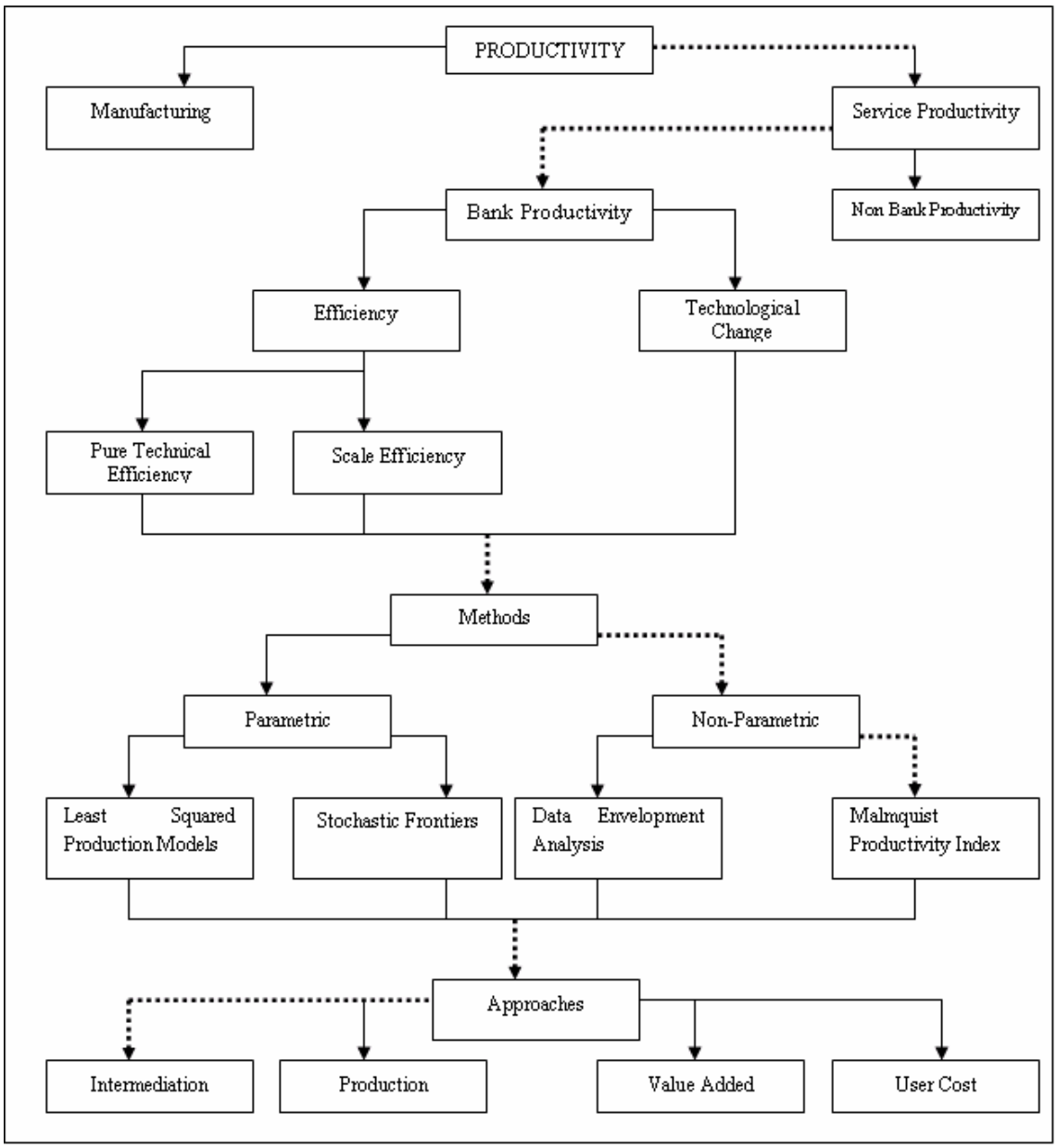
banks relative to one another) and the scale efficiency (changes in production scales relative to a bank's optimal scale size). Given balanced panel data, where input data is available across all periods under study, chained MPI scores can be generated that allow productivity analysis to be conducted over several time periods. The computation of MPI is done based on a number of assumptions about the production technology. Because these rarely represent the actual production technology, researchers employ either the parametric or the non-parametric approaches to estimate the production technology.

This study implements this non-parametric DEA MPI approach in the Malaysian dual banking case in such a way that the distinctive characteristics of conventional and Islamic banks and the conceptual similarity between both systems preserved and accounted for to achieve a viable and robust cross-system means of measuring comparable bank productivity.

What follows is a conceptual framework that defines bank productivity. To illustrate in a simple manner, Figure 3.1 is a graphical representation of this conceptual framework that comprehensively captures the vital aspects of bank productivity. Following this, the discussion of the framework is centred on the following categories/themes:

1. The definition of productivity in the context of service productivity that applies to banks as opposed production productivity.
2. The subtle yet distinctive features of productivity and efficiency. Although both are commonly used interchangeably, both terms are different from one another. It is also shown why productivity gives a more accurate measure of bank productivity.
3. The definition and derivation of three mutually exclusive components of productivity changes namely technical change, relative technical efficiency change and scale efficiency change.
4. A brief and concise survey on the common methods and approaches of measuring bank productivity changes and the sub components. A discussion also covers the pros and cons of each method. This provides insights as to this study's choice of a non-parametric DEA methodology.

Figure 3.1: The Conceptual Framework Measuring Bank Productivity



3.2: The Definition of Productivity

In conventional theoretical terms, productivity is defined as the rate of transformation of inputs to outputs, or simply the ratio of outputs over inputs (Coelli et al., 1998). This represents the output-orientated view of productivity. Productivity however, can be similarly defined with the alternative input orientated approach as the ratio of inputs over outputs. Thus, to increase

productivity, a DMU can either seek to maximize outputs for a given level of inputs or minimize inputs for a given level of outputs.

3.2.1: Productivity in the Context of Total Factor Productivity (TFP)

Because in real practice a particular Decision Making Unit (DMU) often uses multiple inputs to produce multiple outputs, a method that is able to aggregate multiple inputs and outputs into a single index must be used to compute a single measure of aggregate productivity. Accordingly, the ratio of outputs over inputs becomes the ratio of an output vector over an input vector and the ratio of input over output becomes the ratio of an input vector over an output vector. Coelli et al (1998) terms these as the measures of Total Factor Productivity (TFP) that gauge the productivity of all production factors as opposed to partial productivity measures such as land and labor productivity that only considers the productivity of land and labor in isolation. The interest of this study is to assess the overall productivity of banking units given their technology, inputs, outputs and industry environment. Therefore, by assessing bank productivity changes, this study means assessing the changes in bank TFP.

3.2.2: Productivity as Applied in the Services Industries

Here, an analysis of the productivity concept in the context of services production is imperative to generate accurate measures and intuitive interpretation of bank productivity. In the words of (Jarvinen et al, 1996), service productivity can be defined as the ability of a service providing DMU to utilize its inputs to provide services with a quality matching the expectations of customers. This definition is crucial as banks being part of the service industry, use multiple physical inputs (such as labor and technology) and funds sources to provide multiple banking services and financial products of a certain complexity and quality as required by customers and demanded by regulators, that are not easily defined in clear cut physical measures. Thus, the measurement of bank productivity differs from standard productivity measures in manufacturing DMUs where outputs are rarely more than the physical products produced.

A number of approaches have been devised by researchers over the years to model the production process of banks. The two most notable ones are (1) the traditional production approach, in which banks employ the input vector of labor, capital and banking funds as input factors to produce a vector of three bank outputs namely short-term loans, long-term loans and other earning assets and (2) the non-traditional intermediation approach, in which the bank is seen as a financial intermediary that gathers surplus financial resources and channels them to deficit units for productive investments and consumption (Isik et al, 2002). Accordingly, banks in the second approach use 4 inputs (staff numbers, deposits, interest expenses, and non-interest expenses) and produce 3 outputs (net loans, net interest income and non-interest income) (Avkiran, 1999b). There has been no consensus among scholars as to the most superior model. Bank production models will be explained in detail in the following sections. At this point however, it is worth noting that because this study conceptualizes banks as financial intermediaries, it opts to adopt the latter approach.

However, it is an objective of the study to demonstrate that the productivity measurements used in production-based DMUs may be inadequate to measure the productivity of service-based DMUs such as banks, where multiple tangible, intangible and specialized factors of production are in use. Although several researchers have, including Gianrini (1991) and Gronroos (199), argued that quality and productivity cannot be dealt with separately as in the case of services, most studies do recognize them as separate concepts (Brignall and Ballantine, 1996; Heskett et al, 1994).

3.3: The Distinction Between Productivity and Efficiency

The concept of productivity has been rooted in the production function approach that describes the relationship between input factors and output products (Vehmanen, 1994). But so is the concept of production efficiency.

Both productivity and efficiency terms have so frequently been used interchangeably that many infer both are synonymous. Coelli et al (1998) regards this development as unfortunate as using efficiency in isolation to measure productivity can be misleading. This is because both technological progress and production efficiency are two different sources of productivity enhancement. In terms of the production frontier that reflects the maximum output attainable from each input level or simply as the current production technology, technology progress is seen as shifts (not necessarily parallel shifts) in the production frontier over time due to technological innovation (Coelli et al, 1998). This must be distinguished from technical efficiency gains that refer to the distance of an observed production away from the production frontier. Fully efficient DMUs are located on the production frontier. Hence, improving efficiency is indicated by movements closer to the production frontier (Avkiran, 1999a). However, one aspect may become obvious from this observation, as identified by Noulas (1997)[3], is that increased efficiency from one period to another does not necessarily indicate higher productivity since the production technology may have changed. Similarly, improved productivity does not signify a corresponding improvement in efficiency if the production frontier has shifted but the relative distance from the new frontier remains unchanged as the previous distance from the previous production frontier.

Performance measures between two time periods are therefore confounded by effects of technological progress and cannot be solely attributed to efficiency measures. By measuring TFP productivity, effective comparisons can be made across DMUs and time, whereas in the case of efficiency measurement, effective comparison can only be made against a pre-determined standard or ideal that is reflected by the production function (Vuorinen et al, 1998). Thus, productivity indicators give a more holistic view and assessment of banks' performance across units and time. This fine distinction will be made obvious in the Methodology section, where a detailed discussion in terms of production economics is devoted to explain the subtle difference.

[3] As quoted in Avkiran (2000).

3.4: Measuring Total Factor Productivity

Measuring TFP changes for a DMU involves measuring the changes in the levels of output produced and the levels of inputs employed in the production process over at least two time periods. In practice, the simple ratio of output over input cannot adequately and accurately measure and compute the changes in multiple inputs and outputs over time periods owing to the difficulty in determining a common set of weights to be applied to input and output vectors across all DMUs that may differ considerably from one another. Furthermore, a simple productivity ratio is unable to attribute changes in productivity levels to either efficiency changes or technological changes.

An index number approach can address these challenges. An index number is a real number that captures the changes in the value of variables across time and space (Coelli et al, 1998). It requires only 2 data observations from 2 distinct periods to measure the changes in productivity between these two periods. By using a hypothetical example, Coelli et al (1998) shows that in theory, an index number is able to decompose a single productivity change measure into technical change, efficiency change and scale efficiency change. In practice, researchers employ one of two different performance indices, the stochastic Tornqvist (1936)[4] index or the non-stochastic Malmquist (1953) index, to compute the productivity changes for a particular DMU.

The Tornqvist index is by far the most popular index number approach implemented by studies on productivity (Coelli et al, 1998). This is due to the fact that the Tornqvist index features a number of economic-theoretic

[4] As quoted in Isik et al (2002)

properties as expounded by Diewert (1976, 1981)[5] and Caves et al (1982)[6] that enable the index to generate very reasonably close approximations to the actual output and index numbers and does not smooth the pattern of technical progress. The Tornqvist index is essentially a weighted geometric average of relative prices with the weights being the simple average of the share values in period 0 and 1 (Coelli et al, 1998). However, although the Tornqvist index can be easily computed by using only a single observation in each time period, it requires both price and quantity information that may not be easily obtained and the assumptions that all DMUs are cost minimisers and revenue maximisers (Coelli et al, 1998). Furthermore, in its original form, the Tornqvist index does not allow for the decomposition of productivity change into changes in technical efficiency or management performance and changes in technology since it also assumes that production is always efficient (Fare et al, 1994).

The Malmquist Productivity Index (MPI) on the other hand is less restrictive. It allows one to identify productivity changes between two periods from a given panel data without the need of price data and to decompose productivity changes into two components, one due to technical change (shifts in the frontier) and the other due to technical efficiency change (the catching up effect). Fare et al (1994) extended the original MPI decomposition to derive the third component to include effects due to change in scale efficiency (changes in production scale relative to the optimal scale size). Thus, given the availability of suitable panel data, the MPI gives a richer account of productivity change.

3.5: The Malmquist Productivity (MPI) Approach of Measuring Productivity

and the Decomposition of Total Factor Productivity (TFP) Productivity Measure

[5] As quoted in Coelli et al (1998)
[6] As quoted in Coelli et al (1998)

The MPI was initially founded by Malmquist (1953) and expounded in a consumer theory context. The idea behind Malmquist (1953) was to measure the quantity of consumption that an individual needed to consume in a certain year in order to achieve the same utility level as in the previous year. The quantity index proposed by the study represents a proportional scaling factor that is expressed as the ratio of two distance functions from different time periods. This method of utilizing distance functions in productivity measurement was formally developed by Caves et al (1982) into a general production framework that showcases great similarities to the formulation of distance functions of Shepard (1970). However, Fare et al (1992), who identified the direct link between the distance function concepts of Caves et al (1982) and the measures of relative technical efficiency of Farrell (1957), whereby the distance functions are the reciprocals to Farrell measures of technical efficiency. Contrary to Caves et al (1982) that required assumptions on the economic behavior of DMUs, Fare et al (1994) utilized the non-parametric linear programming, Data Envelopment Analysis (DEA) and showed that a DEA MPI can be decomposed into changes in production technology, technical efficiency and scale efficiency. This study adopts the DEA based MPI because of these virtues.

Fare et al (1994) employ the DEA MPI to decompose productivity growth into two mutually exclusive components: changes in technology (technical change) and improvements in production efficiency relative to the production frontier (technical efficiency). Across time, technical change involves advances in technology due to technological innovations and is represented by an upward shift in the production frontier. The second component-technical efficiency- describes the degree to which an activity generates a given quantity of outputs with a minimum consumption of inputs, or generates the largest possible outputs from a given quantity of inputs (Anthony, 1965; Avkiran, 1999). Firms in a particular industry are technically efficient if they operate on the production frontier, and technically inefficient if they operate below the frontier. Fare et al (1994) showed that it is also possible to

decompose technical efficiency change into two distinct components: changes in management practices or pure technical efficiency change and changes in production scale relative to the most productive scale size or the optimal scale. In relating to scale efficiency, the third component of productivity, Coelli (1998) noted that a firm may be technically efficient but may still be able to improve its productivity by exploiting scale economies. In addition, the author observed that the increase in a firm's productivity from one year to the next need not have been from efficiency improvements alone, but may have been due to technical change or the exploitation of scale economies, or from some combination of these three components.

There are a number of important studies of banking productivity that harness the MPI to derive and decompose TFP changes. Notable ones include Alam (2001), Avkiran (2000), Fernandez et al (2002), Mukherjee et al (2001), Wheelock and Wilson (1999), Berg et al. (1992) and Grifell-Tatje and Lovell (1996).

3.6: Common Methods of Measuring Productivity

Although Coelli et al. (1998) illustrated that changes in the TFP index can be easily shown to be attributed to changes in technical efficiency, scale efficiency, scale of technology and technical change, the study concluded that even for the simplest one-input, one-output cases, it is not possible to interpret the sources of TFP changes without some knowledge of the production technology. Production functions can be estimated from sample data and generally requires information on inputs and outputs.

The vast number of previous studies in bank productive efficiency generally differ in the methods used in production function or frontier estimation. Research methods in measuring bank productivity have developed in two main directions, the parametric method that employs econometric and

statistical methods and the non-parametric method, which uses linear programming applications (Berger and Humphrey, 1997). Both approaches differ from one another in terms of the structure of the benchmark production function, whether random error is accounted for and the distribution of inefficiencies to isolate inefficiency from random error.

3.6.1: The Parametric Methods

The parametric methodology is empirically more popular than the non-parametric approach in frontier analysis in economic studies because it allows for random error and offers room for mathematical manipulation but is more restrictive. A fundamental requirement in constructing a parametric function is to select and impose an appropriate functional form that attempts to resemble the actual production process as closely as possible (Coelli et al, 1998). These functional forms can be simple (such as the Cobb Douglas production function) or complex (like the translog functions) with many other variants of varying degrees of complexity in between these two. These however impose restrictive constraints that represent a critical limitation on the parametric approach as a specific functional form may be applicable to some DMUs while inappropriate to describe the production process of others because all DMUs are essentially unique and not homogenous in reality (Avkiran 1999a). Furthermore, it is also difficult for parametric functions to accommodate multiple outputs.

The three main parametric models are:

1. The Stochastic Frontier Approach (SFA). SFA is the principal parametric model applied by previous studies. It involves the use of econometric modeling methods to specify the functional form for cost, profit and production functions in relation to inputs and outputs and allows for random errors. It measures technical efficiency, scale efficiency, allocative efficiency and MPI. This method has few problems as the selection of a distribution form may be arbitrary and thus, flexible. SFA also allows the testing of hypotheses in regards to inefficiency and structure of production

technology. However the SFA is only appropriate when applied to estimate single-output production technologies and is therefore, difficult to adapt to multiple outputs. Some of the studies on banking performance that harnessed this approach include Ferrier and Lovell (1990) and Altunnbas et al (1995).

2. The Distribution Free Approach (DFA). Similar to SFA, the DFA specifies a functional form for production technology but assumes that efficiency is stable and that random error averages out to near zero over time. Thus, the DFA seeks to describe average deviations in terms of inefficiency of each DMU relative to the benchmark's inefficiency at any point in time. DFA has been employed by Bauer et al (1993) and Berger and Humphrey (1998).
3. The Thick Frontier Approach (TFA). Unlike SFA and DFA, TFA does not impose any pre-conceived functional form on technology. Instead random errors and inefficiencies are accounted for by (1) deviations from predicted performance within the highest quartiles and (2) deviations from predicted performance between the lowest and the highest quartiles. Studies that have applied the TFA technique include Lazano (1998), Bauer et al. (1993) and Mahajan et al. (1996).

3.6.2: The Non-Parametric Methods

Non-parametric approaches are less restrictive in nature because they do not require the imposition of a possibly unwarranted functional form on the structure of the production technology as required by the econometric approach that may not be applicable to a particular DMU (Rebelo and Mendes, 2000) and Avkiran (1999). They also more readily accommodate multiple outputs. Non-parametric approaches however attribute all deviations from the frontier to inefficiency.

The non-parametric technique that has been most frequently used is the Data Envelopment Analysis (DEA). DEA is a non-parametric methodology that

constructs a piece-wise frontier formed by linear combinations of the best practice observations in the sample and hence, it does not impose any form specification on the production function. The frontier is formed in such a way that no observation point lies beyond the frontier. Therefore, the frontier creates an envelopment of all data points. DEA is often used in literature on banking efficiency to generate relative technical efficiency scores by comparing a particular DMU to a virtual technically efficient DMU (or its target) that has the same input-output configuration. The efficiency scores generated follow the technical efficiency ratio as defined by Farrell (1957). DEA is a close substitute for SFA and reports the same measures that SFA does. DEA has gained popular acceptance and application among studies on banking efficiency and productivity. Some of the most influential papers in this literature field include Berg et al (1992), Elysiani and Mehdian (1995), Wheelock and Wilson (1995), Zaim (1995), Grifell-Tatje and Lovell (1996), Miller and Noulas (1996), Bhattacharya et al (1997), Shyu (1998) and Avkiran (2000a, 200b).

Another non-parametric but relatively less known technique is the Free Disposal Hull (FDH). The FDH is somehow a lesser variant of the DEA because it constructs the same stepwise production frontier that is either lower or similar to the DEA. Berger and Humphrey (1997) report that in the banking performance literature, efficiency studies employing the non-parametric approaches (overwhelmingly DEA approaches) outnumber efficiency studies using parametric approaches.

3.7: Common Approaches of Modelling Bank Production/ Behavior

In order to compute productivity measures for banking units, both inputs and outputs must be specified. There however appears to be no consensus among researchers with regard to the selection of inputs and outputs for bank efficiency studies. In general the banking literature has considered 4 approaches for modelling bank production or behaviour. The first two

approaches are the most frequently encountered and both apply the traditional microeconomic theory of the firm to banking and differ only in the specification of banking activities (Denizer et al., 2000).

Firstly, the intermediation approach models banks as financial intermediaries where financial assets are transferred from surplus to deficit units. This is also dubbed as the non-traditional banking approach that views the bank as the financial intermediary between surplus units and deficit units. Following the second approach, 4 inputs (staff number, deposits, interest expense, and non-interest expense) and 3 outputs (net loans, net interest income and non-interest income) have been identified (Avkiran, 1999). This approach is found to be more relevant to banks as it includes interest expense, which is a significant contribution of costs to banks (Elyasiani and Mehdian, 1990; Berger and Humphrey, 1991). These studies have found that interest expense often accounts for between one half to two thirds of total banking costs. Its relevance is even more so given inclusion of off balance sheet activities OBS in non-interest income. OBS involve trading financial instruments and generating income from fees and loan sales. These activities affect banks' profits but do not necessarily appear in conventional bank balance sheets. These non-traditional banking activities however, are increasingly seen as a potential dependable income source to at least compensate the competitive erosion and volatility of interest income in the relatively deregulated banking industries.

The production approach is where banks are regarded as production centers of services to both depositors and borrowers (Denizer et al., 2000). As such, banks utilize traditional production factors of labor and capital to generate deposits and loans (Avkiran, 1999). This approach is also known as the traditional banking approach and was introduced by Benston (1965). Under this approach, outputs are usually measured in units rather than in dollar terms. Although this approach recognizes the multi-product nature of banking activities, earlier studies ignored this aspect of banking products, partly

because the techniques to deal with scale and scope issues were not well developed (Freixas and Rochet, 1997).

A third approach is the value-added approach (Berger and Humphrey, 1992), where high value creating activities are regarded as outputs, measured in dollar terms, and labour, physical capital, and purchased funds are regarded as inputs (Wheelock and Wilson, 1995). Berg (1992) applied the value-added approach to study the efficiency of Norwegian banks.

The fourth approach known as user-cost, is usually attributed to Hancock (1986)[7] and this assigns an asset as an output if the financial returns are greater than the opportunity cost; and a liability item is regarded as an output if the financial costs are less than the opportunity costs. When neither condition is satisfied, the asset or liability is classified as an input (Berger and Humphrey, 1992).

3.8: Summary

In summary, the conceptual framework of bank productivity assessment as summarized in Figure 3.1 of this chapter, comprehensively captures the vital aspects of bank productivity. This chapter defines productivity in the context of service productivity that applies to banks; explores the distinctive features between productivity and efficiency; and explains the derivation of three components of productivity changes namely technical change, relative technical efficiency change and scale efficiency change. A concise survey and discussion on the common methods and approaches of measuring bank productivity changes provides insights as the choice of proposing the usage of a non-parametric DEA methodology.

[7] As cited in Murkhejee et al (2001).

CHAPTER 4:

LITERATURE REVIEW

4.1: Evidence of Productivity Efficiency Gains From Financial Deregulation

Much of the available literature on bank productivity investigates bank productivity changes following a deregulation of the respective financial market relative to the pre-deregulation period. The weight of empirical evidence so far suggests that regulation of the banking industry is the chief source of bank inefficiency although the existence of considerable degrees of mixed results may confound this statement. This lends support to the notion that with strong regulatory protection coupled with the absence or lack of market competition, bank management tends to misuse or misallocate resources available to them. With this in mind, substantial reduction of regulation and heightened competition would be expected to induce positive effects on bank productivity and efficiency. It must be noted that deregulation of the banking sector means the determined effort of the banking authorities to remove a number of banking regulations that have been stifling market forces from operating fully and properly. The degrees and speed of deregulation differ greatly across countries resulting in varying conclusions.

The overwhelming majority of empirical evidence on *bank productivity* available comes largely from the scrutiny of the banking industry in the US, European and Australian markets, with a few studies focusing on developing countries. Studies on *bank efficiency* on the other hand are more balanced with notable attention given to examining banks in emerging markets. However, the weight of literature reviewed still draws on studies conducted on the US and European banking industries where the majority of bank productivity studies tend to be focused.

4.1.1: Efficiency and Productivity Concepts

Previous studies conducted on banking efficiency and productivity assessment use various and different concepts of efficiency and productivity. It is therefore essential to fully understand what these concepts mean before attempting to draw conclusions from previous literature.

Total Factor Productivity: This is defined as the ratio of all outputs of a firm over all factors of production or inputs. The value indicates how much output vectors can be produced by a unit of input vectors (Coelli et al, 1998).

Allocative Efficiency: It deals with the minimization of cost of production with proper choice of inputs for a given level of output and set of input prices, assuming that the organization being examined is already fully technically efficient (Avkiran, 1999a).

Technical Efficiency: This concept looks at how the ability of a firm to obtain maximum outputs from a given set of inputs while assuming full allocative efficiency. Technical efficiency itself may be confounded by scale effects. Thus, it can be decomposed into pure technical efficiency and scale efficiency. Pure technical efficiency gauges the management performance in maximizing output. Scale efficiency meanwhile reflects whether a DMU is operating at the optimal scale size. There would be scale inefficiencies if the firm is operating at any other scale size (Avkiran, 1999a).

4.1.2: Empirical Evidence from Developed Economies

In the earliest published work on bank productivity, Berg et al. (1992) analyzed the productivity of Norwegian banks before and after deregulation between 1980 and 1989 by using the MPI. Results showed TFP regress during the pre-deregulation periods arising mainly from input accumulation and building of idle production capacity by banks in anticipation of increased competitive pressures from the imminent financial deregulation by the financial authorities in 1984. From 1987 onwards however, there was rapid post-deregulation productivity growth with large banks exhibiting the most rapid growth. The authors however highlighted that these gains were sourced largely from technical efficiency rather than technical change. This means that in an increasingly competitive industry following deregulation, inefficient banks converged to the frontier to maintain their market shares. Subsequently, the scores for the best practice banks stabilized while those of the least efficient banks continued to catch up. Towards the end of the study period, similar high productivity levels were observed for all banks indicating a highly successful deregulation exercise in boosting catch up effects and knowledge diffusion leading to increased competition.

Humphrey (1991) analyzed the effects of deregulation on US banks between 1977 and 1987 by using the growth accounting approach rather than the conventional parametric and non-parametric frontier analysis. The study found that during the study period, bank deregulation in the 1980s appeared to have led to very low and even negative productivity growth for banks.

Elyasiani and Mehdian (1995) conducted a similar study on US commercial banks that were divided into small and large banks according to asset size for the periods 1979 and 1986. Both years represented the pre and post deregulation years in the US. By applying DEA on an intermediation model, the study found that small banks exhibited relatively higher efficiency during the pre-deregulation period but this advantage was reduced in the post-deregulation period. Meanwhile, small banks experienced technical progress compared to large banks that underwent technical regress instead. The

authors attributed the differences to the possibility that market conditions affect small and large banks differently and therefore, small and large banks had different efficient frontiers. The analysis was however confined to two widely spaced years and as such, a large productivity progress in one year could be offset by a large productivity regress in another year, giving the impression of little productivity changes over the period of study (Alam, 2001).

By decomposing the MPI into pure technical efficiency change, scale efficiency change, technical change and change in scale of technology using the intermediation approach that classified inputs and outputs on user cost basis, Wheelock and Wilson (1999) found on average, during the deregulated period 1984-1993, US banks experienced diminished productivity. In general the smallest banks experienced the largest declines in productivity and efficiency while large banks experienced smaller declines. They however reported advances in technology. The declines are due to the failure of technological progress to offset the decreases in technical and scale efficiencies. Only a minority of banks in each size were pushing the frontier at a decreasing rate while the majority failed to catch up and even experienced declining productivity. This development may suggest that deregulation affects banks of different sizes in different ways.

In an another study on US banks that also used the MPI methodology, Alam (2001) found on average banks did not move closer to the frontier. Instead, changes in measured productivity are mostly attributed to shifts of the frontier or technology. Significant productivity progress was initially registered followed by a regress following a wave of shocks before the banks settled down and adjusted to a slower but steady productivity growth. Alam (2001) used the intermediation approach of modeling banks.

Grifell-Tatje and Lovell (1996) probed the productivity of Spanish savings banks during the post deregulation period between 1986 and 1991 using the MPI. The study adopts the value-added approach to model banks' behavior. Findings indicate rapid productivity decline due to technical regress for the

best practice banks. Meanwhile less efficient banks catch up with the efficient ones at a declining pace. The paper also found that productivity decline was the slowest among fast branching banks and that mergers and acquisitions had no effect on productivity. In general, this study casts some doubts on the productivity and efficiency gains in the wake of a banking deregulation.

Noulas (1997) investigated the deregulated Hellenic banking between 1991 and 1992 by employing the MPI based on the intermediation model. Results show that state banks experienced technological progress as they upgrade their technological capabilities in response to competition from private banks and technical efficiencies increased for private banks and decreased for public banks.

Avkiran (2000) performed MPI analysis in investigating the productivity of major trading and regional banks in Australia in the deregulated period 1986-1995. The study employed the intermediation approach. The principal findings include an overall productivity increase attributed to technological progress rather than technical efficiency and that the performance for both groups of banks was almost identical. The study highlighted technological innovation as the dominant effect resulting from deregulation. The author also concluded that management has little control in reducing non-interest expenses and therefore technical efficiency. On the other hand, the study suggests that management has more control over technological progress. Based on this evidence; the author calls for more policies that support capital investment mainly in the form of preferential tax treatment.

Therefore, the results of deregulation on the productivity and efficiency of banks in the post-deregulation period are mixed. Notable studies that indicate negative experiences are Spain (Grifell-Tatje and Lovell, 1995) and the US (Humphrey and Pulley, 1997) and (Wheelock and Wilson, 1999). To explain the US experience, Burger and Humphrey (1997) noted that interest rate deregulation in the US sparked a competitive scramble to pay higher rates on deposits without a corresponding reduction in banking services or increase in deposit fees. Thus, the productivity gains made cannot be adequately

captured by scrutinizing the banks' balance sheets as many of the benefits may have been passed on to consumers. On the other hand, the productivity decline of Spanish banks may have been caused by the willingness of the banks to trade efficiency and productivity gains to rapidly expand market share. In (Wheelock and Wilson, 1999), the authors concluded that in an industry that is undergoing rapid changes, only a few pioneering banks are able to adapt quickly in response to new market opportunities because a regulation change has different effects on different banks. Therefore, depending on the unique market conditions and bank behaviour that prevails prior and during deregulation, the results of liberalization are likely to differ across countries.

4.1.3: Empirical Evidence from Developing Countries

Because Malaysia is a developing country, it may be worthwhile and of interest to this study to investigate some productivity and efficiency outcomes of a number of banking deregulations carried out elsewhere in other developing countries.

Perhaps the most relevant literature on bank productivity and efficiency performance assessment pertaining to the comparative performance between domestic and foreign banks in a liberating developing economy comes from the studies of the Indian banking system. Four closely related papers provide a good comprehensive coverage on the subject: Bhattacharyya et al. (1997), Bhattacharyya et al. (1997), Sathye (1998) and Isik (2002).

Bhattacharyya et al. (1997) investigated the impact of the Indian banking industry during the early years of deregulation by using a combination of DEA and stochastic frontier analysis. The data examined were modelled on the value-added approach. The results indicated that public banks were the most efficient banks but foreign banks appeared to catch up with them at increasing rate owing to their better adaptation to a more competitive environment and better specialization on banking niches in metropolitan areas as opposed to

domestic banks that were required to serve both rural and urban markets. The authors noted that towards the end of the study period, foreign banks were nearly as efficient as public banks despite facing more regulatory constraints in terms of branching restrictions, higher capital adequacy requirements and inhibitions on lending to priority sectors. The study did not use MPI and therefore did not investigate productivity changes.

The authors attributed the rise in efficiency of foreign banks to the fact that (1) foreign banking institutions were constrained by numerous regulations especially on capital adequacy, (2) foreign banks were only subjected to inhibited priority sector lending as compared to local banks (3) Indian banks were required to branch into rural and suburban areas and make significant commitments towards funding priority sectors. Thus foreign banks were able to efficiently extend their networks within urban areas only and thus they are regarded as more efficient in adapting to an increasingly competitive environment.

The results of the study were echoed by that of Sathye (1998). Sathye (1998) measured the productive efficiency of publicly owned, privately owned and foreign owned banks operating in India for the 1997-1998 period using two DEA models- model A and model B. Model A had interest expense and non-interest expense as inputs and net interest income and non-interest income as outputs (similar to Avkiran (2000)). In Model B, a less direct approach to measure banks' efficiency was taken with deposits and staff numbers as inputs and net loans and non-interest income as outputs. The study found that public banks had higher efficiency scores compared to private and foreign banks for Model A but foreign banks dominated both public and private banks in Model B. These results led the author to conclude that (1) foreign banks appeared to be more efficient users of input quantities (deposits and staff numbers) to produce output but needed to focus on pricing aspects (interest and non interest income and expenses), (2) the disappointing results of private banks obtaining the lowest scores in both models could have been attributed to the fact that banks were expanding and thus, employed higher

fixed assets that had yet to generate any returns. The paper recommended policies to reduce non-performing assets and establishment expenditure (through voluntary retirement of bank staff and rationalization of rural branches) to increase the overall efficiency of Indian domestic banks enabling them to better compete with foreign banks.

Sathye's (1998) study was complemented by Bhattacharyya et al. (1997) where the Total Factor Productivity (TFP) growth of Indian public sector banks was studied. The authors decomposed the TFP growth index into (1) technological change, (2) scale economies and (3) the effects of imperfect adjustment to quasi-fixed factors. It is noted that this study is the first to investigate changes in Indian banks' productivity over a long- enough time period to capture the effects of regulatory changes on banks' productivity. Emphasis was given to the banks' performance following the nationalization of commercial banks that took place from the late 1950s to the early 1980s and the deregulating period since the mid 1980s. The study reported productivity decline during the first few years after the initiation of bank nationalization before banks started to recover in 1975. Productivity regress during the early years was attributed to technological regress suggesting that banks had too few years to absorb the shock of nationalization. Nevertheless, the authors found moderate scale economies progressed throughout these early years. High scale growth was reported for the late 1970s to early 1980s due to branch network expansion but fell subsequently due to (1) structural adjustments due to the deregulation process and (2) reduced scope for cost reduction following better utilization of existing capacity.

After the initial period of shock, banks' productivity grew at 2% on average per year. Growth rates later accelerated substantially during the deregulating years with the final few years of the study reporting growth rates as high as 7%. The authors linked the TFP performance decline during the early years of nationalization to major changes to the operations of banks as banks were required to (1) expand their branch network into rural areas, (2) achieve

lending targets to priority areas and (3) adopt differential structure of interest rates that were tied to borrowers' income and lending type. These regulations were later either abolished or modified during the subsequent deregulation of the banking system that led to increased productivity and technical progress.

In a study of liberalization effects on the bank efficiency of Turkish banks that practice Islamic banking, Zaim (1995) found, by using the intermediation approach to model banks' behavior, that technical efficiency increased by 10% on average and that technical efficiency differences among banks narrowed over time. Most inefficiency was sourced from technical inefficiency. Banks however were able to operate at their most productive scale or be fully scale efficient following the deregulation.

In a related study of Turkish banks, Isik (2002) found that public banks experienced the slowest productivity growth while foreign banks saw the fastest. However, although all bank groups experienced substantial progress in TFP change, efficiency change, pure efficiency change and scale efficiency change, all (except for foreign banks) recorded notable technical regress. Isik (2002) also reported that both domestic and foreign private banks were more apt at improving technical efficiency through better management practices rather than improvement in scale efficiency. Nevertheless, most productivity growth for public banks came from scale changes

Foreign banks strongly outperformed domestic banks and represented the best practice banks along the frontier owing to the fact that foreign banks have been pioneers in introducing many services, products and standards. Domestic banks were reported to be catching up in terms of technological progress by imitating foreign banks rather than indepdently pushing their own frontiers. For instance the study identified many products and services offered by domestic banks such as factoring, forfaiting, on-line computer systems and market-oriented management philosophy, which were copied from the pioneer

foreign banks. The paper also quoted Pehlivan and Kirkpatrick (1992)[8] , which stated that even planning, marketing and recruitment policies were imitated and diffused through Turkish bank staff who received their training in foreign banks and later joined domestic institutions.

Ishik (2002) further explained that the findings pertaining to prevalent technical regress run contrary to expectations of improved technology given that Turkish banks had invested heavily in computerizing their operations. Thus, the results were also inconsistent with studies in the USA, Spain and Korea that found productivity growth was mainly driven by technical progress rather than efficiency progress. Amongst some of the factors cited to explain the findings are; (1) efficiency gains arising from technological investments are realized over longer time periods, which are not captured by the study, as banks need more time to learn how best to implement costly high technologies and (2) the liberalization of the Turkish banking industry prompted banks to expand their branch and ATM networks beyond the levels that could be justified leading to huge amounts of idle resources. The author ascribed such unimpressive performance of Turkish banks on the lack of sophisticated market participants, poor managerial talent, restrictive legal infrastructure and other factors that are mostly exogenous to Turkish banks.

Shyu (1998) conducted a study on Taiwan's banking industry for both pre and post-deregulation periods with data modeled on the user-cost approach. The study reported that although banks experienced improved overall efficiency and close to full-scale efficiency, the principal source of inefficiency originated from allocative efficiency and not technical efficiency especially during the pre-deregulation years.

Leightner and Lovell (1998) meanwhile performed MPI analysis on Thai banks to identify the effects of deregulation relative to the individual banks' objectives and the Thai central bank's objectives. In the early 1990s, the Bank of Thailand began to exert informal pressures on Thai banks to reduce

[8] As cited in Isik (2002)

speculative investments in the property market. The study covers the period 1989-1994 before the 1997 financial crisis. The authors found that on average, deregulated Thai banks are more adept in achieving individual organizational objectives as opposed to central bank's objectives where a regress in TFP was reported (especially the largest Thai banks). An interesting finding was that small foreign banks (only small foreign banks were allowed to operate in Thailand during the study period) experienced rapid productivity growth based on both objectives. This led the authors to conclude that under the right market conditions, financial liberalization can lead to productivity growth and that such strong growth may not be always desirable to the public and economy.

In a study on a full-fledged Islamic banking system, Nazirrudin and Abd Elrhman (2003) measured the technical efficiencies of Sudanese Islamic banks. Among national banks, private domestic banks and foreign joint venture banks, all banks were reported to be technically inefficient. The results however showed that foreign joint venture banks are technically more efficient than domestic banks. The sources of inefficiency appeared to be problems of ownership, lack of banking technologies, severe economic sanctions and lack of competency in managing the high risks of Islamic financing modes.

However as noted by Isik (2002), different ownership and organizational forms could result in different impacts of financial liberalization on different forms of banks. For instance, foreign and domestic banks have different levels of familiarity with different economic environments, different attitudes towards risk, different resource and talent endowments and different degrees of support from regulators. In general foreign banks utilize more purchased funds than domestic banks in funding assets and have a tendency towards managing investment securities that require operating large networks of branches, competent management and continual technological innovations and adoption rather than loan production where domestic banks, both public and private, are more involved.

It appears that the reported findings by Hassan and Bashir (2003) and Brown (2003) suggest that the appropriateness of the data complied by BankScope is questionable at least in the Islamic Banking context. More specifically, there are no clear indications provided on the sampling design used, data selection and inclusion policy and the extent of specific country coverage in respect to different size variables. Bhattacharya (2003) for example found strong selectivity bias towards large banks in BankScope that renders the database sample somewhat unrepresentative of the actual financial market. Ehrman et al (2001) observed that since small banks are not adequately covered, BankScope proves to be a poor instrument to investigate micro effects across banks but is capable of giving fair descriptions of likely macro effects.

4.1.4: Empirical Evidence from Malaysia and Singapore

While there have been many studies on the productivity of banks in developed countries, the same cannot be said of the Malaysian and Singaporean banking environment. Despite the importance of efficiency in banking markets of the region, few studies have investigated bank efficiency and no studies appear to have provided productivity measures. One related study, which also refers to an oligopolistic Stoekelberg type market was conducted by Chu and Lim (1998) on cost and profit efficiencies of banks in Singapore, in the pre consolidation period. Employing DEA, this study found less dispersion in efficiency scores - appearing to have been the result of the small sample size used. This may be overcome by extending the population to include banks in the region as attempted in this proposal.

There are very limited studies probing the technical efficiencies of Malaysian conventional and Islamic banking operations. Earlier studies on efficiency in the Malaysian banking industry appeared to focus on the determinants of commercial bank profitability[15]. Only recently have there been formal analyses using the analytic techniques of economics.

[15] Although, the scope of Haron (1996) was merely limited to Islamic banks.

Yahya et al. (2001) followed the intermediation approach and applied DEA to rate the relative efficiencies of domestic banks against 3 foreign banks in the period 1997-98 to gauge the success of the financial consolidation program. The study found considerable inefficiency among domestic banks. The major cause of this inefficiency is the oversupply of inputs especially ATMs. They also identify capital, reserves and total assets as the core strength of all efficient banks. One interesting discovery is that the relative efficiencies of domestic banks did not change much throughout the crisis. This suggested improvements in loan and advances management as well as deposit attraction.

Katib (1999) assessed the efficiencies of pre-crisis domestic banks from 1989 to 1995 using an intermediation DEA model. He noted efficiency deterioration under both assumptions and summarized that banks tend to waste resources. He also investigated the determinants of efficiency though a regression analysis and found that while bank size has an inverse relationship with efficiency, the reverse is found for market power and cost structure difference.

In terms of Islamic banking, one recent, closely related study was by Hamid and Ahmad (2001) who used cross-sectional regression analysis in comparing the performance of Bank Islam Malaysia Berhad (BIMB) and the Islam counters of conventional banks from 1996 to 1999. Results were inconsistent with one another, However, they found that in general, Islamic banking counters appear to be on a better platform in terms of performance and structure than does a full-fledged Islamic bank. Another study of Islamic banking in Singapore by Gerard and Cunningham (1997) only investigated the awareness of the country's population to Islamic banking.

4.2: Literature Review: Evidence of Productivity Gains from Mergers and Benefits to the Public

4.2.1: Rationales for Market-Based Bank Mergers

There are many rationales that motivate market-based bank mergers. Over the years, a wealth of competing literature has emerged attempting to conceptualize the possible rationales. In a rather simple approach, Vennet (1996) outlined that generally merger theories can be categorized as value-maximizing explanations and non-value maximizing explanations. Under the former category, banks seek to merge or acquire another to embark on hostile takeovers of potentially lucrative but poorly managed banks through the market for bank control, to realize economies of scale and scope from operational synergies or to enhance market power in a relatively oligopolistic market. Meanwhile under the latter category, mergers can be the result of managers channeling expenditures according to private preferences with the motivation to perhaps increase balance sheet amounts to notable levels or raise power and prestige.

Regardless, these theories are not of much use in this study to explain Malaysian bank mergers because the Malaysian experience was after all directed by the BNM and not market-based.

Rather it is more worthwhile to investigate some economic theories that are widely held in regards to the relationship among mergers, industry market structure and outcomes on performance and benefits to the public.

4.2.2: Mergers, Gains from Mergers, Industry Structure and Benefits to the Public: The Theories

Traditionally the market power hypothesis MPH suggests that tacit or explicit collusion is more likely to exist in markets with few competitors and should result in a significant positive relationship between structure and performance (Devaney and Weber, 2000). On the contrary, the efficient structure hypothesis ESH maintains that firms with superior management and production technology have lower costs and higher profits capturing more market share and thus resulting in greater concentration (Demsetz 1974)[9].

[9] As cited in Devaney and Weber (2000).

The MPH and ESH have radically different implications for the industry structure and consumers' economic welfare. If increasing concentration occurs as a consequence of efficient banking firms displacing inefficient ones, then consolidation should enhance social welfare. Alternatively, increasing concentration without efficiency gains may be undesirable, especially in small, localized and concentrated markets where local banks are more likely to loan to small business and local enterprises. Meanwhile, according to Peltzman (1977)[10] and Smirlock (1985)[11] the positive relationship between structure and profits is a consequence of economic efficiency rather than an exercise of market power.

Schumpeter (1942) and Galbraith (1956) are of the view that large firms with market power are necessary for a rapid rate of technological progress. This is because market power provides captured markets and monopolistic prices and profits enabling firms to achieve economies of scale in R&D and to erect barriers to entry that are necessary to reap any profits associated with successful innovations. Presumably, market concentration reduces uncertainty and increases the returns on technological investments since firms share profits among fewer competitors. In contrast, the Efficient Structure Hypotheses (ESH) argues that firms with superior production technology have lower costs and higher profits which result in the acquisition of market share and an increase in concentration.

Petersen and Rajan (1995)[12] found that banks in concentrated markets frequently price discriminate as a means of building long-term "lending relationships". As a result they may provide low cost credit to emerging high-risk firms, while mature firms in the local market rely more on internally generated financing. Therefore, they conclude that loan pricing retains significant "local effects" consistent with the structure-performance paradigm.

[10] As cited in Devaney and Weber (2000).
[11] As cited in Devaney and Weber (2000)
[12] As cited in Devaney and Weber (2000).

The studies of contestable markets have shown that if entry and exit are costless, the economic outcome in even highly concentrated markets can approximate to perfect competition (Baumol et al, 1982)[13]. This is because persistent monopoly profits can only exist in markets with imperfect competition with no threat of entry by potential competitors. Because potential competition is usually not directly observed, empirical tests of contestable markets infer potential competition from market entry, differential regulatory barriers or change in market share or market concentration (Morrison and Winston 1987, Whalen 1992).

Berger (1995) introduced the relative market power hypothesis where profits are hypothesized to be only significantly related at high concentration levels. Berger (1995)[14] found little evidence supporting both hypotheses but concludes that neither are of great importance in explaining bank profits. Overall, research suggests that efficiency gains from scale are small (Berger and Humphrey 1991)[15] and that larger, multi-office banks tend to loan a smaller percentage of assets to small business than small banks (Keaton 1995)[16].

4.2.3: Mergers, Gains from Mergers, Industry Structure and Benefits to the Public: The Empirical Evidence

Over the past two decades, the banking industry has been experiencing profound restructuring changes with most of the effects stemming from mergers in consolidation exercises. The trend started off with merger deals in the US but more recently, mergers of European banks and banks from developing countries are slowly dominating the scene (Cybo-Ottone and Murgia, 2000). To date most of the studies, which provide evidence of economic gains from mergers, were conducted in the US market.

How Mergers Can Result in Productivity Gains

[13] As cited in Devaney and Weber (2000).
[14] As cited in Devaney and Weber (2000).
[15] As cited in Devaney and Weber (2000).
[16] As cited in Devaney and Weber (2000).

Mergers can be considered as economically motivated moves that result in the involved entities moving along the profit function through changes in size, scope and distance from the efficient frontier (Cybo-Ottone and Murgia, 2000). Alternatively it can be seen that bank mergers can increase value by reducing costs or increasing revenues. Costs can be reduced when redundant managerial, overlapping bank branches, facilities and headquarters and identical back office functions can be eliminated. Cost reduction may be greater when merging banks have geographic overlap because banks often claim that overlap elimination can result in cost savings amounting to around 30% of the target's non-interest expenses (Houston et al. 2001). Likewise, revenue enhancements are often attributed to cross-selling of bank services and the improved ability to raise fees revenues and lower interest rates on deposits (Houston et al. 2001). (However, this may be done through the exercise of market power).

Mergers can increase efficiency when larger merged entities reach required critical mass to gain access to cost-saving technologies, spread fixed costs over a larger production base catering to a larger market share, exploit economies of scale, improve managerial efficiency and enter new markets while cross selling their products to a wider customer base. This seems to be the dominant argument behind BNM's systematic merger move to improve Malaysian banking productivity.

In general however, there has been no consensus among researchers on the benefits of mergers to the productivity of the merging entities, to the public or to the shareholders. However, despite the fact that many academic studies show no substantial gains from mergers, the number and value of new mergers in the US and elsewhere go on unabated (Cybo-Ottone and Murgia, 2000).

Moreover, while merged entities may become more productive, there is no certainty that the gains will be passed on to consumers via lower prices, wider product range of improved quality and better services. This is because

consolidation yields increased market power to the merged entities thus resulting in higher prices and a less desirable product mix, quality and services. For instance while an in-market merger is expected to result in cost savings when redundant bank branches are closed down, such savings cannot be sustained over the long run unless the savings result from improved institutional efficiencies in both the acquiring and the target banks (Avkiran ,1999). If not, the public could end up paying for products and services at above competitive prices. Furthermore, many bank products are price inelastic especially when it comes to the retail banking sector and localized market. Customers may agree to pay more if there is little option or incentive in shifting to a new bank or when there is a general maneuver made by all banking groups in unison. The eventual outcome therefore rests on the eventual magnitude of efficiency effects relative to that of market power. Previous studies have also found that consolidation leads to concentration of market power and thus less competitive pricing that would hurt consumers.

4.2.4: Literature Review

Much of the literature suggests substantial potential for efficiency improvements from mergers of banks. Recent studies discovered unexploited scale economies even for the large banks in US and Europe (Berger and Mester, 1997; Berger and Humphrey, 1997; Allen and Rai, 1996)[17]. For instance, a recent analysis found that substantial cost scale economies have been realized (20% of costs for bank sizes of $10 million to $25 million in assets) (Berger and Mester, 1997)[18].

However, the potential for enhancing banks' scale efficiency made possible through size enlargement following bank mergers is controversial. Haynes and Thompson (1999) summarized the studies of US banks. The studies generally found that (1) economies of scale are usually found for smaller banks, (2) economies of scale tend to become negative for very large banks, (3) the measured extent for scale economies to be exploited was small and

[17] As cited in Berger, Demsetz and Strahan (1999).
[18] As cited in Berger, Demsetz and Strahan (1999).

(4) banks tend to exhibit higher levels of technical or X-inefficiency rather than scale efficiency. Rather than enhancing productivity growth through increased scale efficiency, Dutz (1989)[19] pointed out that merging banks with overlapping coverage may result in economies arising from selective deployment of assets. Specifically the study found that horizontal mergers could generate savings surplus capital is reassigned to more productive uses. On the other hand, Haynes and Thompson (1999) also cited that if a bank mergers result in transferring assets to better quality managers, X-efficiency gains are likely to result: where potential acquirers are usually more efficient than target banks (under performers). In Haynes and Thompson (1999), the authors discovered in the acquisitions of UK building societies, the gains are not the result of scale but attributed to assets being transferred for more productive use and management. Resti (1998) meanwhile found increased efficiency levels for small Italian banks with considerable market overlaps. Thus, the literature suggests that bank mergers have some limitations on raising efficiency through scale economies but there is room for improvement in terms of enhancing technical efficiency

Berger and Humprey (1997) showed because the banking industry exhibits substantial X-inefficiencies ranging from 20-25% of total costs, mergers may substantially improve cost efficiency when relatively efficient banks acquire relatively inefficient banks. However, the results of cost X-efficiency studies were quite similar to those concluded for scale economies. The studies on US banking generally show very little or no cost X efficiency improvement on average from bank mergers in the 1980s with order of 5% of costs or less (Berger and Humphrey, 1992; Rhoades, 1993; DeYoung, 1997 and Peristiani, 1997)[20]. Studies using data from the 1990s were meanwhile mixed. Rhoades (1998)[21] and Berger (1998)[22] found modest cost x-efficiency gains for US in-market mergers. Berger et al (1999) summarized these findings by indicating that even if there were technological gains on average from consolidating

[19] As cited in Haynes and Thompson (1999).
[20] As cited in Berger, Demsetz and Strahan (1999).
[21] As cited in Berger, Demsetz and Strahan (1999).
[22] As cited in Berger, Demsetz and Strahan (1999).

branches, operations and processes, these may have been offset by managerial difficulties in monitoring larger organizations, conflicts in corporate culture and system integration problems.

In contrast, Akhavein et al (1997) and Berger (1998) found substantial efficiency gains to be realized if either or both consolidating participants were less efficient than their or its peer banks suggesting mergers may have resulted in synergies and streamlining inefficient bank management. Wheelock and Wilson (1998) studied US bank mergers and found that banks with a high degree of cost inefficiency are likely to be acquired without government assistance. In another study of US banks, Peristiani (1993)[23] reported that acquiring banks are more profitable and have smaller NPL loan ratios than target banks.

European studies correlate closely with most of the US studies. In Vander Vennet (1997) and Focarelli at al (1998), large efficient banks tended to acquire small less efficient banks. In a comprehensive study of European M&A in the 90s covering 52 banks, Huizinga et al (2001) indicated that there are significant unexploited scale economies even among large banks. Large banks however, exhibited lower profit efficiency than their peers although small merging banks exhibit higher level of profit efficiency. Much of the evidence shows that increases in cost efficiency are larger when merging banks have relatively poor pre-merger cost efficiency levels. Meanwhile mergers tend to reduce profit efficiencies for large banks and vice versa for small banks.

It can be seen that the affirmative studies often conclude that the potential gains in efficiency and productivity are due to one factor or another. Yet, many studies also found that these gains are seldom realized. Studies of US bank mergers found little or no cost x-efficiency improvements (DeYoung, 1997; Peristiani, 1997; Berger, 1998). In reviewing the voluminous empirical

[23] As cited in Berger, Demsetz and Strahan (1999).

literature relating to US banking mergers, Pilloff and Santomero (1998) pointed out that despite academic studies showing little or no gains in value for bank mergers, the number and value of new mergers continues to grow. Huizinga et al (2001) explained that the potential gains from consolidating banks may have been offset by resultant managerial inefficiencies in integrating merged entities.

In the midst of the conflicting conclusions as to the existence of gains from bank mergers, Calomiris (1999) summarized the literature on the assessment of bank consolidations into three broad areas:

- Cross-regime comparisons that contrast performance of banks under a regulatory regime that permit consolidation and another that forbids it.
- Analysis of the causes and subsequently the likely benefits of consolidation.
- Studies of the consequences in terms of individual bank performance following a merger. This involves event studies such as stock price responses and analysis based on pre and post merger bank financial statements.

The author found that in general, the first two categories of research yield positive results suggesting that consolidation enhances competition and efficiency. Meanwhile studies in the third category are generally pessimistic in that they found small or no average savings. The study is however silent on the source of efficiency gains if there are any, and the debate on market power and efficiency enhancement is incomplete.

In a study of price effects of mergers in the US airline industry, Kim and Singal (1993) found that merged airlines companies on average raised airfares by 9.44% relative to those unaffected by the mergers. In the banking study by Prager and Hannan (1998)[24], the authors highlighted that bank mergers

[24] As cited in Focarelli and Paneta (2002).

reduced deposit rates. Sapienza (2002)[25] meanwhile reports that loan rates increase when the target has a large local market share. Kahn et al. (2000)[26] concluded that large in-market mergers lead to increased market power that causes a rise in personal loan rates.

These studies however only study the effects over the short run and may have missed the effects that take longer to manifest. Focarelli and Paneta (2002) highlighted that although the merged entity may exert market power over the short run, improvements in efficiency may emerge after some time resulting in more favorable future pricing for consumers. For bank mergers, empirical evidence has shown considerable lags are likely between the completion of a merger and the realization of the gains. This is because integrating the merged banks is no easy task. Firstly, cost cutting takes time while rationalization of overlapping capacities is exercised and there is usually reluctance or resistance by staff to retrenchment. Even when this factor has been discounted, reorganization of the merged entities into a coherent entity is often met with difficulties in harmonizing different management and communication styles, customer profiles and distribution channels.

To complicate matters, there is also disagreement among researchers on the length of the gestation period following a merger before the dominant effect can be assessed. Berger et al. (1998)[27] and Calomiris and Karceski (2000)[28] mentioned 3 years are needed before the effects of a merger can be safely evaluated. In contradiction to this view; interviews with staff of the Federal Reserve Board involved with bank mergers proclaimed that “the cost savings would be fully achieved within 3 years after merger with the majority of cost savings being achieved after 2 years (Rhoades, 1998)[29]. Finally in a more recent study on large US bank mergers, Houston et al. (2001) found that costs savings and revenue enhancements would be evident after between 2 to 4 years.

[25] As cited in Focarelli and Paneta (2002)
[26] As cited in Focarelli and Paneta (2002).
[27] As cited in Focarelli and Paneta (2002).
[28] As cited in Focarelli and Paneta (2002).
[29] As cited in Focarelli and Paneta (2002).

Focarelli and Paneta (2002) showed that a comprehensive assessment requires analysis of price changes that resulted from bank mergers over the long run. By examining interest rates for different categories of deposits of Italian banks over 9 years, the authors found that, consistent with previous studies, short run consolidation increases market power, evidenced by a lowering of deposit rates by about 3.3% of market rates within the first year of merger. Subsequently however, the deposit rate of merged banks rose over time to reach some 13 basis points above its pre-merger level. They also compared price changes between in-market mergers and out-of-market mergers (which do not change the banks' local market shares) and found that there was deposit rate deduction unfavorable to consumers for in-market mergers and that this reduction is larger in samples that are sensitive to market power such as small retail deposits and concentrated localized markets. No changes to the interest rates in the short run were found in the case of out-market mergers. However both merger modes generate an increase in deposit rates in the long run. They found that in the long run, efficiency gains from mergers dominate market power effects. Therefore, consumers gain eventually if banks are successful in reducing costs or in other words, become more productive. However, the authors cautioned policy makers to be sceptical of rapid efficiency improvement claims. Focarelli and Paneta (2002) appear to offer the most convincing arguments on the subject.

In another related study, Avkiran (1999) assessed the role of mergers in efficiency gains and the degree to which they are passed on to the public in the Australian banking system. Avkiran found that three out of four merger cases lend support to the hypothesis that acquiring banks are more efficient but reported no clear evidence that acquiring banks at least maintained their pre-merger efficiency following a merger. The author also found that in the case of an in-market merger there was a gradual rise in relative efficiency. By using change in market share of deposits as a proxy to measure the extent of operating efficiencies being passed on to the public, the author found mixed results and attributed this to the possibility that increased market penetration

creates monopoly power and as such, merged entities are less inclined to improve service at better prices.

4.2.5: Caution in Comparing the Mergers in Malaysia with Existing Studies

It must be noted that most of the merger studies discussed assess market motivated mergers. On the contrary, the bank consolidation exercise in Malaysia was a pre-emptive move directed by the BNM and not at all guided by market forces. This political and regulatory influence may add further ambiguity to the consistency of the data about the success of the Malaysian experience compared to those of US and Europe. There has also been an indication that a second wave of mergers may be coming, this time entirely based on market forces. Perhaps it is only after the completion of the new consolidation that any meaningful comparisons can be made with the existing literature on bank mergers from elsewhere. Until such time, any results must be interpreted with care as Calomiris (1999) pointed out, during a continuous merger wave, gains accrued over several years, one-time merger costs and assumptions that limit time horizons of gains can contribute to substantial underestimation of the gains from mergers.

4.3: Conclusion

This chapter explains the different concepts of efficiency and productivity and the impact from bank mergers. These concepts are critical to understanding and drawing conclusions from previous literature on the area.

It is evident from the literature review above, that there is a void in credible research relating to comparable productivity measures within the dual banking system. The need for a cross system bank productivity measure is fueled by the serious void of any credible empirical research on the comparable performance between the two banking systems. Most of the previous studies of Islamic banks focused primarily on expounding the conceptual principles of interest-free financing. In fact, it has been recognized that the general lack of

relevant and reliable data is seriously impeding any comprehensive analysis of cross-system bank performance measurement. Most of the few empirical studies of Islamic banks' performance fail to account for these fundamental differences.

As explained above, Islamic banking and conventional differ fundamentally in both their principles and operations. Due to the inadequacies of BankScope's data to attempt a comparable performance data analysis between conventional and Islamic banks, a comparison cannot be interpreted and applied with confidence. Given these, it is opinioned that because no cross-system studies, have relied on other credible sources than BankScope, there is a void within the voluminous banking literature on cross-system comparable bank performance measurement in the dual banking industry.

It is thus, the aim of this study to pioneer one where the productivity aspects of conventional and Islamic banks are compared at both the same time and across time as well as between banks of the same system at one time and across time.

CHAPTER 5:
RESEARCH METHOD AND DESIGN

PART I
METHODOLOGY

This study has established the methodological usage of MPI as the comparable bank productivity measure of the Malaysian dual banking system in the era of bank mergers. In order to comprehend MPI within the DEA, it is significant to understand the related variables. This chapter explains the derivation of the various variables and components of productivity changes under the MPI.

5.1: Productivity in terms of Total Factor Productivity (TFP)

Productivity changes are often defined in terms of Total Factor Productivity (TFP) changes. Coelli et al (1998) termed TFP as an overall productivity measure that encompasses the productivity of all production factors or outputs. When the overall productivity of a Decision Making Unit (DMU) or a whole industry is considered, distinction must be made between TFP and other commonly used partial productivity measures such as labor and capital productivity. This is because a DMU usually transforms multiple inputs into multiple outputs. The evaluation of partial productivity measures alone can be misleading and could result in inconsistent and inaccurate conclusions. As with other studies that utilize index number approaches, this paper considers TFP changes as indicators of overall productivity changes. Both terms will be used interchangeably henceforth.

In a one-input, one-output case, the simplest yet general measure of productivity is the ratio of outputs over inputs. This ratio generates a value indicating how many output units that can be produced by employing a single input unit. A rising ratio generally indicates rising productivity. This view is essentially an output orientated one. An input orientated productivity ratio looks at how many input units can be reduced to or required by a single output unit.

5.2: The Components of Total Factor Productivity (TFP)

The same output over input ratio is often used in non-technical media as an indicator of the overall efficiency of a DMU. This is a flawed statement. Both productivity and efficiency are two distinct, although closely related terms. This subtle yet important distinction can be illustrated by Figure 5.1. A production frontier f is drawn that transforms a single input into a single output. This relationship also represents the maximum y output units that can be feasibly attained from a single x input unit and hence, it is also called the production frontier. It also reflects the current production technology. Note that

the slope of the frontier is the ratio of y/x, which is also the average product AP of all the points that lie along the frontier. Because it rises upward to A before tapering off, the technology is said to exhibit non-constant returns to scale. Specifically it is Increasing Returns to Scale (IRS) up to A before experiencing declining returns to scale DRS after that.

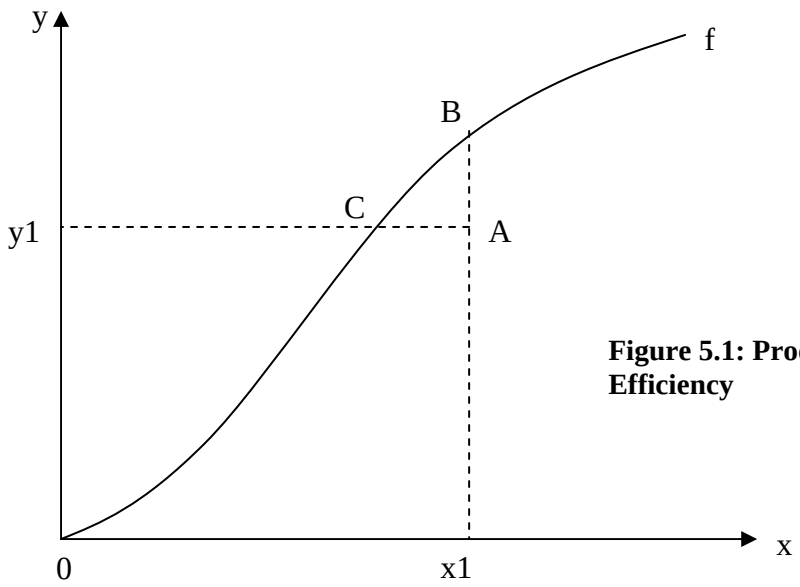


Figure 5.1: Production Frontier and Technical Efficiency

5.2.1: Technical efficiency

A and B are technically efficient producers because both lie on the frontier. This means A and B are already producing the maximum possible output using inputs via technology f. C is technically inefficient because it could still increase its output level by employing the same input level at x1 by moving upwards to B. Because the production frontier also defines the feasible production set, D is regarded as infeasible to attain by technology f.

5.2.2: Scale Efficiency

The same diagram is replicated in Figure 5.2 but with rays drawn extending from the origin . Notice the slopes of the rays are also of the values x/y and AP. Because AP is identical along the rays, these can be viewed as technologies with constant returns to scale, CRS specification. **As C moves to B**, the slope of the ray becomes steeper, indicating greater input-output transformation and thus, productivity. However, if C moves to A, the steepest ray is tangent to production frontier f. Point A thus represents the optimal

scale and has the maximum possible productivity. Production on any other point along the frontier although technically efficient, results in lower productivity. C essentially moves to A by exploiting scale economies. Therefore a scale-inefficient DMU may be efficient but it can still exploit scale economies to improve its productivity (Coelli et al, 1998).

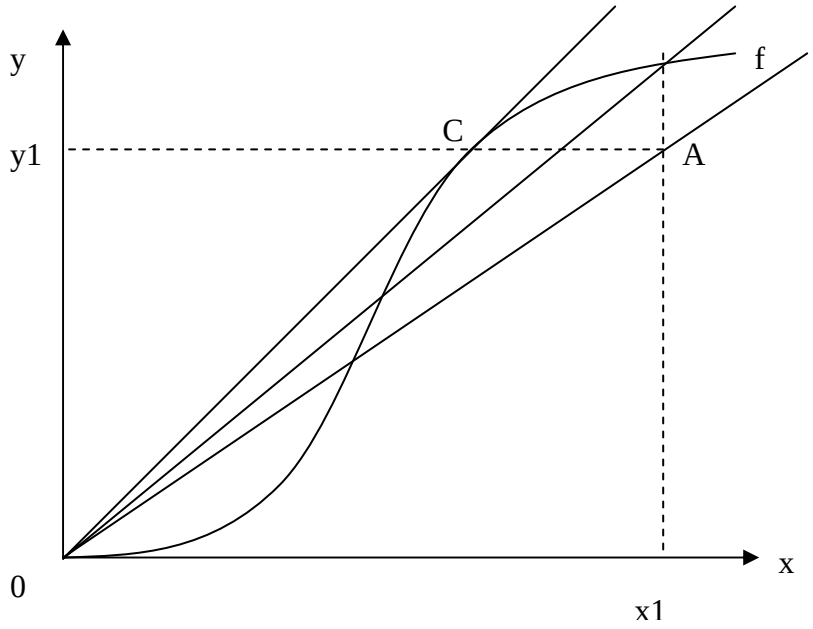


Figure 5.2: Technical Efficiency and Scale Efficiency

5.2.3: Technical Change

Figure 5.3 brings the discussion one step further by introducing technical change. Technical change is an additional source of productivity change but takes place over time. Technological advancement is represented by an upward shift of production frontier f1 to f2, where at B, the same input level x1 is associated with a higher output level y2.

It is apparent then, that from the examples shown, a DMU can alter its productivity by altering its technical efficiency, scale efficiency and by virtue of technical change. Productivity therefore, is composed of technical efficiency, scale efficiency and technical change.

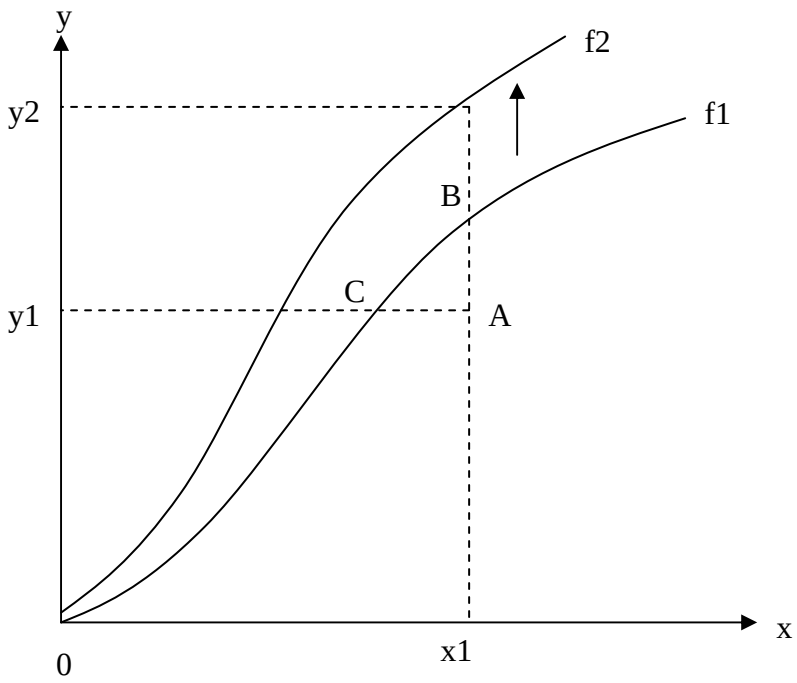


Figure 5.3: Technical Change

5.3: Economic Efficiency Measures and Their Relationships with Productivity

5.3.1: Technical Efficiency and Allocative Efficiency

In the economic literature, overall economic efficiency EE is made up of technical efficiency TE and allocative efficiency AE. AE is defined as the effective selection of inputs vis a vis their prices to produce a given quantity of output at the minimum production costs (Avkiran (1999)). TE on the other hand, investigates how well a DMU implements an effective production plan to convert its inputs to outputs (Avkiran, 2000).

These efficiency concepts can be illustrated by Figure 5.3, which illustrate a production process that involves 2 outputs (y1 and y2) being produced by a single input x. The II concave curve represents the production possibility frontier of fully efficient firms while AA represents the slope of the isorevenue line or the output price ratio. Note that this is the output-orientated approach

to explain economic efficiencies where the objective is to expand output production (y1 and y2 at A) as much as feasibly possible from a given level of input. The input orientated model meanwhile incorporates a unit isoquant between two inputs (x1 and x2) and an isocost line. It attempts to contract the inputs as much as permissible by the production isoquant to produce a given level of output. Refer to Coelli et al (1998) for a comprehensive coverage of the topic.

In terms of Figure 5.4, TE is represented by the distance AB and is expressed as a ratio of AB/OB or according to the equivalent specifications of Farrell (1957) in the input orientation model as OA/OB which is 1-AB/OB or the reciprocal of AB/OB. AE meanwhile is indicated by BC, that is, the reduction of production costs that would occur at allocatively efficient point B'. AE is expressed as the ratio of OB/OC. Thus;

$$EE = (OA/OB) \times (OB/OC) = OA/OC$$
$$= TE \times AE$$

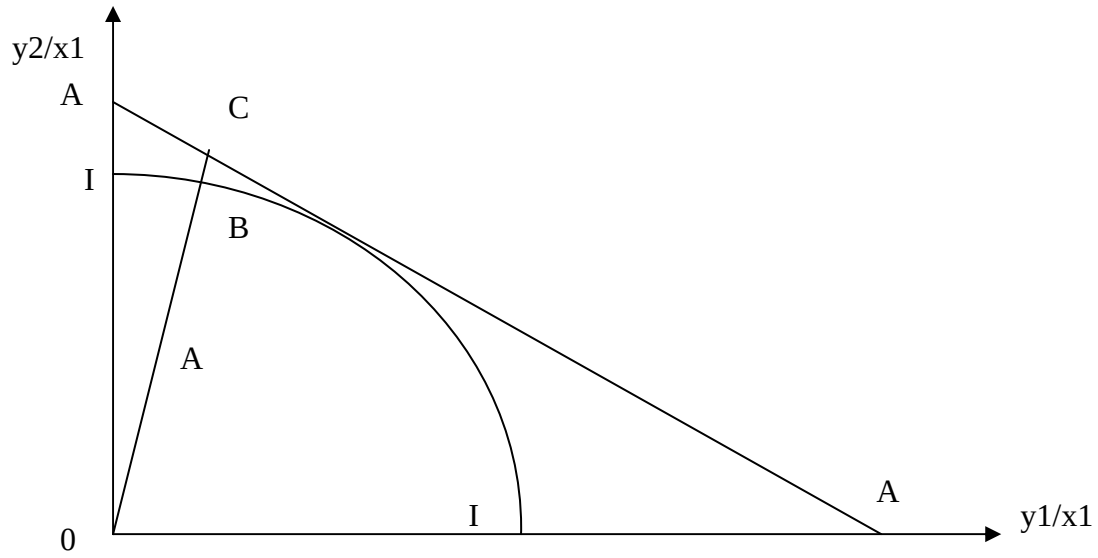
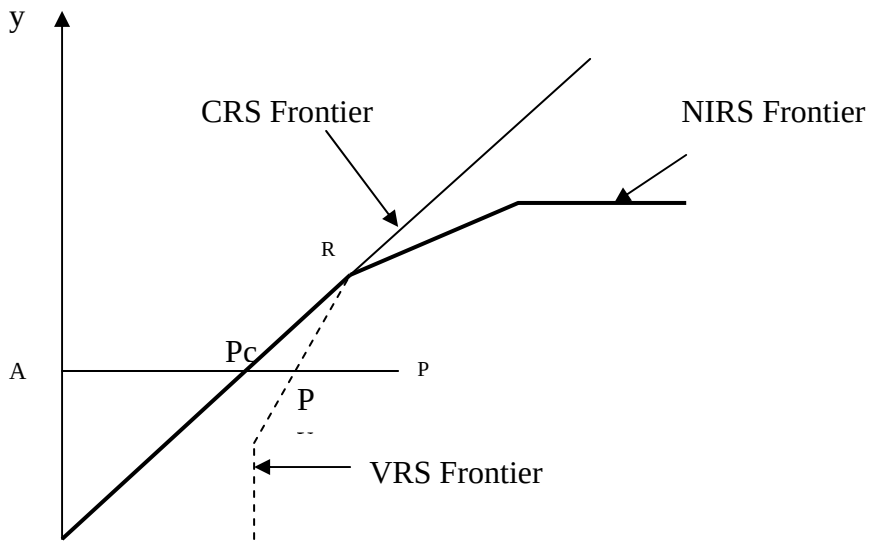


Figure 5.4: Technical Efficiency and Allocative Efficiency
Source: Coelli et al (1998)

5.3.2: Pure Technical Efficiency, Scale Efficiency

The economic measures outlined so far are defined under a CRS technology. However, if VRS specification is allowed, scale efficiency SE can be derived. To simplify the discussion, the production frontier seen in Figure 5.1 is summarised in Figure 5.5. In Figure 5.5, both CRS and VRS frontiers for a one-input, one-output scenario are indicated. Under CRS specification, the TE of point A is the distance PPC. Under VRS assumption however, TE is only PPV. The difference between the CRS and VRS TE scores is due to scale inefficiency that can be expressed as APC/APV. The CRS TE therefore, can be decomposed into pure technical efficiency PTE (APC/AP) and scale efficiency SE (APC/APV). The SE measure can be roughly translated as the ratio of average product AP of a DMU operating at point PV to the average product of a DMU operating at point R, the point of optimal scale. Any divergence of the DMU from the most productive scale size MPSS point (point R) represents some degrees of scale inefficiency (Avkiran, 1999).

However if a non-increasing returns to scale (NIRS) production technology is specified, one is able to determine whether a DMU is experiencing increasing returns to scale IRS or decreasing returns to scale DRS. If a particular VRS score equals the NIRS score, the DMU is operating under DRS. On the other hand, if VRS is not equal to NIRS, the DMU is operating under IRS. If VRS equals the CRS score, then the DMU is operating at the MPSS.



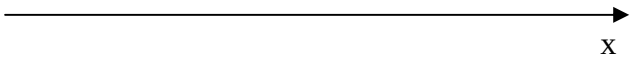


Figure 5.5: Scale Efficiency, Scale Economies and Most Productive Scale Size (MPSS)
Source: Coelli et al, 1998

Recalling that it has been established above that an overall productivity measure is the sum of technical efficiency, scale efficiency and technical change, the PTE definition of Figure 5.5 corresponds to the technical efficiency mentioned earlier. For the rest of the study, it is referred to as PTE. Thus:

TE= PTE x SE

From the examples given, it is apparent that while EE accounts for AE and TE, it leaves out the technical change component. This is yet another proof that productivity and efficiency are both the same terms and that y/x does not equal efficiency.

5.4: Derivation and Decomposition of the TFP Index

Coelli et al (1998) demonstrated that a TFP index can be constructed and subsequently decomposed into PTE, SE and technical change components. It has been shown that average product AP serves as a proxy for productivity. Consider a simple one-input, one-output case, and letting (x0, y0) and (x1, y1) denote the observed input-output combinations for period 0 and period 1. Then, the productivity of a particular DMU in periods 0 and 1 are given by:

AP0= y0/ x0

AP1= y1/ x1

Any changes in overall productivity (π) for the same DMU over periods 0 and 1 can be captured by the ratio of AP of period 1 over the AP of period 0 as shown by:

π = AP1 = $\frac{y1/ x1}{AP0 \quad y0/ x0}$ …… Equation 1

The same expression can be re-arranged as:

π = AP1 = $\frac{y1/ y0}{AP2 \quad x1/ x0}$……..Equation 2

Coelli et al (1998) showed that the same ratio is also the TFP index that measures productivity changes for periods 0 and 1.

π = AP1 = $\frac{y1/ y0}{AP2 \quad x1/ x0}$ = TFP0, 1 ……..Equation 3

If the condition of technical inefficiency and differing input levels utilization between the two periods are to be factored in (which is usually the case), then Coelli et al (1998) demonstrated that the ratio in Equation 3 can be expanded into:

TFP0, 1 = $\frac{\lambda 1}{\lambda 0}$ x $\frac{f1 (\kappa x0)/ \kappa x0}{f0 (x0) / x0}$……Equation 4

where λt: inefficiency coefficient of period t

κ: x1 input usage coefficient of period 1 as a proportion of x0

ft (x): observed output levels at period t, as implied by the production function of period t.

By rearranging the expression, the arrangement becomes:

TFP0, 1 = $\frac{\lambda 1}{}$ x $\kappa^{\varepsilon (t)-1}$ x $\frac{f1(x0)}{}$

$\lambda 0$ f0(x0)…….Equation 5

where κ: the scale of operations

ε: returns to scale parameter

Equation 5 gives the complete decomposition of the overall productivity index, where the first term represents technical efficiency change, the second term indicates the effects of change in scale of operations and the third term computes the technical change. Note that the third term is also controlled by the scale of operations κ and the returns to scale parameters ε. If the technology is specified as a CRS benchmark, then $\varepsilon(t)= 1$, $\varepsilon(t) -1=0$ and thus $\kappa^{\varepsilon (t)-1}= 1$. Therefore, the third term becomes irrelevant when CRS is assumed. However, if VRS prevails, then the second term will assume some other positive value and will become relevant.

From this example, it can be summarized that an index number approach is able to compute overall productivity change as well as decompose overall productivity change into pure technical efficiency change (PEFCH), scale efficiency change (SECH), scale change of technology (SCHTCH) and technical change (TECHCH). There are also a number of important conclusions that can be drawn from Coelli et al (1998):

- It is vital to have some knowledge of the production technology to derive the TFP index
- Without extraneous information, it is impossible to break the TFP down into the different sources of productivity change
- The DMU is assumed to be allocative efficient. Otherwise, the TFP index may harbor some effects of allocative inefficiency.

Coelli et al (1998) have shown that with these conditions in place, an index number approach is able to capture the different sources of TFP changes. The question now turns to which index number methodology to adopt. In general, there are 4 index number approaches to measure and decompose

TFP change: output price, input price, output quantity and input quantity indices.

5.5: The Malmquist Productivity Index (MPI)

In this study, productivity or TFP changes are calculated using the Malmquist Productivity Index MPI as introduced by Caves et al. (1982) and developed by Fare et al. (1994). The MPI is capable of being defined as either an output quantity index or as an input quantity index. Most of the literature on banking productivity assessment that harnesses the MPI uses the output quantity index. To maintain consistency with the majority of related studies, this paper follows an input quantity index approach.

5.5.1: MPI in terms of Distance Functions

The MPI can be computed by using only quantity data for both inputs and outputs alone and is expressed as the ratio of distance functions. Distance functions are function representations of multiple-output and multiple input technology that require only data on quantities without the need to specify behavioral objectives such as cost minimization or profit maximization (Avkiran, 2000). Distance functions alone can either be input or output functions. An input distance function defines the production technology by referring to the maximal contraction of the input vector given an output vector. By contrast, the output distance function seeks maximal expansion of the output vector given the input vector. Because the approach adopted in this study is essentially an output orientated one, output distance functions are used to derive the MPI.

5.5.2: Output Distance Functions

To define the output based MPI, a general production technology must be first defined and understood as the output set P(x) that represents all output vectors y that can be produced by employing an input vector x. The technology or P(x) is denoted as:

P(x) = {y: x can produce y}

= {y: (x, y) $\in$ S^t} for all x……..Equation 6

In equation 6, P(x) models the transformation of inputs x into outputs y for each period t= 0, 1…T. S^t meanwhile represents the feasible output set for technology P(x).

In terms of the output index number model, Equation 6 is slightly modified as below. Following Shephard (1970), the output distance function for period t is expressed as:

Dt (x, y) = min { δ: (y/δ, x) $\in$ S^t}……Equation 7

δ represents the smallest distance by which the output needs to be deflated so as to become feasible to be produced by period t technology (Coelli et al, 1998). This applies to an output vector that lies above the technology or production frontier like y1 in Figure 5.6. In this instance, $\delta > 1$. On the other hand, if the observed output vector is below the production frontier, then $\delta < 1$ to inflate the output vector thus bringing it onto the surface of the production frontier or production possibility set S^t. In particular, Dt (x, y) $\leq$ 1 if and only if (x, y) $\in$ S^t and Dt (x, y)= 1 if and only if (x, y) is on the frontier, that is, technically efficient.

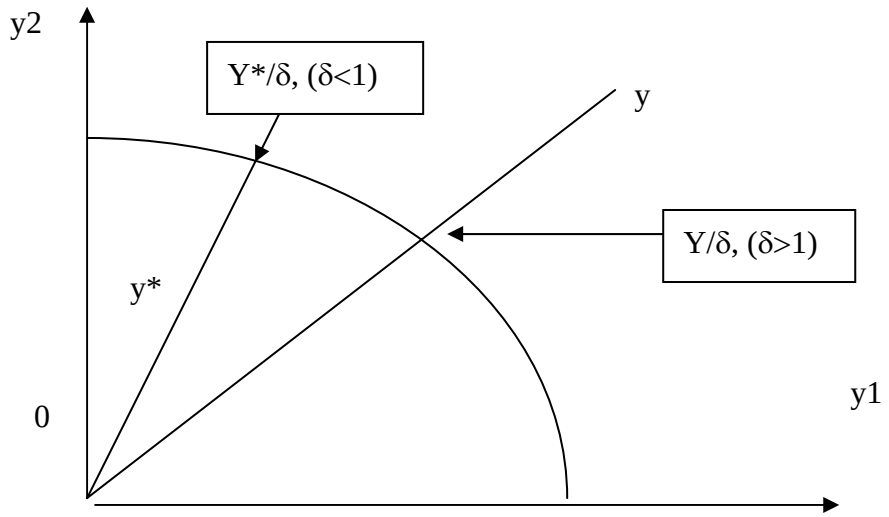


Figure 5.6 Output Distance Function: Output Vector Contraction and Expansion

Source: Coelli et al 1998

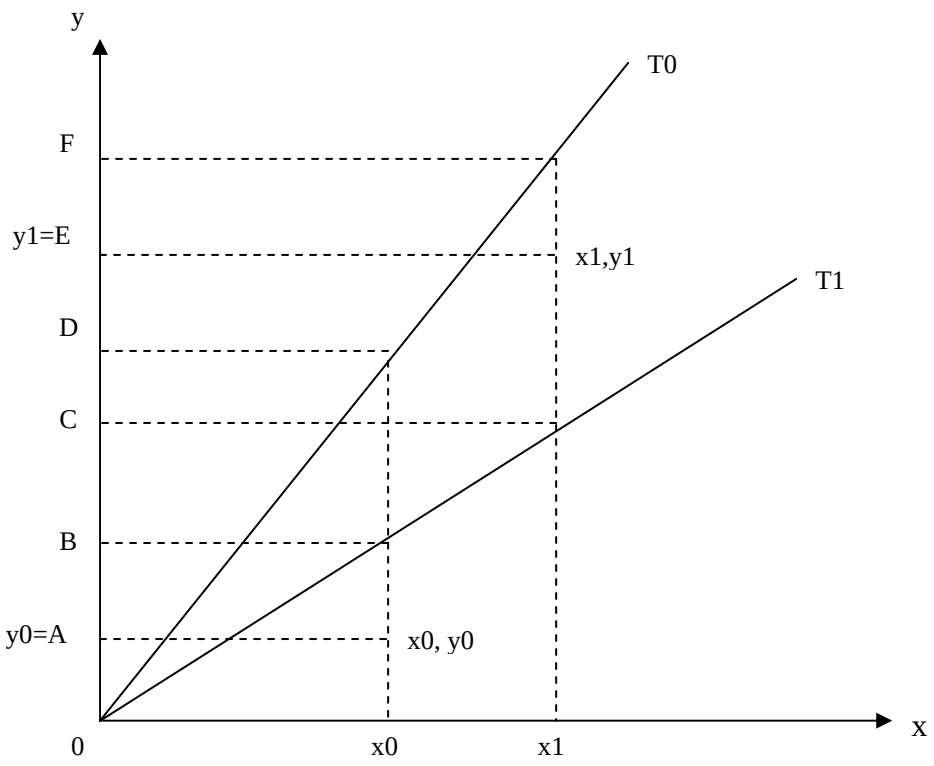


Figure 5.7 Derivation of MPI: One-Input, One-Output Case with Constant Returns to Scale CRS Technology.
Source: Alam (2001)

This can be illustrated by Figure 5.7 where scalar input is used to produce scalar output. Because (xt, yt) is interior in relation to t technology, it is not technically efficient. The distance function would then seek the greatest proportional increase in the output such that the output remains feasible. Maximum feasible production is yt/θ . Thus, the value of the distance function would be $Oa/Ob \leq 1$, which is the value of δ through which (xt, yt) needs to be inflated through y/δ. Also recall from Equation 7 that if $\delta > 1$, y would be deflated via y/δ to bring it back to the surface of the production set p(x) associated with x. All output distance functions henceforth, would be evaluated in a similar manner.

Note that the production frontiers P(xo) and P(x1) are drawn under CRS specification. P(xt) adopts the CCR technology that satisfies the assumptions

laid in Charnes et al. (1978) where CRS and free disposability of inputs and outputs are specified.

5.5.3: The General Overall MPI Index

What follows is the derivation of the MPI index as pioneered by Caves et al. (1982). In the spirit of the study, CCD computed TFP changes between 2 data points as the ratio of distance functions for each (x, y) relative to a common technology. In particular, Caves et al. (1982) defined the MPI with period 0 technology as the benchmark as:

$$MCCD0 = \frac{DC0\ (x1, y1)}{DC0\ (x0, y0)} \quad \text{.....Equation 8}$$

Where DC0 means the input distance function with CRS technology of period 0 as the benchmark. A value of more than 1 indicates productivity increase while a value of less than 1 indicates productivity regress. A unity value means no productivity change. In terms of the output distance function,

$$DC0\ (x1, y1) = \min \{ \delta : (y1/\delta, x1) \in P(x)0 \}$$

Where the distance function measures the maximum proportional change in outputs required to make (x1, y1) feasible in relation to period 0 technology. In terms of Figure 5, δ = Od/Oe which is $>$ 1. Therefore, (x1, y1) would be deflated back to the surface of P(x)0 by δ.

Alternatively, one could define a period 1 technology-based MPI as:

$$MCCD1 = \frac{DC1\ (x1, y1)}{DC1\ (x0, y0)} \quad \text{.....Equation 9}$$

In order to avoid choosing an arbitrary benchmark, a geometric mean of the two ratios is taken instead as the MPI index:

1/2

$$MCCD_{0,1} = \left[\frac{DC_0(x_1, y_1)}{DC_0(x_0, y_0)} \quad \frac{DC_1(x_1, y_1)}{DC_1(x_0, y_0)} \right] \quad \text{……Equation 10}$$

5.5.4: The Decomposition of the General MPI

Apart from the specification of CRS and weak disposability of inputs and outputs, CCD also assumed that each DMU both be technically and allocatively efficient so that MCCD=TECHCH. However Fare et al (1989, 1992) and Coelli et al (1998) showed that if sufficient observations in each period are available to estimate the technology in each period, then the assumption can be dropped. Moreover, it is more common to observe some degrees of technical inefficiency in the operations of most banks. Note that all DMUs are still being assumed to be allocatively efficient. Following Fare et al (1994) where technical inefficiency is present, Equation 10 can be rewritten as:

$$M(x_1, y_1, x_0, y_0) = \frac{DC_1(x_1, y_1)}{DC_0(x_0, y_0)} \times \left[\frac{DC_0(x_1, y_1)}{DC_0(x_0, y_0)} \quad \frac{DC_1(x_1, y_1)}{DC_1(x_0, y_0)} \right]^{1/2} \quad \text{…….Equation 11}$$

An index greater than 1 indicates improvement while a value less than 1 reflects regress. Both components may move in different directions. Note that if x0=x1 and y0=y1, M=1, signalling that there has been no change in productivity. The two components are reciprocals but not necessarily equal to 1. In terms of Figure 5 and following Fare et al (1994) and Alam (2001), the MPI index is expressed as:

$$M(x_1, y_1, x_0, y_0) = \frac{0E}{0F} \times \frac{0B}{0A} \left[\frac{0F}{0C} \times \frac{0D}{0B} \right]^{1/2}$$

The ratios within the brackets measure shifts in the technology or production frontier at input levels x0 and x1. Technical change or TECHCH is thus, the geometric mean of the 2 shifts. The term outside the bracket computes

technical efficiency change at period 1 and 0 determines whether production in catching up or deviating away from their contemporaneous frontier. In this study's application, this component would capture the degree of technology diffusion among banks.

Even with the MPI now being decomposed into TECHCH and technical efficiency change, the expression still falls short of the complete decomposition of the TFP index as discussed in Section 3. It has been highlighted in Section 2 that the difference between CRS and VRS efficiency scores is due to scale inefficiencies. Therefore, in order to calculate changes in scale efficiencies SECH, this study follows the FGNZ approach where the output distance functions are also computed under VRS. FGNZ outlined this enhanced decomposition as:

$$M(x1, y1, x0, y0) = \frac{DC1(x1, y1)}{DC0(x0, y0)} \left[\frac{DC1(x1,y1)/DV1(x1, y1)}{DC0(x0, y0)/DV0(x0, y0)} \right]^{1/2} x \left[\frac{DC0(x1, y1)}{DC1(x1, y1)} \frac{DC0(x0, y0)}{DC1(x0, y0)} \right]^{1/2} \quad \text{.....Equation 13}$$

M(x1, y1, x0, y0)= PEFCH x SECH x TECHCH

Where DV0 means the input distance function with VRS technology of period 0 as the benchmark. Thus, technical change TECHCH is calculated with reference to the CRS benchmark, the efficiency change component-now represented by pure efficiency change PEFCH is computed as the ratio of own period distance functions relative to VRS and the scale efficiency in each period is the ratio of distance function restricted by VRS. This leaves scale efficiency change SECH as ratio of scale efficiency from each period.

Further decomposition of this expression is possible in order to derive the residual scale change of technology (that is whether period 1 VRS is relatively closer or further from CRS than period 0 VRS) SCHTCH. This derivation can be found in Simar and Wilson (1998), Wheelock and Wilson (1999), Zofio and

Lovell (1998) and more recently by Fernandez et al (2001). This paper will not pursue a further enhanced decomposition due to the already existing disagreements of researchers surrounding Equation 13. In particular, Ray and Desli (1997) disputed the simultaneous use of CRS and VRS, stating such procedures only generate internal inconsistencies within the model. However, this study chooses to apply Equation 13 due to a number of credible reasons, which were explained in the literature review.

5.6: Computing MPI within the Data Envelopment Analysis (DEA) Framework

There are several ways to compute the distance functions that make up the MPI. Here this study follows Fare et al (1994) and calculates the output distance functions by applying a linear programming approach called Data Envelopment Analysis. It was shown in Chapter 3 that it is impossible to decompose the TFP into its various subcomponents without some knowledge of the relevant technology. Because one can never know the exact technology, it needs to be estimated.

Studies of the non-parametric DEA linear programming approach of estimating technology following Farrell (1957) suggest the use of a non-parametric price-wise production possibility frontier as illustrated in Figure 5.6 that is constructed to fit into a multi-output, single input output orientated model so that no observed points lie to the right or above the frontier. Therefore, the constructed frontier envelopes all observation points, hence the name Data Envelopment Analysis.

5.6.1: The Data Envelopment Analysis DEA Methodology

Charnes et al. (1978) developed and extended Farrell's ideas into a non-parametric methodology known as Data Envelopment Analysis. This development addressed a critical shortcoming of the weighted relative efficiency ratio expressed below that was originally conceived by Farrell and Fieldhouse (1962) to construct an efficient hypothetical unit (on the frontier)

against which all other inefficient units are compared. The problem associated with the ratio is determining a common set of weights to be applied to all DMUs since DMUs value inputs and outputs differently and therefore a common standardization may introduce bias into the results.

$$\text{Efficiency of DMUj} = \frac{u_1 y_{1j} + u_2 y_{2j} + \ldots}{v_1 x_{1j} + v_2 x_{2j} + \ldots}$$

where u_1 = the weight given to output 1

y1j = amount of output 1 from DMU j

v1 = weight given to input 1

x1j = weight of input 1 to DMU j

Charnes et al (1978) recognized the problem and proposed instead that each DMU be allowed to adopt a set of weights that will put the DMU in the best light possible relative to all other DMUs in the sample.

Mathematically, their model is expressed as:

$$\text{Max } H0\ u, v\ (u'yj / v'xj)$$

$$\text{s.t.} \quad (u'yj / v'xj) \leq 0$$

$$u, v \geq 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{Equation I}$$

where xj = input vector for DMU j

yj = output vector for DMU j

The efficiency of the jth DMU, H0, is thus maximized but subjected to two constraints. The first ensures that the relative efficiency score is bounded by zero and 1 with value 1 indicating a fully efficient DMU. The second makes certain that variables u and v that represent the weights to be uniquely applied to each DMU have values more than unity. The solution to the model would

yield the most favorable weights u and v, to be applied to DMUj that would maximize its efficiency H0 that would be simultaneously obtained from the operation as well. The relative efficiency score would take a value between 1 and 0 as dictated by the first constraint.

5.6.2: A Graphic Illustration of DEA

Figure 5.8 showcases a production possibility frontier in producing two outputs y1 and y2 by employing input x in the most efficient manner possible. The convex combination of A and C will create the most combination of outputs for a given set of input and thus is defined as the efficiency frontier. Since B lies below the efficiency frontier, the DMU is inefficient relative to A and C. However, it would be erroneous to derive B's efficiency score relative to A and C because B is somehow different and unique to A and C. Instead, A and C are the peers of B because both A and C define the relevant portion of the frontier (AC) to produce efficient production for B.

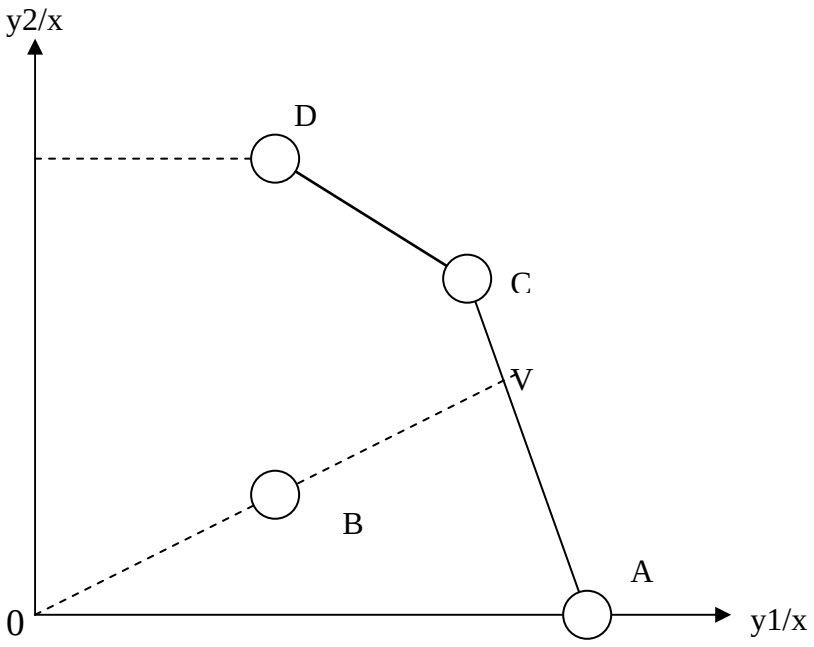


Figure 5.8: A Two-Output, One-Input Output Orientated DEA Model.

B's efficiency would be determined by comparing it to a virtual DMU V or its target that is made up by different proportions of A and C. The percentage of C in V is AV/AC. Similarly, the proportion of A is CV/AC. The efficiency of B would then be calculated as OB/OV, which is the amount by which the output V has to contract but with the amount of inputs utilized still unchanged for both B and V. Another way of interpreting this is DMU V only needs OB/OV fraction of its input to produce as much as B. The figure also highlights that if the relative efficiency scores of A and C are to be calculated, the virtual DMUs for A and C would be A and C themselves. The ratios OA/OV and OC/OV will be equal to 1. Thus inefficient units like B would have efficiency scores of less than 1 but more than 0 while fully efficient units would score the value of 1.

5.6.3: DEA as a Non-Parametric Linear Programming Methodology

Because Equation I is on the fractional linear form, it is converted into more a familiar form of linear programming problem in Equation II to facilitate its computation. Equation 2 seeks to maximize the ratio in Equation I by setting the denominator v'xj to a constant, thus allowing the numerator u'yj to be maximized in relation to the denominator (Avkiran, 1999).

Max H0 u, v (u'yj)

s.t. $v'x_i = 1$

$u'y_j - v'x_j \leq 0 \quad j = 1, 2 \ldots N$

$u, v \geq 0$…….Equation II

The original linear program in Equation II is in the primal or multiplier form. As with any linear program, it is possible to formulate a partner program or the dual that has less constraints involved as in Equation III. Generally in linear programming, the more constraints a model has, the more difficult it is to solve (Coelli et al. 1998). Furthermore, as the number of inputs and outputs increase, more DMUs tend to get an efficiency rating of 1 as they become too specialized to be evaluated with respect to other DMUs.

Max $\theta,\lambda\ \theta$

s.t. $-y0 + Y\lambda j \geq 0$,

$\theta x0 - X\lambda j \geq 0$,

$\lambda \geq 0$…….Equation III

5.6.4: Input and Output Orientated DEA Models

Note that the case illustrated in Figure I is an example of an output-orientated efficiency measure. Efficiency itself is capable of being defined by both output-orientated and input orientated models. Output orientation addresses the question how much output can be feasibly expanded by holding the level of input constant. On the contrary, the input orientation looks at how much input can be feasibly reduced to produce the same level of output. The two DEA orientations would yield the same efficiency measures under CRS specification but unequal under VRS (Coelli et al, 1998). In many DEA studies, analysts have tended to select input orientated models because in most DMUs, input quantities seem to be the primary variables (Coelli, 1996). This argument however, is less applicable in the banking industry since banks have limited control over their inputs. In Avkiran (1999), it is mentioned that when inputs may well be outside the control of managers, the output orientated model needs to be applied. Although Avkiran (1999) applied the input-orientated model, it is the author's opinion in this study that the relatively regulated Malaysian and Singaporean banking industries (where bank managers have little control over input variables such as deposit rates) warrant the use of the output-orientated DEA model.

5.6.5: Computing MPI Output Distance Functions

Also notice that the output distance function as in Equation 7 is the reciprocal to the output-based Farrell measure of technical efficiency where:

$[DCt\ (xt, yt)]^{-1} = \max \theta$…….Equation 14

According to equation 14 the inverse of an output distance function is equivalent to the DEA technical efficiency score. Notice that the production function in Equation 7 is the reciprocal of the maximum proportional expansion of the output vector y, given the input vector x that has been discussed in Chapter 4. Therefore, one can make use of this inverse relationship to compute the necessary output distance functions to derive the MPI index and its decomposition via a DEA means. There are two DEA models to choose from input orientated DEA and output orientated DEA. Since this study seeks to derive and decompose the output based MPI index, this analysis will follow the output orientated DEA.

DEA calculations can be conducted using a number of computer programs that allow linear programming procedures. Apart from simple spreadsheets and statistical packages such as Excel, SAS and SHAZAM, there are a few DEA specialist software packages available including IDEAS, Frontier Analyst, WDEA and DEAP. This study uses DEAP version 2.1 developed by Coelli to construct the piece-wise production frontier and derive the technical efficiency scores. The output oriented model to be specified into DEAP would resemble the following:

$\text{Max}\ \theta,\lambda\ \theta$

$\text{s.t.}\ -y0 + Y\lambda j \geq 0,$

$\theta x0 - X\lambda j \geq 0,$

$NI'\lambda = 1$

$\lambda \geq 0$…….Equation 15

Note that DEAP is instructed to calculate an output-orientated VRS model by adding the constraint $NI'\lambda=1$ to the output orientated linear programming LP. Coelli et al (1998) stated that where there are reasons to believe that the DMUs may not be operating at optimal scale due to imperfect market competition, the specification of VRS is warranted. In the DEAP model,

efficiency θ can assume any positive value but 1-θ would indicate the proportional expansion of output that can be feasibly attained by DMU j with input quantities held constant (Coelli, 1996). DEAP would report TE scores as 1/θ, which is bounded by zero and 1 (Coelli, 1996).

The operations of DEAP can be graphically represented in Figure 5.9 that shows a hypothetical DEA production possibility frontier. DMU L, M and N form a solid line that represents the efficient frontier. Therefore L, M and N are technically efficient. All other DMUs beneath the efficient frontier are classified as inefficient. K for example, needs to travel to K' or its target before being deemed as efficient because it can still expand its output with the given level of input. Because M and N forms the relevant portion of the frontier to produce efficient production for K. Therefore, M and N are the peers of K. Here DMU M would make a greater contribution to DMU K's TE score. Meanwhile P would be projected on the frontier (the dotted line), not the efficient frontier (the solid line) as P' because production of y1 can be increased by P'L without using any more inputs. This is an example of an output slack.

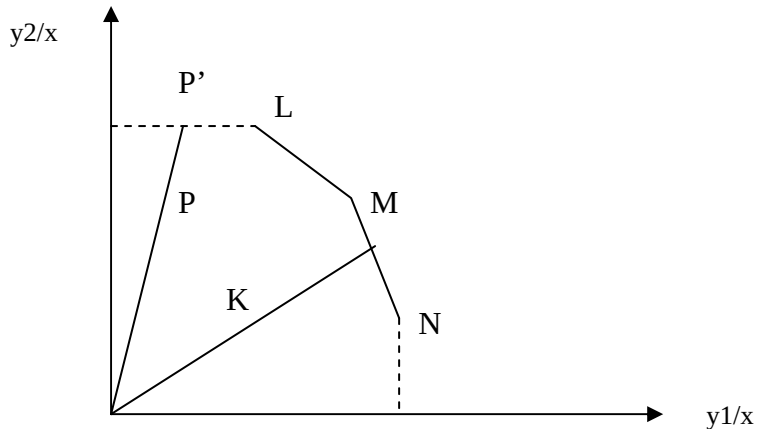


Figure 5.9: DEAP Output Oriented Model.

5.6.6: Solving DEA Linear Programming

Based on the algebraic expressions for the fully decomposed MPI, it is necessary to calculate four distance functions to measure TFP change between period 0 and 1 for the jth DMU. Therefore, this requires the solving of four linear programming problems as also outlined in LP1 to LP4 below (Avkiran, 2000).

Both Equations 1 and 2 represent the case where a datum point observed in a period is compared to the production technology or frontier of that period. In Equations 3 and 4, the datum points are compared to the technology of the previous period. These four LP equations have to be solved for each bank in each pair of adjacent periods. To construct a chained index, it is necessary to solve N x (3T-2) linear programs, where N is the number of banks while T is the number of time periods (Avkiran, 2000).

Note that in linear programs 3 and 4, where the data points are compared to the technologies from different time periods, the θ parameter may not be greater than or equal to 1 as it must be when calculating standard output-oriented technical efficiencies (Coelli and Prasada Roa, 2003). The datum point could lie above the production frontier. This will most likely to happen in LP4 where the production point from period t+1 is compared to the technology from the earlier period t. If technical progress has indeed occurred, then θ being less than 1 is possible (Coelli and Prasada Roa, 2003). Note that this could also happen in LP 3 if technical regress has occurred although such an event is less likely.

$[D1\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_1\lambda \geq 0,$

$x_1 - X_1\lambda \geq 0,$

$\lambda \geq 0$……LP (1)

$[D0\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_0\lambda \geq 0,$

$x_0 - X_0\lambda \geq 0,$

$\lambda \geq 0$……LP (2)

$[D1\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_1\lambda \geq 0,$

$x_0 - X_1\lambda \geq 0,$

$\lambda \geq 0$……LP (3)

$[D0\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_0\lambda \geq 0,$

$x_1 - X_0\lambda \geq 0,$

$\lambda \geq 0$……LP (4)

The LPs above are run with CRS specification. To extend the decomposition of technical efficiency into pure technical efficiency PTE and scale efficiency SE components requires the solution of two additional LPs that imposes a convexity restriction when comparing two production points.

This is done by adding the constraint NI'λ=1 to LP 1 and LP 2 as shown below where scale efficiency in each period can be constructed as the ratio of CRS distance functions to VRS distance functions (Coelli et al, 1998). To obtain the nature of returns to scale, NIRS can be specified by substituting NI'λ=1 with NI'$\lambda \leq 1$ (Coelli et al 1998).

$[D1\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_1\lambda \geq 0,$

$x_1 - X_1\lambda \geq 0,$

$\lambda \geq 0$……LP (1)

$[D0\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_0\lambda \geq 0,$

$x_0 - X_0\lambda \geq 0,$

$\lambda \geq 0$……LP (2)

$[D1 (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_1\lambda \geq 0,$

$x_1 - X_1\lambda \geq 0,$

$NI'\lambda=1$

$\lambda \geq 0$……LP (3)

$[D0 (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_0\lambda \geq 0,$

$x_0 - X_0\lambda \geq 0,$

$NI'\lambda=1$

$\lambda \geq 0$……LP (4)

$[D1 (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_1\lambda \geq 0,$

$x_0 - X_1\lambda \geq 0,$

$\lambda \geq 0$……LP (5)

$[D0 (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_0\lambda \geq 0,$

$x_1 - X_0\lambda \geq 0,$

$\lambda \geq 0$……LP (6)

In terms of Figure 5.10, $NI'\lambda \leq 1$ would map out the convex technology bounded by 0AB while $NI'\lambda=1$ would impose the convex X1AB technology. Without both constraints, $NI'\lambda$ can take any non-negative values, the technology becomes the 0AY1 cone.

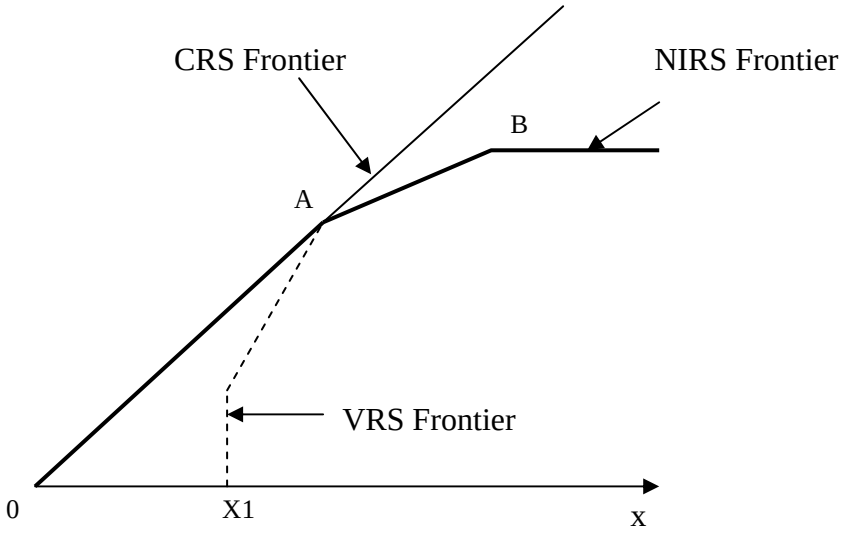


Figure 5.10: Returns to Scale Frontiers (CRS VRS NIRS)
Source: Fare et al 1994

5.7: Summary of Methodology

In summary, this study uses the MPI index as proposed by Caves et al (1982) as a measure of TFP index change to compute productivity changes of the banks in the sample. To fully account for the effects of technical efficiency change, scale efficiency change and technical change, this study follows the MPI decomposition suggested by Fare et al (1994). Despite the possibility of using an enhanced decomposition methodology to derive the fourth component of productivity change, the change in technical scale, this study has opted not to implement it in this study due to the general disagreement among researchers on both the interpretation of the fourth component and the formula expression. Between output and input orientated MPI measures, this study uses the former to maintain consistency with the majority of previous banking studies that employ MPI measures of productivity change.

The output orientated MPI is the ratio of two output distance functions, each with reference to a benchmark technology using different time periods. The non-parametric linear programming Data Envelopment Analysis DEA technique is adopted here to compute the output distance functions. Specifically, the output-orientated DEA model is employed because it is the author's opinion that banks within the study sample do not have full control

over their inputs. Subsequently, the DEA model is run with CRS, VRS and NIRS production technology specifications. This approach allows one to examine not only pure technical efficiency and scale efficiency changes that comprise technical efficiency change, but also to determine the nature of returns to scale of a particular bank. Thus, this study enables one to determine what improvements would need to be made by an inefficient bank to become efficient.

CHAPTER 5:
RESEARCH METHOD AND DESIGN

PART I
METHODOLOGY

This study has established the methodological usage of MPI as the comparable bank productivity measure of the Malaysian dual banking system in the era of bank mergers. In order to comprehend MPI within the DEA, it is significant to understand the related variables. This chapter explains the derivation of the various variables and components of productivity changes under the MPI.

5.1: Productivity in terms of Total Factor Productivity (TFP)

Productivity changes are often defined in terms of Total Factor Productivity (TFP) changes. Coelli et al (1998) termed TFP as an overall productivity measure that encompasses the productivity of all production factors or outputs. When the overall productivity of a Decision Making Unit (DMU) or a whole industry is considered, distinction must be made between TFP and other commonly used partial productivity measures such as labor and capital productivity. This is because a DMU usually transforms multiple inputs into multiple outputs. The evaluation of partial productivity measures alone can be misleading and could result in inconsistent and inaccurate conclusions. As with other studies that utilize index number approaches, this paper considers TFP changes as indicators of overall productivity changes. Both terms will be used interchangeably henceforth.

In a one-input, one-output case, the simplest yet general measure of productivity is the ratio of outputs over inputs. This ratio generates a value indicating how many output units that can be produced by employing a single input unit. A rising ratio generally indicates rising productivity. This view is

essentially an output orientated one. An input orientated productivity ratio looks at how many input units can be reduced to or required by a single output unit.

5.2: The Components of Total Factor Productivity (TFP)

The same output over input ratio is often used in non-technical media as an indicator of the overall efficiency of a DMU. This is a flawed statement. Both productivity and efficiency are two distinct, although closely related terms. This subtle yet important distinction can be illustrated by Figure 5.1. A production frontier f is drawn that transforms a single input into a single output. This relationship also represents the maximum y output units that can be feasibly attained from a single x input unit and hence, it is also called the production frontier. It also reflects the current production technology. Note that the slope of the frontier is the ratio of y/x, which is also the average product AP of all the points that lie along the frontier. Because it rises upward to A before tapering off, the technology is said to exhibit non-constant returns to scale. Specifically it is Increasing Returns to Scale (IRS) up to A before experiencing declining returns to scale DRS after that.

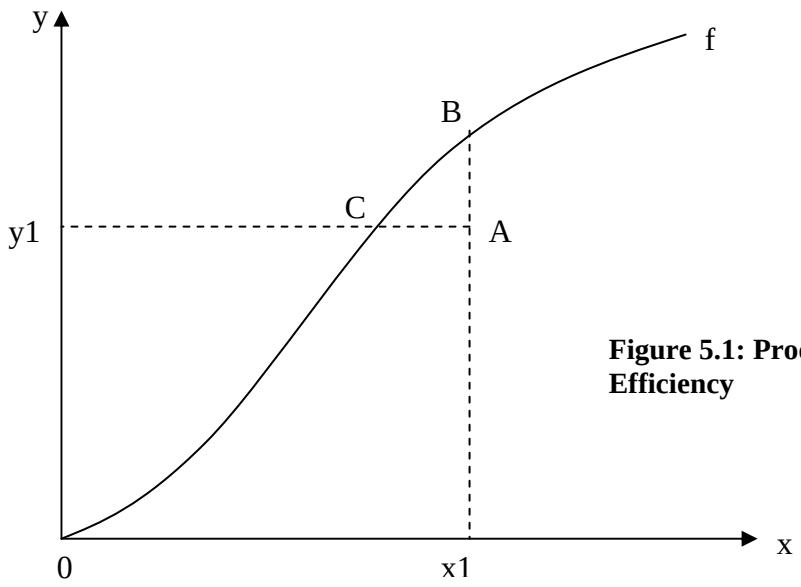


Figure 5.1: Production Frontier and Technical Efficiency

5.2.1: Technical efficiency

A and B are technically efficient producers because both lie on the frontier. This means A and B are already producing the maximum possible output using inputs via technology f. C is technically inefficient because it could still increase its output level by employing the same input level at x1 by moving upwards to B. Because the production frontier also defines the feasible production set, D is regarded as infeasible to attain by technology f.

5.2.2: Scale Efficiency

The same diagram is replicated in Figure 5.2 but with rays drawn extending from the origin . Notice the slopes of the rays are also of the values x/y and AP. Because AP is identical along the rays, these can be viewed as technologies with constant returns to scale, CRS specification. **As C moves to B**, the slope of the ray becomes steeper, indicating greater input-output transformation and thus, productivity. However, if C moves to A, the steepest ray is tangent to production frontier f. Point A thus represents the optimal scale and has the maximum possible productivity. Production on any other point along the frontier although technically efficient, results in lower productivity. C essentially moves to A by exploiting scale economies. Therefore a scale-inefficient DMU may be efficient but it can still exploit scale economies to improve its productivity (Coelli et al, 1998).

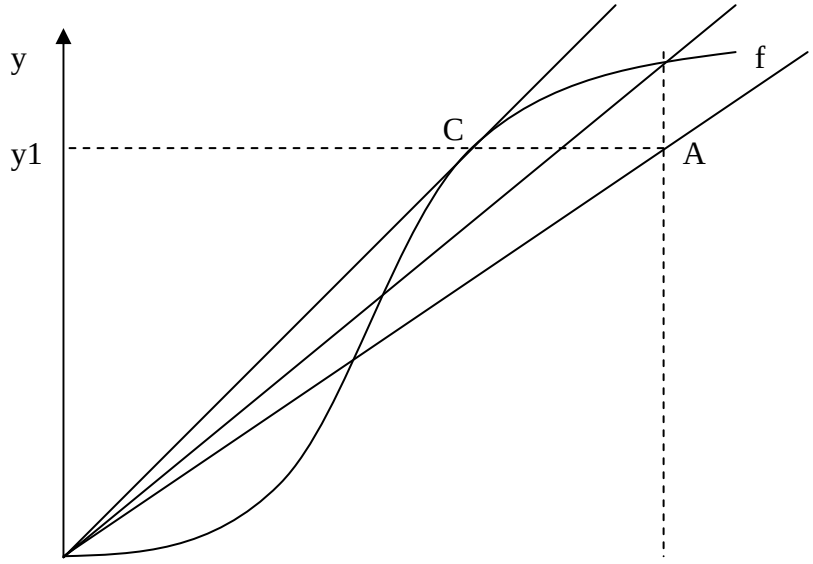


Figure 5.2: Technical Efficiency and Scale Efficiency

5.2.3: Technical Change

Figure 5.3 brings the discussion one step further by introducing technical change. Technical change is an additional source of productivity change but takes place over time. Technological advancement is represented by an upward shift of production frontier f1 to f2, where at B, the same input level x1 is associated with a higher output level y2.

It is apparent then, that from the examples shown, a DMU can alter its productivity by altering its technical efficiency, scale efficiency and by virtue of technical change. Productivity therefore, is composed of technical efficiency, scale efficiency and technical change.

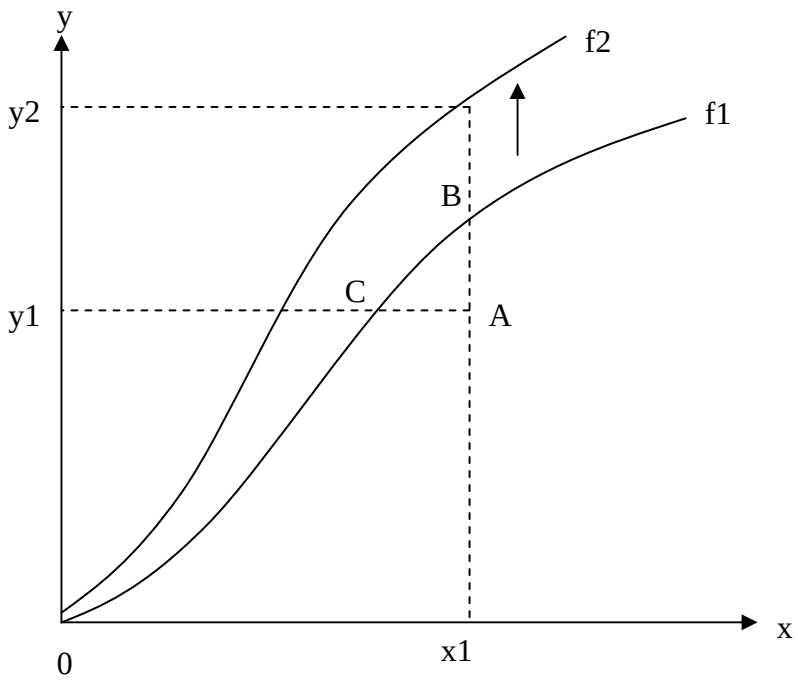


Figure 5.3: Technical Change

5.3: Economic Efficiency Measures and Their Relationships with Productivity

5.3.1: Technical Efficiency and Allocative Efficiency

In the economic literature, overall economic efficiency EE is made up of technical efficiency TE and allocative efficiency AE. AE is defined as the effective selection of inputs vis a vis their prices to produce a given quantity of output at the minimum production costs (Avkiran (1999)). TE on the other hand, investigates how well a DMU implements an effective production plan to convert its inputs to outputs (Avkiran, 2000).

These efficiency concepts can be illustrated by Figure 5.3, which illustrate a production process that involves 2 outputs (y1 and y2) being produced by a single input x. The II concave curve represents the production possibility frontier of fully efficient firms while AA represents the slope of the isorevenue line or the output price ratio. Note that this is the output-orientated approach to explain economic efficiencies where the objective is to expand output production (y1 and y2 at A) as much as feasibly possible from a given level of input. The input orientated model meanwhile incorporates a unit isoquant between two inputs (x1 and x2) and an isocost line. It attempts to contract the inputs as much as permissible by the production isoquant to produce a given level of output. Refer to Coelli et al (1998) for a comprehensive coverage of the topic.

In terms of Figure 5.4, TE is represented by the distance AB and is expressed as a ratio of AB/OB or according to the equivalent specifications of Farrell (1957) in the input orientation model as OA/OB which is 1-AB/OB or the reciprocal of AB/OB. AE meanwhile is indicated by BC, that is, the reduction of production costs that would occur at allocatively efficient point B'. AE is expressed as the ratio of OB/OC. Thus;

EE= (OA/OB) x (OB/OC)= OA/OC

= TE x AE

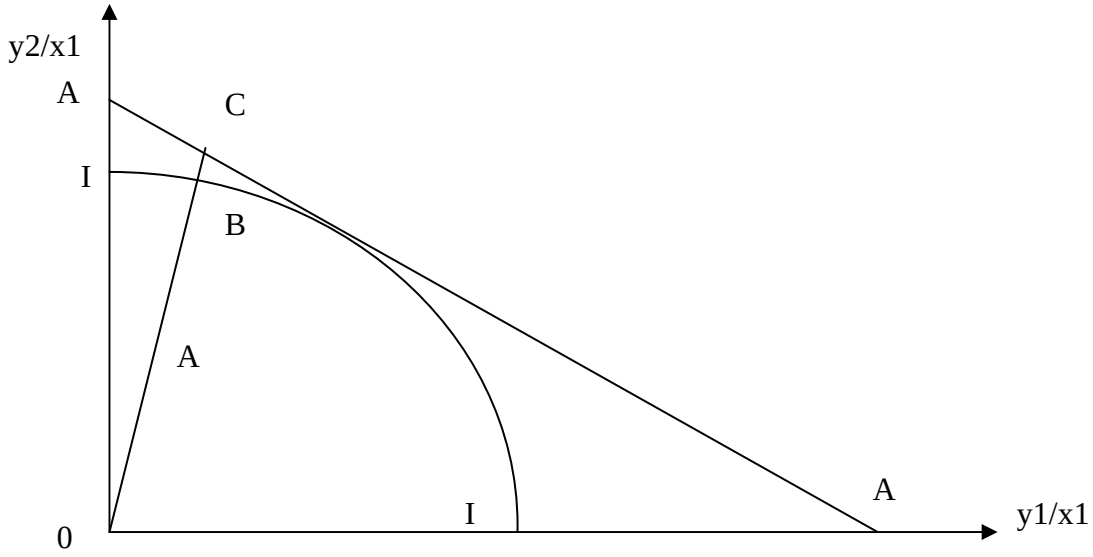


Figure 5.4: Technical Efficiency and Allocative Efficiency
Source: Coelli et al (1998)

5.3.2: Pure Technical Efficiency, Scale Efficiency

The economic measures outlined so far are defined under a CRS technology. However, if VRS specification is allowed, scale efficiency SE can be derived. To simplify the discussion, the production frontier seen in Figure 5.1 is summarised in Figure 5.5. In Figure 5.5, both CRS and VRS frontiers for a one-input, one-output scenario are indicated. Under CRS specification, the TE of point A is the distance PPC. Under VRS assumption however, TE is only PPV. The difference between the CRS and VRS TE scores is due to scale inefficiency that can be expressed as APC/APV. The CRS TE therefore, can be decomposed into pure technical efficiency PTE (APC/AP) and scale efficiency SE (APC/APV). The SE measure can be roughly translated as the ratio of average product AP of a DMU operating at point PV to the average product of a DMU operating at point R, the point of optimal scale. Any divergence of the DMU from the most productive scale size MPSS point (point R) represents some degrees of scale inefficiency (Avkiran, 1999).

However if a non-increasing returns to scale (NIRS) production technology is specified, one is able to determine whether a DMU is experiencing increasing returns to scale IRS or decreasing returns to scale DRS. If a particular VRS score equals the NIRS score, the DMU is operating under DRS. On the other hand, if VRS is not equal to NIRS, the DMU is operating under IRS. If VRS equals the CRS score, then the DMU is operating at the MPSS.

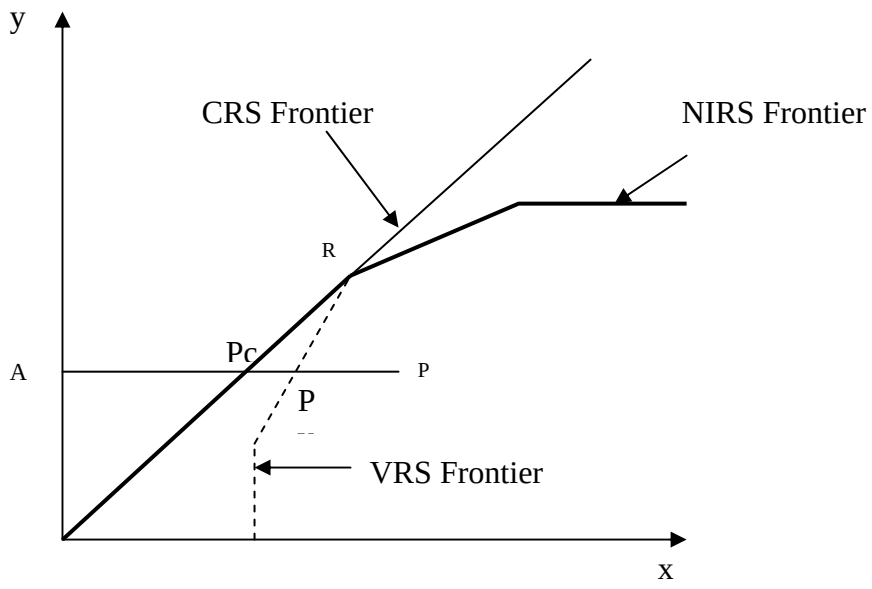


Figure 5.5: Scale Efficiency, Scale Economies and Most Productive Scale Size (MPSS)
Source: Coelli et al, 1998

Recalling that it has been established above that an overall productivity measure is the sum of technical efficiency, scale efficiency and technical change, the PTE definition of Figure 5.5 corresponds to the technical efficiency mentioned earlier. For the rest of the study, it is referred to as PTE. Thus:
TE= PTE x SE

From the examples given, it is apparent that while EE accounts for AE and TE, it leaves out the technical change component. This is yet another proof that productivity and efficiency are both the same terms and that y/x does not equal efficiency.

5.4: Derivation and Decomposition of the TFP Index

Coelli et al (1998) demonstrated that a TFP index can be constructed and subsequently decomposed into PTE, SE and technical change components. It has been shown that average product AP serves as a proxy for productivity. Consider a simple one-input, one-output case, and letting (x0, y0) and (x1, y1) denote the observed input-output combinations for period 0 and period 1. Then, the productivity of a particular DMU in periods 0 and 1 are given by:

AP0= y0/ x0
AP1= y1/ x1

Any changes in overall productivity (π) for the same DMU over periods 0 and 1 can be captured by the ratio of AP of period 1 over the AP of period 0 as shown by:

$$\pi = AP1 = \frac{y1/\ x1}{AP0 \quad y0/\ x0} \quad \text{…… Equation 1}$$

The same expression can be re-arranged as:

$$\pi = AP1 = \frac{y1/\ y0}{AP2 \quad x1/\ x0} \quad \text{……..Equation 2}$$

Coelli et al (1998) showed that the same ratio is also the TFP index that measures productivity changes for periods 0 and 1.

$$\pi = AP1 = \frac{y1/\ y0}{AP2 \quad x1/\ x0} = TFP0,\ 1 \quad \text{……..Equation 3}$$

If the condition of technical inefficiency and differing input levels utilization between the two periods are to be factored in (which is usually the case), then Coelli et al (1998) demonstrated that the ratio in Equation 3 can be expanded into:

$$TFP_{0,1} = \frac{\lambda 1}{\lambda 0} \times \frac{f1(\kappa x0)/\kappa x0}{f0(x0)/x0} \quad \text{Equation 4}$$

where λt: inefficiency coefficient of period t

κ: x1 input usage coefficient of period 1 as a proportion of x0

ft (x): observed output levels at period t, as implied by the production function of period t.

By rearranging the expression, the arrangement becomes:

$$TFP_{0,1} = \frac{\lambda 1}{\lambda 0} \times \kappa^{\varepsilon(t)-1} \times \frac{f1(x0)}{f0(x0)} \quad \text{Equation 5}$$

where κ: the scale of operations

ε: returns to scale parameter

Equation 5 gives the complete decomposition of the overall productivity index, where the first term represents technical efficiency change, the second term indicates the effects of change in scale of operations and the third term computes the technical change. Note that the third term is also controlled by the scale of operations κ and the returns to scale parameters ε. If the technology is specified as a CRS benchmark, then $\varepsilon(t)= 1$, $\varepsilon(t) -1=0$ and thus $\kappa^{\varepsilon(t)-1}= 1$. Therefore, the third term becomes irrelevant when CRS is assumed. However, if VRS prevails, then the second term will assume some other positive value and will become relevant.

From this example, it can be summarized that an index number approach is able to compute overall productivity change as well as decompose overall productivity change into pure technical efficiency change (PEFCH), scale efficiency change (SECH), scale change of technology (SCHTCH) and technical change (TECHCH). There are also a number of important conclusions that can be drawn from Coelli et al (1998):

- It is vital to have some knowledge of the production technology to derive the TFP index
- Without extraneous information, it is impossible to break the TFP down into the different sources of productivity change
- The DMU is assumed to be allocative efficient. Otherwise, the TFP index may harbor some effects of allocative inefficiency.

Coelli et al (1998) have shown that with these conditions in place, an index number approach is able to capture the different sources of TFP changes. The question now turns to which index number methodology to adopt. In general, there are 4 index number approaches to measure and decompose TFP change: output price, input price, output quantity and input quantity indices.

5.5: The Malmquist Productivity Index (MPI)

In this study, productivity or TFP changes are calculated using the Malmquist Productivity Index MPI as introduced by Caves et al. (1982) and developed by Fare et al. (1994). The MPI is capable of being defined as either an output quantity index or as an input quantity index. Most of the literature on banking productivity assessment that harnesses the MPI uses the output quantity index. To maintain consistency with the majority of related studies, this paper follows an input quantity index approach.

5.5.1: MPI in terms of Distance Functions

The MPI can be computed by using only quantity data for both inputs and outputs alone and is expressed as the ratio of distance functions. Distance

functions are function representations of multiple-output and multiple input technology that require only data on quantities without the need to specify behavioral objectives such as cost minimization or profit maximization (Avkiran, 2000). Distance functions alone can either be input or output functions. An input distance function defines the production technology by referring to the maximal contraction of the input vector given an output vector. By contrast, the output distance function seeks maximal expansion of the output vector given the input vector. Because the approach adopted in this study is essentially an output orientated one, output distance functions are used to derive the MPI.

5.5.2: Output Distance Functions

To define the output based MPI, a general production technology must be first defined and understood as the output set P(x) that represents all output vectors y that can be produced by employing an input vector x. The technology or P(x) is denoted as:

$P(x) = \{y: x \text{ can produce } y\}$

$= \{y: (x, y) \in S^t\}$ for all x……Equation 6

In equation 6, P(x) models the transformation of inputs x into outputs y for each period t= 0, 1…T. S^t meanwhile represents the feasible output set for technology P(x).

In terms of the output index number model, Equation 6 is slightly modified as below. Following Shephard (1970), the output distance function for period t is expressed as:

$D_t (x, y) = \min \{ \delta: (y/\delta, x) \in S^t\}$……Equation 7

δ represents the smallest distance by which the output needs to be deflated so as to become feasible to be produced by period t technology (Coelli et al, 1998). This applies to an output vector that lies above the technology or production frontier like y1 in Figure 5.6. In this instance, $\delta > 1$. On the other hand, if the observed output vector is below the production frontier, then $\delta < 1$ to inflate the output vector thus bringing it onto the surface of the production frontier or

production possibility set S^t . In particular, Dt (x, y) $\leq$ 1 if and only if (x, y) $\in$ S^t and Dt (x, y)= 1 if and only if (x, y) is on the frontier, that is, technically efficient.

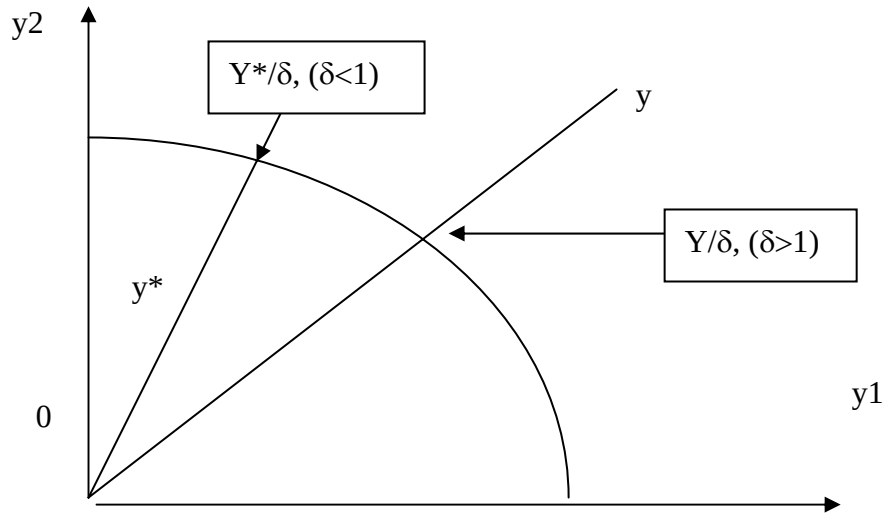


Figure 5.6 Output Distance Function: Output Vector Contraction and Expansion
Source: Coelli et al 1998

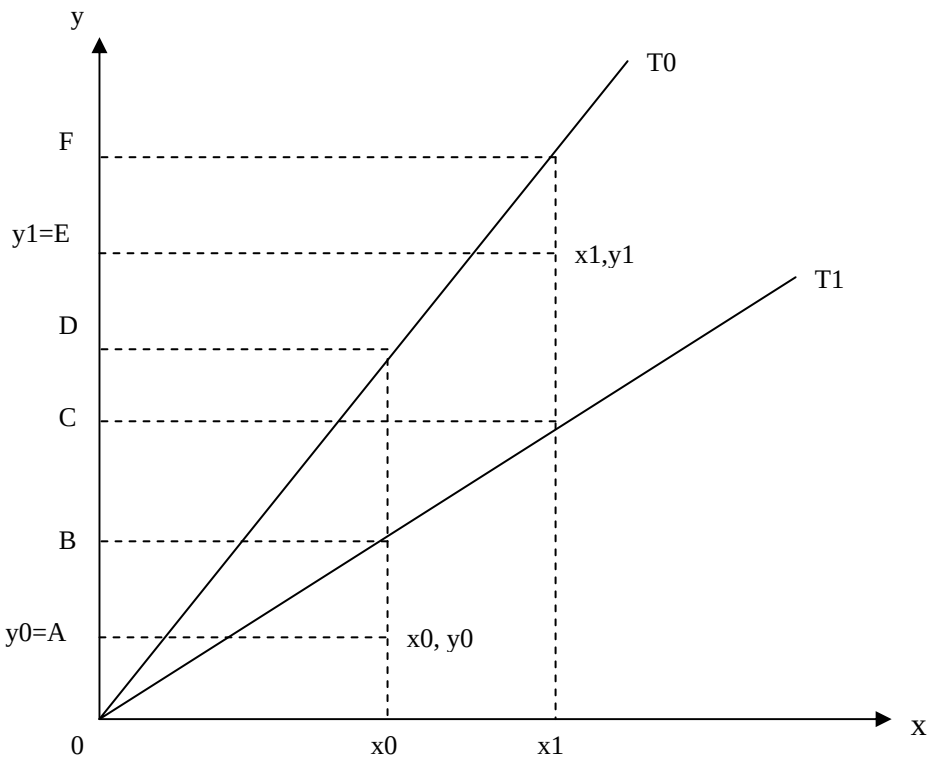


Figure 5.7 Derivation of MPI: One-Input, One-Output Case with Constant Returns to Scale CRS Technology.
Source: Alam (2001)

This can be illustrated by Figure 5.7 where scalar input is used to produce scalar output. Because (xt, yt) is interior in relation to t technology, it is not technically efficient. The distance function would then seek the greatest proportional increase in the output such that the output remains feasible. Maximum feasible production is yt/θ . Thus, the value of the distance function would be Oa/Ob ≤ 1, which is the value of δ through which (xt, yt) needs to be inflated through y/δ. Also recall from Equation 7 that if $\delta > 1$, y would be deflated via y/δ to bring it back to the surface of the production set p(x) associated with x. All output distance functions henceforth, would be evaluated in a similar manner.

Note that the production frontiers P(xo) and P(x1) are drawn under CRS specification. P(xt) adopts the CCR technology that satisfies the assumptions laid in Charnes et al. (1978) where CRS and free disposability of inputs and outputs are specified.

5.5.3: The General Overall MPI Index

What follows is the derivation of the MPI index as pioneered by Caves et al. (1982). In the spirit of the study, CCD computed TFP changes between 2 data points as the ratio of distance functions for each (x, y) relative to a common technology. In particular, Caves et al. (1982) defined the MPI with period 0 technology as the benchmark as:

$$MCCD0 = \frac{DC0\ (x1, y1)}{DC0\ (x0, y0)} \quad \text{.....Equation 8}$$

Where DC0 means the input distance function with CRS technology of period 0 as the benchmark. A value of more than 1 indicates productivity increase while a value of less than 1 indicates productivity regress. A unity value means no productivity change. In terms of the output distance function,

$$DC0\ (x1, y1) = \min \{ \delta : (y1/\delta, x1) \in P(x)0 \}$$

Where the distance function measures the maximum proportional change in outputs required to make (x1, y1) feasible in relation to period 0 technology. In terms of Figure 5, δ = Od/Oe which is $>$ 1. Therefore, (x1, y1) would be deflated back to the surface of P(x)0 by δ.

Alternatively, one could define a period 1 technology-based MPI as:

$$MCCD1 = \frac{DC1(x1, y1)}{DC1(x0, y0)} \quad \text{Equation 9}$$

In order to avoid choosing an arbitrary benchmark, a geometric mean of the two ratios is taken instead as the MPI index:

$$MCCD0,1 = \left[\frac{DC0(x1, y1)}{DC0(x0, y0)} \cdot \frac{DC1(x1, y1)}{DC1(x0, y0)} \right]^{1/2} \quad \text{Equation 10}$$

5.5.4: The Decomposition of the General MPI

Apart from the specification of CRS and weak disposability of inputs and outputs, CCD also assumed that each DMU both be technically and allocatively efficient so that MCCD=TECHCH. However Fare et al (1989, 1992) and Coelli et al (1998) showed that if sufficient observations in each period are available to estimate the technology in each period, then the assumption can be dropped. Moreover, it is more common to observe some degrees of technical inefficiency in the operations of most banks. Note that all DMUs are still being assumed to be allocatively efficient. Following Fare et al (1994) where technical inefficiency is present, Equation 10 can be rewritten as:

$$M(x1, y1, x0, y0) = \frac{DC1(x1, y1)}{DC0(x0,y0)} \times \left[\frac{DC0(x1, y1)}{DC0(x0, y0)} \cdot \frac{DC1(x1, y1)}{DC1(x0, y0)} \right]^{1/2} \quad \text{Equation 11}$$

An index greater than 1 indicates improvement while a value less than 1 reflects regress. Both components may move in different directions. Note that if x0=x1 and y0=y1, M=1, signalling that there has been no change in productivity. The two components are reciprocals but not necessarily equal to 1. In terms of Figure 5 and following Fare et al (1994) and Alam (2001), the MPI index is expressed as:

$$M(x1, y1, x0, y0) = \frac{0E}{0F} \times \frac{0B}{0A} \left[\frac{0F}{0C} \times \frac{0D}{0B} \right]^{1/2}$$

The ratios within the brackets measure shifts in the technology or production frontier at input levels x0 and x1. Technical change or TECHCH is thus, the geometric mean of the 2 shifts. The term outside the bracket computes technical efficiency change at period 1 and 0 determines whether production in catching up or deviating away from their contemporaneous frontier. In this study's application, this component would capture the degree of technology diffusion among banks.

Even with the MPI now being decomposed into TECHCH and technical efficiency change, the expression still falls short of the complete decomposition of the TFP index as discussed in Section 3. It has been highlighted in Section 2 that the difference between CRS and VRS efficiency scores is due to scale inefficiencies. Therefore, in order to calculate changes in scale efficiencies SECH, this study follows the FGNZ approach where the output distance functions are also computed under VRS. FGNZ outlined this enhanced decomposition as:

$$M(x1, y1, x0, y0) = \frac{DC1\ (x1, y1)}{DC0\ (x0, y0)} \left[\frac{DC1\ (x1,y1)/\ DV1\ (x1, y1)}{DC0\ (x0, y0)/\ DV0\ (x0, y0)} \right]^{1/2} \times \left[\frac{DC0\ (x1, y1)}{DC1\ (x1, y1)} \frac{DC0\ (x0, y0)}{DC1\ (x1, y1)} \right]^{1/2} \quad \text{……Equation 13}$$

M(x1, y1, x0, y0)= PEFCH x SECH x TECHCH

Where DV0 means the input distance function with VRS technology of period 0 as the benchmark. Thus, technical change TECHCH is calculated with reference to the CRS benchmark, the efficiency change component-now represented by pure efficiency change PEFCH is computed as the ratio of own period distance functions relative to VRS and the scale efficiency in each period is the ratio of distance function restricted by VRS. This leaves scale efficiency change SECH as ratio of scale efficiency from each period.

Further decomposition of this expression is possible in order to derive the residual scale change of technology (that is whether period 1 VRS is relatively closer or further from CRS than period 0 VRS) SCHTCH. This derivation can be found in Simar and Wilson (1998), Wheelock and Wilson (1999), Zofio and Lovell (1998) and more recently by Fernandez et al (2001). This paper will not pursue a further enhanced decomposition due to the already existing disagreements of researchers surrounding Equation 13. In particular, Ray and Desli (1997) disputed the simultaneous use of CRS and VRS, stating such procedures only generate internal inconsistencies within the model. However, this study chooses to apply Equation 13 due to a number of credible reasons, which were explained in the literature review.

5.6: Computing MPI within the Data Envelopment Analysis (DEA) Framework

There are several ways to compute the distance functions that make up the MPI. Here this study follows Fare et al (1994) and calculates the output distance functions by applying a linear programming approach called Data Envelopment Analysis. It was shown in Chapter 3 that it is impossible to decompose the TFP into its various subcomponents without some knowledge of the relevant technology. Because one can never know the exact technology, it needs to be estimated.

Studies of the non-parametric DEA linear programming approach of estimating technology following Farrell (1957) suggest the use of a non-parametric price-wise production possibility frontier as illustrated in Figure 5.6 that is constructed to fit into a multi-output, single input output orientated model so that no observed points lie to the right or above the frontier. Therefore, the constructed frontier envelopes all observation points, hence the name Data Envelopment Analysis.

5.6.1: The Data Envelopment Analysis DEA Methodology

Charnes et al. (1978) developed and extended Farrell's ideas into a non-parametric methodology known as Data Envelopment Analysis. This development addressed a critical shortcoming of the weighted relative efficiency ratio expressed below that was originally conceived by Farrell and Fieldhouse (1962) to construct an efficient hypothetical unit (on the frontier) against which all other inefficient units are compared. The problem associated with the ratio is determining a common set of weights to be applied to all DMUs since DMUs value inputs and outputs differently and therefore a common standardization may introduce bias into the results.

$$\text{Efficiency of DMUj} = \frac{u_1 y_{1j} + u_2 y_{2j} + \ldots}{v_1 x_{1j} + v_2 x_{2j} + \ldots}$$

where u_1 = the weight given to output 1

y1j = amount of output 1 from DMU j

v1 = weight given to input 1

x1j = weight of input 1 to DMU j

Charnes et al (1978) recognized the problem and proposed instead that each DMU be allowed to adopt a set of weights that will put the DMU in the best light possible relative to all other DMUs in the sample.

Mathematically, their model is expressed as:

Max H0 u, v (u'yj / v'xj)

s.t. (u'yj / v'xj) $\leq$ 0

u, v $\geq$ 0……..Equation I

where xj = input vector for DMU j

yj = output vector for DMU j

The efficiency of the jth DMU, H0, is thus maximized but subjected to two constraints. The first ensures that the relative efficiency score is bounded by zero and 1 with value 1 indicating a fully efficient DMU. The second makes certain that variables u and v that represent the weights to be uniquely applied to each DMU have values more than unity. The solution to the model would yield the most favorable weights u and v, to be applied to DMUj that would maximize its efficiency H0 that would be simultaneously obtained from the operation as well. The relative efficiency score would take a value between 1 and 0 as dictated by the first constraint.

5.6.2: A Graphic Illustration of DEA

Figure 5.8 showcases a production possibility frontier in producing two outputs y1 and y2 by employing input x in the most efficient manner possible. The convex combination of A and C will create the most combination of outputs for a given set of input and thus is defined as the efficiency frontier. Since B lies below the efficiency frontier, the DMU is inefficient relative to A and C. However, it would be erroneous to derive B's efficiency score relative to A and C because B is somehow different and unique to A and C. Instead, A and C are the peers of B because both A and C define the relevant portion of the frontier (AC) to produce efficient production for B.

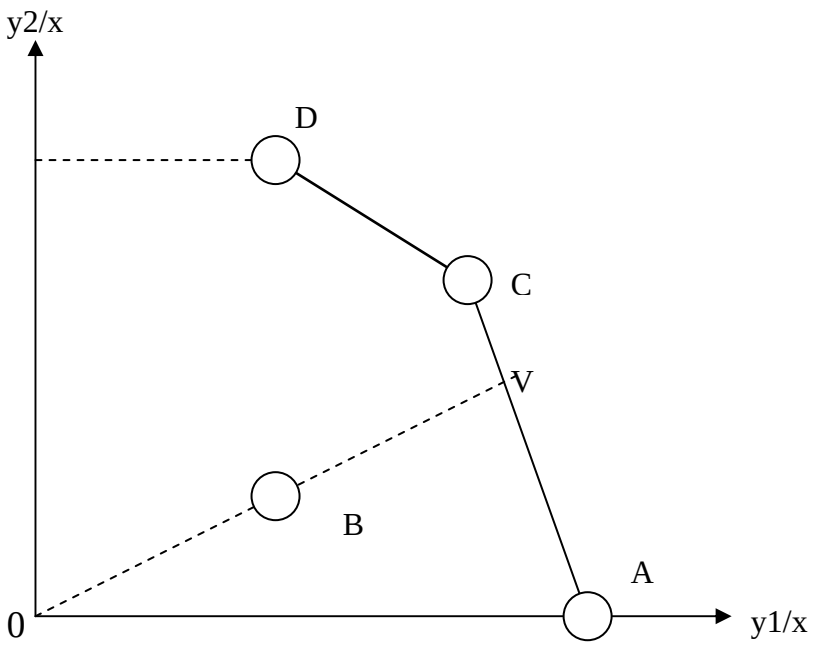


Figure 5.8: A Two-Output, One-Input Output Orientated DEA Model.

B's efficiency would be determined by comparing it to a virtual DMU V or its target that is made up by different proportions of A and C. The percentage of C in V is AV/AC. Similarly, the proportion of A is CV/AC. The efficiency of B would then be calculated as OB/OV, which is the amount by which the output V has to contract but with the amount of inputs utilized still unchanged for both B and V. Another way of interpreting this is DMU V only needs OB/OV fraction of its input to produce as much as B. The figure also highlights that if the relative efficiency scores of A and C are to be calculated, the virtual DMUs for A and C would be A and C themselves. The ratios OA/OV and OC/OV will be equal to 1. Thus inefficient units like B would have efficiency scores of less than 1 but more than 0 while fully efficient units would score the value of 1.

5.6.3: DEA as a Non-Parametric Linear Programming Methodology

Because Equation I is on the fractional linear form, it is converted into more a familiar form of linear programming problem in Equation II to facilitate its computation. Equation 2 seeks to maximize the ratio in Equation I by setting the denominator v'xj to a constant, thus allowing the numerator u'yj to be maximized in relation to the denominator (Avkiran, 1999).

Max H0 u, v (u'yj)

s.t. $v'xi = 1$

$u'yj - v'xj \leq 0 \quad j= 1, 2…N$

$u,v \geq 0$…….Equation II

The original linear program in Equation II is in the primal or multiplier form. As with any linear program, it is possible to formulate a partner program or the dual that has less constraints involved as in Equation III. Generally in linear programming, the more constraints a model has, the more difficult it is to solve (Coelli et al. 1998). Furthermore, as the number of inputs and outputs increase, more DMUs tend to get an efficiency rating of 1 as they become too specialized to be evaluated with respect to other DMUs.

Max $\theta,\lambda\ \theta$

s.t. $-y0 + Y\lambda j \geq 0,$

$\theta x0 - X\lambda j \geq 0,$

$\lambda \geq 0$…….Equation III

5.6.4: Input and Output Orientated DEA Models

Note that the case illustrated in Figure I is an example of an output-orientated efficiency measure. Efficiency itself is capable of being defined by both output-orientated and input orientated models. Output orientation addresses the question how much output can be feasibly expanded by holding the level of input constant. On the contrary, the input orientation looks at how much input can be feasibly reduced to produce the same level of output. The two DEA orientations would yield the same efficiency measures under CRS specification but unequal under VRS (Coelli et al, 1998). In many DEA studies, analysts have tended to select input orientated models because in most DMUs, input quantities seem to be the primary variables (Coelli, 1996). This argument

however, is less applicable in the banking industry since banks have limited control over their inputs. In Avkiran (1999), it is mentioned that when inputs may well be outside the control of managers, the output orientated model needs to be applied. Although Avkiran (1999) applied the input-orientated model, it is the author's opinion in this study that the relatively regulated Malaysian and Singaporean banking industries (where bank managers have little control over input variables such as deposit rates) warrant the use of the output-orientated DEA model.

5.6.5: Computing MPI Output Distance Functions

Also notice that the output distance function as in Equation 7 is the reciprocal to the output-based Farrell measure of technical efficiency where:

$[DCt\ (xt, yt)]^{-1} = \max \theta$……Equation 14

According to equation 14 the inverse of an output distance function is equivalent to the DEA technical efficiency score. Notice that the production function in Equation 7 is the reciprocal of the maximum proportional expansion of the output vector y, given the input vector x that has been discussed in Chapter 4. Therefore, one can make use of this inverse relationship to compute the necessary output distance functions to derive the MPI index and its decomposition via a DEA means. There are two DEA models to choose from input orientated DEA and output orientated DEA. Since this study seeks to derive and decompose the output based MPI index, this analysis will follow the output orientated DEA.

DEA calculations can be conducted using a number of computer programs that allow linear programming procedures. Apart from simple spreadsheets and statistical packages such as Excel, SAS and SHAZAM, there are a few DEA specialist software packages available including IDEAS, Frontier Analyst, WDEA and DEAP. This study uses DEAP version 2.1 developed by Coelli to construct the piece-wise production frontier and derive the technical efficiency

scores. The output oriented model to be specified into DEAP would resemble the following:

Max $\theta,\lambda\ \theta$

s.t. $-y0 + Y\lambda j \geq 0$,

$\theta x0 - X\lambda j \geq 0$,

$NI'\lambda=1$

$\lambda \geq 0$…….Equation 15

Note that DEAP is instructed to calculate an output-orientated VRS model by adding the constraint $NI'\lambda=1$ to the output orientated linear programming LP. Coelli et al (1998) stated that where there are reasons to believe that the DMUs may not be operating at optimal scale due to imperfect market competition, the specification of VRS is warranted. In the DEAP model, efficiency θ can assume any positive value but $1-\theta$ would indicate the proportional expansion of output that can be feasibly attained by DMU j with input quantities held constant (Coelli, 1996). DEAP would report TE scores as $1/\theta$, which is bounded by zero and 1 (Coelli, 1996).

The operations of DEAP can be graphically represented in Figure 5.9 that shows a hypothetical DEA production possibility frontier. DMU L, M and N form a solid line that represents the efficient frontier. Therefore L, M and N are technically efficient. All other DMUs beneath the efficient frontier are classified as inefficient. K for example, needs to travel to K' or its target before being deemed as efficient because it can still expand its output with the given level of input. Because M and N forms the relevant portion of the frontier to produce efficient production for K. Therefore, M and N are the peers of K. Here DMU M would make a greater contribution to DMU K's TE score. Meanwhile P would be projected on the frontier (the dotted line), not the efficient frontier (the solid line) as P' because production of y1 can be increased by P'L without using any more inputs. This is an example of an output slack.

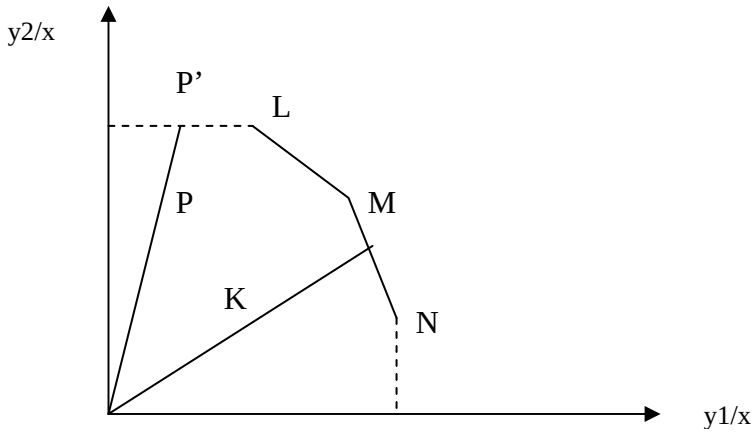


Figure 5.9: DEAP Output Oriented Model.

5.6.6: Solving DEA Linear Programming

Based on the algebraic expressions for the fully decomposed MPI, it is necessary to calculate four distance functions to measure TFP change between period 0 and 1 for the jth DMU. Therefore, this requires the solving of four linear programming problems as also outlined in LP1 to LP4 below (Avkiran, 2000).

Both Equations 1 and 2 represent the case where a datum point observed in a period is compared to the production technology or frontier of that period. In Equations 3 and 4, the datum points are compared to the technology of the previous period. These four LP equations have to be solved for each bank in each pair of adjacent periods. To construct a chained index, it is necessary to solve N x (3T-2) linear programs, where N is the number of banks while T is the number of time periods (Avkiran, 2000).

Note that in linear programs 3 and 4, where the data points are compared to the technologies from different time periods, the θ parameter may not be greater than or equal to 1 as it must be when calculating standard output-oriented technical efficiencies (Coelli and Prasada Roa, 2003). The datum point could lie above the production frontier. This will most likely to happen in LP4 where the production point from period t+1 is compared to the technology from the earlier period t. If technical progress has indeed occurred, then θ being less than 1 is

possible (Coelli and Prasada Roa, 2003). Note that this could also happen in LP 3 if technical regress has occurred although such an event is less likely.

$$[D1\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$$

$$\text{s.t.} \quad -\phi y_1 + Y_1\lambda \geq 0,$$

$$x_1 - X_1\lambda \geq 0,$$

$$\lambda \geq 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{LP (1)}$$

$$[D0\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$$

$$\text{s.t.} \quad -\phi y_0 + Y_0\lambda \geq 0,$$

$$x_0 - X_0\lambda \geq 0,$$

$$\lambda \geq 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{LP (2)}$$

$$[D1\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$$

$$\text{s.t.} \quad -\phi y_0 + Y_1\lambda \geq 0,$$

$$x_0 - X_1\lambda \geq 0,$$

$$\lambda \geq 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{LP (3)}$$

$$[D0\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$$

$$\text{s.t.} \quad -\phi y_1 + Y_0\lambda \geq 0,$$

$$x_1 - X_0\lambda \geq 0,$$

$$\lambda \geq 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{LP (4)}$$

The LPs above are run with CRS specification. To extend the decomposition of technical efficiency into pure technical efficiency PTE and scale efficiency SE components requires the solution of two additional LPs that imposes a convexity restriction when comparing two production points.

This is done by adding the constraint NI'λ=1 to LP 1 and LP 2 as shown below where scale efficiency in each period can be constructed as the ratio of CRS distance functions to VRS distance functions (Coelli et al, 1998). To obtain the

nature of returns to scale, NIRS can be specified by substituting NI'λ=1 with NI'$\lambda \leq 1$ (Coelli et al 1998).

$[D1\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_1\lambda \geq 0,$

$x_1 - X_1\lambda \geq 0,$

$\lambda \geq 0$……LP (1)

$[D0\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_0\lambda \geq 0,$

$x_0 - X_0\lambda \geq 0,$

$\lambda \geq 0$……LP (2)

$[D1\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_1\lambda \geq 0,$

$x_1 - X_1\lambda \geq 0,$

NI'λ=1

$\lambda \geq 0$……LP (3)

$[D0\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_0\lambda \geq 0,$

$x_0 - X_0\lambda \geq 0,$

NI'λ=1

$\lambda \geq 0$……LP (4)

$[D1\ (y0, x0)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_0 + Y_1\lambda \geq 0,$

$x_0 - X_1\lambda \geq 0,$

$\lambda \geq 0$……LP (5)

$[D0\ (y1, x1)]^{-1} = \max_{\phi,\lambda} \phi$

s.t. $-\phi y_1 + Y_0\lambda \geq 0,$

$x_1 - X_0\lambda \geq 0$,

$\lambda \geq 0$……LP (6)

In terms of Figure 5.10, NI'$\lambda \leq 1$ would map out the convex technology bounded by 0AB while NI'λ=1 would impose the convex X1AB technology. Without both constraints, NI'λ can take any non-negative values, the technology becomes the 0AY1 cone.

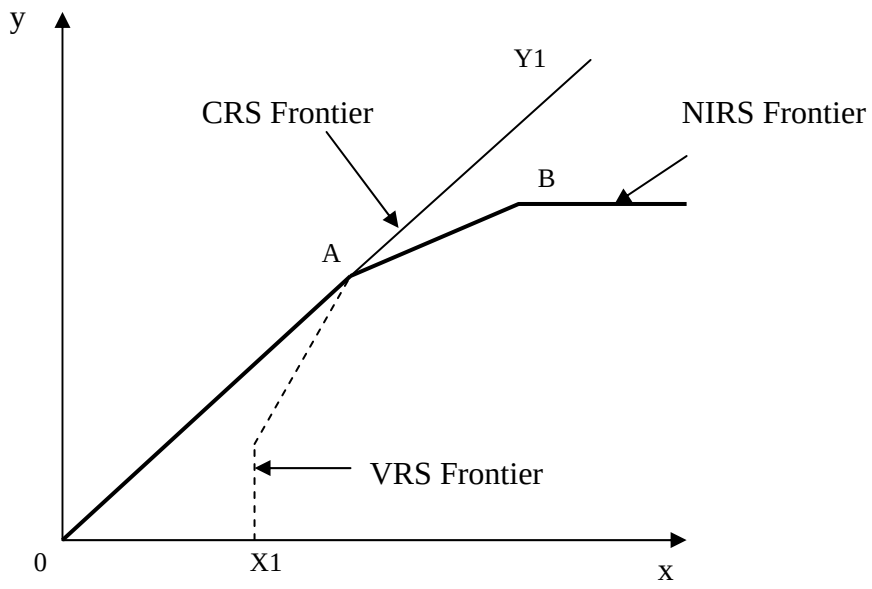


Figure 5.10: Returns to Scale Frontiers (CRS VRS NIRS)
Source: Fare et al 1994

5.7: Summary of Methodology

In summary, this study uses the MPI index as proposed by Caves et al (1982) as a measure of TFP index change to compute productivity changes of the banks in the sample. To fully account for the effects of technical efficiency change, scale efficiency change and technical change, this study follows the MPI decomposition suggested by Fare et al (1994). Despite the possibility of using an enhanced decomposition methodology to derive the fourth component of productivity change, the change in technical scale, this study has opted not to implement it in this study due to the general disagreement among researchers on both the interpretation of the fourth component and the formula expression.

Between output and input orientated MPI measures, this study uses the former to maintain consistency with the majority of previous banking studies that employ MPI measures of productivity change.

The output orientated MPI is the ratio of two output distance functions, each with reference to a benchmark technology using different time periods. The non-parametric linear programming Data Envelopment Analysis DEA technique is adopted here to compute the output distance functions. Specifically, the output-orientated DEA model is employed because it is the author's opinion that banks within the study sample do not have full control over their inputs. Subsequently, the DEA model is run with CRS, VRS and NIRS production technology specifications. This approach allows one to examine not only pure technical efficiency and scale efficiency changes that comprise technical efficiency change, but also to determine the nature of returns to scale of a particular bank. Thus, this study enables one to determine what improvements would need to be made by an inefficient bank to become efficient.

CHAPTER 5:

PART II

DATA SELECTION AND ANALYSIS

This study employs the DEA framework to calculate the values of the output distance functions and subsequently, derives the MPI before decomposing it into three components: technical change, technical efficiency change and scale efficiency change.

5.8: The Population, Sample and Time Period of Study

The sample used for the study comprises 10 domestic Malaysian conventional banks, 11 Malaysian Islamic banking units (IBS) that are being benchmarked against 13 Malaysian foreign banks, 4 of which offer Islamic banking services and 3 other Singaporean banks. The study covers the time period between 1996 and 2002 in order to capture the rapid changes within the Malaysian banking industry that occurred in both conventional and Islamic banking areas following the onset of the Asian financial crisis. This hit Malaysia during the 1997-1999 period and ushered in a subsequent banking consolidation phase that saw the systematic merger of 54 pre-crisis Malaysian domestic banks into 10 domestic post-crisis anchor banks. The consolidation process was directed by the Malaysian central bank as a policy response to strengthen a number of floundering banks in an effort to avert a deeper financial crisis and to enhance the competitiveness of domestic banks in the wake of growing competition from foreign banks, as Malaysia progressed towards deregulating the industry. The base year 1996 also represented the year when domestic IBS began to report their operations to the central bank and the investing public, finally making reliable and consistent data available. Meanwhile foreign banks were included into the sample amid reports by the central bank authorities that due to their asset sizes and competencies, they were outperforming the domestic banks even in the context of Islamic banking. This is an area where local banks were once thought to have an advantage. Singaporean banks are included in the

study given that Singapore serves as the regional financial center and was largely unscathed by the 1997-1998 Asian financial crisis, Singaporean banks are thus generally considered to be the best practice banks of the region.

Because the first bank mergers took place in 1998 with the majority of the rest exercised towards the year 2000 before the dateline of September 30th 2000 as stipulated by BNM, the upper period limit of 2002 meant that the effects of the mergers can only be assessed after a time period ranging between 2-4 years. Although this may satisfy the prescribed minimum adjustment and assimilation periods mentioned in Berger et al. (1998)[1], Calomiris and Karceski (2000)[2] and Houston et al. (2001)[3] that average around 3 years, the observed post-merger effects from mid 1999 to 2000 may be too premature to be conclusive.

5.9: Qualitative Characteristics of Data

5.9.1: Sources of Data

To ensure reliability, consistency and comparability of the results, the data are obtained from individual commercial bank's audited annual reports produced in accordance with company reporting standards in Malaysia and Singapore, the central bank's annual report, as well as other publicly available published information from stock exchanges and libraries. Unlike previous studies, we do not incorporate data inputs from the BankScope database by IBCA as done by Hassan and Bashir (2003) and Brown (2003). This was for two reasons.

First, although BankScope features a specialized category for Islamic banking, we are not confident about the applicability of some of the data as being appropriate to describe the actual operations of Islamic banking. This is because BankScope does not disclose anything about its data selection and inclusion policy and studies that have relied on data inputs from BankScope have reported variables or ratios that show interest-related characteristics that do not apply to Islamic banks since they operate on interest-free principles.

[1] As cited in Focarelli and Paneta (2002).
[2] As cited in Focarelli and Paneta (2002).
[3] As cited in Focarelli and Paneta (2002).

Second, this approach is consistent with the findings of Bhattacharya (2003), Ehrmann et al (2001)[4], De Brandt and Davis (1999)[5] and Corvorsier and Gropp (2001)[6] who all cautioned that despite the usefulness of BankScope for the purposes of examining the financial statements of individual banks across several years and the comparison of these figures with the majority of peers and competitors. The samples compiled by BankScope suffer from an implicit selectivity bias in favour of large banks and are not representative of the actual banking industry and thus may yield biased and inaccurate results in country specific and even cross-country studies that serve to obscure heterogeneity across banks. There are many factors that contribute to this shortcoming but Ehrmann et al (2001)[7] noted that the biases appear to be stronger between 1992 and 1999 since the coverage of BankScope was relatively poor during its earlier years of data compilation. Bhattacharya (2003) and Ehrmann et al (2001)[8] recommended comparable databases, such as those maintained by central banks, because they usually have more complete data and therefore produce more consistent, robust and stable results.

In order to assist stakeholders to decide on efficient financial resource allocation between and among conventional and Islamic banks, productivity and efficiency measures and variables must be comparable so that the users of the information are able to discern and evaluate the similarities and differences between and amongst conventional and Islamic banks at one time and across time and yet be able to juxtapose them in terms of performance measurement on a level playing field. This has to be done without omitting relevant and reliable information items that may adversely affect the accuracy of the results and subsequently, impair decision making about scarce financial resource allocation by users of such information. A variable should possess the primary qualitative characteristics of relevance and reliability in order to become comparable. Relevant in that the information should help users to predict and

[4] As cited in Bhattacharya (2003)
[5] As cited in Bhattacharya (2003)
[6] As cited in Bhattacharya (2003)
[7] As cited in Bhattacharya (2003)
[8] As cited in Bhattacharya (2003)

confirm performance outcomes and reliable in that the information should be sufficiently representative of the operations of the bank concerned without the existence of bias and undue gross errors. Hence, comparable bank performance measures should assist users to accurately measure and meaningfully compare the performance of conventional and Islamic banks and this should ultimately lead to sound decisions about efficient scarce recourse allocation.

5.9.2: The Need for Balanced Panel Data

It must be noted that in order to complete the derivation of the MPI by running DEAP Version 2.1, one must have panel data (across banks and time) and this panel data must be "balanced" in the sense that all observations for a particular bank must be present throughout the period of the study. This is because the MPI employed in this study is constructed by comparing two data points with reference to two technologies, those of period t and period t+1. An "unbalanced" panel of data is likely to give rise to internal inconsistency. This is often termed as transitivity and is an important issue in studies that consider cross-sectional elements such as this one. For instance if productivity change can be measured from period t to period t+1 and then from period t+1 to t+2, would a comparison between period t and t+2 yield the same results? Coelli et al (1998) suggested that this is not likely since analytically, although technical efficiency change is transitive, technical change is neutral. This subject was also studied by Balk and Althin (1996)[9] who proposed the EKS method that is capable of generating transitive multilateral MPI from non-transitive bilateral MPI. The EKS method was created by Elteto-Koves (1964)[10] and Szulc (1964)[11]. Although Coelli et al (1998) expounded some of the concepts behind the EKS method, they generally found that the approach is somewhat mechanical and concluded that further work is needed to fine-tune the methodology. The EKS method is not considered in this paper. Transitivity of data is however not an issue in the DEA application.

[9] As cited in Coelli et al (1998)
[10] As cited in Coelli et al (1998)
[11] As cited in Coelli et al (1998)

5.9.3: Absence of Suitable Data and Bank Exclusion from Sample

Thus, the samples used for our study would be slightly less than the population. This is because over the study period, some banks have to be excluded. This is necessary since over a period of active mergers and acquisition, the availability of suitable data is inconsistent at best while the lack of transparency of foreign banks' financial statements may inhibit the inclusion of some Singaporean banks and foreign banks in Malaysia into the study sample.

5.10: Choice of Modeling Banking Behavior

Complexity of Modeling Banks

To derive the MPI through the DEA framework, an output orientated DEA model is run. To do so requires data on inputs and outputs to be fed into the model. There appears to be no consensus among researchers into banking efficiency and in the productivity literature about the selection of inputs and outputs. This is because, unlike other DMUs in the primary and secondary sectors, banks use multiple funds sources and offer multiple services and financial products that are not easily defined into clear cut physical measures. As a result, a model of a multi product bank that uses multi inputs needs to be employed (Humphrey, 1991).

The Production and Intermediation Approaches

In general, there are two alternative approaches commonly adopted in modeling bank behavior: the production approach and the intermediation approach. The production approach views the bank as producers of loans and deposits utilizing

input resources such as labor and capital. This approach is also known as the traditional banking approach and was introduced by Benston (1965)[12]. According to this model, banks use three input factors; namely labor, capital and banking funds to produce a vector of 3 outputs in the form of short-term loans, long-term loans and other earning assets. On the other hand the bank borrows depositor's funds and channels them to deficit units as loans and other assets in the intermediation approach. This is also dubbed as being the non-traditional banking approach as it views the bank as a financial intermediary between surplus units and deficit units. Using the second approach, 4 inputs (staff numbers, deposits, interest expense, and non-interest expense) and 3 outputs (net loans, net interest income and non-interest income) have been identified (Avkiran, 1999b). Berger and Humphrey (1997) suggest that the production approach is more appropriate to measuring bank branch level efficiency while the intermediation approach is better for measuring bank level efficiency.

Almost all DEA frontier studies have adopted the intermediation approach except for Ferrier and Lovell (1990). Wheelock and Wilson (1995)[13] compared both approaches and found that technical efficiency is greater for the intermediation approach. Meanwhile Hefferman (1996) found that most studies employed the intermediation approach because there are fewer problems with the data. Although Aly et al (1990)[14] suggested that interest expense could be excluded since it is purely financial and is not an accurate measure of x-efficiency, nevertheless, Elyasiani and Mehdian (1995) and Berger and Humphrey (1991) found that interest expense often accounts between one half to two thirds of total banking costs. For this reason, much of the literature on banking efficiency favors the intermediation approach whereby the focus seems to be on x-efficiency or the ability of bank management to control costs and generate revenues.

[12] As cited in Mukherjee et al (2001)
[13] As cited in Yahya et al. (2001).
[14] As cited in Yahya et al. (2001).

Another advantage that the intermediation approach has over the production approach is the inclusion of off balance sheet activities (OBS) in non-interest income. OBS's involve trading financial instruments and generating income from fees and loan sales. These affect banks' profits but do not appear in a bank's balance sheets. These non-traditional banking activities however, are increasingly seen as a potentially dependable income source to balance the competitive erosion and volatility of interest income in relatively deregulated banking industries that are characterized by consolidation, convergence and innovation. Berger and Mester (1997)[15] stated that with weights imposed by the Basle Accord, OBS items are perceived to have roughly the same risks and production costs as loans. These non-traditional operations are also concentrated among local and foreign banks that are typical of those in our sample. Thus, if no account is taken of these items, banks could be shown as having disproportionately higher costs compared to their measured output.

The intermediation approach is adopted in this study. The primary reason is that by using the functional perspective of the financial intermediation concept to model the operations for both conventional banks and Islamic banks as illustrated in Part 1: Introduction, banks are viewed as financial intermediaries whose primary function is to facilitate the allocation and deployment of financial resources effectively and efficiently from surplus units to deficit units, spatially and temporarily in an uncertain economy. Apart from this, it is also thought that consistent with earlier studies, the use of the intermediation approach is more relevant and appropriate to measure the entire bank level performance since it includes interest expense, which represents a significant fraction of total banking costs for conventional banks whilst being able capture the effects of OBS operations that seem to have dominated the operations of banks as they provide the means to augment earnings and manage risks.

[15] As cited in Isik (2002).

5.11: Estimating the Parameters of Conventional Banking and Islamic Banking under the Intermediation Approach

The Need to Derive Comparable Variables for Islamic Banking

When estimating the parameters of our DEA model, care is taken to account for the specific characteristics of Islamic banks. This is because Islamic banking differs from conventional banking in that it is based on the concept of investment profit and loss (PLS) sharing rather than only interest returns and costs. Islamic banking forbids the charging and acceptance of interest because it represents the notion that profit is pre-determined in advance and does not appear commensurate with an equal amount of risk taken. This notion is rejected by the Sharia. Hence, in order to perform a meaningful yet accurate productivity comparison among conventional and Islamic banking operations, it is a pre-requisite that a set of comparable variables or parameters be determined first for Islamic banking. Previous studies that attempt to assess the performance of Islamic banking such as Abdullah and Elzira Said (2003), Hassan and Bashir (2003), Hamid and Ahmad (2001) and Brown (2003) employed conventional variables such as net interest revenue and gross loans but did not disclose anything about the appropriateness of using them within the Islamic banking framework nor provide any explanation as to how the variables are qualified to be used as suitable proxies for items found in Islamic banks' balance sheets.

Choice of Inputs and Outputs in Modeling Banks

For simplicity's sake, the list of comparable variables for both conventional and Islamic banking used in thus study is outlined in Table 5.1 below. The qualification of the variables is discussed next. The first input is interest expense- a proxy for deposits in which to model bank behavior (Avkiran, 2000). This comparable input in Islamic banking operations is income attributable to depositors. The second input is non-interest expense which is comparable to expenses not related to income-attributable to depositors. This represents the resources expended in converting deposits to loans. When a less direct

approach (as in DEA model B) is taken to measure efficiency, deposits will be used to replace net interest income and staff numbers replace non-interest expense. The two outputs are net interest income, which is a proxy for net loans the equivalent term to income from financing; and non-interest income - a proxy for non-traditional activities which compares to the Islamic variable non-financing related income.

Qualifications of Inputs and Outputs

The parameters outlined in Table 5.1 must be accurately estimated because banks remain the most difficult entities to value despite the multitude of regulatory and reporting requirements imposed on them and therefore a considerable degree of complexity is involved in defining the inputs and outputs.

	Conventional Banking Variable	Islamic Banking Comparable Variable
Inputs	Interest Expense	Income attributable to depositors
	Non-Interest Expense	Expenses not related to income attributable to shareholders
Outputs	Interest Income	Income from financing
	Non-Interest Income	Non-financing income

Table 5.1: The List of Comparable Variables for Conventional and Islamic Banking following the Intermediation Approach of Modeling Bank Behavior.

The variables used in this study are defined by slightly extending the financial intermediation models for both conventional and Islamic banks that have been introduced in the Part 1-Introduction as Figure B and C. With reference to Figure B and Table 5.1, one would notice that the only differences are 2 additional items- non-interest expense and non-interest revenue found in Table 5.1. Both non-interest expense and non-interest revenue are important components in the financial intermediation role of the banks but are difficult to incorporate into the graphical depiction of the models without sacrificing the simplicity of the models. Expressed simply - banks incur non-interest expense

(such as employee wages and technology maintenance costs) in carrying out their financial intermediation processes. Furthermore banks do not only earn interest revenues from advances extended. A significant proportion of a banks' total revenue is earned in the form of fees for services provided for their customers as well as by off balance sheet OBS operations. It is worthwhile to note that banks are involved in OBS activities to better manage the risks emanating from their loan portfolios besides augmenting their earnings. The Islamic banking equivalents of both non-interest expense and non-interest revenue are expenses not related to income attributable to shareholders and non-financing income.

The definition of the variables in this study also follows closely the discussion in Schoon et al (2003) that aimed at studying the applicability of the Residual Income Model to the valuation of conventional and Islamic banks in a way that accounts for the different characteristics of Islamic banking. Although a different methodology was adopted in the paper, the authors highlighted the need to account for the effects of risks and returns on the banks' balance sheet items that may affect the choice between an accounting value reported in the financial statements or some other more-desirable values that need to be derived.

Accordingly, expected returns related to both on and off balance sheet items need to be considered when the total returns of a bank are determined. Penman 1992)[16] argued that net income attributable to shareholders provides a measure of change in value and thus any adjustments to incorporate effects of marked-to-market revaluation of financial assets available for sale and currency translation gains and losses that may affect equity also need to be incorporated. This value is also known as the clean surplus. Schoon et al (2003) however also cited Walker (1997)[17] that advocate accounting book values as being superior due to the fact that reported book values guide rational investment decisions and therefore accounting numbers. Reference was also made to Stark (1997)[18] who argued that accounting values alone are sufficient unless

[16] As cited in Schoon et al, (2003).
[17] As cited in Schoon et al, (2003)
[18] As cited in Schoon et al, (2003)

the components of clean surplus inherit predictive ability. Since Stark (1997)[19] also concluded that clean surplus components in general have no information content, earnings or revenues for conventional banks in this study will follow the accounting values as disclosed by the banks' financial statements.

In terms of Islamic banking, bank earnings are capable of being defined as (1) income attributable to shareholders and (2) income attributable to shareholders and unrestricted investment account (Schoon et al, 2003). The difference stems from the fact that investment accounts in Islamic banking can be either included in or extracted from capital. Restricted investment accounts are set up with the investment purpose specifically indicated by the account holder and therefore, the bank only manages funds in the account. On the other hand, funds in unrestricted investment accounts can be invested on the discretion of the bank and holders bear full risk of the losses.

In accordance to the Accounting, Auditing and Governance Standards for Islamic Financial Institutions AAOIFI standards, restricted investment accounts are treated as off balance sheet items. Unrestricted investment accounts meanwhile may exhibit some characteristics of capital but at the same time can be compared with discretionary portfolio management related funds in conventional banks and therefore cannot be treated as being part of permanent capital (Schoon et al, 2003). The AAOIFI position is that investment accounts whether restricted or unrestricted would not be included into equity since it defines equity as the residual value after liabilities have been deducted from the assets (Schoon et al, 2003). Thus under approach (1), returns of investment accounts would be included within expenses not related to income attributable to shareholders within the framework of this study. On the other hand if approach (2) is taken, then returns on investment accounts would be excluded. The decision about the choice however, needs to be implemented consistently.

Earnings for Islamic banks also need to be determined carefully in the sense that profits may be shared in two different ways, the pooling and the separation

[19] As cited in Schoon et al, (2003)

methods. These variations may have material impacts on reported earnings. Under the first method, all sources of funds should share in all the revenues and expenses from the investments except for the revenues and expenses attributed to subsidiary and affiliated companies and employee remunerations (Schoon et al, 2003). Under the separation method, revenues and expenses related to investments are shared among investment account holders only although some equity funds may have partly funded an investment (Schoon et al, 2003). Although these may not affect the outputs in our model, they affect the income attributable to the depositors' component if they are subsequently retained and reinvested.

5.12: Determining Degrees of Gains Passed to the Public

To determine the extent of productivity gains from Australian bank mergers that are passed on to the public, Avkiran (1999b) and Rhoades (1986) suggested that a good proxy to measure this is the change in deposit market share. The authors reasoned that if the pricing and quality of banks' products and services improve as a result of improved productivity from mergers, it is reasonable to expect the bank's post-merger market share will rise. Meanwhile, Focarelli and Panetta (2002) described the deposit market share as the ideal testing ground in studying the effects of enhanced consumer welfare and adverse pricing due to the exercise of market powers. Both authors attributed this to the fact that because deposits are highly standardized products (since the characteristics of deposits are regulated and sanctioned by laws), they can be meaningfully compared between different banks over time. In addition given the assumptions that (1) the competition is at the local level, (2) that barriers to entry into local deposit markets exist and (3) by holding the industry constant, the local deposit market allows an effective examination of the pricing effects of bank mergers that can alter the competitive conditions in markets with different characteristics. This study follows Avkiran (1999b) and use market share of deposits of a bank as a proxy to investigate whether post-merger productivity gains have been passed on to the public.

However, extreme caution needs to be exercised here. In adopting the approach in Avkiran (1999b) it is assumed firstly that there have been productivity gains as a result of the mergers. Secondly we assume a positive correlation to exist between change in market share of deposits and change in productivity when the benefits are actually passed on to the public. Avkiran (1999b) highlighted that this assumption may not hold because a decline in productivity may not increase price and lead to decline in banking quality. Finally, all domestic banks in Malaysia were merged (almost simultaneously) within a 2-3 years period. If all banks have in fact improved their productivity following the mergers and pass the benefits to the public, it is likely that deposit market shares for each banking group may not change very much at all. This is because banks are measured relative to one another. However, it would be erroneous to conclude that no productivity gains have been passed to the public.

5.13: Research Design

The key research objective is to investigate the empirical evidence about productivity changes within the Malaysian dual banking system (including Islamic banking operations), benchmarked to Singaporean banks, surrounding the period of bank consolidation. This evidence will be examined using the Malmquist Productivity Indices (MPI), which enable the decomposition of productivity into technological changes, technical efficiency and scale efficiency. The breakdown provides insight into sources of inefficiencies and also indicates whether banks operate closer to the optimal scale size as a result of mergers.

MPI Indices Derivation using DEAP 2.1

Input data are firstly keyed into Microsoft Excel templates before being computed using Formula 1 as introduced in the Methodology section to estimate the MPI in the form of indices. Here, the MPI indices will be derived using the program DEAP Version 2.1 (Coelli, 1996). The DEAP 2.1 is a DOS

language computer program developed by Tim Coelli of the Center for Productivity and Efficiency Analysis (CEPA) that can be easily run on any Windows based IBM-compatible PCs. In order to generate MPI indices, DEAP firstly runs a DEA to generate the following four technical efficiencies needed to compute the ratio of distance functions as identified in Coelli (1996):

- The CRS DEA frontiers from previous period
- The CRS DEA frontiers for the current period
- The CRS DEA frontiers for the next period
- The VRS DEA frontiers for the current period

A principal requirement to compute MPI indices using DEAP is that a panel of data for the sample must be used. In other words, all firms must be observed in terms of inputs and outputs in all time periods. In our sample of 41 separable banking units, we can only include 30 units in order to satisfy this requirement. Descriptive statistics on the 2 inputs and 2 outputs used are presented in Table X.

Based on the calculation of distance function ratios, 5 indices relative to the previous periods are produced for each DMU beginning in the 2 period namely: (1) the technical efficiency change index, (2) the pure technical efficiency change index, (3) the scale efficiency change index, (4) the technical change index and (5) a product of all previous indices, is the total factor productivity or TFP change index. Index values above 1 indicate productivity progress between periods t-1 and t while index values below 1 indicate productivity regress. Unitary values signify no productivity changes between the periods. The TFP change index results of the analysis denote the values of MPI indices. Indexes 1 to 4 provide the complete decomposition of the MPI index.

The Need for Careful Selection of Suitable Study Samples.

It must be noted that our sample of 30 banking units represents the enlarged sample that includes conventional commercial banks and Islamic banks regardless of ownership and regulatory environment. The DEA MPI is initially

run with this “universal” sample to project common grand frontiers to enable the derivation of MPI indices. This approach provides the simplest and most direct way of comparing productivity levels of all banking units relative to one another. However, it is not by any means the most accurate and desirable. Avkiran (2000) explains that one major limitation of generating MPI scores using enlarged samples is that one needs to assume that all banking units share the same common technology or frontier. However, this assumption may be too far-fetched if banking units within a sample operate in different markets or are subjected to different regulatory environments or are of different asset size or differ by ownership type. In such a scenario, productivity differences are likely to prevail and it can be difficult to attribute this to either differences in characteristics or actual operations on an equal footing (Avkiran, 2000).

Such factors may have been responsible for large divergent results between large and small US banks on productivity levels that have been reported and documented by numerous studies. Recently, Wheelock and Wilson (1999) found that it was only a few innovator banks that push the frontier, while most, especially small banks, lag behind resulting in overall technological regress that ultimately decreased bank productivity levels in their study. In an earlier paper, Elysiani and Mehdian (1995)[20] proposed that small and large banks have different efficient frontiers following contrarian results between large and small US banks in their study.

This apparent problem has been acknowledged by Alam (2001) who opted to run the DEA MPI program separately on differentiated samples based on the type of regulatory environment as advocated by Berger and Humphrey (1991,1992)[21], Berger (1993)[22] and Adams et al. (1999)[23] to highlight the fact that banks under different regulatory environments are unlikely to share the same technology and thus are heterogeneous. The author however did

[20] As cited in Avkiran (2000) and Alam (2001).
[21] As cited in Alam (2001).
[22] As cited in Alam (2001).
[23] As cited in Alam (2001).

complement the analysis with a sample that contains all differentiated banking units despite the fact that doing so violates the homogeneity requirement in order to provide comparison and acts as a control sample.

Following Alam (2001), it was decided to implement the DEA MPI on differentiated samples categorized on the basis of regulatory environment alongside the construction of the grand frontier to enhance comparison. These sub samples are namely: domestic commercial banks, foreign commercial banks, domestic IBS, foreign IBS and Islamic banks. However, it must be noted at the same time that there is a major caveat involved. Despite recognizing the fact that a common grand frontier may be technically flawed, Avkiran (2000) proceeded to analyze the enlarged sample instead citing that the small sample size may restrict the ability of DEA to discriminate between efficient and inefficient DMUs. Indeed as explained by Coelli et al (1998), by reducing the number of units entering the DEA, the comparison set is thus reduced, resulting in many units being identified as efficient. In this way, the discriminatory power of DEA would be greatly reduced rendering the scores generated questionable.

Choice of Study Samples.

Thus, to strike a balance between two undesirable ends to the same problem, we run the DEA MPI on both the enlarged samples and the sub samples. This way, the samples can be used to control one another besides aiding comparison. Specifically:

- To discriminate the MPI scores between conventional commercial and Islamic banking units, the enlarged sample of 30 banking units observed during the period would be used.
- To discriminate the performance between domestic and foreign commercial banks, 3 samples are used: (1) commercial banks (that includes both domestic and foreign commercial banking units), (2) domestic commercial banks and (3) foreign commercial banks.
- To discriminate the performance of Islamic banking operations, no differentiated samples would be used. This is because of the lack of

availability of suitable panel data to compute the MPI, and the sample is necessarily small. Instead, the sample of Islamic banking operations IBO will be used instead that includes domestic IBS, foreign IBS and Islamic banks.

The Need for Inclusion of DEA Efficiencies.

The MPI indices and their decomposition provide a robust approach to assess the magnitude and direction of changes in productivity measures. By their use, it is possible to identify the TFP, the TE, the PTE or the SE. Thus, the methodology is suitable to indicate whether a bank is progressing or regressing or remaining stagnant and the speed of change relative to other banks. One major drawback of the MPI is that the indices do not tell one how efficient is a banking unit relative to the others at any point of time. Therefore, while the MPI can indicate productivity/efficiency changes between 2 time periods, it cannot indicate the level of productivity/efficiency.

This distinction is critical because a bank may be reporting a MPI score of 1 (constant efficiency relative to previous period) or less than 1 (efficiency regress relative to previous period), but the bank may be very efficient relative to the others throughout the study period. On the contrary, a bank with an MPI score of more than 1 (efficiency progress relative to previous period) may on the whole be inefficient relative to the others. Furthermore, by capturing progress and regress between 2 time periods, MPI scores are highly volatile and time series analysis may not be very useful to identify trends.

Thus, a thorough analysis of banking productivity and efficiency based solely on the MPI indices is insufficient. Often one also needs to assess the levels of efficiency of one bank against another. This is particularly important as there has been noted shift towards studying x efficiencies of banks recently (Avkiran 2000; Elysiani and Mehdian, 1990; Ferrier and Lovell, 1990; Allen and Rai,

1996)[24]. This trend is generally traced to the findings of existing studies that report x inefficiencies constituting up to 20% of operational costs for banks while inefficiency in scale and scope economies make up less than 5% or less of costs (Berger et al, 1993)[25]. Therefore, there is a consensus on the significance of x efficiencies (or the ability of management to control costs and maximize revenues) to the performance of banks. Following this, it is an objective of this paper to report on the levels of this x-efficiency as well as the productivity changes to our sample banks to complete the performance analysis in a dual banking system.

DEA Efficiencies Derivation using DEAP 2.1

As explained within the Methodology part, x-efficiency can be computed by DEA. To do so, DEAP is instructed to compute one-stage VRS DEA scores based on the output orientated model to provide full decomposition of technical efficiency into pure technical efficiency and scale efficiency. Here it is assumed that the DEA technical efficiency serves as an exact proxy for x-efficiencies. In truth, x-efficiency comprises of both technical and allocative efficiencies.

The same 2 inputs and 2 outputs employed within the MPI framework are used to generate DEA efficiency scores. However, the sample size differs from year to year because (1) balanced panel data is not a requirement and (2) banking units are excluded in a particular year if there are zero or negative values for the inputs and outputs reported for that year. The optimal sample selection issue highlighted for MPI applies to DEA computation as well. Therefore, to preserve fair and accurate degrees of discrimination and comparison, the DEA specification is run on the same sample sets for MPI as identified earlier.

[24] As cited in Avkiran (1999a).
[25] As cited in Avkiran (1999a).

5.14: Summary

In summary this paper applies the output orientated DEA model. Avkiran (1999a) highlighted that when inputs may well be outside the control of managers, the output orientated model needs to be applied. It is opinioned that within the relatively regulated Malaysian and Singaporean banking industries, bank managers have little control over input variables such as deposit rates, and thus it warrants the output-orientated DEA specification.

This study follows the intermediation approach of modeling bank production primarily because the intermediation approach is more appropriate for measuring bank-level efficiency as opposed to branch-level performance since it includes interest expense, that represents a significant fraction of total banking costs for conventional banks (Goddard et al, 2001). Another advantage that the intermediation approach has is the inclusion of off balance sheet activities (OBS). Furthermore, this study seeks to establish consistency with other DEA frontier studies, an overwhelming majority of which have adopted the intermediation approach.

CHAPTER 6:

RESULTS[26]

6.1: Introduction

This section examines the relative efficiency and productivity levels of the banks featured in the sample (see description below). The results are obtained by running the DEA model using the DEAP program to firstly construct a grand frontier that envelopes all the input-output observations for all banks. The sample used in this study comprised of Malaysian domestic commercial banks (DCB), foreign commercial banks in Malaysia (FCB), Singaporean commercial banks (SCB), Islamic Banking Schemes provided by Malaysian domestic banks (DIBS), Islamic Banking Schemes provided by foreign commercial banks (FCB) and pure Islamic Banks in Malaysia (IB).

Note that the primary objective of this study is to investigate and compare the relative efficiency and productivity performance of commercial banks and Islamic banking operations (IBO) within the Malaysian dual banking system. SCB units are included into the sample with the sole purpose of enhancing the discriminatory ability of the DEA and MPI models by acting as benchmarks against which to calculate relative efficiency and productivity for each banking unit in each year as previously mentioned. Thus, the focus of our analysis will be on Malaysian banks although brief explanations of the notable SCB performance features will be disclosed.

[26] Tables and Figures relating to Results appear at the end of this chapter.

6.2: Analysis Organization

6.2.1: General Trends in Relative Efficiency and Productivity Performance for All Banks

To facilitate the accessibility and intelligibility of the presentation of the results, this section is broken down into several sections. The presentation commenced with Section 6.3 where an attempt is made to examine the whole banking industry in a broad sweep that encompasses all conventional and Islamic banking operations in Malaysia and Singapore. Attention will firstly be given to the average or mean relative efficiency scores across the study years (from 1996 to 2002). Here, the average TE, PTE and SE scores for each banking group from 1996 to 2002 will be analyzed. Subsequently, the variability of the annual average TE, PTE and SE scores (denoted by coefficients of variations) for each group are examined to determine the consistency of performance across the study periods. Section 1.1 plays a crucial role in revealing which banking groups have the highest efficiency level on average. This facilitates the analysis in determining whether conventional banking outperforms Islamic banking or otherwise. Section R1.1 however can only give a partial view of the productivity performance of banks.

To fully comprehend the relative productivity performance of the banks over time, trend analysis on the DEA efficiency levels will also be presented. With trend analysis, information relating to efficiency improvement and deterioration is made available that would be impossible to derive by the static benchmarks since benchmarks are also likely to change from one year to another. Yet, another crucial objective that can be accomplished is to provide another missing piece in the puzzle of determining the relative productivity level of banks. It may be recalled that the productivity of any DMU or the Total Factor Productivity of a DMU is the sum of (1) pure technical efficiency, (2) scale efficiency and (3) technical change. Because the third component involves a shift in the efficient frontier between two time periods, it is possible to compute and decompose the MPI index. In doing so, it is possible not only to determine the index value for technical change (Tech Change) but also TE change, PTE change and SE

change indices. These subcomponents of the MPI index thus would provide additional insights that would further enrich our analysis on the nature and behavior of the banks' efficiency and productivity performance. This of course would have been impossible if we confined the study was confined to DEA relative efficiency scores.

6.2.2: Results Interpretation

Caution however must be exercised when interpreting DEA relative efficiency scores and MPI relative productivity index scores together before making any inference. By definition DEA relative efficiency scores assign numerical values (between 0 and 1) to the efficiency level of a DMU relative to others whereas MPI indices assign numerical vales (≥ 0; where values of < 1 denote regress while values >1 indicates progress) to denote (1) any progress or regress as pertaining to TE, PTE, SE and Tech Change and (2) the speed of such changes. Thus, one can ascertain that while DEA can reveal how efficient is a DMU relative to the others, the MPI sub indices indicate the direction and speed of DEA efficiency levels from one period to another. For instance a declining MPI PTE change index would indicate deterioration not of DEA PTE levels, but rather a decline in the rate of DEA PTE improvement. It should be nooted that the absence of balanced panel data for a number of banks, the samples that were used to generate DEA efficiency scores and MPI productivity indices differ from one year to another. Therefore, the changes portrayed by DEA trend analysis may not be accurately reflected by the MPI indices.

Research Question 1

Section 6.3 to 6.6 state the results and answers to the principal research questions of the relative efficiency and productivity levels of all banks as found within the sample used to construct the grand frontier. Section 6.3 is dedicated to the determination and assessment of whether conventional commercial banks or Islamic banking operations were more efficient and productive based on a comparison of average efficiency and productivity measures between the CBS and IBO. Section 6.4 probes the same research question whilst

distinguishing between the many different banking groups within CBS and IBO. Section 6.5 meanwhile presents an analysis of the results to establish whether FCB outperformed DCB over the study period. Thus Section 6.3 for instance will discuss average DEA relative efficiency levels and the measures of performance variations between conventional banks and IBO to scrutinize the DEA efficiency trends and MPI sub indices trends for both conventional banks and IBO.

Research Question 2

The results pertaining to the second research question are presented in Section 6.6. If bank mergers and consolidations improve banks' efficiency and productivity performance, then increased efficiency would be observed for a particular banking group in the years following a merger. To this end, annual post-merger TE, PTE and SE scores for up to 3 years after a bank merger are provided. Furthermore, the relative efficiency scores are disclosed for both the acquiring bank and the target bank for the year prior to a merger to determine whether acquiring banks are more efficient than target banks. This also enables us to investigate if acquiring banks manage to maintain their pre-merger efficiency levels during the post-merger period.

Research Question 3

Finally, Section 6.7 attempts to answer the final research question with respect to detecting any evidence of transmission of efficiency gains to the public, if there is any at all, as a result of the bank mergers and consolidation. To establish this, we include (1) measures of change of deposit market share are included for each merged entity (DCB) for each of the 3 years after a bank merger and (2) measures of change in TE levels for DCB to enable a correlation to be established with changes in deposit marker share. The second component thus examines the results for any indications that suggest that efficiency gains are passed on to the public in the form of enhanced service and better pricing (higher deposit rates). Inferences in this section would also establish the degree of market power enjoyed by the merged domestic banking groups as a result of

the mergers that significantly reduced the number of major players within the Malaysian dual banking system that has so far posed many regulatory restrictions on foreign banks' operations. A response to this question would thus indicate the level of competition within the Malaysian dual banking system.

6.3: Relative Efficiency and Productivity Results for All Banking Groups

First, DEA was applied on x bank/year observations comprising of all banking groups (DCB, FCB, SCB, DIBS, FIBS and IB) to construct the grand frontier against which the radial efficiency for all banking units are computed on an annual basis. The results for DEA technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) for all banking groups and units are tallied and presented in Table 6.1, Table 6.2 and Table 6.3 where the discussion will be focused. Note that variations in performance for each banking group can be divided into (1) mean variation scores across all periods as denoted by the coefficients of variation in Table 6.1, Table 6.2 and Table 6.3 and (2) the average annual variation scores for each year of the study and are denoted by the coefficients of variation in Table 6.2, Table 6.3 and Table 6.5.

6.3.1: DEA Efficiency Results: General Findings

The presentation of data is begun by considering the TE results for all banks between 1996 and 2002. With reference to Table 6.1, it is noted that throughout 1996 to 2002, SCB were the most efficient banks on average relative to all other banking groups in the study. Within the Malaysian dual banking system, DIBS were the most efficient and followed closely by FCB, FIBS and DCB. IB meanwhile turned out to be the most inefficient group of banks.

There was however, a considerable gap, between the most efficient banks (SCB with average score of 0.734) and the least efficient banks (IB with average score of 0.589), with an average range of 0.145. Nevertheless, efficiency value ranges declined over time from 1996 to 2002. However, due to the concurrent rise in the coefficient of variation (CV) of annual efficiency means, banks' efficiency scores became volatile overtime. This indicates that banks' performances were diverging but standard-practice banks, especially

small and less efficient banks, generally managed to catch up with the best practice banks.

Overall, all banking groups did not boast very high levels of technical efficiency. Even SCB's on average could still improve output levels by 26.6% without increasing the level of inputs. Furthermore, although SCB have been the most efficient, their performance over the years was nevertheless not very consistent as shown by their average coefficient of variation (CV) of 23.9%. This measure of variation is however small compared to all other banks. DIBS for instance had the most consistent performance with the lowest CV score of 12.5%. DIBS also had the second highest efficiency score of 0.704 outperforming foreign IBS with a score of 0.669. In terms of conventional banking, FCB on average outperformed domestic banks. IB meanwhile were the least efficient with a mean of only 0.589. In all, DIBS, FIBS and FCB had quite similar efficiency performances and they outperformed DCB and IB. Meanwhile, FIBS had the most variable efficiency performance over the study years (0.343) followed closely by DCB (0.341) while DIBS were the least volatile (0.125).

The mean of annual PTE and SE scores for all banks presented in Table R5 and R6 show that banks on average were more PTE efficient than scale efficient. A close study of the CV values for each banking group show that on average, SE changes were more significant in commercial banks while PTE changes were more prevalent among IBO. Nevertheless, the CV measures for PTE and SE in each year show that changes in TE were primarily sourced from SE changes between 1997-1998 while PTE effects were more prevalent from 1999 to 2001. By 2002 however, both PTE and SE had equally influenced banks' efficiency.

Table 6.7 meanwhile revealed that conventional commercial banks and IBO operated mostly under DRS although 2 FCB managed to attain MPSS in 2002. On the other hand, most IBS operations achieved MPSS consistently

throughout 1996-2002. Only one small DIBS operation managed to attain IRS consistently since 2000.

Table 6.4 shows that there is considerably more efficiency variation among Islamic banking operations on a year to year basis. This indicates that Islamic banking units were quite heterogeneous among one another even within the same banking group. For instance there was higher variation among DIBS than other IBO units in 1996 although the trend declined. Variation among FIBS on the other hand dominated other banks from 1999-2001. IB's meanwhile were the most heterogeneous group in 2002. Among all Malaysian banks, DCB banks were the most homogeneous group (0.088). Throughout the study period, DCB were more consistent than FCB (0.188). Variation among FCB peaked in 1998 and 2001. Both Table 6.5 and 6.6 explain that variations among DCB, FCB, DIBS and FIBS were mostly due to PTE differences while IB were influenced more by SE differences.

6.3.2: Pure Technical Efficiency (PTE) Levels

In regards to the contribution of x-efficiency by managerial competence levels, Table 6.2 and Figure 6.2 showcase the PTE levels for all banks. Both show on average PTE levels were quite uniform throughout but were visibly trending downwards at a very gradual pace with a shallow trough in 2001. Pure technical efficiencies however improved in 2002. Evidence was less certain on the degree of performance convergence. Both the range and the CV showed both ups and downs throughout 1996-2002. Both experienced peaks in 1998 and 2001 and troughs in 2000. It should be noted that towards 2002, both measures actually increased compared to the 1996 measures. Thus, banks' managerial efficiency actually diverged somewhat from 1996 to 2002.

Overall, Singaporean banks were the most efficient (0.980), followed by FCB in second place with 0.869 and DCB in third with 0.864. In contrast, IB were the worst performers in terms of PTE (0.727). On the other hand, FIBS had the

most volatile PTE scores (CV of 23.5%) throughout the study period followed by IB (CV of 23%).

Figure 6.2 illustrates that SCB were the top tiered performers with relatively stable performance. DCB had declining PTE up until 1999, before it rose in 2000 only to decline once more in 2001. The year 2002 however saw a modest recovery. FCB on the other hand, dominated DCB until 2000 but experienced increased inefficiency in excess of their domestic counterparts in 2001. By 2002 however, PTE levels for DCB and FCB were almost identical. PTE performance for both DIBS and FIBS meanwhile closely mirrored that of TE although the decline of PTE in 1997 for DCB was more pronounced. The same conclusion can be made about IB except in 1996 when banks experienced declining efficiencies.

In terms of PTE performance homogeneity among member banks of the same banking group however, Table 6.5 shows that FIBS units appeared to be the most heterogeneous, followed by DIBS, IB, FCB and lastly, DCB. This indicates that DCB banks share greater bank managerial similarities among themselves than any other banks. Trend analysis meanwhile points out that FIBS and DCB were more heterogeneous than other conventional and Islamic banks throughout the study period. For conventional banks in Malaysia, PTE variability peaked in 2001. IBO however did not share similar performance variability characteristics. DIBS for instance were the most heterogeneous in the earlier years of 1996 and 1997, FIBS in 1998, 1999, 2000 and 2002 and IB in 2001. Nevertheless, all banks showed stable variation levels except for FIBS and IB.

6.3.3: Scale Efficiency (SE) Levels.

In terms of scale efficiency or the ability to gain scale economies arising from the optimal/ideal scale size, Table 6.3 and Figure 6.3 highlight the findings that for all banks, SE experienced a sharp decline from 1996 to bottom out in 1998 (0.572).

Nevertheless, a strong SE recovery was evident beyond 1998 reaching maximal SE efficiency (0.928) in 2000 before charting another decline in 2001 and a slight recovery in 2002. Similar to PTE, the range and CV both exhibited cyclical features. Range was the widest in 1997 and 2000 while CV peaked in 1998 and 2001. Both measures however revealed a gradually declining pattern but the results were inconclusive and it cannot inferred that banks are converging in terms of SE.

FIBS operated with the best scale size, realizing average SE of 0.886, followed by DIBS (0.850) and FCB (0.804). IB however were not far behind with 0.770. Overall, Islamic banking operations had better operation scale sizes (i.e. more scale efficient) than conventional banks. Meanwhile FCB (0.804) continued to outperform DCB (0.733). A distinction was also apparent in measures of SE variability. DCB had the highest volatility on average (26.7%) while domestic IBS had the least volatility (8.9%) but all in all, Islamic banking operations had lower volatility SE measures compared to conventional banking operations.

Figure 6.3 exhibits that from 1996 to 2002, in terms of SE, DCB and FCB moved closely together. However DCB were more prone to SE changes after having experienced the greater SE deterioration in 1998 and 2001 which was more than by any other banking groups. By the end of the study period, both DCB and FCB had almost identical SE scores. Both DIBS and FIBS however improved their SE even when all other banking groups showed declines in 1998. For DIBS, SE rose but fell slightly in 2001 but SE improved dramatically in 2002. FIBS meanwhile enjoyed sustained SE improvement from 1998 to 2000 but gradually tapered off in the beginning of 2001 although FIBS were almost fully scale efficient (SE levels were very close to 1).

Table 6.6 explains that DIBS banks were the most heterogeneous in terms of SE performance, followed by IB, SCB, FCB and DCB. FIBS banks on the other hand, had the most homogeneous SE performance. When analyzed across

time, both IB and FIBS had the most varied scale efficiency scores among banks in 1997. IB and DCB banks were also converging in terms of performance towards 2002. However FCB began to become more heterogeneous after being the most homogeneous group in 2000.

Table 6.7 and Figures 6.13 to 6.16 summarize the nature of scale returns for all banks. DRS scale size dominated commercial banks most notably in DCB where DRS were was most prevalent. Some FCB managed to achieve MPSS towards the end of the study period. IRS was reported in both 1996 and 2000 but foreign banks seemed to have exhausted these to the optimum level. DIBS and FIBS on the other hand were operating with better scale sizes with fair shares in both IRS and MPSS. Both MPSS and IRS were however on the decline for domestic IBS indicating that banks were growing beyond the MPSS. FIBS were much more characterized by IRS throughout, although these were giving way to MPSS as banks began to expand to reach their optimal sizes. IB however were mostly operating under DRS.

6.3.4: Trend Analysis

6.3.4.1 Technical Efficiency Trend Analysis: 1996-1998 Financial Crisis and Falling Efficiency

Figure 6.1 charts the trends for the annual DEA technical efficiency scores for all banking groups over the study period. It is apparent that most banks suffered increased inefficiency between 1996 and 1998 before recovering in 1999 and 2000 before becoming more inefficient again in 2001 only to recover yet again in 2002. Also note that the efficiency trends for DCB, FCB and IB were very similar. Efficiency trend for DIBS and FIBS on the other hand declined earlier in 1997 and later improved towards 2002 even as all the other banking groups charted a different course.

The financial crisis coincided with the 1997-1998 period. Except for FIBS, all banking groups operated at their most inefficient levels in 1998. This general

performance deterioration was largely due to a deep contraction in SE especially within DCB and FCB, indicating that banks were somehow oversized and overstaffed, and thus it made banks vulnerable to the effects of the crisis. The banking industry was in disarray in 1998 and the financial crisis certainly did affect different banking groups with different levels of severity. This is because 1998 also recorded the highest CV score. Nevertheless, the efficiency gap between the best practice bank and the worst practice bank was narrowing.

6.3.4.2: Technical Efficiency Trend Analysis: 1999-2000: Recovery

Table 6.1 and Figure 6.1 both illustrate that the banks recovered strongly over the 1999-2000 period.

The narrowing range and CV values in Table 6.1 also suggest that banks were becoming more homogeneous amongst one another in terms of technical efficiency levels as the less efficient banks managed to catch up with the best banks. The efficiency recovery however was largely attributed to sharp improvement in scale efficiency among both conventional and Islamic banking operations alike as Table 6.2, Table 6.3 and Figure 6.3 suggest. PTE levels were somewhat more stable even since 1996. This indicates that between 1996 and 1999, banks were more prone to changes in scale efficiency rather than managerial efficiency.

6.3.4.3: Technical Efficiency Trend Analysis: 2001-2002: The Effects of Bank Consolidation

Banks however grew inefficient again in 2001 just as the bank merger exercise initiated in 2000 was successfully completed. Efficiency levels were at the second lowest point in 2001 after the worst bank performance was registered in 1998 and were greatly affected by exceptionally low efficiency scores for DCB, FCB and IB. The increased inefficiencies this time were attributed to both deterioration in SE and PTE in DCB, FCB and IB although scale inefficiency played a larger role. During 2001, DRS were prevalent among them. The higher CV value (second only to the value of 1998) for 2001 in Table 6.1 highlights the

fact that once again that banks' performances were not only deteriorating but deviating from each other as well. Table 6.4 points out however that the highest variation was attributed to both FIBS and DIBS. Thus, all DCBs, FCBs and IBs were quite homogeneous in terms of their performance, perhaps this was linked to common trigger factors and/or common organizational and market structures. The depressed efficiencies eventually resulted in a TFP regress between 2000-2001. Although Table 6.13 illustrates that the banks recorded the highest technical change during this period, the decline in TFP can be traced to both PTE and SE regresses (Table 6.11 and Table 6.12).

Banks' efficiency recovered yet again in 2002 due to the banks becoming more PTE and SE efficient. Only FIBS recorded a small SE deterioration. Nevertheless, Figure R1-3 highlights that banks were diverging. However, the figure also shows an interesting grouping feature, in that towards 2002 (1) FIBS were converging with SCB to become the best in PTE, (2) DIBS, DCB and FCB converged together in PTE, (3) FIBS and DIBS converged together to attain the highest SE, (4) SCB, FCB and DCB converged in SE and (5) IB had the lowest PTE and SE levels.

6.3.5: Total Factor Productivity (TFP) Change

With reference to Table 6.9, it is noted that on the whole, all banks within the sample considered together, recorded the strongest TFP growth between 1999 and 2000 (1.098), followed by more modest growth during the 2001-2002 period (1.042). In contrast, the industry suffered TFP regress by 0.976 during the first period (1998-1999) as well as the final study period (2001-2002) by 0.981. Thus, the industry experienced rather short-lived productivity growth that was tightly concentrated over a 3-year period-1999, 2000 and 2001.

The productivity of banks however displayed a trend towards convergence as illustrated by (1) the narrowing range and (2) the decreasing volatility of productivity indices among different banking groups as indicated by the coefficient of variation (CV). Therefore, standard practice banks managed appeared to keep up with the best practice and banks were becoming more

homogenous. Accordingly, the early 1998-1999 period saw the most volatile performance (54.2%) while the most recent 2001-2002 period recorded the lowest score dispersion value of (24.2%).

Based on the results shown in Table 6.9, all banking groups enjoyed TFP progress except for IB that experienced TFP regress with a mean regress of 0.921. On average, FIBS had the strongest TFP growth with a progress index of 1.199 followed by DIBS with a progress of 1.148. All conventional commercial banks recorded very modest TFP growth on average with the benchmark SCB leading with 1.080 and trailed by foreign banks with 1.046 and finally domestic banks with 1.043. Thus, IBS had superior productivity growth (especially FIBS) to those of conventional banks and pure IB.

Finally, in Figure 6.5, the 1999-2000 period saw the largest TFP growth although the largest single increase occurred within the 2000-2001 period. The earliest study period (1998-1999) and the final study period (2001-2002) had the most dismal performance with most banking groups experiencing TFP regress.

6.3.6: Technical Efficiency (TE) Change

In terms of technical change or x-efficiency change, both Table 6.10 and Figure 6.6 suggest that collectively, all banks registered sustained TE regress from 1998 up until 2001 (with the lowest index regress score of 0.807) rebounding strongly between 2001 and 2002 to even surpass the performance of 1998-1999 with a TE progress of 1.188. Thus, banks had only improved their x-efficiency management in a much more accelerated manner more recently after a period following 1998 where the pace had been slower. With the inconsistent standard deviations and CVs, there is little evidence to show whether banks' performance was converging or diverging in terms of improvement in x-efficiency although differences had generally narrowed over the years. The most volatile period was between 1998-1999 (0.472) while the period between 1999-2000 was the least volatile (0.194).

Table 6.10 again suggests that FIBS had the strongest TE growth (index of 1.320). Consistent with the findings in TFP change, DIBS again comes in second with a commendable progress of 1.182. Both DCB and FCB were close with foreign banks slightly better than domestic banks (with 1.069 over 1.028). Nevertheless, the performance gap in TE change is more pronounced than the gap in TFP change. Finally, although IB registered the lowest mean TE score of 1.027 (very close to that of DCB), the banks were at least progressing. DCB had also been most consistent with the lowest CV score of 18.5% while IB had the highest score of 49.7% which is considerably much higher than any other banking groups.

Figure 6.6 provides some new insights. Almost all banking groups were regressing or showing decreasing TE progress over the 1998-1999, 1999-2000, 2000-2001 periods, TE change rebounded strongly between 2001 and 2002. The progress "recovery" was the strongest for IB. On the other hand, DIBS only managed a slight TFP progress increase from a TE regress between 2000-2001. FIBS were the exception. After having regressed from 1998 to 1999, FIBS recorded the only sustained TE progress over the remaining study periods. It is also apparent that IB had the most volatile performance. Overall, Islamic banking seemed to have outperformed conventional banking with an early contribution from DIBS and a later contribution from both FIBS and IB.

Meanwhile Figure 6.7 charts a rough U shaped trend from 1998 to 1999 with a TE performance trough during the 2000-2001 period despite the performance of FIBS that seemed to have defied the prevailing trend. In all, the final period of 2002-2002 saw the largest TE increase in terms of number and magnitude for all banks. Thus by the end of 2002, most banking groups experienced higher x-efficiency growth than in the earlier periods. In the early period of 1998-1999, all banks progressed except for FIBS. Thereafter FIBS dominated the rest. Only IB rose during the final period of 2001-2002 to match that of FIBS.

6.3.7: Pure Technical Efficiency (PTE) Change

Table 6.11 and Figure 6.8 show that throughout the study period, Malaysian and Singaporean banks experienced unchanged PTE between 1998-1999 but progressed in 1999-2000. This was followed by a regress during 2000-2001 only to progress again between 2001-2002. Thus, PTE changes were inconsistent throughout with rising and falling rates from period to the next. Nevertheless, the range had dropped considerably from a wide gap of 2.982 recorded during the early period of 1998-1999. Both the range and the CV trended in a U shape over the study period with both troughs in 2000-2001 period. Hence, banks' managerial competence to minimize costs and maximize revenues appeared to be converging prior to 2000-2001 but diverging beyond this time period.

Table 6.11 illustrates that once more FIBS and DIBS outperformed other banking groups. However, although DIBS had the highest growth of 1.112, FIBS were very close behind with a mean index 1.111. Thus, both FIBS and DIBS were almost similar in their bank management competence or PTE progress. FIBS however, had a much higher variation as conveyed by the CV of 31.5% compared to a more stable 17.8% recorded by domestic IBS. The difference in PTE change was more marked between DCB and FCB with FCB dominating (mean index of 0.987) over DCB (mean index of 0.972). In other words, FCB continued to outperform DCB although both banking groups suffered PTE regress on average. IB fared poorly with an overall PTE regress of 0.927. Therefore, Table 6.11 concludes that only DIBS and FIBS consistently improved their managerial competence. All other banks, except for SCB with a score that remained unchanged, experienced overall managerial deterioration.

Figure 6.8 shows a more complete picture. Both DIBS and FIBS had high levels of PTE progress but these occurred in different time periods. DIBS recorded their highest PTE growth between 1998-1999 before registering slight progress and regress thereafter while FIBS experienced that later during 1999-2000 and 2000-2001. Another markedly visible feature is that while IB regressed on a continuous basis from 1998 to 2001 and had the lowest mean PTE index score,

they made a huge progress jump between 2001-2002. Note also that FCB followed the same trend although the final progress was less spectacular. DCB on the other hand, had been mostly regressing although they experienced a marked PTE progress between 1999-2000.

In terms of Figure 6.9, there had been marked PTE change progress in each period but this was dominated by different banking groups. Between 1998-1999, DIBS led the way while FIBS was experiencing the worse PTE regress. Fortunes changed however during 1999-2000 and 2000-2001 when FIBS dominated with a large lead. By the 2001-2002 period however, both DIBS and FIBS progress were negligible. On the other hand, IB dominated along with a lower but nevertheless considerable PTE progress of FCB.

6.3.8: Scale Efficiency (SE) Change

Table 6.12 and Figure 6.10 show that on average, the industry followed a U-shaped trend throughout the study periods. The industry experienced the worst SE change (a SE regress of 0.912) during 2000-2001 from the highest SE progress of 1.177 between 1998-1999. It is also worth noting that the SE progress made during the final period of 2001-2002 was somewhat slower than the pace attained by banks during the first period of 1998-1999.

The general trend however indicated a slowing SE growth since 1998 for most banks except for DIBS. Both the range and the CV also followed a U-shaped course, indicating that banks were converging in terms of SE change before 2000-2001 and diverging thereafter.

In Table 6.10, on average, all banks registered SE progress. FIBS scored the highest SE progress of 1.120. They were trailed by IB with index value of 1.103. FCB (1.087) also outperformed DCB (1.062). DIBS meanwhile experienced the smallest SE progress of all with a mean index of 1.019. Thus, between Islamic banking operations and conventional banking, the results for SE change are mixed. In terms of performance consistency, FIBS (the best overall performers)

had the most volatile SE changes (25.4%) followed by IB (33.9%). On the other hand, DCB experienced the least volatility (with 16.3%) compared to FCB (17.7%).

Figure 6.10 provides additional insights. Notable trends are (1) both DCB and FCB shared the same SE change patterns although DCB had a higher SE change index in 2001-2002 while FCB dominated during 1998-1999 and (2) both for FIBS and IB meanwhile also exhibited the same trend. FIBS however peaked between 2001-2002 while IB peaked in 1998-1999. In both time periods, DIBS and IB progressed. The most marked progress was made by FIBS between 2001-2002. DIBS on the other hand only made significant progress in 1999-2000 whilst they regressed in all other time periods.

In Figure 6.11, it is evident that the 2000-2001 period saw all banks experience a SE regress. However another less visible feature was that the SE trends roughly followed a U-shaped development path with most banks having SE regress during the 2000-2001 period. IB dominated in 1998-1999 (although all banks except for DIBS recorded commendable SE progress), domestic IBS in 1999-2000 and foreign IBS in 2001-2002. Both the 1999-2000 and 2001-2002 time periods also saw significant progress in other banks. From 1998 to 2001, FCB dominated DCB but DCB outperformed FCB during the last period of 2001-2002.

6.3.9: Technical Change

Technical change tracks the changes of TFP resulting from shifts of the efficient frontiers. Table 6.13 and Figure 6.12 summarize that between 1998 and 2002, all banks experienced technical regress from 1998 to 1999 but progressed between 1999 to 2001, except for the DIBS and FIBS. Both regressed between 1999-2000. By 2001-2002, however, all banks experienced technical regression. Technical progress peaked during the 2000-2001 period with an index of 1.292 only to plunge into the deepest regression from 2001 to 2002 with an index value of only 0.826. Both the range and CV were rising throughout the study periods signaling that the banks began to push the frontier at different

paces whilst some were left behind. Although the range was the widest during 2000-2001, technical change was most volatile (21.1%) during the final period of 2001-2002.

From Table 6.13, it can be seen that most banks had technical regress on average except for DCB and SCB. SCB experienced the strongest technical progress (1.032) with DCB in second with an index value of 1.018. FCB regressed on average (0.980). Thus between 1998-2002, only DCB within the Malaysian dual banking system managed to display technical change progression on average. DIBS, FIBS and IB on the other hand regressed with mean index values of 0.984, 0.953 and 0.922 respectively. Hence, of all Islamic banking operations, FIBS still fared better than both DIBS and IB. The best banks- SCB- also had the lowest variation in their performance. Displaying a contrary trend, IB had the most volatile technical change performance.

Figure 6.10 shows all banks, with the exception of DIBS, followed the same pattern of technical change with technical change peaking during the 2000-2001 period. Figure 6.13 meanwhile traces a discernable up and down trend (akin to an inverted U shape). Generally, technical change progressed the most during the 2000-2001 period only to fall to lower levels between 2001 and 2002. Also note that almost all banks had made technical progress in 2001-2002 while all banks regressed in 2001-2002. The highest technical progress was made within the 2000-2001 period by the DCB and FCB and IB. The FCB performed better than the DCB during 1999-2000 and 2000-2001 and vice versa in 1998-1999 and 2001-2002. The DIBS meanwhile dominated Islamic banking operations in 1998-1999 and 2001-2002 while IB were superior in 1999-2000 and 2000-2001.

6.4: Comparative Efficiency and Productivity Performance between CBS and IBO: Comparing All Banking Groups

The empirical findings in relation to the separate different banking groups under CBS and IBO are outlined. It should be noted that CBS comprise of DCB and FCB while IBO are made up of DIBS, FIBS and IB. What follows are summarized excerpts derived from Section R1.

6.4.1: Summary of DEA Efficiency Performance

Within the Malaysian dual banking system, DIBS on average outperformed all other banks from 1996 to 2002, followed by FCB, FIBS, DCB and finally IB. Thus, a simple generalization of comparative efficiency performance between components of CBS and IBO cannot be reached. In terms of performance consistency across the years, DCB had the most consistent TE performance between 1996 and 2002 while FIBS had the least. Table 6.4 shows that there is actually more efficiency variation among IBO. This indicates that Islamic banking units were quite heterogeneous among one another. There was higher variation among DIBS than other IBO units in 1996 but the trend has been declining. Variation among FIBS on the other hand dominated from 1999-2001. IB meanwhile were the most heterogeneous group in 2002.

All conventional banks (DCB, FCB and SCB) tended to follow a common TE trend: decreasing in 1997-1998, recovering in 1999 and 2000, declining once more in 2001 before rising yet again in 2002. IBS operations (DIBS and FIBS) meanwhile experienced TE decline in 1997 but made a sustained increase after 1999 to dominate other banking groups by 2002. Throughout the study period, IB were the least efficient banks. Another notable feature is that IB were inclined to follow the trends of CBS.

Both DIBS and FIBS became more efficient than DCB and FCB beyond year 2000 with FIBS showing eventual dominance. In fact towards the end of the 7-year study period, FIBS were more efficient than any other banking groups. Figure 6.1 however also testifies to the efficiency volatility inherent in FIBS prior to 2000, where FIBS banks plunged from being fully efficient in 1996 to hit a bottom in 1997 before efficiencies began to make sustained strong recovery thereafter. DIBS on the other hand had more stable efficiency scores with only a shallow trough in 1998.

Tables 6.2 and Table 6.3 show that on average, SE was dominant in DIBS and FIBS while PTE was more dominant in IB. Against all Islamic banking groups,

FIBS were more scale efficient in 1996 and from 1999-2001 and more PTE efficient in 2002, DIBS were more scale efficient in 1998 and more PTE efficient in between 2000 and 2001 while IB dominated SE in 1997 and PTE in 1996-1997 and 1999.

Trends with the IB were however more or less congruent (rising and falling at almost the same time) as those of DCB and FCB. Nevertheless, it is interesting to note that while banks in general were becoming less efficient in the years leading to 1998 IB emerged to become the most efficient banks in that year. Efficiency for IB however deteriorated after 1999 even as other banks were becoming more efficient during 1999 but somehow IB managed to recover in 2002 to match DCBs' efficiency levels. On the whole, DCB, FCB and IB tended to exhibit the same trends although the timing and magnitude differed but only slightly. The highest correlation was perhaps seen in 1998 during the financial crisis when all three banks experienced a sharp rise in inefficiency. These banks made strong recovery in 2000. On the other hand, FIBS and DIBS followed yet another set of common trends although a close fit was difficult to identify due to the greater volatility of FIBS efficiency levels.

In terms of PTE, Table 6.2 highlights that conventional banking had better managerial competence compared to Islamic banking. Table 6.5 shows that IBO had more variation in PTE performance on both their 1996-2002 average and their annual averages compared to CBS banks. FIBS appeared to be the most heterogeneous, followed by the DIBS, and IB. This finding thus points out that not only do IBO banks show less consistency in their performance between 1996 and 2002 but also that the FIBS and DCB were more heterogeneous than CBS and IB throughout the study period. In fact, the FIBS and IB also exhibited less stable PTE variation measures.

Within the Malaysian dual banking system, commercial banks on average had better managerial efficiency but Islamic banking (except for IB) had better scale efficiency. Nevertheless by 2002, both DIBS and FIBS had higher PTE and SE performance than any other banks in Malaysia. In Islamic banking, FIBS

dominated DIBS and IB in SE but DIBS had higher PTE results than the DIBS and IB on average.

For the FIBS, efficiency was equally influenced by both PTE and SE. PTE however dominated in 1996-1999 and from 2001 to 2002 while SE was more influential between 1999 and 2000. Similarly, declining PTE dominated DIBS performance between 1998-1999 although SE was rising. Improving SE however managed to offset declining PTE from 2001 to 2002. Throughout the study period, both IBS operations were more scale efficient as opposed to PTE efficient. In contrast to IBS, Islamic banks had higher PTE rather than being more scale efficient. This made Islamic banks more similar to commercial banks than IBS operations.

Overall, SCB dominated PTE. However, towards the end of the study period, FIBS recorded superior PTE performance to match that of SCB in 2002. Both DIBS and FIBS also shared the best SE scores in 2002. IB remained the least efficient banks on both PTE and SE accounts

6.4.2: Summary of MPI Productivity Performance

In Table 6.9, the results show the banking industry only had a brief period of TFP growth from 1999-2000 and 2000-2001. During this time, almost all banking groups enjoyed TFP progress Only IB experienced TFP regress with a mean regress of 0.921. Except for DCB, FIBS and DIBS outperformed all other conventional banks as well as full-fledged Islamic banks. Towards the end of the study periods however, only FIBS managed to maintain TFP growth but at decreasing rates while DIBS began to show a tendency to regress. All other banks had TFP regress by 2002. Thus, IBS operations had superior productivity growth (especially FIBS) to those of conventional banks and pure IB. Nevertheless, FIBS was progressing at decreasing rates towards the latter periods while DIBS were fast slipping into TFP regress.

Between conventional banking and Islamic banking, FIBS and DIBS consistently outperformed other banking groups in TFP change, TE change and PTE change measures. FIBS also dominated SE change. Both DCB and FCB however outperformed Islamic banking operations in SE change (except for FIBS) and technical change. Overall, FIBS had the strongest performance followed by DIBS, SCB, DCB and FCB. IB meanwhile became the worst performers in terms of relative and almost all productivity measures except for SE change.

FIBS were more or less equally influenced by both PTE and SE change, DIBS by PTE and IB by SE. Thus, technical change did not make significant contributions to IBO TFP change. In fact, all IBO experienced technical regress on average between 1998 and 2002 although all IBO banking groups had technical progress between 2000-2001. Among IBO groups, DIBS had the least technical regress followed by FIBS and finally IB.

In general, all banks experienced TFP progress throughout the study period except for IB that experienced TFP regress in all but one of the study periods and thus, had the least desirable TFP change results.

6.5: Comparative Efficiency and Productivity Performance between DCB and FCB

This section looks into the comparative efficiency and productivity performance between the DCB and FCB. The section is begun by analyzing the trends for DEA relative efficiency in terms of TE, PTE and SE. It should be noted that in this section, summarized empirical findings are explained in length in Section R1 which relate to the second research question. This is because unlike Section R2 in which banks were aggregated into CBS and IBO, here it is only necessary to examine the trends between DCB and FCB.

6.5.1: Summary of DEA Efficiency Performance

With reference to Table 6.2, it is apparent that FCB (0.698) were more efficient than DCB (0.632) in terms of TE throughout 1996 to 2002. In addition, FCB also had more consistent TE performance on average with a lower CV (0.272) than DCB (0.341). Nevertheless, Table R7 illustrates that FCB were more heterogeneous among one another relative to DCB. Hence FCB had higher annual CV among individual foreign banks' TE scores for all years. Variation among FCB peaked in 1998 and 2001. In comparison, variation among DCB peaked in 2001 but with a much CV measure of 0.144.

Table 6.2 and Table 6.4 meanwhile show that FCB dominated DCB in terms of both PTE and SE. Nevertheless, FCB had comparatively higher mean PTE scores. Thus, FCB had better managerial efficiency and were operating on a more productive scale size than DCB. DRS scale size dominated commercial banks most notably in DCB where DRS were was most prevalent. Some FCB managed to achieved MPSS towards the end of the study period. IRS was reported in both 1996 and 2000 but foreign banks seemed to have exhausted these to the optimum level.

SE effects dominated TE performance for both DCB and FCB as SE scores exhibited more volatile performance across time. On average however, both DCB and FCB had higher PTE than SE scores although PTE for both banking groups were trending downwards. Nevertheless by 2002, DCB were at least as efficient as FCB in PTE. SE trends however saw deep troughs in 1998 due to the fallout of the 1997-1998 financial crisis and 2001 following the full completion of the coordinated domestic bank merger exercise. By 2002 however, the SE for DCB and FCB were similar.

Figures 6.1 to Figure 6.3 depict the trends for TE, PTE and SE for both DCB and FCB. In terms of TE, there was a deep TE contraction in 1998 followed by a recovery between 1999 and 2000. In 2001, there was "less severe" efficiency deterioration. Finally in 2002, TE for FCB largely improved as opposed to a negligible improvement for DCB. There was indeed high correlation between

the trends for both DCB and FCB. Nevertheless, FCB had been consistently more efficient than DCB.

Efficiency levels however appeared to be diverging from 2001 onwards as foreign banks improved while domestic banks stagnated. Figure 6.10 illustrates that the difference in efficiency performance between DCB and FCB peaked in 1998 and 2002 and that the gap had increased since 2000. The performance difference in 1998 was dominated by SE difference. Figure 6.10 also shows that there was a peak in PTE differential in 1999 and a combination of PTE-SE differential in 2001. The efficiency differentials in 1998 and 1999 were in favor of FCB. As for the PTE-SE difference in 2001, DCB dominated PTE while FCB dominated SE.

In all saw a combination of a PTE-SE peak. Table 6.8 shows that DCB only managed to outperform FCB in terms of TE in 1997, PTE in 1997 and 2000-2001 and SE in 1999.

6.5.2: Summary of MPI Productivity Performance

Within conventional banking, FCB on average outperformed DCB with a higher TFP change index. Specifically, FCB dominated DCB in TE change, PTE change and SE change measures but vice versa when technical change measure is considered. On average, Table 6.10 shows that FCB (1.069) had higher TE change relative to DCB (1.028). FCB also had greater TE change variability (CV of 0.268). In terms of trends, FCB experienced higher TE progress in the earliest studied 1998-1999 period and the most recent 2001-2002 period. DCB meanwhile had better performance in 1999-2000 and 2000-2001. Both DCB and FCB however regressed from 2000 to 2001.

In Table 6.11, FCB outperformed DCB although both banking groups suffered PTE regress on average. Figure 6.3 shows that FCB regressed from 1998 to 2001 but made a huge PTE progress between 2001-2002. DCB on the other hand, had been mostly regressing throughout the study periods of 1998-1999,

2000-2001 and 2001-2002 although they experienced a marked PTE progress between 1999-2000. In terms of performance consistency, FCB exhibited higher PTE change variability (0.172) relative to DCB (0.115).

Figure 6.10 highlights that both DCB and FCB shared the same SE change patterns although in general, FCB dominated DCB in SE change from 1998 to 2001 while DCB managed to catch up with FCB and outperformed FCB during the last study period of 2001-2002. Furthermore, DCB experienced the less volatility (with 16.3%) compared to FCB (17.7%).

Table 6.11 shows that from 1998 to 2002, only DCB managed to experience technical progress on average (1.018) within the Malaysian banking industry. FCB on the other hand regressed with a technical change index of 0.980. FCB nevertheless performed better than DCB during 1999-2000 and 2000-2001 and vice versa in 1998-1999 and 2001-2002.

6.6: Examining Pre- and Post-Merger Efficiency Levels and Gains

The empirical findings obtained from the DEA TE results are presented here to probe whether there is evidence to suggest that (1) acquiring banks were more efficient than target banks prior to bank mergers (2) that bank mergers initiated by BNM in 2001 led to enhanced efficiency to the merged banking entities during the post-merger period and (3) that acquiring banks maintained their pre-merger efficiency levels during the post-merger period. Table 6.14 to Table 6.16 summarize the DEA TE, PTE and SE scores for participating DCB banks involving 9 merger cases. It should be noted that there are 10 anchor DCB banking groups in Malaysia. One banking group, namely Ambank Bhd, has been excluded because the group had been internally transformed through the study period without merging with other banking institutions.

6.6.1: Examining Efficiency Levels of Acquiring and Target Banks

In analyzing the efficiency scores within the "pre-merger year" column, it is apparent that in 8 out of 9 the cases in Table 6.14, the acquiring bank were more efficient in terms of TE than the target banks one year prior to their respective mergers. Furthermore Table 6.15 shows that in all 9 cases, the acquiring banks had higher PTE levels than the target banks during the pre-merger period. However results from Table 6.16 show that only 2 of the 9 cases where the acquiring banks had higher SE than the target banks. In all the remaining 7 cases, the acquiring banks had lower SE scores than the target banks. Thus, in the case of the Malaysian banking consolidation, it has been established that the acquiring banks were more efficient than the target banks in terms of TE and PTE. However, it appears that in the majority of the cases, the acquiring banks had lower SE than the target banks.

6.6.2: Examining Post-Merger Efficiency Levels- TE

Meanwhile according to Table 6.14, in 9 out of 10 cases, bank mergers led to an increase of TE during the merger year but subsequently fell during the first post-merger period. The only exception is Case 4 where TE fell during and after the merger. In Case 1, 3, 7 and 9, TE eventually improved during the second post-merger year. In Cases 2, 5 and 6, TE continued to deteriorate. In Case 6, TE subsequently improved marginally. Thus, for a majority of DCB, bank mergers initially boosted TE during the merger year but subsequently led to growing inefficiency in the first year after the merger. However, DCB were more or less equally split as to the time taken by the merged entities to fully integrate their operations among themselves to become more efficient. 4 cases saw TE improvement beginning the second post-merger year while 3 cases show TE deterioration in the second year. In one exceptional case where there was the opportunity to observe the bank's performance beyond 2 post-merger years, it was found that TE improved in the first year, deteriorated in the second year and improved once more in the third year.

6.6.3: Examining Post-Merger Efficiency Levels- PTE and SE

With reference to Table 6.15, it was found that for 8 out of 9 cases, PTE improved during the merger year, but declined during the first post-merger year, only to increase again in the second post-merger year. The exceptional case is Case 5 where multiple mergers at different time frames led to an apparent decrease in TE during the merger year but improved beginning in the first post-merger year and eventually became fully efficient during the first, second and the third post-merger year. In terms of SE, Table 6.16 shows that in all cases SE rose during the merger year. Nevertheless in Cases 1, 3, 5 and 7, SE subsequently worsened during the first-post merger year but improved in the second year. For Cases 2 and 9, SE declined during the first and second post-merger years. For Case 4, SE worsened in the first post-merger year. There was however some delay due to the usual initial fall in efficiency and subsequent SE improvement due to the presence of multiple bank mergers that seem to have confounded the efficiency results.

6.7: Examining Transmissions of Post-Merger Efficiency Gains to the Public

Finally, this section probes the existence of transmission of efficiency gains to the public. Table 6.17 details that in 9 out of the 10 DCB cases, changes in market share of deposits rose during the first post-merger year. At the same time however, only 2 cases reported increase in TE for 2 DCB while the remaining 8 cases reported TE declines. However only Case 2 sees a positive correlation between increase in both market share of deposits and TE. During the second post-merger year however, 3 cases (Case 3, 5 and 7) reported such a relationship. As for the third post-merger year, Case 2 and 3 reported declines in both market share of deposits and TE. Thus, as to the question of whether post-merger efficiency gains are passed on to the public, our empirical findings permit no conclusive inference.

6.8 Summary

In summary this chapter reveals the results of the study; covering the general trends in relative efficiency and productivity performance of all banks in the sample and also provides an interpretation of results of the three research questions. The results on various components of Total Factor Productivity, Technical Efficiency, Scale Efficiency, Pure Technical efficiency and Technical Changes are stated and displayed in tables and figures. The related discussions are pursued in detail in the next chapter.

Figure 6.1: All Banks Technical Efficiency

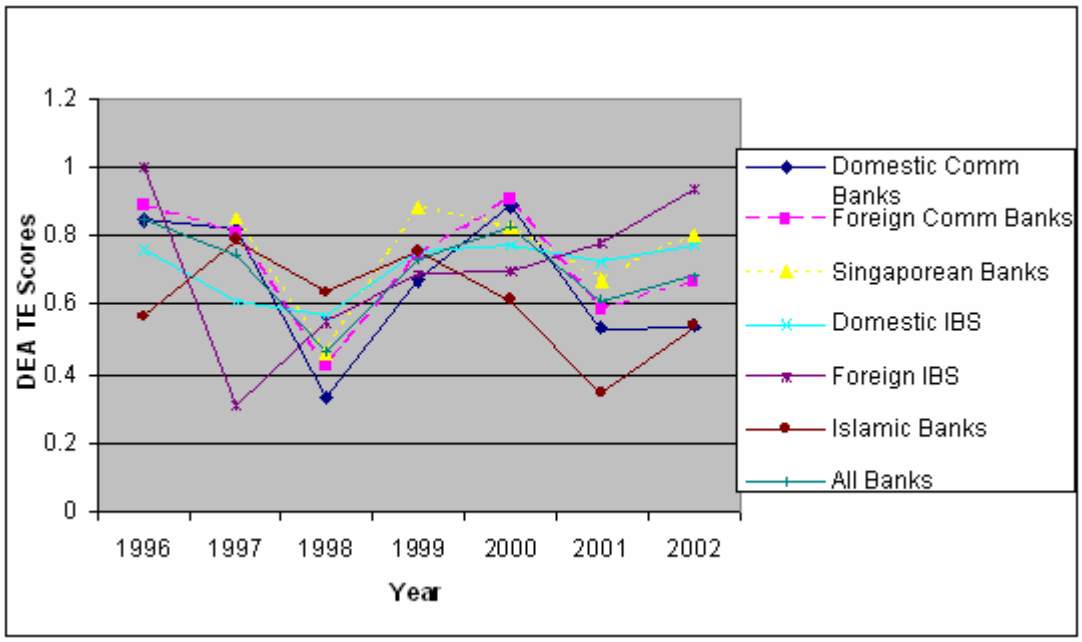


Figure 6.2: All Banks Pure Technical Efficiency

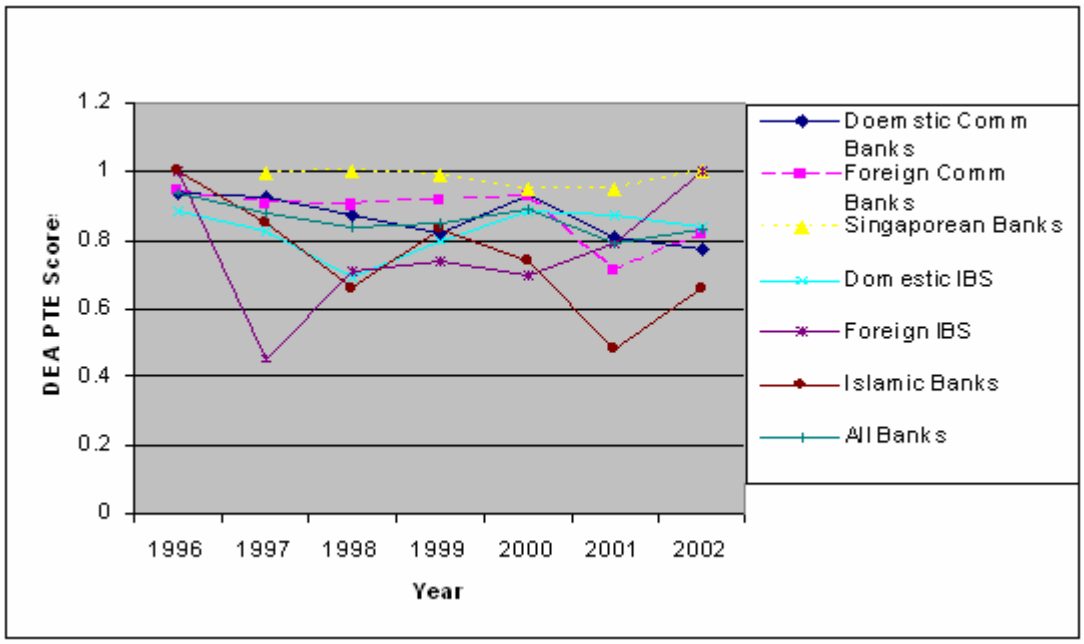


Figure 6.3: All Banks Scale Efficiency

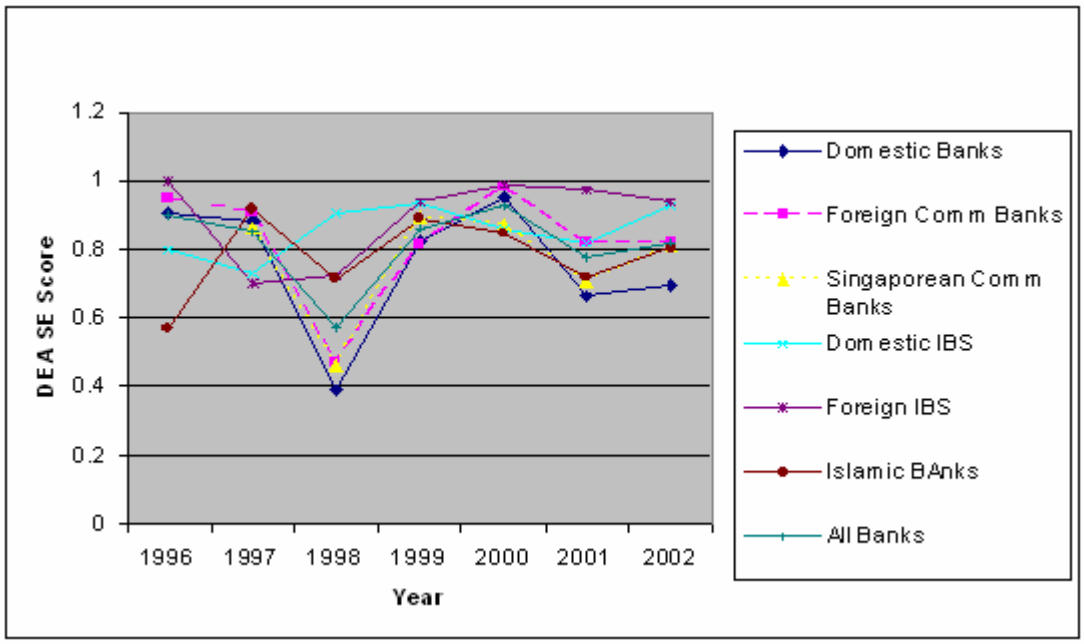


Figure 6.4: Annual Total Factor Productivity Change (by bank type)

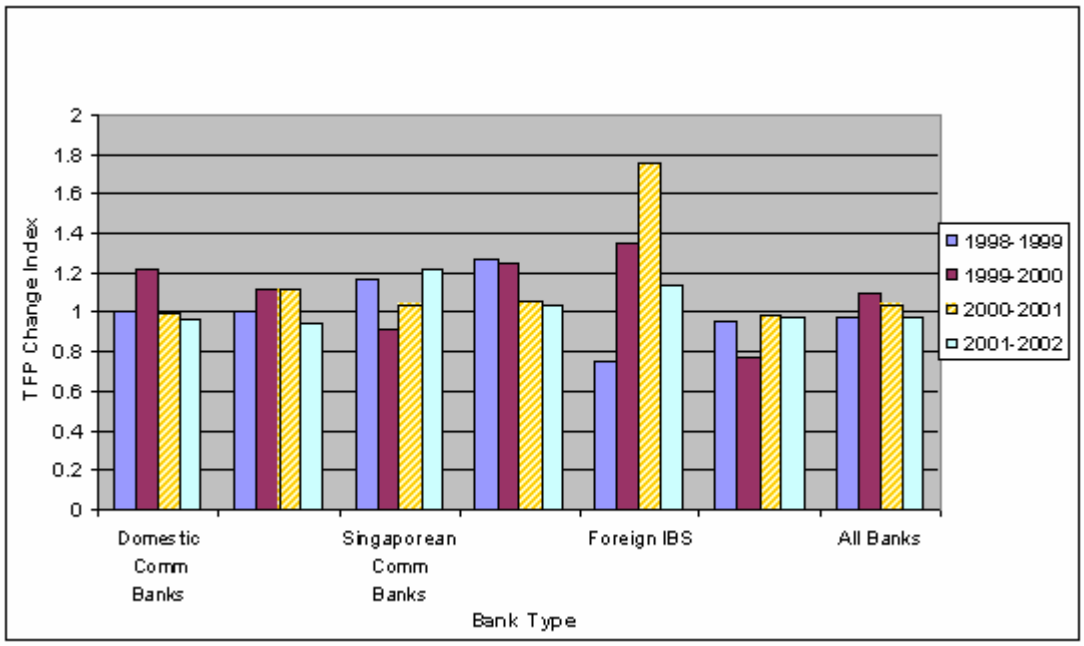


Figure 6.5: Annual Total Factor Productivity Change (by period)

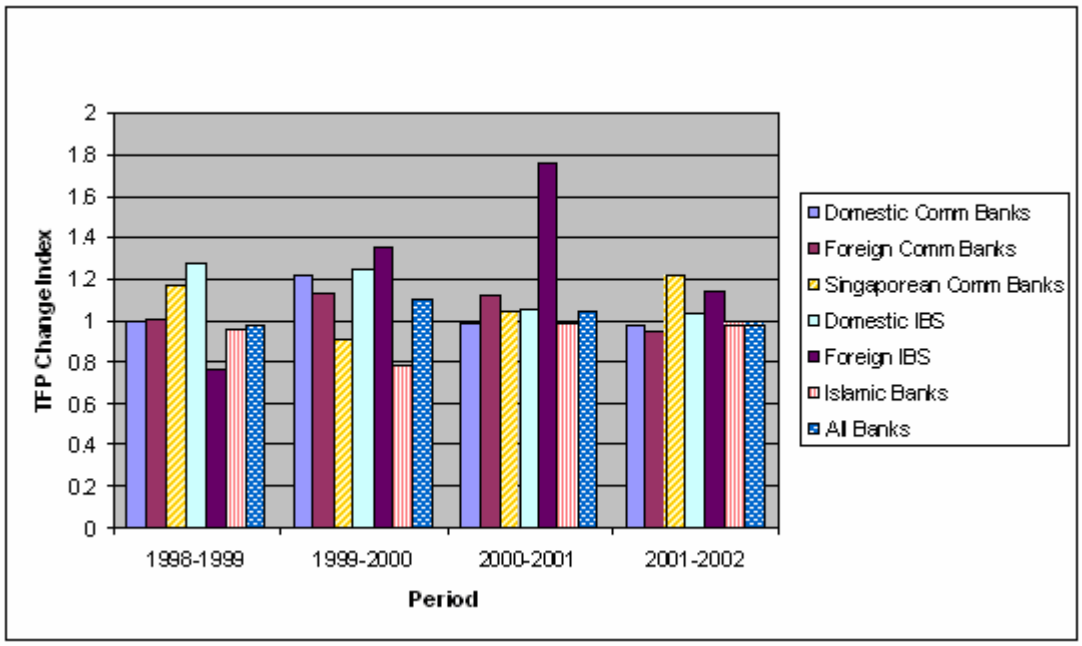


Figure 6.6: Annual Technical Change (by bank type)

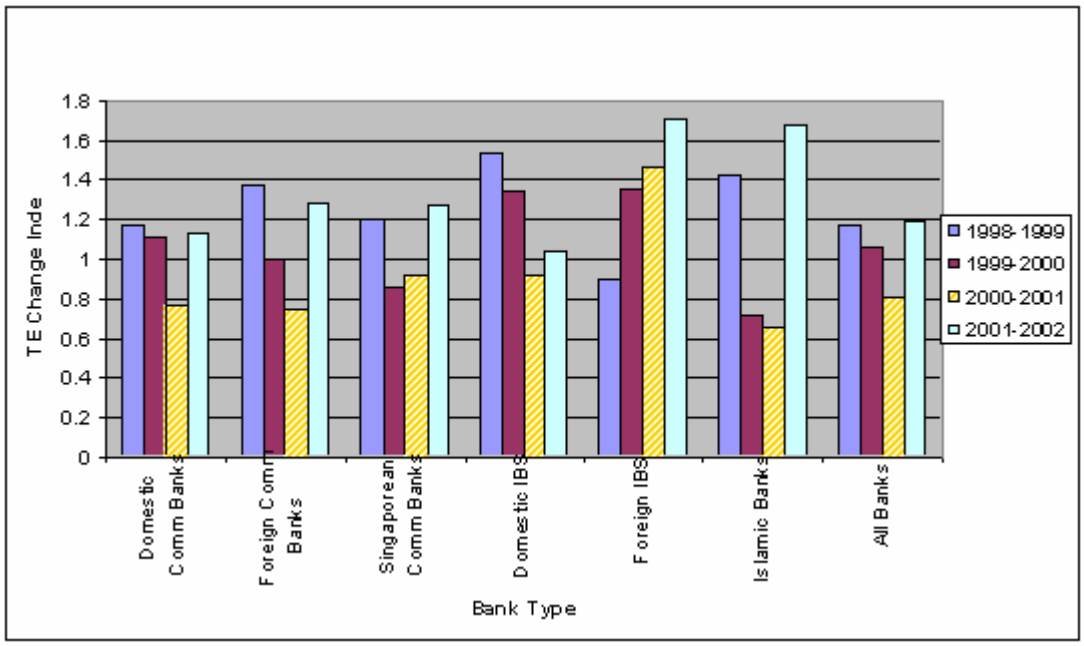


Figure 6.7: Annual Technical Change (by period)

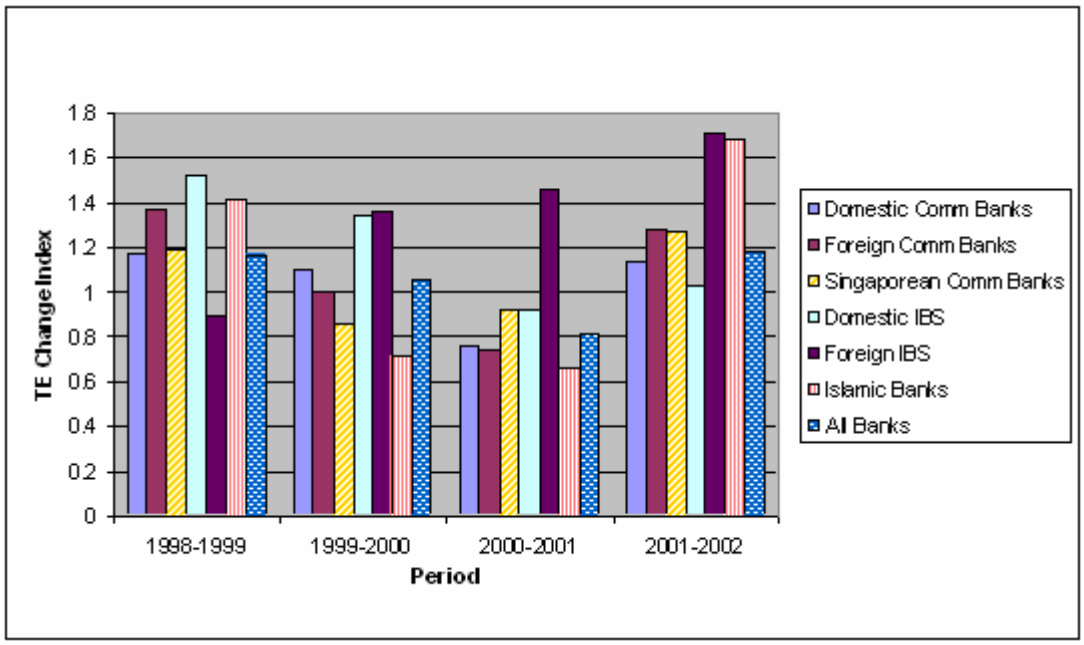


Figure 6.8: Annual Pure Technical Efficiency hange (by bank type)

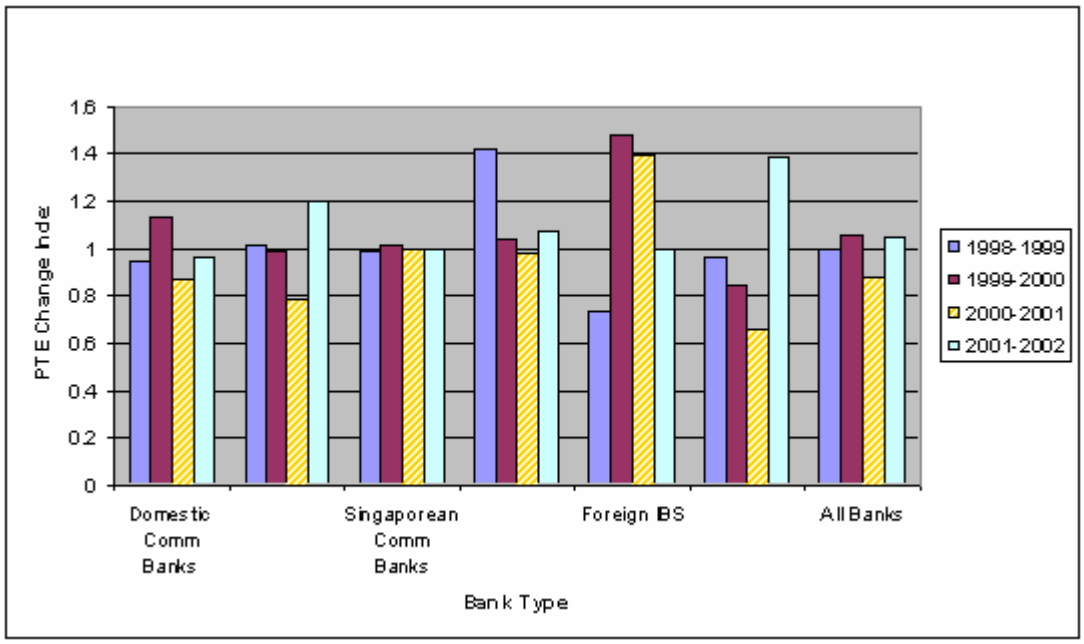


Figure 6.9: Annual Pure Technical Efficiency Change (by period)

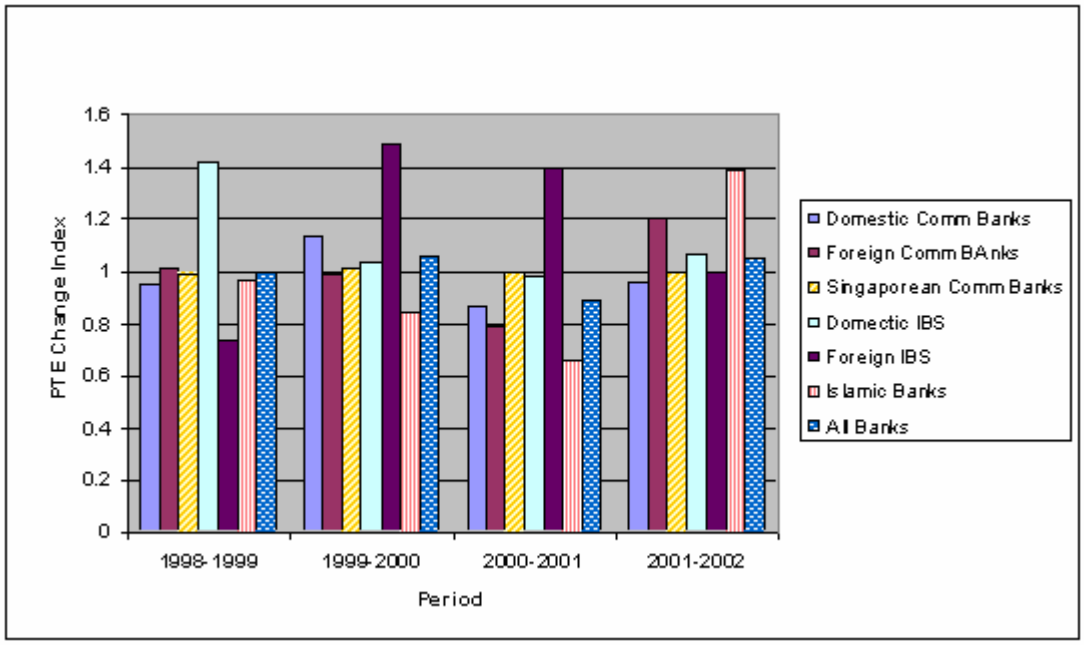


Figure 6.10: Annual Technical Change (by bank type)

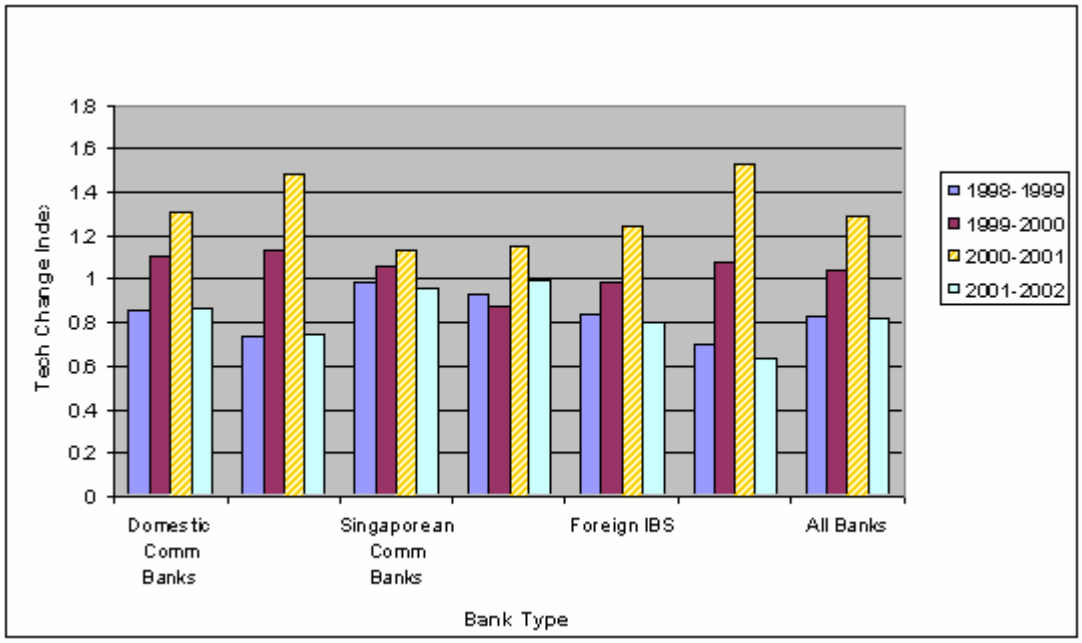


Figure 6.11: Annual Technical Change (by period)

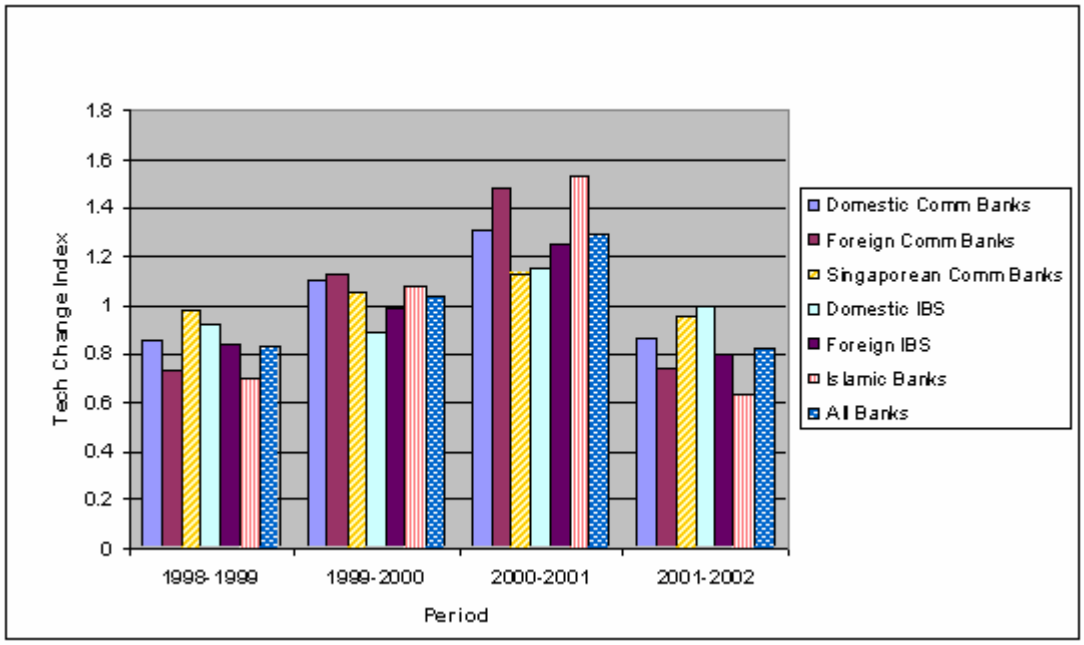


Figure 6.12: Comparative Pure Technical Performance between Coomercial Bank and Islamic Banking Operations

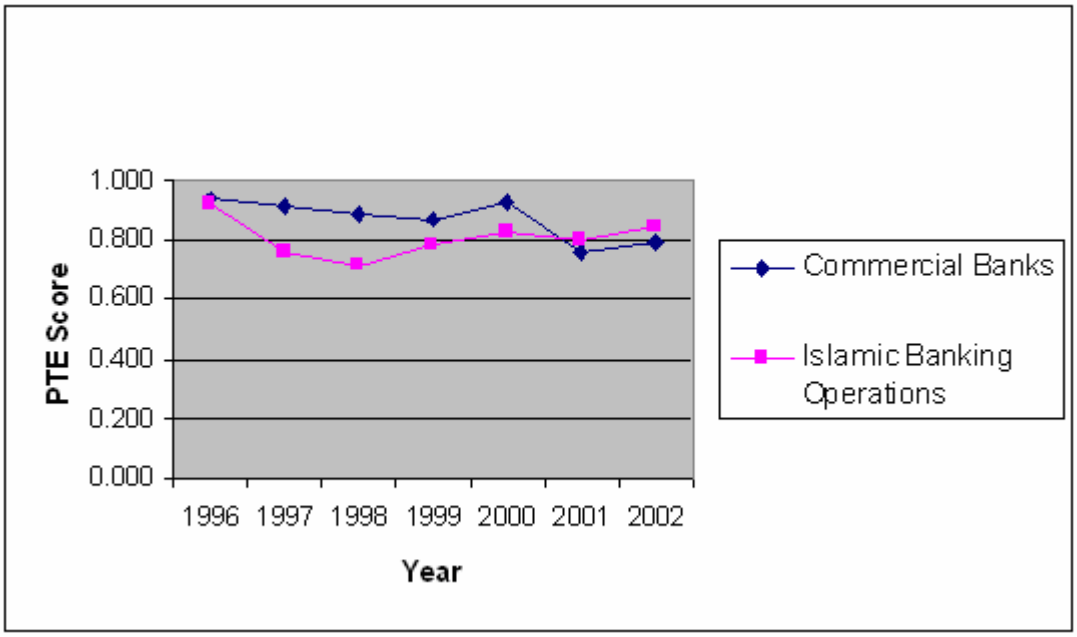
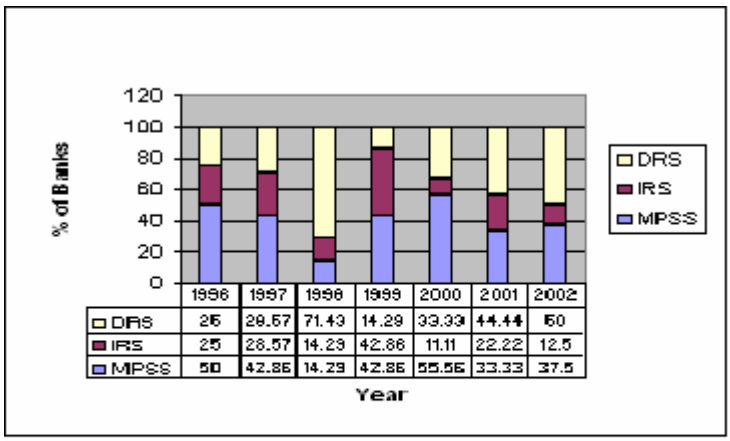
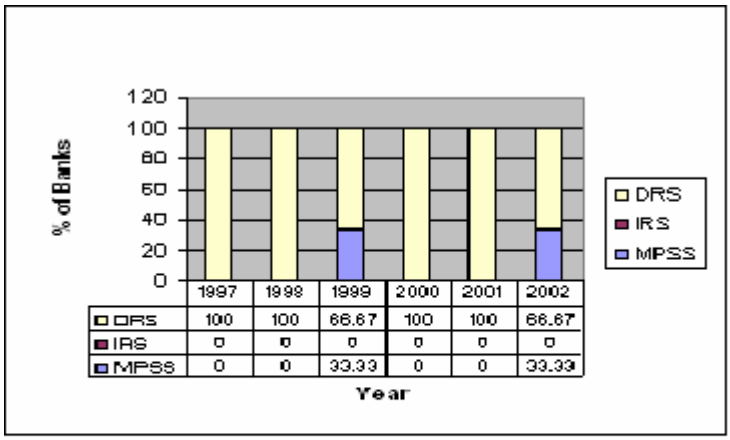


Figure 6.13: Nature of Scale Returns (Singaporean Banks)



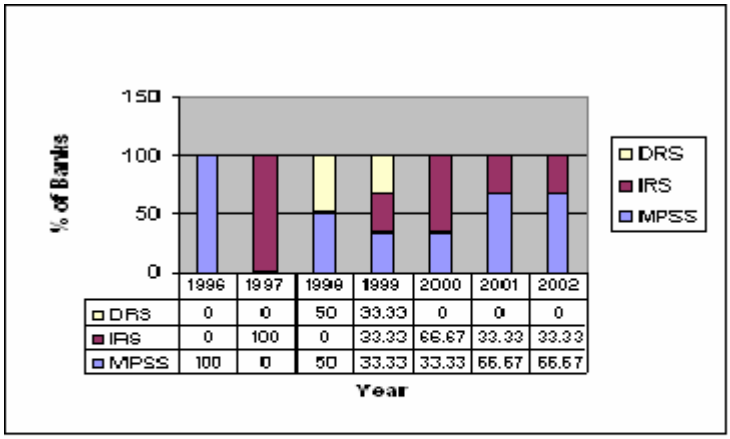
	1996	1997	1998	1999	2000	2001	2002
DRS	25	28.57	71.43	14.29	33.33	44.44	50
IRS	25	28.57	14.29	42.86	11.11	22.22	12.5
MPSS	50	42.86	14.29	42.86	55.56	33.33	37.5

Figure 6.14: Nature of Scale Returns (Foreign Islamic Banking Services)



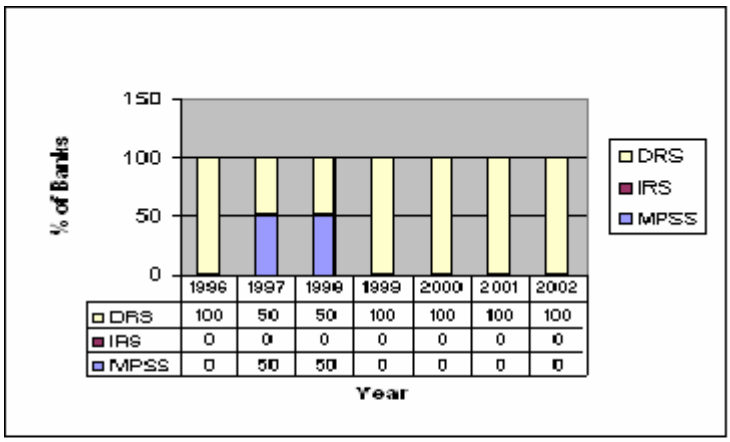
	1997	1998	1999	2000	2001	2002
DRS	100	100	66.67	100	100	66.67
IRS	0	0	0	0	0	0
MPSS	0	0	33.33	0	0	33.33

Figure 6.15: Nature of Scale Returns (Domestic Islamic Banking Services)



	1996	1997	1998	1999	2000	2001	2002
DRS	0	0	50	33.33	0	0	0
IRS	0	100	0	33.33	66.67	33.33	33.33
MPSS	100	0	50	33.33	33.33	66.67	66.67

Figure 6.16: Nature of Scale Returns (Islamic Banking Services)



	1996	1997	1998	1999	2000	2001	2002
DRS	100	50	50	100	100	100	100
IRS	0	0	0	0	0	0	0
MPSS	0	50	50	0	0	0	0

* mean values across years are geometrical means

Table 6.1: Summary of Annual DEA Technical Efficiency Means (All Banks)

BANKS	1996	1997	1998	1999	2000	2001	2002	MEAN*	SD	CV
Domestic Commercial Banks	0.849	0.817	0.335	0.675	0.891	0.535	0.536	0.632	0.215	0.341
Foreign Commercial Banks	0.889	0.814	0.424	0.741	0.909	0.583	0.67	0.698	0.19	0.272
Singaporean Commercial Banks		0.855	0.463	0.886	0.824	0.673	0.807	0.734	0.175	0.239
Domestic IBS	0.759	0.606	0.567	0.753	0.773	0.727	0.773	0.704	0.088	0.125
Foreign IBS	1	0.311	0.553	0.692	0.695	0.778	0.936	0.669	0.23	0.343
Domestic Islamic Banks	0.569	0.79	0.639	0.753	0.612	0.346	0.538	0.589	0.158	0.268
ALL BANKS										
MAX	1	1	1	1	1	1	1	0.663		
MIN	0.137	0.077	0.188	0.194	0.239	0.27	0.391	0.719		
RANGE	0.863	0.923	0.812	0.806	0.761	0.73	0.609	0.751		
MEAN	0.847	0.749	0.467	0.734	0.829	0.615	0.682	0.708		
SD	0.174	0.229	0.22	0.194	0.198	0.213	0.187	0.709		
CV	0.205	0.306	0.471	0.264	0.239	0.346	0.274	0.607		

Table 6.2: Summary of Annual DEA PTE Means (All Banks)

BANKS	1996	1997	1998	1999	2000	2001	2002	MEAN*	SD	CV
Domestic Commercial Banks	0.936	0.925	0.871	0.823	0.931	0.808	0.77	0.864	0.057	0.066
Foreign Commercial Banks	0.941	0.905	0.9	0.913	0.926	0.709	0.814	0.869	0.086	0.099
Singaporean Commercial Banks		0.993	1	0.988	0.949	0.949	1	0.98	0.025	0.025
Domestic IBS	0.881	0.824	0.694	0.799	0.884	0.873	0.84	0.825	0.073	0.089
Foreign IBS	1	0.453	0.71	0.737	0.7	0.787	1	0.748	0.176	0.235
Domestic Islamic Banks	1	0.849	0.657	0.829	0.735	0.481	0.659	0.727	0.167	0.23
ALL BANKS										
MAX	1	1	1	1	1	1	1			
MIN	0.578	0.257	0.196	0.21	0.427	0.36	0.522			
RANGE	0.422	0.743	0.804	0.79	0.573	0.64	0.478			
MEAN	0.935	0.874	0.838	0.851	0.889	0.787	0.829	0.856	0.047	0.055
SD	0.101	0.187	0.203	0.181	0.155	0.195	0.145			
CV	0.108	0.214	0.242	0.213	0.174	0.248	0.175			

Table 6.3: Summary of Annual DEA Scale Efficiency Means

BANKS	1996	1997	1998	1999	2000	2001	2002	MEAN*	SD	CV
Domestic Commercial Banks	0.908	0.884	0.389	0.824	0.956	0.665	0.697	0.733	0.196	0.267
Foreign Commercial Banks	0.948	0.903	0.47	0.813	0.983	0.82	0.822	0.804	0.169	0.211
Singaporean Commercial Banks		0.861	0.463	0.894	0.871	0.707	0.807	0.749	0.163	0.218
Domestic IBS	0.797	0.73	0.906	0.934	0.86	0.817	0.928	0.85	0.076	0.089
Foreign IBS	1	0.701	0.722	0.935	0.99	0.976	0.936	0.886	0.127	0.144
Domestic Islamic Banks	0.569	0.916	0.711	0.887	0.844	0.72	0.806	0.77	0.121	0.157
ALL BANKS										
MAX	1	1	1	1	1	1	1			
MIN	0.237	0.077	0.301	0.582	0.354	0.546	0.549			
RANGE	0.763	0.923	0.699	0.418	0.646	0.454	0.451			
MEAN	0.898	0.85	0.572	0.862	0.928	0.777	0.818	0.807	0.118	0.146
SD	0.161	0.161	0.235	0.114	0.143	0.146	0.141			
CV	0.179	0.189	0.411	0.132	0.154	0.188	0.172			

Table 6.4: Measures of TE variation (Coefficient of Variation)

BANKS	1996	1997	1998	1999	2000	2001	2002	MEAN*
Domestic Commercial Banks	0.061	0.045	0.103	0.091	0.089	0.144	0.127	0.088
Foreign Commercial Banks	0.107	0.113	0.364	0.229	0.128	0.296	0.218	0.188
Singaporean Commercial Banks	-	0.036	0.335	0.181	0.1	0.141	0.216	0.137
Domestic IBS	0.55	0.839	0.68	0.313	0.412	0.305	0.331	0.456
Foreign IBS	-	0.216	0.703	0.629	0.422	0.494	0.118	0.365
Domestic Islamic Banks	-	0.376	0.801	0.447	0.053	0.098	0.386	0.254

Table 6.5: Measure of PTE Variation (Coefficient of Variation)

BANKS	1996	1997	1998	1999	2000	2001	2002	MEAN*
Domestic Commercial Banks	0.057	0.044	0.081	0.11	0.063	0.147	0.125	0.082
Foreign Commercial Banks	0.104	0.113	0.139	0.132	0.134	0.216	0.126	0.134
Singaporean Commercial Banks	-	0.013	0	0.02	0.094	0.092	0	0
Domestic IBS	0.231	0.376	0.478	0.269	0.219	0.24	0.229	0.28
Foreign IBS	-	0.33	0.355	0.619	0.411	0.47	0	0.437
Domestic Islamic Banks	-	0.253	0.369	0.293	0.136	0.009	0.293	0.146

Table 6.6: Measures of PTE Variation (Coefficient of Variation)

BANKS	1996	1997	1998	1999	2000	2001	2002	MEAN*
Domestic Commercial Banks	0.042	0.026	0.156	0.061	0.043	0.109	0.092	0.064
Foreign Commercial Banks	0.08	0.072	0.298	0.184	0.014	0.141	0.14	0.098
Singaporean Commercial Banks	-	0.026	0.335	0.164	0.089	0.057	0.216	0.108
Domestic IBS	0.469	0.459	0.127	0.1	0.304	0.233	0.167	0.228
Foreign IBS	-	0.118	0.34	0.064	0.015	0.042	0.118	0.076
Domestic Islamic Banks	-	0.13	0.576	0.166	0.189	0.109	0.1	0.172

Table 6.7: Nature of Scale Returns

FIRM	BANK	1996	1997	1998	1999	2000	2001	2002
1	AFFIN	drs	drs	drs	drs	drs	drs	drs
2	ALLIANCE	drs	drs	drs	drs	mpss	drs	drs
3	AMBANK	drs	drs	drs	drs	drs	drs	drs
4	BCB	drs	drs	drs	drs	drs	drs	drs
5	EONBANK	drs	drs	drs	drs	irs	drs	drs
6	HONG LEONG	drs	drs	drs	drs	drs	drs	drs
7	MAYBANK	drs	drs	drs	drs	drs	drs	drs
8	PUBLIC	drs	drs	drs	drs	drs	drs	drs
9	RHB	drs	drs	drs	drs	drs	drs	drs
10	SOUTHERN	drs	drs	drs	drs	drs	drs	drs
11	ABN AMRO	irs	drs	drs	drs	mpss	drs	drs
12	BANGKOK B	-	drs	drs	drs	irs	drs	drs
13	BOAMERICA	-	drs	drs	-	-	drs	mpss
14	BOCHINA	-	-	-	-	irs	drs	drs
15	BTOKYO	drs	drs	drs	drs	drs	-	-
16	CITIBANK	drs	drs	drs	drs	mpss	drs	drs
17	DUETSCHE B	drs	drs	drs	-	-	-	-
18	HSBC	drs	drs	drs	drs	drs	drs	drs
19	OCBC	drs	drs	drs	drs	drs	drs	drs
20	STD CHARTERED	drs	drs	drs	drs	drs	mpss	drs
21	NOVA SCOTIA	drs	drs	drs	drs	-	drs	drs
22	JPMORGAN	mpss	mpss	drs	mpss	-	drs	mpss
23	UOB	mpss	drs	drs	drs	drs	drs	drs
24	DBS (S)	-	drs	drs	drs	drs	drs	mpss
25	OCBC (S)	-	drs	drs	mpss	drs	drs	drs
26	UOB (S)	-	drs	drs	drs	drs	drs	drs
27	AFFIN (IB)	-	mpss	drs	mpss	mpss	mpss	-
28	ALLIANCE (IB)	-	-	-	-	irs	irs	irs
29	AMBANK (IB)	-	-	irs	-	drs	drs	drs
30	EONBANK (IB)	-	drs	drs	irs	mpss	drs	drs
31	HONG LEONG (IB)	-	irs	-	irs	mpss	irs	mpss
32	MAYBANK (IB)	mpss	mpss	drs	mpss	mpss	drs	mpss
33	PUBLIC (IB)	mpss	mpss	mpss	mpss	drs	mpss	mpss
34	RHB (IB)	drs	drs	drs	drs	drs	drs	drs
35	SOUTHERN (IB)	irs	irs	drs	irs	mpss	mpss	drs
36	CITIBANK (IB)	mpss	-	mpss	mpss	-	-	-
37	HSBC (IB)	-	-	mpss	-	mpss	mpss	mpss
38	OCBC (IB)	-	irs	drs	drs	irs	mpss	mpss
39	STD CHARTERED (IB)	-	irs	drs	irs	irs	irs	irs
40	BIMB	drs	drs	drs	drs	drs	drs	drs
41	BMMB	-	mpss	mpss	drs	drs	drs	drs

Table 6.8: Difference in Annual Means DEA Efficiency Scores (between DCB and FCB)

	1996	1997	1998	1999	2000	2001	2002
TE	0.040	*0.003*	0.088	0.066	0.019	0.050	0.135
PTE	0.005	*0.021*	0.029	0.091	*0.005*	*0.099*	0.044
SE	0.040	0.019	0.081	*0.011*	0.027	0.154	0.124

* Numbers in italics denotes efficiency differences in favour of DCB

Table 6.9: Summary of Annual TFP Means

BANKS	1998-1999	1999-2000	2000-2001	2001-2002	MEAN	SD	CV
Domestic Commercial Banks	1.004	1.218	0.995	0.971	1.043	0.115	0.11
Foreign Commercial Banks	1.005	1.128	1.116	0.948	1.046	0.087	0.083
Singaporean Commercial Banks	1.175	0.91	1.046	1.217	1.08	0.139	0.128
Domestic IBS	1.273	1.249	1.056	1.036	1.148	0.125	0.109
Foreign IBS	0.758	1.353	1.764	1.141	1.199	0.42	0.35
Domestic Islamic Banks	0.957	0.778	0.987	0.978	0.921	0.099	0.107
ALL BANKS							
MAX	3.612	2.821	2.801	1.565			
MIN	0.341	0.587	0.606	0.374			
RANGE	3.271	2.234	2.195	1.191			
MEAN	0.976	1.098	1.042	0.981			
SD	0.529	0.411	0.405	0.238			
CV	0.542	0.375	0.389	0.242			

Table 6.10: Summary of TE Change Annual Means (All Banks)

BANKS	1998-1999	1999-2000	2000-2001	2001-2002	MEAN	SD	CV
Domestic Commercial Banks	1.178	1.102	0.761	1.132	1.028	0.191	0.185
Foreign Commercial Banks	1.377	0.997	0.744	1.279	1.069	0.286	0.268
Singaporean Commercial Banks	1.196	0.859	0.923	1.267	1.047	0.2	0.191
Domestic IBS	1.53	1.341	0.923	1.032	1.182	0.279	0.236
Foreign IBS	0.898	1.354	1.46	1.708	1.32	0.339	0.257
Domestic Islamic Banks	1.416	0.716	0.653	1.68	1.027	0.511	0.497
ALL BANKS							
MAX	5.111	1.95	2.371	2.415			
MIN	0.411	0.589	0.543	0.676			
RANGE	4.7	1.361	1.828	1.739			
MEAN	1.172	1.057	0.807	1.188			
SD	0.781	0.305	0.326	0.387			
CV	0.666	0.289	0.405	0.326			

Table 6.11: Summary of PTE Change Annual Means (All Banks)

BANKS	1998-1999	1999-2000	2000-2001	2001-2002	MEAN	SD	CV
Domestic Commercial Banks	0.948	1.132	0.867	0.958	0.972	0.112	0.115
Foreign Commercial Banks	1.011	0.992	0.787	1.201	0.987	0.169	0.172
Singaporean Commercial Banks	0.99	1.011	1	1	1	0.009	0.009
Domestic IBS	1.415	1.034	0.975	1.071	1.112	0.198	0.178
Foreign IBS	0.736	1.485	1.396	1	1.111	0.35	0.315
Domestic Islamic Banks	0.961	0.843	0.659	1.385	0.927	0.308	0.332
ALL BANKS							
MAX	3.454	1.969	1.792	2.127			
MIN	0.472	0.791	0.601	0.794			
RANGE	2.982	1.178	1.191	1.333			
MEAN	0.996	1.057	0.884	1.048			
SD	0.47	0.205	0.215	0.269			
CV	0.472	0.194	0.243	0.256			

Table 6.12: Summary of SE Change Annual Means (All Banks)

BANKS	1998-1999	1999-2000	2000-2001	2001-2002	MEAN	SD	CV
Domestic Commercial Banks	1.245	0.974	0.881	1.19	1.062	0.173	0.163
Foreign Commercial Banks	1.376	1.005	0.942	1.07	1.087	0.192	0.177
Singaporean Commercial Banks	1.209	0.85	0.923	1.267	1.047	0.206	0.197
Domestic IBS	0.919	1.305	0.938	0.959	1.019	0.184	0.18
Foreign IBS	1.128	0.874	0.936	1.708	1.12	0.38	0.339
Domestic Islamic Banks	1.493	0.844	0.991	1.187	1.103	0.281	0.254
ALL BANKS							
MIN	0.52	0.731	0.549	0.821			
MAX	1.986	1.923	1.323	2.415			
RANGE	1.466	1.192	0.774	1.594			
MEAN	1.177	1	0.912	1.134			
SD	0.294	0.233	0.132	0.279			
CV	0.25	0.233	0.144	0.246			

Table 6.13: Summary of Technological Change Annual Means (All Banks)

BANKS	1998-1999	1999-2000	2000-2001	2001-2002	MEAN	SD	CV
Domestic Commercial Banks	0.857	1.105	1.316	0.863	1.018	0.22	0.216
Foreign Commercial Banks	0.738	1.133	1.484	0.744	0.98	0.358	0.365
Singaporean Commercial Banks	0.983	1.059	1.135	0.96	1.032	0.079	0.077
Domestic IBS	0.925	0.883	1.154	0.994	0.984	0.119	0.121
Foreign IBS	0.839	0.987	1.252	0.797	0.953	0.206	0.216
Domestic Islamic Banks	0.694	1.083	1.527	0.629	0.922	0.414	0.449
ALL BANKS							
MAX	1.252	1.467	1.855	1.508			
MIN	0.616	0.587	0.629	0.472			
RANGE	0.636	0.88	1.226	1.036			
MEAN	0.833	1.038	1.292	0.826			
SD	0.136	0.167	0.23	0.211			
CV	0.163	0.16	0.178	0.256			

Table 6.14: Relative Efficiency Scores (TE) for 1 pre-merger year and 3 post-merger years

	Technical Efficiency		Pre-merger Yr	Merger Yr	Post Merger Yr1	Post Merger Yr 2	Post Merger Yr 3
Case 1	Acquiring Bank	AFFIN	0.631	0.876	0.38	0.484	n.a
	Target Bank(s)	BSNC	0.602	n.a	n.a	n.a	n.a
Case 2	Acquiring Bank	ALLIANCE	0.755	0.982	0.612	0.5	n.a
	Target Bank(s)	IBM	0.633	n.a	n.a	n.a	n.a
		SABAHB	0.634	n.a	n.a	n.a	n.a
Case 3	Acquiring Bank	BCB	0.786	0.384	0.662	0.794	0.477
	Target Bank(s)	BBMB	0.608	n.a	n.a	n.a	n.a
Case 4	Acquiring Bank	EONBANK	0.608	0.923	0.485	0.442	n.a
	Target Bank(s)	ORIENTALB	0.648	n.a	n.a	n.a	n.a
Case 5	Acquiring Bank	HONG LEONG	0.722	0.938	0.642	0.607	n.a
	Target Bank(s)	WTBB	0.601	n.a	n.a	n.a	n.a
Case 6	Acquiring Bank	MAYBANK	0.336	0.732	0.912	0.566	0.602
	Target Bank(s)	PABB	0.339	0.525	0.849	n.a	n.a
		TPBB	0.305	n.a	n.a	n.a	n.a
Case 7	Acquiring Bank	PUBLIC	0.672	0.833	0.494	0.599	n.a
	Target Bank(s)	HHB	0.656	n.a	n.a	n.a	n.a
Case 8	Acquiring Bank	RHB	0.539	0.571	n.a	n.a	n.a
	Target Bank(s)	BUB	0.582	n.a	n.a	n.a	n.a
Case 9	Acquiring Bank	SOUTHERN	0.728	0.91	0.57	0.593	n.a
	Target Bank(s)	BHL	0.688	n.a	n.a	n.a	n.a

Table 6.15: Relative PTE Scores for 1 pre-merger year and 3 post-merger years

	Pure Technical Efficiency		Pre-merger Yr	Merger Yr	Post Merger Yr1	Post Merger Yr 2	Post Merger Yr 3
Case 1	Acquiring Bank	AFFIN	0.805	0.908	0.571	0.721	n.a
	Target Bank(s)	BSNC	0.678	n.a	n.a	n.a	n.a
Case 2	Acquiring Bank	ALLIANCE	0.908	1	0.874	0.769	n.a
	Target Bank(s)	IBM	0.67	n.a	n.a	n.a	n.a
		SABAHB	0.705	n.a	n.a	n.a	n.a
Case 3	Acquiring Bank	BCB	0.931	0.854	0.908	0.814	0.803
	Target Bank(s)	BBMB	0.712	n.a	n.a	n.a	n.a
Case 4	Acquiring Bank	EONBANK	0.705	0.946	0.703	0.682	n.a
	Target Bank(s)	ORIENTALB	0.683	n.a	n.a	n.a	n.a
Case 5	Acquiring Bank	HONG LEONG	0.831	0.979	0.878	0.759	n.a
	Target Bank(s)	WTBB	0.615	n.a	n.a	n.a	n.a
Case 6	Acquiring Bank	MAYBANK	1	0.978	1	1	1
	Target Bank(s)	PABB	0.782	0.572	0.905	n.a	n.a
		TPBB	0.81	n.a	n.a	n.a	n.a
Case 7	Acquiring Bank	PUBLIC	0.813	0.894	0.786	0.772	n.a
	Target Bank(s)	HHB	0.882	n.a	n.a	n.a	n.a
Case 8	Acquiring Bank	RHB	0.888	0.829	n.a	n.a	n.a
	Target Bank(s)	BUB	0.741	n.a	n.a	n.a	n.a
Case 9	Acquiring Bank	SOUTHERN	0.926	0.93	0.731	0.767	n.a
	Target Bank(s)	BHL	0.848	n.a	n.a	n.a	n.a

Table 6.16: Relative SE Scores for 1 pre-merger year and 3 post-merger years

	Scale Efficiency SE		Pre-merger Yr	Merger Yr	Post Merger Yr1	Post Merger Yr 2	Post Merger Yr 3
Case 1	Acquiring Bank	AFFIN	0.784	0.964	0.666	0.671	n.a
	Target Bank(s)	BSNC	0.887	n.a	n.a	n.a	n.a
Case 2	Acquiring Bank	ALLIANCE	0.831	0.982	0.701	0.651	n.a
	Target Bank(s)	IBM	0.946	n.a	n.a	n.a	n.a
		SABAHB	0.899	n.a	n.a	n.a	n.a
Case 3	Acquiring Bank	BCB	0.846	0.9	0.562	0.69	n.a
	Target Bank(s)	BBMB	0.854	n.a	n.a	n.a	n.a
Case 4	Acquiring Bank	EONBANK	0.988	0.69	0.648	n.a	n.a
	Target Bank(s)	ORIENTALB	0.948	n.a	n.a	n.a	n.a
Case 5	Acquiring Bank	HONG LEONG	0.868	0.958	0.731	0.799	n.a
	Target Bank(s)	WTBB	0.977	n.a	n.a	n.a	n.a
Case 6	Acquiring Bank	MAYBANK	0.336	0.749	0.912	0.566	0.602
	Target Bank(s)	PABB	0.433	0.917	0.938	n.a	n.a
		TPBB	0.377	n.a	n.a	n.a	n.a
Case 7	Acquiring Bank	PUBLIC	0.827	0.932	0.629	0.776	n.a
	Target Bank(s)	HHB	0.744	n.a	n.a	n.a	n.a
Case 8	Acquiring Bank	RHB	0.607	0.689	n.a	n.a	n.a
	Target Bank(s)	BUB	0.785	n.a	n.a	n.a	n.a
Case 9	Acquiring Bank	SOUTHERN	0.785	0.978	0.779	0.772	n.a
	Target Bank(s)	BHL	0.812	n.a	n.a	n.a	n.a

Table 6.17: Change in Relative Efficiency Scores (TE) and Market Share of Deposits in the 3 years following merger.

	DCB	Period	Market Share of Deposits	Change in Market Share of Deposits	Change in TE for Merged Banks
Case 1	AFFIN	During year of merger	2.05%		
		During Post-Merger Year 1	2.50%	22.02%	-36.53%
		During Post-Merger Year 2	2.43%	-3.14%	29.74%
		During Post-Merger Year 3	Nil	Nil	Nil
Case 2	ALLIANCE	During year of merger	1.04%		
		During Post-Merger Year 1	1.92%	83.83%	23.76%
		During Post-Merger Year 2	1.97%	2.64%	-5.60%
		During Post-Merger Year 3	1.93%	-2.26%	-3.18%
Case 3	BCB	During year of merger	2.62%		
		During Post-Merger Year 1	7.10%	171.22%	-27.50%
		During Post-Merger Year 2	7.37%	3.76%	13.79%
		During Post-Merger Year 3	7.06%	-4.17%	-11.64%
Case 4	EONBANK	During year of merger	0.82%		
		During Post-Merger Year 1	1.67%	102.58%	-21.69%
		During Post-Merger Year 2	1.65%	-0.77%	4.19%
		During Post-Merger Year 3	Nil	Nil	Nil
Case 5	HONG LEONG	During year of merger	2.42%		
		During Post-Merger Year 1	2.86%	18.13%	-3.60%
		During Post-Merger Year 2	3.03%	5.88%	3.52%
		During Post-Merger Year 3	Nil	Nil	Nil
Case 6	MAYBANK	During year of merger	10.29%		
		During Post-Merger Year 1	12.94%	25.71%	-11.34%
		During Post-Merger Year 2	12.93%	-0.08%	9.51%
		During Post-Merger Year 3	Nil	Nil	Nil
Case 7	PUBLIC	During year of merger	4.08%		
		During Post-Merger Year 1	4.97%	21.94%	-13.62%
		During Post-Merger Year 2	5.53%	11.18%	18.15%
		During Post-Merger Year 3	Nil	Nil	Nil
Case 8	RHB	During year of merger	5.64%		
		During Post-Merger Year 1	5.42%	-3.90%	10.33%
		During Post-Merger Year 2	Nil	Nil	Nil
		During Post-Merger Year 3	Nil	Nil	Nil
Case 9	SOUTHERN	During year of merger	1.92%		
		During Post-Merger Year 1	1.97%	2.64%	-6.03%
		During Post-Merger Year 2	1.93%	-2.26%	-1.61%
		During Post-Merger Year 3	Nil	Nil	Nil

CHAPTER 7:
DISCUSSION

7.1: The Comparative Productivity Performance between CBS and IBO.

Research Question 1: ***What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?***

In response to the first research question, the results from the previous Chapter illustrate that within the dual banking system environment in Malaysia, Islamic banking operations (IBO) had outperformed conventional banking (CBS) throughout the study period 1996-2002. Specifically, the study found that:

7.1.1: Discussion on Research Question 1, Finding 1

7.1.1.1: Discussion 1: The growth of Islamic banking

Research Question 1:

What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?

Research Question 1, Important Finding 1

Since the 1997-1998 financial crisis, Islamic banking enjoyed a sudden surge of efficiency and productivity growth. The year 1998 marked the rise of Islamic banking performance. Subsequently, DIBS evolved to become the most efficient banks on average followed closely by FIBS. Both FIBS and DIBS eventually progressed to record the highest PTE, SE, TFP change, TE change and PTE change by 2002 relative to conventional banking. In addition, FIBS also dominated others in SE change. Furthermore, IBO tend to operate at a more efficient scale size with a majority of them attaining MPSS. Overall, PTE change and SE change were the highest for IBO although SE change was slightly

dominant between the two. Nevertheless, all IBO experienced technical regress on average. Thus, IBO were better in improving managerial efficiency and realizing scale economies than were the CBS but they were not as innovative as the CBS.

Discussion 1 on Research Question 1, Important Finding 1

7.1.1.1: The growth of Islamic banking

The rise of Islamic banking in 1998 was largely attributed to the 1997-1998 financial crisis. During the pre-crisis period, Islamic banking generally faced a lack of acceptance amongst savers despite the introduction of the Interest Free Banking Scheme back in 1993 and a period of sustained and rapid economic development. With the participation of 25 commercial banks, 21 finance companies and 1 Islamic bank, the Islamic banking sector expanded in 1996 with higher deposits, a broader financing base and greater product variety but the share of deposits and financing was very small in the context of the total financial system (BNM, 1996). Financing meanwhile was heavily exposed to the property sector, where the majority of funds were extended to finance residential properties (BNM, 1997).

The onset of the 1997-1998 financial crisis brought a change in fortunes for Islamic banking in Malaysia. In 1997 and 1998, Islamic demand deposits suddenly gained popularity due to the migration of deposits from conventional banking to Islamic banking. This was largely because of the better investment deposit rates on outstanding balances available to depositors as deposit interest rates fell as the BNM pursued easy monetary policy during the latter half of 1998 to counter the contraction of the domestic economy (BNM, 1998). The growth of the sector was timely as the sector had already received a boost in 1996 when BNM required banks to disclose their Islamic banking operations and allowed eligible banks to establish full-fledged Islamic banking branches rather than through Islamic banking “windows” to encourage banks to focus more resources towards developing Islamic banking in Malaysia (BNM, 1996).

These empirical findings thus are consistent with the theories presented by Erol and El Bdor (1989), Haron et al. (1994), and Gerrard and Cunningham (1997).Their results show that religion is not necessarily the overriding factor leading to the public embracement of Islamic banking but rather circumstances where there is the expectation of higher returns on deposits or better terms than might be available from the conventional banks. In fact, the religious and moral appeal of Islamic banking did very little to contribute to the growth of Islamic banking in Malaysia prior to 1998. This argument is significant considering that Islamic banking in Malaysia has relied heavily on the public awareness among its majority Muslim population about the unlawfulness of interest to mobilize deposits since March 1983 when the first Islamic bank, the Bank Islam Malaysia Bhd (BIMB) was first incorporated.

Levis and Algaoud (2001) maintain that the most critical factors to sustaining growth in Islamic banking are (1) the ability to provide modern banking facilities supported by the latest technological advancements and (2) the ability to offer rates of return comparable to those received by depositors in conventional banks. It is apparent in the results, at least during the early growth years of Islamic banking between 1996 and 1998, that the second factor appears to be dominant. According to the author's the Malaysian experience appeared to deviate from the religious underpinnings claimed by Islamic banking proponents that require the business community to place first emphasis on contribution towards the larger economic development and more equitable distribution of income and wealth over the institution of individual economic profits. Nevertheless, such a strong inference must somehow be counter-balanced with the fact that Islamic banking in 1998 was also buttressed by strong interest among Malaysia's non-Muslims whose prime motives were to earn generally higher profits in Islamic banking compared to conventional banks.

Another interesting development, that highlights the prevalence of economic profit motives among Islamic banking customers, has been the fact that although very short-term investment deposits constituted the largest amount of Islamic banking fund sources throughout the formative years, it is savings accounts that have had the largest number of depositors (Levis and Algaoud,

2001). The largest contributors to longer-term investment accounts on the other hand, have primarily been the Malaysian government and 5 other government institutions (Lewis and Algaoud, 2001). Another factor to consider is that the principal reason for the popularity of savings accounts is that IBO has chosen to distribute a return on savings accounts although the contract from them does not guarantee the rate and the banks' continued ability/willingness to do so. Thus, the IBOs had resorted to incentive mechanisms that were akin to paying interest to garner deposits and gain a competitive edge over conventional banks. In summary, these findings further lend credence to the notion that participation in Islamic banking has been primarily motivated by its profitability appeal and on the grounds of ethical banking or the unlawfulness of paying and receiving interest.

Nevertheless, the financing expansion was however small and pale compared to the deposit growth and was largely set aside to finance investments in residential properties within the broad property sector. This is because growth in funds demand was mostly restricted towards residential property financing due to the fixed rate nature of the Bai Bithaman Ajil facility/service of Islamic banking (BNM, 1998). Such a facility provided households and businesses with opportunities to refinance their loans to lock in financing rates. As a result, financing income rose significantly in 1998 for Islamic banking institutions even as interest revenues were depressed in conventional banking.

This asset-liability imbalance highlights one of the most critical issues in Islamic banking in mixed systems during the formative years. Levis and Algaoud (2001) have already observed in Section 1 that while it is relatively easy to place and accept interest-free deposits within the financial system, it has been more difficult to implement PLS financing assets. The result is that at present, the demand and supply for Islamic deposits and transactions far outstrips the supply of suitable financing/investment avenues, creating an imbalance between the deposit/liability side and financing/asset side of the IBO. Some of the major factors that contributed to this imbalance can be explained by the

unique risks inherent in Islamic banking that have been discussed at length in Chapter 1. They include the heightened risks to both the IBO and depositors as a result of: (1) equity funding as opposed to debt financing, (2) the problem of adverse selection and moral hazard arising from financing contracts that are unable to protect the IBO from information asymmetries as opposed to debt contracts, and (3) the problem of commodity and interest rate risks faced by the IBO when extending fixed-rate Islamic financing contracts.

The problems above also reflect the reasons why the public tend to place their deposits in both savings and investment accounts over very short-term maturities. As expounded in Chapter 1, depositors in investment accounts generally face greater risks than a usual shareholder does. This is because Islamic banking does not entitle them to voting rights, regular receipts of information pertaining to the project's or company's management and the ability to buy or sell their shares/interests in a company or project. In response depositors usually opt (1) for shorter term investments to reduce their risks and/or (2) exercise their "shareholders' activism" on the IBO by placing greater and more frequent monitoring of IBO investments although contractual provisions usually do not entitle depositors to meddle with the IBO's investment policies (unless under the musyaraka investment mode that are longer-term in nature). The second factor also led to the banks' refusal to invest in private projects that entail longer-term and higher risks. This is perhaps the most cited reason why the IBO generally have excessive liquidity due not to the shortage of investment channels but the unfavorable trade-off banks faced that created a shortage of "suitable" investment opportunities.

Meanwhile the inability of banks to guarantee certain rates of return on savings accounts prompted depositors who migrated from conventional banks in search of higher rates of return to concentrate over the short-term maturity span to minimize risks.

Another distinctive feature of Islamic bank financing in Malaysia has been the significant political influence over the IBO operations and the eventual rates of return on investments, especially when considering the two Islamic banks that leveraged heavily on governmental assistance to establish their presence. As noted in Section 1, the ability of the IBOs to attract funds and expand their assets owed much of their success to the Islamisation programs initiated by many Muslim country governments. Thus, governmental decisions have significant bearings on the operations of IBOs since it is relatively easier for the government to secure financing from IBOs to fund public projects/expenditures that are deemed as ethical and socially desirable. Within the Malaysian experience, although the prevalence of investments in residential properties on the financing side of banks' balance sheets can be attributed to the avoidance of adverse selection risks by banks (this is because exposure in residential properties is considered to be less risky compared to exposures to finance production of industries), the trend appears to be more driven by the government emphasis and directives to enhance funding towards financing residential properties to cushion the decline of the broad property sector of residential properties following the 1997-1998 financial crisis.

In contrast, there was a significant contraction in interest income and increase in interest expense in conventional commercial bank operations that led to a sharp decline in efficiency in 1998 as opposed to the increased efficiency in Islamic banking. Inefficiencies were due to decline in interest income that was attributed to (1) rising NPLs, (2) negative loan growth and (3) higher loan loss provisions. Loan loss provisions and interest in suspense in fact rose some 208% in 1998 (BNM, 1998). These were further augmented by the regulatory adoption of more stringent provisioning requirements under the recently revised Guideline on the Suspension of Interest on Non-performing Loans and Provisions for Bad and Doubtful Debts that shortened the period during which banking institutions were required to make loan provisions for doubtful debts. In an environment where interest rates were high whilst economic progress was contractionary, NPLs rose sharply in 1998, especially when the new guidelines required that a 3-month NPL classification be made in place of the usual 6-

month classification. Furthermore, individual banks faced with severe liquidity constraints bid up interest rates on deposits to a level that would not justify returns on investments for viable business. These resulted in heightened interest expenses and as interest income declined at the same time, conventional commercial banks grew increasingly inefficient.

Islamic banking meanwhile continued to enjoy rapid asset and deposit expansion in 1999 as a result of spillover effects from the improving economy. In the same year, Islamic banking also recorded impressive profitability and efficiency increase largely due to higher financing income and lower financing loss provision expenses as financing write-backs and recoveries increased. During 1999, the Islamic banking sector was further enlarged following the establishment of the second Islamic bank, Bank Muamalat Malaysia. Islamic banking operations by DIBS meanwhile also received a boost when BNM allowed DIBS to accept conventional deposit placements to facilitate the withdrawal of conventional deposits and to receive payments for conventional loans from customers of conventional banking branches (BNM, 1999). This allowed customers of the same bank to perform their banking at all branches[27].

Since 1999, The Islamic banking sector continued to record robust growth in financing and non-financing income in line with the picking up of the domestic economy as it recovered from the financial crisis. With the commercial bank merger exercise initiated in 1999 in place, the number of market/institutional participants were soon reduced to 2 Islamic banks and 13 IBS operational units. In March 2001, the BNM launched the Financial Sector Masterplan, where the BNM committed itself to assist industry to achieve the targeted market share of 20% of total banking assets by 2010. Some of the significant measures taken by the BNM during the study period include:

[27] The chief requirement to do so however was that the bank needs to attain at least 5% market share in terms of deposits and financing. Although BNM had chosen to defer the compliance to end of 2000, all DIBS fulfilled this pre requisite.

1. Allowing Islamic banking operation institutions to offer products that were based on floating rates and Islamic leasing facilities to reduce the risk of asset-liability mis-matching and to stimulate product/service innovation within industry.
2. The setting up of a standard framework to ensure standardization of rate determination, specification, maturity structure and industry practice to enable institutions to better adapt and adjust to meet changing needs of bank customers that are becoming increasingly differentiated.
3. Promotion of the consolidation of the IBS with their respective banking groups to generate scale economies and cost effectiveness.
4. Establishment of the Islamic Interbank Money Market (IIMM) to facilitate the provision of funds for banks to meet their liquidity requirements. The absence of an interbank market for Islamic banking is often cited as a primary factor that impedes the growth of Islamic banking elsewhere.
5. Establishment of the Islamic Financial Services Board (IFSB) to better adapt and harmonize standards for Islamic financial products. These gave a much needed boost towards attracting depositors and borrowers to the industry.

7.1.1.2: Discussion 2 on Research Question 1, Important finding 1

The Superiority of Islamic Banking Schemes Operations (IBS) over Full Fledged Islamic Banks (IB)

Research Question 1:

What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?

Research Question 1, Important Finding 1

Since the 1997-1998 financial crisis, Islamic banking enjoyed a sudden surge of efficiency and productivity growth. The year 1998 marked the rise of Islamic banking performance. Subsequently, DIBS evolved to become the most efficient banks on average followed closely by FIBS. Both FIBS and DIBS eventually progressed to record the highest PTE, SE, TFP change, TE change and PTE

change by 2002 relative to conventional banking. In addition, FIBS also dominated others in SE change. Furthermore, IBO tend to operate at a more efficient scale size with a majority of them attaining MPSS. Overall, PTE change and SE change were the highest for IBO although SE change was slightly dominant between the two. Nevertheless, all IBO experienced technical regress on average. Thus, IBO were better in improving managerial efficiency and realizing scale economies than were the CBS but they were not as innovative as the CBS.

Discussion 2 on Research Question 1, Important finding 1

Against this backdrop, the total of banking assets and deposits continued to grow. These regulatory inducements however benefited the IBS operators more than Islamic banks. By 2000, the IBS operations had managed to control the largest market segment with a total market share of 42.7% (BNM, 2000). This trend reflected the increased confidence and acceptance of the general public towards Islamic banking's ability to generate comparable rates of return for investors. Following this, both financing and non-financing incomes for FIBS and DIBS had begun to increase at a faster rate than IB beyond 2000. Thus, the trends indicated a greater efficiency improvement for the IBS operations relative to as well as at the expense of IB. However, the streamlining process by the DIBS operations led to large gains in technological change for domestic institutions but a large dip in SE in 2001 with only a negligible decline in PTE. The significant deterioration in SE was largely caused by the sudden increase in branch, bank staff and ATM networks that resulted from the mergers.

The merged banking entities however had fully succeeded in integrating their operations by rationalizing common organizational functions and downsizing branch, banking staff and ATM networks by the end of 2001. Thus in 2002, the DIBS regained some measures of SE by large degree. By the end of 2002, both the DIBS and the FIBS were the most efficient in terms of SE although managerial inefficiencies continued to rise slightly for the DIBS. Nevertheless, the spectacular gains in PTE and SE for both the DIBS and the FIBS relative to

all other banks that had taken place since 1998, ensured that both IBS operations dominated TFP change, PTE change and SE change.

7.1.2 Discussion Research Question 1 Finding 2

Research Question 1:

What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?

Finding 2

Although DIBS became the most efficient banks on average for the period from 1996 to 2002, FIBS nevertheless managed to catch up and even surpassed DIBS beginning in TE performance with effect from the year 2000. These efficiency performance improvements were largely attributed to greater SE scores relative to FIBS beginning 1999. DIBS however continued to dominate FIBS in PTE until 2001. By 2002, FIBS not only had the best TE and SE score of all banks, but FIBS were also fully PTE efficient. Thus it is not surprising that FIBS began to grow more efficient at a faster rate than any other banking groups, and consistently outperformed others in TFP change, TE change, PTE change and SE change measures. The efficiency of FIBS was heavily influenced by both managerial efficiency (PTE) and scale efficiency (SE) during this period although PTE effects dominated SE effects slightly. Meanwhile DIBS were subjected more to PTE rather than SE effects.

Discussion on Research Question 1 Finding 2

Within Islamic banking, there was a noted difference in productivity performance between FIBS and DIBS. First and foremost the FIBS operations were more scale efficient than the DIBS especially after 1998. The aftermath of the financial crisis left many DCB banks vulnerable to scale inefficiencies in the face of the rising costs of bank staff and overheads in the maintenance of overextended networks of branches. At the same time, the crisis prompted the

BNM to take correctional measures that saw mergers among the DCB and the reintegration of finance companies with their parent DCB banks.

The DCB bank merger exercise initiated in 2000 and completed in 2001 had significant spill-over effects on the DIBS operations since the DCB are often the parent bank of the DIBS operations. Furthermore, the DIBS often share the same branch and ATM network as well as banking staff with their parent DCB. The sudden enlargement of size following the bank mergers in 2000 eventually resulted in increased scale inefficiency among the DIBS. The FIBS on the other hand were operated by FCB that were in turn restricted by regulation in terms of enlarging their branch and ATM network. Thus, the FIBS often had to rely on their marketing and service quality expertise in marketing themselves to the public. As the assets, deposits and financing income increased while their operation scale remained largely unchanged, the FIBS experienced greater SE. In fact as Table 6.7 highlights, the FIBS largely operated under IRS or MPSS after 1999. Thus, Table 6.3 highlights that beginning in 1999, the FIBS became more scale efficient than the DIBS and the difference peaked in 2001 following the completion of the DCB mergers and the beginning of the post-merger integration process at the end of 2000. It is also apparent that by 2002, the SE difference had started to narrow considerably following a surge in scale efficiency among the DIBS. This signals that the merged domestic banking entities were successful in integrating their internal functions. Therefore, the FIBS advantage in SE is expected to erode further as domestic banks continue to consolidate.

Meanwhile the DIBS dominance in PTE eventually gave way in the beginning of 2000. By 2002 the FIBS became more PTE efficient than the DIBS. The sustained but gradual PTE deterioration in the DIBS was a result of the DIBS reliance on funds in the form of short term deposits on which rates of return are paid rather than investment accounts and the lack of profitable financing avenues.

Investment deposits in the DIBS tended to concentrate too much on a very short-term maturity horizon between 1 to 3 months (BNM 1998, 1999, 2000, 2001, 2002). The lack of interest in longer-maturity deposit investments was attributed to the marginal increment in rates of return that were not compensatory against the higher long-term risk of Islamic banking investment and also the uncertainty of future rates and economic development (BNM, 2001). Meanwhile, financing activities were largely dominated by proceeds being directed towards financing residential properties due to the attraction of the fixed-rate nature of Islamic financing.

The FIBS on the other hand, were becoming more reliant on non-financing income from fee-based activities to generate profitable returns, due to their greater access and participation in international money markets as a result of their wide international presence, and the existing supporting framework afforded by their conventional banking operations. This distinctive feature that sets the FIBS apart from the DIBS and Islamic banks is shown in Figure 7.1 where it is apparent that although both financing and non-financing income increased at faster rates beyond 2000, non-financing income increases dominated financing income growth. Notice also that FIBS incurred much higher revenue attributable to shareholders' deposits compared to the DIBS and the IB. Nonetheless a combination of high financing and non-financing income was enough to afford the FIBS comfortable margins.

As Figure 7.1 and Table 6.2 show, PTE had become the new source of efficiency advantage to the FIBS. This inference is apparent in Figure 7.1 where towards 2002, the FIBS became more adept in generating very high levels of non-financing income after a history of depressed financing income trends prior to 2000. Following the increases in financing income levels since 2002, the FIBS are expected to earned wider margins in relation to both income attributable to shareholders and expenses not related to income attributable to shareholders.

To summarize, the IBS operations share the same set of difficulties that are faced by most Islamic banking operations in mixed systems elsewhere. These occur where there is; (1) excess of short-term depositors' funds, (2) lack of longer term depositors' funds and (3) shortage of suitable longer term and higher return investment avenues that entail less risks to banks given the distinctive risks mentioned above that are intrinsic to Islamic banking. These factors often constrained the growth of domestic IBO's in Muslim countries. On the other hand, a number of foreign institutions with operational locations at the international level were able to leverage on their risk management competencies, capital markets access, extensive experience in financial engineering and wide distribution networks from their existing conventional banking operations. These have enabled them to surpass many domestic IBO's in Muslim countries in terms of profitability, efficiency and productivity. Not only are they better equipped to manage the unique risks of Islamic banking, but they have been more competent in transforming these risks. Thus, foreign multinational IBS have been active in Islamic finance by assisting the movement and transformation of investment funds to more appropriate and varied avenues of investment from one part to another part of the world. Thus, in many examinations of Islamic banking performance, foreign "Islamic windows" have usually been shown to outperform other IBO by focusing their attention on earning non-financing income by transforming the risk-return and maturity profiles of investment funds as opposed to a sole focus on earning financing income from the mere creation of financing assets and depositor liabilities.

In Levis and Algaoud (2001) the authors show that the critical asset-liability inconsistency in Islamic banking can be often be resolved by market forces similar to those that recycled the petrodollars in the 1970s following the two world oil crises and the more recent Japanese current account surplus to finance US current account deficits. In both examples, the creation of syndicated credit and securities derivates (such as the Euronote facilities) made possible by intensive and innovative financial engineering had been able to transform short-term financing into longer-term funding. Similarly, foreign multinational institutions owe much of their success in "recycling" the short-term

Islamic investment funds pooled from multiple regional locations to fund more profitable but riskier and longer maturity investment projects worldwide. In many instances, foreign institutions act much like merchant banks that assist in funding syndication and the creation of financial derivative securities that are aligned to Islamic precepts in return for fee revenues.

7.1.3: Discussion of Research Question 1 Finding 3

Research Question 1:

What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?

Research Question 1, Finding 3

The IB had the lowest average TE and PTE scores and the second lowest SE mean score relative to all other banking groups. The IB also registered the lowest TFP change, TE change, PTE change and Tech change. Apart from these considerations, IB were inclined to follow the trends of the CBS as the efficiency trends of the IB were more or less congruent (rising and falling at almost the same time) to those of DCB and FCB. PTE effects were more dominant in IB.

Discussion of Research Question 1 Finding 3

Full fledged Islamic banks (IB) had more similarities in terms of their operations with conventional commercial banks. This is because unlike the DIBS and the FIBS, the IB need to maintain their own branch and ATM networks as well as bank staff. Being part of a parent DCB or FCB bank; it must be noted that both DIBS and FIBS had a number of advantages. These include

(1) The ability to utilize their parent banks' existing wider distribution network to market their products and services. IB on the other hand had to build and expand their own distribution network in order to compete. Given the need to maintain their own bank branches and ATM outreach, it is not

surprising then that the IB tended to be more scale inefficient compared to the DIBS and the FIBS. Thus, PTE effects played a larger role in determining the changes in TE for the IB.

(2) The ability to leverage on the existing competencies of the parent bank in areas that lend great degrees of competitive edge such as treasury operations and risk management. These also include ready access to large customer segments within their conventional banking sector to which the DIBS and the FIBS could market their products and services. This aspect is vital as many bank customers desire to transact and manage their wealth under both conventional and Islamic banking. This is not surprising as it has been shown earlier than both depositors and borrowers tended to take on Islamic banking for very specific purposes subject to the comparative economic incentives between conventional banking and Islamic banking. Thus, it seems that to a large degree, Islamic banking has assumed a role that complements conventional banking rather than competing with conventional banks head on as an alternative banking mode. Another advantage that has often been enjoyed by the FIBS is the ability to access large capital markets in the world as well as to mobilize massive Islamic deposits/funds from the Middle East region where Islamic banking has been practiced for quite some time compared to Malaysia. This aided the FIBS in securing cost-effective funds as well as having more profitable financing avenues. This helps to explain why the FIBS earned larger incomes from non-financing activities as previously pointed out.

(3) Both the DIBS and the FIBS also benefited immensely when the DCB bank merger program implemented in 2000 triggered increased investments in technology, human capital and operational innovations among not just the DCB but also the FCB. Being part of the DCB and the FCB bank groups, the DIBS and the FIBS thus did not have to make huge expenditure outlays but stood to share the gains of enhanced banking operations arising from such investments. Thus, this explains

why technological0 change for the DIBS and the FIBS as shown in Table 6.13 was lower than the CBS and the IB in 1999-2000 and 2000-2001 periods. In contrast, the IB had to undertake investments and thus exhibited more similarities with the DCB and the FCB during both periods.

It must be noted as well that throughout the study period, the IB were not only constrained by the financing difficulties that the IBO often face due to the heightened risks arising from asset-liability mismatches unique to Islamic banking, but were also subjected to greater degrees of political pressures in their operations. The study conducted by Lewis and Algaoud (2001) on the financial statements of one Malaysian Islamic bank (BIMB) revealed that the BIMB's operations had over 60% of murabaha investments dedicated towards longer term (over 5 years) investments as compared to other IBS operations in Malaysia. Nevertheless, the bank had the largest exposure (40% of total financing) in the real estate markets in line with the government's economic policy to enhance the provision of housing to consumers to revive the property sector.

These findings suggest that the IB in Malaysia much like other Islamic banks elsewhere in Muslim countries, may have undertaken government priorities due to (1) the assistance extended by governments in the Islamization of the financial system and (2) the principal requirement of Islamic banks to support community-enhancing programs. In the case of Islamic banks in Malaysia, the "politicization" of Islamic banking is even more prevalent due to the fact that government agencies and religious bodies have jointly subscribed most of the paid-up capital of Islamic banks and thus, are in a position to control the operation, management and investment policies of Islamic banks (Lewis and Algaoud 2001). These constraints often result in investment decisions that run contrary to economic profit interests and limit Islamic banks in allocating resources to other more profitable but less morally optimal projects. At the same time however, one cannot conclude that the interests of depositors are not

taken care of since in Islamic banking, “shareholders’ activism” places the advancement of social interests first.

7.1.4: Discussion on Research Question 1 Finding 4

Research Question 1:

What Are the Relative Productivity Scores between Conventional Banks and Islamic Banks operating within a Dual Banking System?

Research Question 1, Finding 4

Only the DCB experienced technical change progress whilst all other banking groups in Malaysia experienced technical regress. All IBO on average regressed. The IB regressed the most followed by FIBS and lastly DIBS. Thus, Islamic banking in Malaysia was better at implementing innovation diffusion whilst the DCB were the more innovative banks.

Discussion on research question 1 finding 4

One striking feature in Table 6.13 has been that from 1998 to 2002, only the DCB within the Malaysian banking industry actually recorded technical progress. All other banks regressed on average including all the IBO. It must be noted that firstly, the measure of central tendency used in Table 6.13 to determine the mean technological change scores across all years is the geometrical mean. Thus, technological changes within the final 2001-2002 period had significant bearing on the mean score. Nevertheless, it is apparent from Table 6.13 that DCB, FCB and IB made significant tech progress between 1999-2000 and 2000-2001. Both periods coincided with the 2000 merger program and all 3 banking groups were directly affected. Therefore, banks seem to have taken preparatory measures in 1999 to (1) ensure smooth integration of their operations in anticipation of the merger exercise for the DCB and (2) to enhance their capacity to compete in anticipation of a more competitive environment for both FCB and IB. As previously mentioned, both the DIBS and the FIBS stood to receive the benefits from the investments taken by their parent DCB and FCB and thus, both need not spend as much. Table

6.13 clearly shows that the DIBS and the FIBS had only started to make technical progress between 2000 and 2001 just as the DCB and the FCB were streamlining their operations.

This observation testifies to the fact that Islamic banks can no longer expect to continue to attract deposits and financing demand from those who particularly believe in the unlawfulness of interest-based transactions as reported by Saed (1995). This is because new financial institutions such as the IBS operations are now able enter the market while leveraging on the existing competencies of their conventional banking operations, and this causes intensified competition resulting in falling profit spreads and margins. Consistent with this argument, Lewis and Algaoud (2001) have identified that the ability of banks to offer rates of return comparable to those received by depositors in conventional banks must be complemented with the ability to provide modern banking facilities. These need to be supported by the latest technological advancements to enhance the processing efficiency of growing transaction volumes in order to succeed in this new form of financial intermediation. Many Western conventional banks are able to effectively win market share from Islamic banks by means of Islamic Windows because they are more able to achieve both goals compared to Islamic banks.

7.2: Discussion on Research Question 2 – Comparative Performance between DCB and FCB

Research Question 2:

What are the Relative Productivity Scores between Domestic Commercial Banks and Foreign Commercial Banks?

Summary of Important Findings

In Tables 6.1 to 6.3, the FCB outperformed the DCB on average TE, PTE and SE measures although both did not achieve very efficient scores on all three measures. Tables 6.3 and 6.4 shows that most of the TE difference is due to the fact that the FCB were more scale efficient than the DCB although both banking groups had almost identical average PTE scores. Across all years, the

FCB were more inconsistent in PTE measures whilst the DCB had more performance variation in SE. Nevertheless Tables 6.4 to 6.6 point out that the FCB are more heterogeneous than the DCB on TE, PTE and SE measures.

Discussion on Research Question 2 Important Findings

Figures 6.1 to 6.3 show that both the DCB and the FCB had highly similar PTE and SE trends between 1996-2002. The 1996-2002 study period can be broken down into 4 sub-periods in which both the DCB and the FCB exhibited distinctive TE, PTE and SE trends. In general, banks were adversely affected by the financial crisis between 1996 and 1998. Subsequently the improving Malaysian economy and the return of financial system stability saw banks briefly recovering from 1999 to 2000. However, the banks grew inefficient once more in 2001 following the completion of the industry wide consolidation program among the DCB initiated by the Malaysian central bank. Nevertheless, by 2002, post-merger bank efficiency levels improved.

Figures 6.1 to 6.3 illustrate that TE levels for both banking groups started to decline in 1996 before plunging sharply to reach the highest inefficiency levels in 1998. This sustained deterioration in the banks' technical efficiency was mostly caused by growing scale inefficiency although the banks' managerial efficiencies were also falling simultaneously as well but with a lesser magnitude. Both the DCB and the FCB were the least SE in 1998. The DCB were more scale inefficient during the 1996-1998 period. In fact, the difference in SE measures between the DCB and the FCB reached an apex in 1998.

During the subsequent recovery period from 1999-2000; the PTE difference widened in favour of the FCB in 1999, although the gap narrowed considerably in 2000. At the same time the SE gap reached aminimum in favour of the FCB in 1999 but widened thereafter. In 2001, the bank consolidation program created high levels of scale inefficiency among the DCB and the FCB. Both banks were the least managerially efficient (PTE) in 2001. Nevertheless, the

difference in both PTE and SE increased considerably in 2002 with the FCB being more efficient. Even when the reintegration process was successfully completed at the end of 2001, the DCB only recovered slightly vis a vis the FCB. Regardless, the FCB continued to outperform the DCB in 2002.

PTE levels were more stable and fairly similar between the DCB and the FCB (except for a period during 1999 when the DCB PTE levels declined even as the FCB became slightly more efficient). Both the DCB and the FCB had higher PTE than SE. The DCB were more PTE efficient than SE efficient in 1996, 1998, 1999 and 2002, whilst the FCB were more PTE efficient from 1997-1999.

Overall, the FCB were more efficient than the DCB and this difference was largely due to the FCB being more scale efficient than domestic banks. In fact throughout the study period, most DCB were oversized as almost all banking institutions operated on DRS. In contrast, a number of the FCB actually managed to attain MPSS towards 2002 although most units exhibited DRS. By 2002, the DCB were the least scale efficient of all. Consequently, the FCB dominated the DCB in TFP change, TE change, PTE change and SE change measures.

However the DCB on average outperformed the FCB where the technical change measure is considered. Both the DCB and the FCB displayed technical progress in 1999-2000 and in 2000-2001 and regress in 1998-1999 and 2001-2002. The DCB however were better innovators in 1998-1999 and 2001-2002 while the FCB dominated in 1999-2000 and 2000-2001.

7.2.1: Discussion on Research Question 2 Findings: In Relation to Relevant Studies

Research Question 2:

What are the Relative Productivity Scores between Domestic Commercial Banks and Foreign Commercial Banks?

Discussion 2 on Research Question 2

Most studies of banks' productivity and efficiency seek to compare the banks' performance between the pre and post events or during the financial liberalization periods. It is important to note that this study only briefly addresses the impact of financial liberalization on the banks' productivity and efficiency because the Malaysian financial system only began to slowly liberalize beginning 1999. The policy was not officially launched by the Central Bank until March 2001 when the Financial Sector Master Plan was released. This details the phases of financial deregulation to be undertaken in the years leading to 2010 when the financial system is expected to be fully deregulated. Thus, this study is limited to the very early years of financial liberalization.

7.2.1.1: Bank Efficiency Levels

The results of this study are quite consistent with those reported in Bhattacharyya et al (1997) where the study findings suggested that although public banks were the most efficient in the Indian banking industry, the public banks were on the decline whilst the foreign banks that usually started off as the least efficient banks were able to catch up and even match the public banks. In this study, it was found that the FCB were consistently more efficient than the DCB throughout the study period. In fact, the performance gap continued to increase in favor of the FCB from 2000. The results agree with Bhattacharyya et al (1997) on the fact that foreign institutions managed to catch up to the efficient frontier faster where the FCB had better TE progress. Nevertheless, the results show the FCB outperforming the DCB between 1999-2000 and 2001-2002. Bhattacharya et al did not report on PTE and SE results.

However Bhattacharyya et al (1997) did report the prevalence of DRS among domestic Indian banks while a number of foreign institutions had been able to operate on IRS and CRS. The authors attributed the rise of foreign banks to the fact that (1) foreign banking institutions were constrained by numerous regulations especially on capital adequacy, (2) foreign banks were only subjected to modest priority sector lending as opposed to, (3) Indian banks that

were required to branch into rural and suburban areas and to make significant commitments towards funding priority sectors. Thus foreign banks were able to efficiently extend their networks within urban areas only and thus they are regarded as more efficient in adapting to an increasingly competitive environment.

The third factor holds true to some extent within the Malaysian context as the results show that the FCB outperformed the DCB due to their ability to operate with better scale size. First and foremost, the FCB in Malaysia were prohibited from opening new branches whilst the usage and acceptance of ATM cards issued by foreign banks was restricted unlike domestic banks' ATM cards where transactions are enabled amongst each others' ATM machines (BNM, 2003). Thus the FCB need to compete within their existing physical presence by expanding their outreach via other means. Many of the FCB resorted to relocating their existing branches and ATM machines to higher-density areas and "customer-preferred locations" to gain better access to a larger and more focused customer base in urban areas (Yeap, 2001).

At the same time, the mergers among the DCB also led to a sudden expansion of branch and ATM networks amongst the DCB. Here, the results were consistent with those of Sathye (1998) who reported that domestic Indian banks were expanding and thus, employed higher fixed assets that have yet to generate any returns. Similarly, the bank consolidation program led to (1) a sudden expansion of scale of operation and (2) huge investment outlays on capital items and technology. Both could have left large amounts of idle resources and become sources of inefficiencies in the short run before banks were able to extract efficiency gains from them through effective and efficient use.

Furthermore, the FCB were mostly concentrated in urban areas except for 4 main FCB whose outreach may be more spread out but nevertheless, the FCB were more focused on certain geographical locations. Thus, the DCB were operating at less efficient scale size relative to the FCB. By the completion of

the merger exercise in 2000, all the DCB were operating under DRS while some FCB were still able to attain IRS and MPSS.

The comparative SE results also correspond well to the findings of Avkiran (2000) in which the author found that regional banks with substantially smaller bank staff size than the major trading banks tended to operate with IRS whilst the major trading banks operated at DRS but sometimes at MPSS as well. The FCB in Malaysia certainly had a far smaller bank staff and branch network than the DCB and thus were able to operate with IRS and MPSS. This indicates that some FCB with IRS are able to enhance their efficiency by expanding their operations. Nevertheless, Avkiran (2000) reported that banks had a returns to scale cycle during the deregulated period; where banks began with MPSS and then deteriorated to DRS. Subsequently, banks experienced IRS and finally MPSS once more. Such findings were not evident in the results. Instead this study found a increase in IRS and MPSS banks in 2000 but most of the FCB reverted to DRS since 2001.

There are however some differences between the banking developments in India and in Malaysia. Similar to Indian banks, both the DCB and the FCB were also subjected to priority lending directives by the central bank to the SME sector. However unlike the case in India, the Malaysian experience has been less intrusive and more market-oriented where the central banks not only compelled through moral suasion but also encouraged and assisted banks in extending funding to the relatively risky SME sector through various regulatory measures. For instance, the Entrepreneur Rehabilitation and Development Fund (ERDF) was established on 3rd July 2001 to assist the resolution of existing NL and to provide working capital to small SMEs. It is noted that while the DCB are generally cautious in expanding SME lending due to the heightened risks, some FCB had already opened branches dedicated to SMEs in areas with a heavy concentration of these enterprises.

In fact, the FCB had been specializing in both consumer and SME lending niches since the pre-crisis period when the DCB were engrossed in serving the

corporate sector. When the 1997-1998 financial crisis resulted in high NPL levels among corporate loans, the focus of the DCB then shifted to both consumer and SME lending where they had a disadvantage. Thus, the FCB had not only generally been able to move faster than the DCB despite the numerous regulatory restrictions on their operations, but also had been able to leverage on their competencies to emerge and compete effectively and efficiently. This was not across all banking markets or in providing the full range of banking services but in a few focused but highly lucrative sectors.

Research Question 2:

What are the Relative Productivity Scores between Domestic Commercial Banks and Foreign Commercial Banks?

Discussion 2 on Research Question 2 Findings

7.2.1.2: Bank Productivity Performance

In terms of banks' productivity, the empirical findings of this study run contrary to those of Bhattacharyya et al. (1997) who found substantial increases in productivity and technical progress growth with the onset of the financial system deregulation. In this study, the Malaysian banking system was beginning to liberalize with the implementation of the Financial Sector Master Plan in March 2001. Banks experienced technical progress from 2000-2001 but regressed in 2001-2002. At the same time, the DCB had PTE regress from 2000 to 2002 while the FCB only progressed from 2001-2002. Both the DCB and the FCB had SE regress from 2000-2001 but progressed from 2001-2002. Thus, the results of this study are mixed and inconclusive as to the evidence of improved productivity in the wake of financial deregulation in Malaysia as opposed to strong and sustained growth in TFP productivity, scale efficiency change and technical change reported by Bhattacharyya et al. (1997). Only the FCB managed to achieve PTE and SE progress between 2001 and 2002. A very likely factor that explains these results is that productivity growth and its components for the DCB in 2001 and 2002 were confounded by the effects of the 2000 bank consolidation program. For instance, heavy capital investments

following the bank merger exercise could have resulted in the technical progress of banks between 2000 and 2001. Subsequently, the rationalization exercises during 2001 during which branches were closed or relocated and banking staff were downsized, could have led to technical regress between 2001 and 2002.

Furthermore, the findings disagree with those of Isik (2002) who found that (1) foreign banks in Turkey were the sole banking group that experienced technical progress on average and (2) domestic private banks were more apt in improving PTE change from imitating banking practices of foreign banks as opposed to scale efficiency changes. This study's results show that firstly the DCB were the only banks that had technical progress on average in Malaysia. The FCB, on the other hand experienced technical regress. Secondly, SE progress was more prevalent than PTE change. Both the DCB and the FCB actually incurred PTE regress on average. Again the results reflect the structural developments that took place with the DCB following the bank merger exercise. Merging DCB entities appeared to have made greater strides in improving their technology. Nevertheless, the FCB outperformed the DCB in both PTE and SE change in most time periods. As the DCB began to realize gains from successful integration of their operations, they began to surpass the FCB in SE change during the final 2001-2002 period. However, the DCB had more performance variation in SE, indicating the effects of the bank consolidation on DCB.

This study agrees however with Isik (2001) that foreign banks outperformed domestic banking institutions in terms of TFP change on average. This is attributed to more superior performance in both PTE and SE change. The reasons for these results have been explained earlier.

7.2.3: Trend Analysis relating to Research Question 2: Comparative Performance between DCB and FCB

Research Question 2:

What are the Relative Productivity Scores between Domestic Commercial Banks and Foreign Commercial Banks?

Discussion 3 on Research Question 2

The discussion now proceeds to explain the trend analysis of the comparative efficiency and productivity performance between the DCB and the FCB to better understand the working mechanisms behind the trends and results from a period to period basis. To ease comprehension, the entire study period is broken down into 4 sub periods: 1996-1998, 1999-2000, 2001 and 2002 to better capture the effects of various but distinctive developments that unfolded in each of the sub periods.

7.2.3.1: Between 1996 and 1998: A period of growing bank inefficiencies

Rising inefficiencies among commercial banks were prevalent between 1996 and 1998 and were largely attributed to (1) narrowing net interest margins as interest expenses increased at a faster rate than the increase in interest income and (2) rapid increase in non-interest expense vis a vis growth in non-financing income. These trends are illustrated by Figures 7.2, 7.3 and **7.4.** Following the use of this study's input and output variables outlined in Section 3, these trends intuitively led to deterioration of the DEA efficiency scores as the value of output over input ratio declined.

The period between 1996 and 1998 was one of the most challenging for the Malaysian banking system. Until 1996, the early 1990s were a period of high profitability and easy credit extension that prevailed. However, the onset of the financial crisis in mid-1997 following a prolonged period of depreciation followed by a devaluation of the Malaysian ringgit and a number of regional currencies left the industry in turmoil. Although the banking system was still profitable for the financial year 1997, the full effects of the financial crisis were eventually felt in 1998 when the industry recorded hefty pre-tax losses for the year. This was largely attributed to exceptional losses for the two main DCB owing to the rapid rise in interest expense and depressed interest revenues (BNM, 1998). The

potential systematic risks posed by the rise of NPL levels and eroding capital buffers of several DCB prompted the BNM to take drastic forced stabilization measures to prevent a potential break down of the financial intermediation process.

Interest expenses rose between mid 1997 to February 1998 when the BNM adopted a tight monetary policy to contain inflationary pressures and capital flight triggered by the rapidly depreciating ringgit (BNM, 1998). This was further compounded by tight liquidity conditions faced by banks as total deposits fell when massive sums of external funds were withdrawn from the domestic banking system (BNM, 1998). Thus, the DCB became over reliant on short term funding to finance asset growth. To add insult to injury, the uneven distribution of liquidity among banks during this period also contributed to a rise in short term interest rates (BNM, 1998). As a result, banks faced with severe liquidity constraints bid up interest rates on deposits to a level that would not justify returns on investments for viable business. Rising interest rates however were accompanied by increased interest income as lending rates rose but the increase was less than proportionate compared to the rising interest expenses. This was because in an environment where interest rates were high and while economic progress was contractionary, NPLs rose sharply in 1998. This was particularly so in the face of the recently revised Guideline on the Suspension of Interest on Non-performing Loans and Provisions for Bad and Doubtful Debts that shortened the period during which banking institutions were required to make loan provisions for doubtful debts and required a 3-month NPL classification in place of the usual 6-month classification. As a result, loan loss provisions and interest in suspense rose some 208% in 1998 (BNM, 1998).

High NPL levels and loan loss provisions were not the only sources of inefficiency in 1998. The worsening financial crisis also bred pessimistic and weak business expectations. Banks that were already constrained by tight liquidity conditions and capital erosion suddenly became over-cautious and reluctant to extend new lending but focused on preserving their balance sheets

instead (BNM, 1998). Thus, there was negative loan growth as the amount of outstanding loans within the banking system declined more sharply than usual. This eventually diminished the primary source of potential interest income. Therefore, on a wider scale, high NPL levels, negative loan growth and higher loan loss provisions squeezed banks' interest margins leading to an overall deterioration in efficiency.

The easing of monetary policy by the BNM during the later part of 1998 through direct lending to banking institutions did little to improve banks' efficiency levels during the year as net interest income continued to decline. This was because banking institutions' average cost of funds generally lagged official policy by an average of 3-6 months before falling to new levels (BNM 1998). Thus for the financial year 1998, net interest income was at least temporarily made worse even as the new liquidity framework was implemented.

Meanwhile, non-interest revenue increased slightly to offset some of the increase in interest expense. This favorable development was largely attributed to net income from trading securities (BNM, 1998). Non-interest expenses however rose as both overheads costs and bank staff costs increased significantly. High overheads were incurred during this period as banks actively sought to expand their network of branches and ATM's (BNM, 1998). On the other hand, banks were faced with higher bank staff costs because of (1) rising bank labor costs as a result of shortage of bank employees that prevailed between 1996 and 1997[28] and (2) banks were largely overstaffed.

Both the DCB and the FCB suffered squeezed interest margins and rising non-interest expenses, resulting in a sharp deterioration of efficiencies in 1998. The FCB however experienced smaller efficiency decline relative to domestic banks as there was some migration of deposits from small DCB to FCB easing somewhat the upward pressures on the deposit rates offered as the liquidity of

[28] In fact, staff cost per employee increased to RM42, 700 per annum in 1998- highest costs recorded in the banking industry between 1996 and 1999 (BNM, 1996-2002).

foreign institutions improved. Furthermore, although the FCB experienced an increased NPL burden, the FCB managed to deal with bad loans more effectively and efficiently than the DCB. This was largely because the FCB had made appropriate provisions for problem loans on a yearly basis to fulfill more stringent reporting requirements that the FCB parent banks face in their home countries. In comparison, the DCB had been known to delay the need to make provisions for NPLs (Fernandez, 2003).

Conditions however were not very difficult 9for large DCB's as they received some share of the "flight to quality" as well (BNM, 1998). Nevertheless, the sharp rise in deposit rates of smaller banks to counter fund outflows resulted in high inefficiencies not only for smaller banks but also for all DCB (as they are aggregated together in a common banking group) on an average basis. During the 1996-1998 period however, most of the inefficiencies were sourced from the increase in scale inefficiency. This was due to (1) high bank staff costs and (2) the large increase in overheads expenses incurred from the banks' large network of branches and ATM's. Thus, banks were both "oversized" and "overstaffed". This condition was made apparent because as the narrowing margins indicated that both increases in interest income and interest expenses generally offset one another leaving non-interest expenses as the primary source of inefficiency and hence the dominance of SE inefficiency.

Investments in technology were significantly dampened during 1997-1998 as banks scathed by the financial crisis adopted overcautious attitudes by avoiding any investment decisions that would spread their resources too thin as some domestic banks ran short of much needed liquidity. Furthermore, the banks were more focused on preserving their balance sheets and controlling loan loss expenses and levels rather than on expansionary plans. Indeed, during the crisis period, asset growth was severely restricted by high NPL levels and a shortage of capital, banks actually needed capital injections to sustain their operations.

7.2.3.2: 1999-2000: Recovery and Rising Efficiencies

The 1999 financial year witnessed a sharp reversal of commercial banks' performance. Figure 7.2, 7.3 and 7.4 show that the banks experienced significant improvements in scale efficiency that resulted in a strong rebound in overall technical efficiency levels from 1999 to 2000 although domestic banks became slightly less PTE efficient in 1999. The recovery was sourced from (1) the larger decrease in interest expenses relative to the decline in interest income and (2) the pickup in non-interest income. Efficiency improvement was however greater for the FCB owing to a wider net interest margin.

The banking industry recovered strongly in 1999 following a sharp improvement in economic activity following a series of structural correction measures taken by the BNM earlier in March 1998 to address the key vulnerabilities of the banking system. The financial restructuring program not only aimed at stabilizing the banking system in the immediate term but also at enhancing banks' resilience to economic shocks over the medium and longer term. The near-term adjustment programs saw (1) the establishment of Danaharta, an asset management company to remove NPLs from banks' balance sheets to restore lending and capital investment activities, (2) the setting up of Danamodal, a bank recapitalization agency, to recapitalize banks where shareholders were simply unable to raise additional capital to finance expansion and (3) the establishment of the Corporate Debt Restructuring Committee (CDRC) to provide a viable bridge between banks and corporations to work out feasible debt workout solutions (BNM, 1999).

Following the financial restructuring program, the banks' profitability and efficiencies for 1999 improved significantly as interest margins widened although the levels were still considerably lower than pre-crisis level. However it must be noted that such profits made during 1999 were only possible with large sums of NPL being removed from banks' balance sheets to Danaharta and public confidence being restored by the recapitalization of the distressed DCB's

by Danamodal. In 1999 alone, the book value of the loans removed from the banking system amounted to some RM 34 million and the NPL levels in banks decreased to 6.6% from a maximum of 9% (BNM, 1999).

Interest revenues however declined on a net basis in 1999 as banks recorded negative growth in outstanding loans as a result of (1) the low interest rate environment as the BNM implemented an easy monetary policy to revive domestic demand, (2) the removal of problem loans from banks' books, (3) the damage inflicted to the banking system during the crisis had made banks somehow still hesitant to extend credit to less credit-worthy borrowers. Nevertheless, given that the economy was barely recovering, higher credit-worthy borrowers were hard to come by, and (4) households and businesses were reluctant to take up additional credit given the largely pessimistic sentiments that still prevailed during that year, and (5) the preference of borrowers to secure Islamic banking to finance purchases of residential properties due to the fixed-rate nature of Islamic finance (BNM, 1999). In fact throughout 1999, domestic commercial banks had a vast number of unused and unutilized credit facilities. Loan activities were mostly restored to finance the manufacturing sector and residential property investments. Interest expenses also declined at the same time however. This was largely attributed to the drop in deposit rates as banks were flushed with excess liquidity as a result of new capital injected by Danamodal and the new liquidity framework to increase the amounts of loanable funds alongside an easy monetary stance by the BNM (BNM, 1999).

Meanwhile non-interest revenue increased significantly, buoyed by the sales of investment securities following an encouragingly good performance of the stock market and the corporate sector (BNM, 1999). The improved profitability of banks was also aided by the fall of non-interest expenses attributed to some 4.4% reduction in banking staff as well as some 8.2% decrease in overhead expenses (BNM, 1999).

The differences/variations in efficiency levels among the DCB and between the DCB and the FCB were marked in 1999 as the financial crisis disrupted the industry. Exceptionally large losses were recorded by one domestic banking group and 2 commercial banks because of provisions for losses and high NPL levels (BNM, 1999). These losses lead to a few isolated cases of low TE scores for DCB's; the efficiency gap between the DCB and the FCB was thus attributed to a difference in managerial efficiency rather than scale efficiency.

The year 1999 also marked the beginning of an industry wide regulatory consolidation process when the BNM directed two commercial bank mergers following large losses that were incurred as a result of substantial provisions arising from high NPLs. It was the BNM's belief that the 1998-1997 financial crisis exposed many vulnerabilities of the banking system that was not well capitalized and thus only a strong, efficient and stable banking system can build resilience in the functioning of the intermediation process. Following this, a comprehensive bank consolidation program involving all domestic commercial banks and finance companies was implemented to push the domestic banks to attain the critical mass level to (1) meet the changing demands of the domestic economy, (2) withstand future shocks to the financial system and (3) to meet competitive challenges arising from globalization and liberalization (BNM, 1999). During the year, the BNM approved the formation of just 10 anchor banking groups that would greatly reduce the number of operating banking institutions from 54 to just 29. Each banking group must have at least RM 2 billion in shareholders' funds and RM 25 billion asset base (BNM, 1999). To further ensure that the merger exercise would be an eventual success, BNM had targeted the end of December 2000 as the completion date for the bank consolidation program and all the DCB were required to conform with this. Although the merger exercise was not market-oriented, the DCB were given the flexibility to form their own merger groups and banking group leaders (BNM, 1999).

Technology advancement in 1999 was thus not only geared towards resilience building and enhancing cost efficiencies but also as a preparatory measure to integrate future operations in anticipation of the exercise. Following the BNM's announcement of the impending merger exercise emphasis was given to new sources of growth, non-interest activities, new distribution technology as well as developing human capital, some of the technological investments made were of a competitive strategy in nature.

The momentum of the financial system restructuring initiated and implemented in 1999 to consolidate the sector continued to gather in 2000. The program had succeeded in fully restoring the stability and credibility of the financial system. With this in hand, the BNM shifted its focus towards enhancing the productivity and competitive abilities of domestic banks. One important decision made by BNM during the year was the permission given to banking institutions to outsource to third parties the management of non-core functions to reduce the burden to and expenses for banks (BNM, 2000).

During 2000, the banks earned higher interest revenues. Non-interest revenues meanwhile rose 10.6% in 2000 due to a 17.8% increase in fee-based activities (BNM, 2000). This is also an indication that banks were beginning to focus on fee-based operations as interest margins continued to narrow. At the same time banks incurred lower non-interest expenses as labor productivity increased and loan loss provisions were reduced (BNM, 2000).

7.2.3.3: 2001: Bank Consolidation and Initial Deterioration of Bank Efficiency

The year 2001 brought new dynamics into the Malaysian banking industry. With the bank merger exercise concluded in 2000 with minimal disruption, the attention was then focused on the process of business integration and rationalization. Although banking groups now enjoyed enhanced size and managerial capacity, size alone does not guarantee success. Instead, this phase is perhaps the most critical one in determining the eventual long-term

success of the merger exercise as new entities within the 10 banking groups must strive to reap the potential benefits of merger activity arising from scale economies, scope economies, synergies, asset rationalization and product/service cross-selling. All banking groups succeeded in doing so throughout 2001 with a total of 187 branches being closed down with 55 branches being reallocated as well as a 4,240 banking staff layoff (BNM, 2001). Although disruptions had been minimal, the rationalization process resulted in huge overhead costs and higher loan loss provisions and NPL's as anchor banks realigned their internal policies on loan loss provisions towards more stringent standards as loan portfolios were integrated (BNM, 2001). Thus, non-interest expenses rose significantly.

At the same time, net interest income continued to be depressed due to declining general interest rate levels that resulted in the reduction of interest income compared to interest expense (BNM, 2001). The low interest rate environment also prompted the DCB to liquidate low-yielding investment securities in their books to extend their loan portfolios (BNM, 2001). Collectively, this action led to intense competition in the retail and mortgage businesses leading to a further decline in lending rates (BNM, 2001). The reduction of net interest income was however offset to a large degree by lower deposit rates. On the other hand, the non-interest revenues of the DCB were boosted when banks reaped extraordinary gains from liquidating their holdings of dividend-based investments to focus on fee-based revenues which by the end of 2001, amounted to some 26.3% of total non-interest income (BNM, 2001). These developments led to declines in PTE and SE in 2001 for the DCB and the IB although banks experienced considerable technological progress. Technological investments however tended towards those that assisted in the integration and rationalization process.

The 2001 period marks a new phase of competition between the DCB and the FCB. The 2000 banking consolidation process resulted in massive scale inefficiency within the DCB. While the DCB were busy integrating their

operations and managerial systems, the FCB seized this opportunity to expand their loan assets. Between 2001 and 2002, loan growth among most of the DCB actually slowed while the main FCB (Citibank, HSBC, OCBC and UOB) managed to maintain and even grow their loan assets during the same period (Fernandez, 2003). The FCB were able to do so because the FCB have always been restricted to smaller bases that prevented them from branching out and expanding their ATM services and thus not only did they operate at more efficient scale sizes (SE), but they had also evolved over time to move faster than the DCB in order to compete leading to higher PTE.

7.2.3.4: 2002: Bank Consolidation and Subsequent Improvement in Banks' Efficiency

The focus of the financial restructuring/deregulation process in 2002 shifted towards enhancing domestic capacity of the newly merged domestic banking groups. With the completion of the integration and rationalization of banking operations, banks were geared towards building suitable and competitive delivery platforms and human capital. Central to these were the financial re-engineering of operations to reap gradual improvements in productivity and produce enhanced high-quality product/service diversity, reconfiguration of business profit and asset-risk management models and heavy investment in technologies that assist banks in gaining competitive market shares. The year 2002 also saw a more streamlined FCB presence with the merger of United Overseas Bank Malaysia and Overseas Union Bank Malaysia following the merger of the parent banks in Singapore (BNM, 2002).

With a more liberalized environment, efforts were directed towards promoting efficiency, productivity and innovation measurement and comparability. The bank performance benchmarking which was initiated by BNM back in 2000 had never became more relevant as within the same year the BNM had committed itself towards instilling active and sophisticated consumerism among the banking public. Following these efforts, BNM had begun to gather performance indicators on the financial performance and customer service quality of domestic banks vis-a-vis their peers, be they domestic or foreign institutions.

Initiatives were also taken to accelerate strategic alliances especially between insurance companies and domestic banks to further enhance banking capacity (BNM, 2002).

Against this new backdrop, interest margins continued to narrow owing to increased competition (especially in the household sectors), ample liquidity conditions attributed to large trade surpluses and foreign investment inflows and low general interest rate environment. For the DCB, interest margins were preserved by higher lending activities to households and the strategic SME sector in compliance with BNM directives. Thus of significance during the year was a shift in loan composition towards small loans. Although the business and corporate sectors had been revived, the largely low-interest environment since the end of the financial crisis had prompted corporations to tap alternative direct financing, especially through the bond markets, to finance projects with longer terms (BNM, 2002). These developments led to somewhat higher interest revenues to the DCB than their FCB counterparts that tended to have less expertise in the SME niche. Meanwhile, low interest rates also resulted in low deposit rates.

The year 2002 also saw a significant increase in non-interest revenues earned by the DCB as higher income was generated by fee-based activities. Strong growth was evident in corporate advisory, underwriting and portfolio management activities. This trend reflected the changing structure of the Malaysian economy as disintermediation became more common and the merged banks were able to restrategize their operations and enlarge their revenue scope. The DCB also managed to tap into the potential presented by high-worth customer segment wealth management services registered a 244% increase during that year alone (BNM, 2002). The favorable economic environment and successful debt restructuring exercise meanwhile brought loan loss provisions down.

Thus, as the newly merged DCB became fully integrated, SE began to improve although only marginally. Nevertheless, the loss of market share for loans to the

FCB during 2001 continued to confound the DCB (Fernandez, 2003). In fact by 2002, the DCB can generally be described as overcapitalized. After 1999, the new areas of growth in the Malaysian banking industry had been consumer lending, wealth management and fee-based off balance sheet activities. These new business segments required not only an intense finance re-engineering process and greater access to capital markets, but also effective innovations in marketing and distribution that extended far beyond maintaining physical branches and ATM's as well as experience in conducting treasury operations- areas in which the main FCB specialized. Standard Chartered Bank for example organized the largest number of syndicated loans in Malaysia in 2002 (Fernandez, 2003). The same article also highlights the fact that the FCB's had more expertise in linking Malaysian firms with foreign firms elsewhere, providing more potential for trade financing. Thus, by 2002, the FCB experienced a sharp increase in PTE while the DCB continued to experience decline.

7.3: Discussion on Research Question 3: Dynamic Analysis on Pre- and Post- Bank Merger Efficiencies

Research Question 3:

What is the Evidence relating to whether Mergers Lead to Productivity Gains?

Summary of Important Findings:

Dynamic Analysis on Pre- and Post- Bank Merger Efficiencies

Discussion on Research Question 3 Findings

In regards to the second research question, this study has found that:

1. Out of 9 merger cases that were investigated, 6 cases showed that the acquiring banks were more efficient than the target banks in terms of TE, one year prior to their respective mergers. In the remaining 3 cases, the target banks were only slightly more efficient than the acquiring banks.
2. In 8 of the 9 merger cases analyzed, the acquiring banks had higher PTE levels than the target banks one year prior to their respective mergers.

Hence, almost all acquiring banks had more competent managerial efficiency.

3. This study found that in 7 cases, the acquiring banks were less scale efficient than the target banks.
4. In 8 bank merger cases out of 9 cases, TE performance improved right after merger. Nevertheless in 6 cases out of 8 cases that permit observation during the first post merger year, efficiency deteriorated. Only 2 cases saw efficiency improvement. Beyond the first post merger year, there is no consistent efficiency performance among banks as some banks improved while others grew more inefficient.
5. For most banks, the improved efficiencies for the merged entities during the merger year was attributed to increased scale efficiency. Scale efficiency nevertheless declined for a majority of the cases scrutinized. In cases that involved observations into the second and third post-merger years, SE either stabilized or continued to decline at slower rates. In terms of PTE, almost all cases saw PTE deterioration. During the second and third post merger years, some banks were more scale efficient while others were more PTE efficient.
6. For a majority of the bank merger cases, the post-merger TE, PTE and SE levels did not recover to match those attained during the pre-merger period.

In this study, it is found that acquiring banks were more efficient than the target banks and that this efficiency advantage was almost all attributed to better managerial competence (PTE). In contrast, acquiring banks were less scale efficient than target banks. Thus, the results agree with Avkiran (1999), Houston and Ryngaert (1994), Berger and Humphrey (1997) and Wheelock and Wilson (1998) that acquiring banks were relatively more efficient than the target banks. It needs to be re-iterated that the Malaysian in-market bank mergers experience was essentially guided by the Malaysian central bank and not market-force oriented as had been the cases studied in the existing literature (although banks were allowed to choose their own merger partners and bank group leader). Nevertheless, the empirical evidence gathered is consistent with the findings of

Wheelock and Wilson (1995) that relative efficiency can serve as a fairly good indicator of becoming a takeover target. Thus, as Avkiran (1999) pointed out, banks that are consistently under-performing are likely to become takeover targets if potential acquiring banks can identify synergies that can lead to increased savings and efficiencies.

This finding would perhaps be more relevant and very vital to both Malaysian policymakers and bank managers alike in the years ahead where the possibility exists of the second round of in-market bank mergers to reduce the existing 10 domestic banking groups to say 6. This is because unlike the previous merger exercise, the coming merger program would be likely guided by market mechanisms.

Although banks generally grew more efficient during the merger year, almost all banks experienced efficiency decline during the first post-merger year. Both PTE and SE deteriorated at the same time, but in 3 bank merger cases, there had been a sharp decline in SE. The sudden enlargement of operating sizes could often result in problems and difficulties in consolidating branches, computer operations and transaction processing during the first few post-merger years (Berger et al, 1999). Furthermore, banks are likely to experience PTE decline as banks are swamped by managerial difficulties in monitoring larger organizations, conflicts in corporate culture and system integration problems. However as Table 6.15 and 6.16 suggest, growing scale inefficiencies were more prevalent among banks and dominated declines in PTE. A possible explanation is pointed out by Yahya et al. (2001) whose study showed that Malaysian domestic banks tended to expand their branch and ATM networks beyond the levels that were deemed necessary and thus created an oversupply in inputs. Furthermore, as explained earlier within the discussion section, domestic banks were somehow “overstaffed” just prior to the merger exercise at the time when the cost of labor was rising.

Nevertheless, the results show inconsistent evidence about increased efficiency levels during the post-merger periods. Banks were split between those that recovered beyond the first post-merger year and those that continued to experience efficiency declines. At the same time, banks were also split between those that were more PTE efficient and those that were more scale efficient. Thus, the results were consistent with a majority of studies of bank mergers in the US, Europe and Australia that found very modest or no efficiency gains resulting from bank mergers (Berger and Humphrey, 1992; Rhoades, 1993; DeYoung, 1997 ;Peristani, 1997; Vennet, 1996; Focarelli at al. 1998 and Avkiran, 1999).

Contrary to the potential for increased scale economies identified by Berger and Mester (1997), Berger and Humphrey (1997), Allen and Rai (1996), this study found no concrete measures of scale efficiency gains. Similarly, the results are inconsistent with (1) Berger and Humphrey (1997) who showed because the banking industry exhibits substantial X-inefficiencies ranging from 20-25% of total costs, mergers may substantially improve cost efficiency when relatively efficient banks acquire relatively inefficient banks, (2) Haynes and Thompson (1999) explain that if a bank merger results in transferring assets to better quality managers, X-efficiency gains are likely to result: where potential acquirers are usually more efficient than target banks and (3) Resti (1998) suggests increased efficiency levels tend to occur when banks have considerable market overlaps. This is because by the end of the study period, we found only one bank that managed to attain TE, PTE and SE levels that matched or surpassed the levels recorded during the pre-merger years.

On the other hand, this study is consistent with Avkiran (1999) whose results assert that acquiring banks may be more efficient than the target banks but they do not necessarily maintain their pre-merger efficiency levels following bank mergers. This study is also consistent with the findings of Berger and Humphrey (1992), Srinivasan and Wall (1992) and Rhoades (1993) whose findings maintained that there is no efficiency gain from in-market mergers where the

acquiring bank is more efficient. Thus, this study shows that even bank mergers in a developing economy do not necessarily lead to efficiency gains as promoted by many academics and policy makers. Following this, decision makers need to be more cautious in promoting bank mergers as a means to attain higher efficiency.

It is very likely that banks became inefficient in the post-merger period relative to the pre-merger period because bank managers need time to address the coordination difficulties arising as a result of bank mergers. Nevertheless, in this study, the Malaysian central bank had reported that all merged banks had successfully integrated their operations within their own groups by 2001. Thus, efficiency gains should be evident by 2002 at the latest. The results show inconclusive evidence of such gains. But perhaps it is also possible that banks need more time to adjust their operations accordingly despite the central bank's claims. This is because the existing literature more or less arrived at a concensus that newly merged entities may take between 2 to 4 years before cost savings and revenue enhancements can be realized Berger et al. (1998), Calomiris and Karceski (2000), Rhoades (1998) and Houston et al. (2001). For 6 of the 9 merger cases studied, the fourth post-merger year would coincide with 2004. Only in 1 of the other 3 bank merger cases had the merged entities been through the 3rd post-merger year by 2002. That particular banking group experienced efficiency growth in the 1st and 2nd post merger years but recorded efficiency decline during the 3rd post merger year. The case however presents a rather different result from the other 8 cases. This is largely because when 2 banks merged into a single entity in 1998, a full fledged Islamic bank was created out of the operations of both merging banks. The Islamic bank operated as a separate and distinct legal entity from the merged commercial banks. Thus, the results from this case cannot be interpreted with confidence as they are confounded by the effects of the event.

A point raised by Haynes and Thompson (1999) is that if a bank merger results in transferring assets to better quality managers, X-efficiency gains are likely to

result: where potential acquirers are usually more efficient than target banks. Furthermore, the findings are also consistent with Resti (1998) who suggests that increased efficiency levels tend to occur when banks have considerable market overlaps.

7.4: Discussion on Research Question 4: Evidence on the Transmission of Post-Merger Gains to the Public

Research Question 4:

What is the Evidence of Public Benefits of Bank Mergers?

Summary of Important Findings: Evidence on the Transmission of Post-Merger Gains to the Public.

Discussion on Research Question 4:

In 7.3, it was shown that the findings are inconclusive in regards to past merger efficiency gains among merged bank entities although banks generally recovered from efficiency declines that occurred during the first post-merger year in the second post-merger year. Nevertheless, the results from 7.3 show:

1. For 8 out of 9 bank merger cases, banks experienced increases in the market share of deposits during the first post-merger year. However, in only 1 case had the increase in deposit market share been accompanied by an increase in TE. Thus, as far as the first post-merger year is concerned, there is only one case in which the transmission of post-merger gains to the public is evident.
2. In the second post-merger year, there were 3 cases where there had been increases of market share of deposits following increases in TE. One of the other 6 cases experienced declines in both (but still preserves the proposed causality between post-merger efficiency gains and the transfer of such gains to the public. In this case, post-merger efficiency losses translate into less favourable rates, pricing and even quality to the public). The remaining 5 cases exhibited inconsistent results.

3. In the only cases where observations for the third post-merger year is possible, both bank groups experienced decline in TE and market share of deposits after showing increases in both during the second post-merger year. Thus, the post-merger efficiency gains and the transmission of such gains to the public appear to be non-sustainable. Nevertheless, these two cases were insufficient to render firm conclusions on the Malaysian bank merger experience as a whole.

Thus, there is inconsistent and inconclusive evidence about the extent to which benefits of post-merger bank efficiency gains are passed on to the public. Only a few cases support the proposition and the causality that changes in market share and changes in overall operating technical efficiency are positively correlated. And even these few cases proved to be unsustainable where the causality appears to have diminished by the third post-merger year.

The same inconclusive results were also inferred by Avkiran (1999). The author attributed the inconsistent results to the possible fact that a change in the market share of deposits is not a very good proxy for measuring the extent of post-merger efficiency gains to be passed on to the public. The author in fact explains that the direction of causality reasoning can be reversed to the effect that the increase in efficiencies does not guarantee decreases in prices and increases in the quality of banking products and services. Furthermore the study expounds the possibility that increased market penetration creates monopoly power due to fewer competitors and as such, merged entities are less inclined to improve service at better prices. However this latter argument forms the basis for providing a rather poor and counterintuitive explanation of the Malaysian financial environment as no single intermediary possesses a substantial market share that threatens Malaysia's competitive financial environment[29].

[29] An observance of the results in Table F provides justification for this stand, as the local bank with the highest market share of deposits as at the end of 2002, merely controls 12.93% of total deposit. This provides a clear indication of the absence of a strong monopoly within the Malaysian financial system.

Nevertheless, it is important to note that both this study and that by Avkiran (1999) only examine both change in market share of deposits and change in post-merger TE variables over a time period of less than 4 years. Focarelli and Paneta (2002) highlighted that improvements in efficiency may emerge after some time resulting in more favorable future pricing for consumers. Empirical evidence has shown considerable lags are likely between the completion of a merger and the realization of the public gains due to the difficulties faced by the merged bank entities in integrating their operations and systems, rationalizing common assets and harmonizing management styles. The same study actually looked into interest rates for different categories of deposits of Italian banks over 9 years to detect favorable pricing effects due to post-merger efficiency gains. A longer time frame, if applied to this study would reveal any noticeable trends.

Figure 7.1: Banks Inputs and Outputs (Foreign Islamic Banking Services)

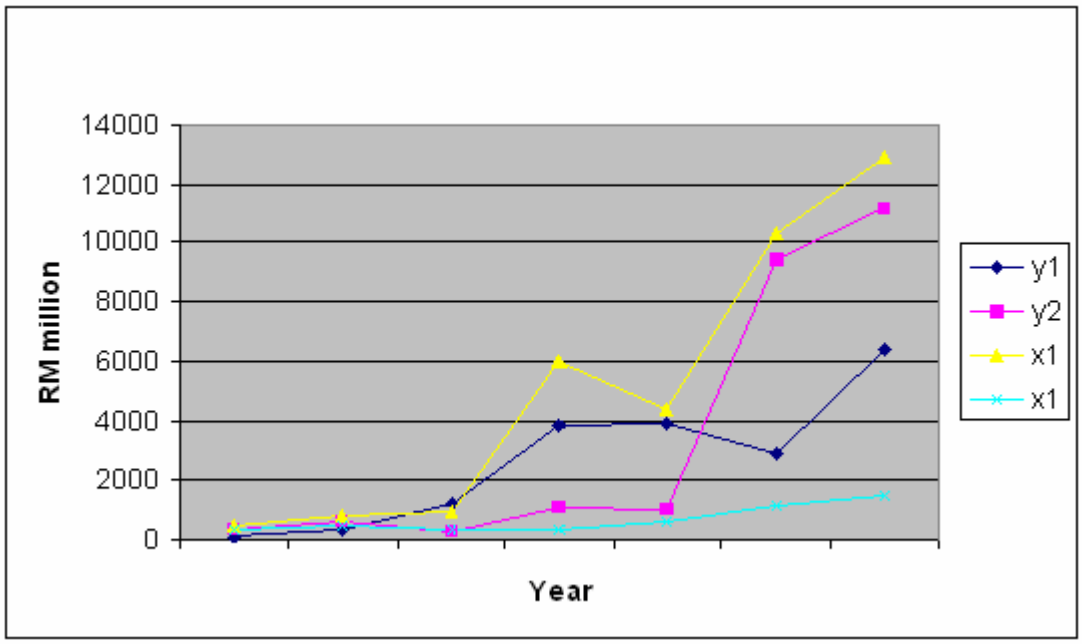


Figure 7.2: Banks Inputs and Outputs (Domestic Commercial Banks)

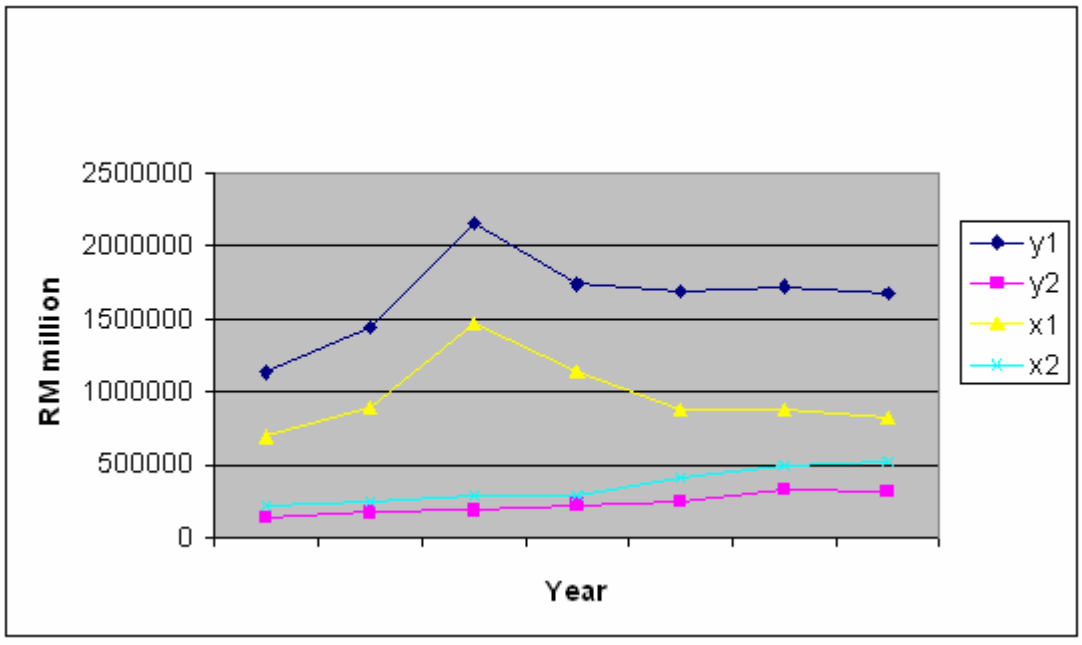


Figure 7.3: Banks Inputs and Outputs (Foreign Commercial Banks)

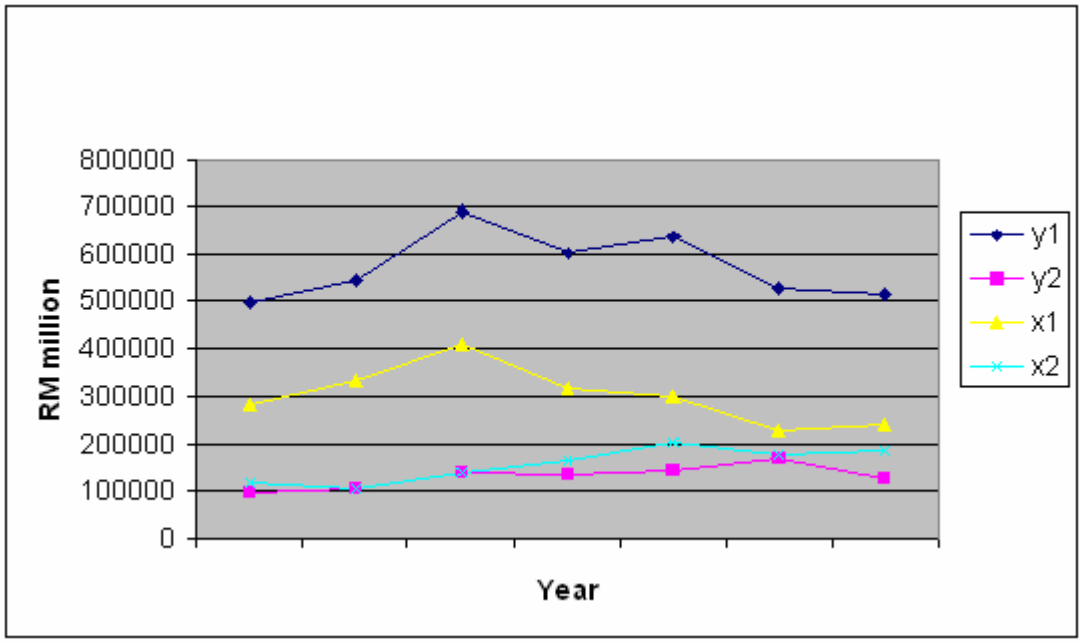
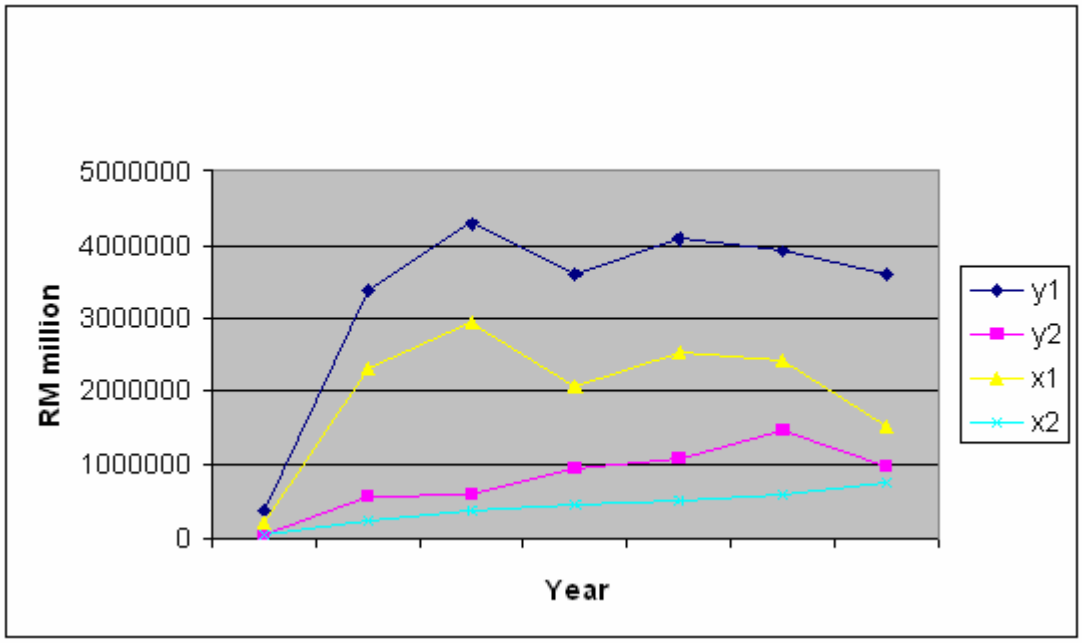


Figure 7.4: Banks Inputs and Outputs (Singaporean Commercial Banks)



Inputs and outputs of Figure 7.1 to 7.4 refer to variables on Table 5.1

	Conventional Banking Variable	Islamic Banking Comparable Variable
Inputs	Interest Expense	Income attributable to depositors
	Non-Interest Expense	Expenses not related to income attributable to shareholders
Outputs	Interest Income	Income from financing
	Non-Interest Income	Non-financing income

Table 5.1: The List of Comparable Variables for Conventional and Islamic Banking following the Intermediation Approach of Modeling Bank Behavior.

CHAPTER 8:
CONCLUSIONS

The role of financial intermediation is to channel pooled funds from surplus units to deficit units to enable the latter to undertake the use of the funds for either consumption or investment purposes. In return, the deficit units or borrowers compensate both the bank and the saver in the form of interest. This contractual design forms the basis of conventional banking that has a record of almost 300 years of history. The interest-based debt contracts have been able to effectively solve problems of moral hazard and adverse selection in the bank-borrower relationship but at times they fall short. This happens in terms of the depositor-bank relationship as depositors often rely on bank shareholders to monitor banks for them when they delegate both agency problems and costs to the banks that act as their agents (Lewis and Algaourd, 2001). This form of financial intermediation nevertheless, has been able to generate acceptable risk and returns to all parties.

The forces of financial deregulation, consolidation, technological advances and financial innovation however, are rapidly transforming the role of financial intermediaries including banks by intensifying competition among them. Financial intermediaries often respond to these forces of change by engaging in financial innovation, a process where new financial solutions that provide better investment opportunities, returns and risk management, thus helping to maintain their competitive positions. As a result, new financial instruments or even new financial systems are being introduced at increasing rates to serve the role of financial intermediation as financial innovation is assisted by advancements in technology, finance theory and the liberalization of financial regulations.

Islamic banking represents a new form of financial intermediation that is fast gaining popularity worldwide. Unlike conventional banking, Islamic banking

prohibits the charging and receipt of interest and the practice of amassing wealth through speculative economic transactions that entail excessive risk. Instead, Islamic banking strives for economic justice and emphasizes societal and community welfare development above the earning of economic profits. In short, the essence of Islamic banking is a dual partnership between the Islamic bank and its depositors and between the Islamic bank and its investment clients to manage the depositors' financial resources towards productive uses. Rather than earning returns in the form of interest, both the Islamic bank and depositors instead share in the profits or loss in a particular project with the investors. Profit and loss sharing (PLS) arrangements in investment financing therefore form the key theoretical framework for Islamic banking.

Islamic banking was initially conceived during the first centuries of Islam to enable Muslims to conduct financial transactions. It had rarely however developed into a formal financial intermediation framework capable of mobilizing massive financial resources from the deficit to the surplus units. Islamic banking is governed by the holy precepts contained in Islamic holy scriptures and therefore it is both a duty and an obligation of Muslims to transact in accordance with Islamic banking principles. Thus, Islamic banking holds tremendous potential especially in Muslim countries where the revival of Islamic banking is fast taking place as conventional banking slowly gives way after becoming the principal financial intermediary since the colonial period. Furthermore, there has been much support and interest shown by non-Muslim depositors, investors and organizations. In fact, collective evidence has shown that multinational banks and organizations have been more adept in operating Islamic banking than full-fledged Islamic banks from Muslim countries. As a result, Islamic banking has experienced astounding growth rates over the past two decades compared to the relatively paler performance of conventional banking.

Nevertheless, the rejection of interest-based mechanisms exposes Islamic banking to heightened risks arising from (1) the nature of equity-like funding, (2)

moral hazards, (3) adverse selection and (4) the lack of risk hedging and liquidity instruments that are based on PLS arrangements. As a result, Islamic banks tend to experience imbalance between funding and financing sides of their balance sheets where funding often exceeds financing because either (1) banks' precautionary stands of expanding investments or/and (2) the lack of suitable investment avenues with more desirable risk-return profiles. To aggravate problems further, the fundamental differences inherent in Islamic banking could potentially result in friction and misunderstanding with regulatory bodies and other external agencies that Islamic banks need to deal with as they often treat banks as authorized interest-based depository financial institutions: the regulations of many central banks to protect depositors in non-Muslim countries are in contradiction with the concept of PLS deposits of Islamic banks. Furthermore, conventional accounting standards are often inadequate for the provision of accurate disclosures of financial reporting to stakeholders.

The distinctive nature and challenges presented by Islamic banking calls into question the sustainability of growth of the sector and its ability to compete against conventional banking as an alternative banking mode despite its impressive record so far. After all, the growth rates of Islamic banking are rather crude measures to gauge the competitiveness of Islamic banking vis a vis conventional banking. This is compounded by the fact that a cross-system performance assessment and analysis between Islamic banking and conventional banking has never been widely researched before. Nevertheless, a credible cross-system bank performance would yield valuable insights to all participants in the financial intermediation process (including regulators) whose decisions would have significant bearing over the eventual success or demise of Islamic banking as a viable alternative financial system to conventional banking.

This study shows that despite the fact that many aspects within Islamic banking deviate significantly from those of conventional banks, Islamic banking is nevertheless performing the same role of financial intermediation function as

conventional banking. This argument then forms the basis for a comparative bank performance assessment methodology between Islamic banking and conventional banking. Subsequently, 2 input and 2 output variables of Islamic banking that are comparable to the input-output variables of conventional commercial banks have been derived. In Islamic banking, (1) financing and (2) non-financing income are shown to be close counterparts of (1) interest revenue and (2) non-interest revenue of conventional banks. Furthermore both (1) income attributable to shareholders and (2) income not related to income attributable to shareholders in Islamic banking are synonymous to (1) interest expense and (2) non-interest expense in conventional banking.

With credible models of both conventional and Islamic banking to hand, the study proceeds to perform a comparative bank performance assessment. Bank performance assessment is then defined in terms of bank total factor productivity that includes (1) technical efficiency, (2) scale efficiency and (3) technical change. Both of the first two terms are absolute measures at a specific point of time while the third term is a relative measure between two time periods to capture the shift of the efficient frontiers. Bank technical and scale efficiency measures are computed using the Data Envelopment Analysis approach to generate relative efficiency scores while the final term is computed using the Malmquist Productivity Index or the MPI approach that employs and compares relative efficiency scores ratios between two time periods.

The methodology is applied to the Malaysian dual banking system case. The dual banking system enables one to make a bank productivity performance comparison between conventional and Islamic banks more effectively and accurately than in a full-fledged Islamic financial system and a mixed financial system. This is because in a dual banking environment, both conventional and Islamic banks enjoy identical regulatory control, supervision and incentives that are often lacking in the other two financial systems. Thus, it is only within a dual banking system that both conventional and Islamic banks compete on a level

playing field and this therefore enables a cross system bank productivity comparison to be done.

The choice of the Malaysian dual banking system as the case study for this study is justified on the grounds that the Malaysian case represents the only developed and sophisticated dual banking system in the world that is complete with (1) effective regulation of Islamic banking, (2) Islamic money and capital markets and (3) a broad spectrum of Islamic financial instruments that include short term government liquidity instruments. These have essentially enabled Islamic banking to effectively compete with conventional banking.

The research questions that were addressed are in brief as follows: (1) what is the comparative productivity performance between conventional and Islamic banks within a dual banking system?, (2) what is the comparative productivity performance between domestic and foreign banking institutions, (3) has there been any post-merger efficiency gains for banks?, (4) if there have been gains, has there been transmission of post-merger efficiency gains to the public.

What follows are summaries of the results and discussions of this study. To ease readability, the following abbreviations should be noted (1) CBS: commercial banking system, (2) IBO: Islamic banking operations, (3) IBS: Islamic banking schemes, (4) DCB: domestic commercial banks, (5) FCB: foreign commercial banks, (5) IB: Islamic banks, (6) DIBS: domestic IBS and (7) FIBS: foreign IBS.

In reference to **Research Question 1** on the comparative productivity and efficiency performance between CBS and IBO, the principal findings of this study indicate that on average, the IBO tended to be more efficient and productive than the CBS within the Malaysian dual banking system. Specifically, the IBO began to improve their efficiency with the onset of the 1997-1998 financial crisis. This was largely caused by a sudden migration of funds from CBS to IBO as depositors received better investment deposit rates or returns in Islamic banking compared to the lower interest rates offered by conventional

commercial banks. This was whilst the central bank pursued an easy monetary policy to revive the economy following the crisis. The results thus show that the acceptance of Islamic banking was largely attributed to motives aimed at earning higher economic returns rather than its salient ethical features. The IBO continued to grow beyond 1998 as the central bank introduced a number of financial restructuring measures geared towards developing the IBO as a viable financial intermediary system capable of mobilizing financial resources on a grand scale that would be comparable to CBS. Thus, the IBO experienced relatively higher progress in terms of PTE and SE change relative to the CBS between 1998 and 2002. The initiatives of the central bank in developing the Islamic banking system in Malaysia alongside the lifting of a number of restrictions on IBS operations saw both the FIBS and the DIBS beginning to increase their efficiency and hence their productivity at a faster rate than the IB beyond 2000.

Nevertheless, there had been imbalance between the financing and funding sides for the IBO. The unfamiliarity of the greater risks inherent in Islamic banking caused the savers to deposit their surplus funds in short-maturity savings accounts rather than investment accounts that have a longer maturity. Although rates of return are not guaranteed in savings accounts, IBO banks in general had been willing to compensate depositors for their funds. The rates of return were nevertheless not determined by the amount of risk assumed by depositors in PLS investments but rather by the demand and supply of loanable funds. Thus, Islamic banking in Malaysia has only been able to outperform CBS by being willing to compensate depositors much like paying interest rates to savers. IBO banks also experienced excess liquidity due considerable difficulties in channelling funds to finance the PLS investment projects that have suitable risk-return profiles. The heightened risk in PLS arrangements generally made banks more cautious in expanding their assets. The financing decisions and directions of the DIBS and the IB were also subject to some degree of political pressures in directing credit towards priority sectors.

The FIBS on the other hand, were becoming more reliant on non-financing income from fee-based activities to generate profit returns due to their greater access and participation in the international money markets as a result of their wide network of international presence and the existing supporting frameworks afforded by their conventional banking operations. The FIBS thus began to surpass the DIBS and the IB in PTE change since 1999.

At the same time, the DCB bank merger exercise initiated in 2000 and completed in 2001 had significant spillover effects on the DIBS operations since the DCB are often the parent bank of the DIBS operations. The sudden enlargement of size following the bank mergers in 2000 eventually resulted in increased scale inefficiency among the DIBS. The FIBS on the other hand were operated by FCB that were restricted by regulations in terms of enlarging their branches and ATM network. By being able to rely on their marketing and service quality expertise in marketing themselves to the public, the FIBS registered higher SE change compared to the DIBS and the IB towards 2002 as the FIBS began to become more efficient in SE in 2000.

Fully fledged Islamic banks (IB) meanwhile had more similarities in terms of their operations with conventional commercial banks. This is because, unlike the DIBS and the FIBS that are able to leverage upon existing risk management competencies, distribution network, technologies and other shared assets with their parent CBS operations, the IB had to provide and build these necessities on their own. Furthermore, the IB operations were more constrained by political pressures to undertake government priorities due to (1) the assistance extended by governments in the Islamization of the financial system and (2) the large fund contributions by the government in the form of longer maturity investment accounts.

Throughout the study period, all the IBO appear to have experienced technical regress on average compared to technical progress made by the DCB. This may be due to the fact that technological investments made by the DCB

benefited their subsidiary the DIBS and the FIBS operations as they often shared the same assets, resources and distribution networks.

With regards to the comparative productivity performance between the DCB and the FCB in **Research Question 2**, the results showed that the FCB outperformed the DCB on average TE, PTE and SE measures. Nevertheless, despite the differences both DCB and FCB did not achieve very efficient scores on all three measures. Most of the TE efficiency difference was attributed to higher SE scores for the FCB compared to the DCB although both banking groups had almost identical PTE scores on average. Subsequently, the FCB dominated the DCB in TFP change, TE change, PTE change and SE change measures.

Overall, the FCB were more efficient than the DCB and this difference was largely due to the FCB being more scale efficient than domestic banks particularly during 1998 during the heights of the financial crisis and in 2001 following the industry-wide bank merger exercise implemented in 2000 by the central bank. In 1998, many DCB that were already experiencing sharp tightening of interest margins were further burdened by excessive overheads and bank staff costs resulting from the banks' actions in over expanding their branch and ATM networks after prolonged periods of profitability growth during the pre-crisis years. The FCB meanwhile experienced less deterioration in SE because they were not allowed by the regulators to expand their branch and ATM networks. On the other hand, the sudden expansion of assets following the bank merger program in 2000 also resulted in many DCB operating beyond the most efficient scale size (MPSS) and all exhibited DRS in 2001. In fact throughout the study period, most DCB were oversized as almost all banking institutions operated on DRS. In contrast, a number of the FCB actually managed to attain MPSS towards 2002 although most units exhibited DRS.

Both efficiency and productivity trends for both the DCB and the FCB had a positive correlation with one another. In general, banks were adversely affected

by the financial crisis between 1996 and 1998 and in 2001 by the bank merger program while banks had efficiency growth in 1999, 2000 and 2002. The DCB however tended to experience lower TE, PTE and SE scores than the FCB throughout, even during 1998 and 2001 when banks had efficiency troughs. This was largely due to better NPL provisioning in foreign banks. However the DCB on average outperformed the FCB where the technical change measure is considered. This is mostly attributed to the bank merger exercise where domestic banks had to change in response to mergers.

In relation to **Research Question 3** on the majority of bank merger cases involving the DCB; the acquiring banks were found to be more efficient in TE and PTE than the target banks. In contrast, in almost all merger cases, the acquiring banks were less scale efficient than the target banks. Following a bank merger, the newly formed bank entities exhibited efficiency increases during the merger year but efficiency subsequently declined during the second post merger year due to higher declines in SE. The evidence gathered from the Malaysian dual banking system showed that there was no conclusive evidence as to post-merger efficiency trends beyond the first post-merger year as some banks experienced efficiency gains while some suffered deterioration. Nevertheless, for a majority of the bank merger cases, the post-merger TE, PTE and SE levels did not recover to match those attained during the pre-merger period. Our results were consistent with a majority of prior studies of bank mergers in the US, Europe and Australia that found very modest or no efficiency gains resulting from bank mergers

As to **Research Question 4** on the transmission of post-merger efficiency gains to the public, the results were too inconsistent to make a general inference that (1) there had been sustained post-merger efficiency gains made by banks and (2) the gains were passed on to the public and thus resulted in higher deposit market shares. The inconsistent results may be due to the possible fact that change in the market share of deposits is not a very good proxy for measuring the extent of post-merger efficiency gains to be passed on to the public.

Summary

The empirical evidence obtained shows that Islamic banking operations (IBO) were more productive than conventional banking schemes (CBS) since 1997 due to the migration of funds that resulted from: (1) the Islamic banks' ability and willingness to offer higher rates of return compared to the relatively lower deposit rates available in conventional banks and (2) the growing scale inefficiencies among conventional banks that followed the financial crisis. IBO tend to operate at more efficient scale sizes than do conventional banks. Nevertheless, the IBO experienced technical regress on average compared to CBS as the majority of the IBO were Islamic banking schemes operated by conventional banks that were able to leverage on the technological investments and other competencies of their parent banks. Consistent with these findings, the study shows that full-fledged Islamic banks were the least productive banks and they exhibited strong performance similarities with conventional banks. Nevertheless, the findings suggest a prevalence of asset-liability imbalance among the IBO due to a unique and heightened risk profile of the IBO. Subsequently, Islamic banking schemes operated by foreign banks were found to be more productive due to the greater contributions from their off-balance sheet activities that partially offset the problems of asset-liability mix problems.

This study also concludes that foreign commercial banks had outperformed domestic commercial banks despite the restrictive regulation on branch and Automated Teller Machines (ATM) network expansion that was imposed on the former. Overall, the foreign conventional banks (FCB) were more efficient than the domestic conventional banks (DCB) and this difference was largely due to the FCB being more scale efficient than domestic banks following the onset of the financial crisis and the bank merger exercise that involve all DCB. The empirical findings also show inconclusive evidence as to the presence of post-merger gains among merged bank entities and the transmission of these gains to the public.

Limitations of study

The results obtained in this study may be confounded by the fact that the post-merger periods for most merged bank entities were simply too short to allow for

suitable gestation period before operation and system integration among the merged entities began to result in efficiency gains for the banks and thus the subsequent transmission of such gains as benefits to the public. Hence, a longer time frame if applied to our study would better reveal any noticeable trends. The results are to be interpreted with the understanding of the context of the study. The application of the intermediation approach indicates that the banking operations were rated based on the function of mobilizing funds only.

Further research

The Malaysia dual banking system allows the study to venture further to gather additional empirical insights to the pertinent issues of post-bank merger efficiency gains and the transmission of such gains to the public. The empirical findings of this study could further add discussion to the already heated debates on the existence of post-merger efficiency gains for banks that are often forwarded as the motives for the bank mergers. The Malaysian experience could also add a further dimension to the banking literature by presenting not only a cross-system bank productivity analysis in a dual banking system alone, but also in a developing country's financial system. Specifically, this study could further address the pertinent issue of comparative performance between domestic banks and foreign banks as they compete on both conventional and Islamic banking fronts. Finally, the inclusion of Singaporean banks enhances the ability of the DEA models to discriminate between efficient/productive banks from those that are not. This could open frontiers to further research of benchmarking in bank productivity within the relatively regulated developing financial systems.

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GLOSSARY

AAOIFI	Accounting and Auditing Organization for Islamic Financial Institutions
AP	Average Product
ASEAN	Association of South East Asian Nations
ATM	Automated Teller Machines
BIMB	Bank Islam Malaysia Berhad
BNM	Bank Negara Malaysia (Malaysia's Central Bank)
CBS	Conventional Banking Schemes
CDRC	Corporate Debt Restructuring Committee
CEPA	Center for Productivity and Efficiency Analysis
CRS	Constant Returns to Scale
CV	Coefficient of Variation
DCB	Domestic Commercial Banks
DEA	Data Envelopment Analysis
DEAP	Data Envelopment Analysis Programming
DFA	Distribution Free Approach
DIBS	Domestic Islamic Banking Schemes
DMU	Decision Making Unit
DRS	Decreasing Returns to Scale
EE	Economic Efficiency
EKS	Econometrics Software
ERDF	Entrepreneur Rehabilitation and Development Fund
ESH	Efficient Structure Hypothesis
FCB	Foreign Commercial Banks
FDH	Free Disposal Hull
FIBS	Foreign Islamic Banking Schemes
FMSP	Financial Sector Master Plan
GATS	General Agreement In Trade and Services
IAIB	International Association of Islamic Banks
IASC	International Accounting Standards Committee
IB	Islamic Banks
IBCA	Intervest Bancshares Corporation
IBO	Islamic Banking Operations
IBS	Islamic Banking Schemes
ICT	Information Communication Technology
IDEAS	Econometrics Software
IFBS	Interest Free Banking Scheme
IFRS	International Financial Reporting Standards
IFSB	Islamic Financial Services Board
IIMM	Islamic Interbank Money Market
IRS	Increasing Returns to Scale
LP	Linear Programming
M&A	Merger and Acquisitions
MAS	Monetary Authority of Singapore
MM	Modogliani and Miller
MPH	Market Power Hypothesis
MPI	Malmquist Productivity Index
MPSS	Most Productive Scale Size
NIRS	Non-Increasing Returns to Scale
NPL	Non-Performing Loans
OBS	Off Balance Sheet
PEFCH	Pure Technical Efficiency Change

PLS	Profit and Loss Sharing
PPC	Production Possibility Curve
PTE	Pure Technical Efficiency
R&D	Research and Development
RAM	Rating Agency Malaysia
SAS	Statistical Software
SCB	Singapore Commercial Banks
SCHTCH	Scale Change of Technology
SE	Scale Efficiency
SECH	Scale Efficiency Change
SFA	Stochastic Frontier Approach
SHAZAM	Econometrics Software
SME	Small and Medium Enterprise
TE	Technical Efficiency
TECHCH	Technical Change
TFA	Thick Frontier Approach
TFP	Total Factor Productivity
VRS	Variable Returns to Scale
WDEA	Econometrics Software
WTO	World Trade Organization