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EFFICIENCY OF ISLAMIC BANKS IN MALAYSIA: A COMPARISON BETWEEN LOCAL ISLAMIC BANKS AND FOREIGN ISLAMIC BANKS

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Universiti Utara Malaysia

MASTER IN ISLAMIC FINANCE AND BANKING

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ABSTRACT

This research paper study the on efficiency level for all Islamic banks in Malaysia during the year 2008 to 2016.Other than that, this research paper compare the efficiency of the local Islamic banks and foreign Islamic bank in Malaysia during the same period of the study. The efficiency of all Islamic in Malaysia is measured by utilizing Data Envelopment Analysis. The data are extracted by Bank scope and Annual Report from 2008 to 2016. The samples consisted of 16 Islamic banks in Malaysia. In overall, the finding shows that Islamic banks in Malaysia perform efficiently. Other than that, the finding shows that local Islamic banks more efficient compare to foreign Islamic banks. Hence, the findings of this research have policy implications and make a contribution to policy-making by providing empirical evidence on the performance of the Islamic banks and their efficiency level.

Keywords: Efficiency, Islamic banks, Data Envelopment Analysis

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ABSTRAK

Kertas kajian ini menjalankan kajian terhadap tahap kecekapan perbankan Islam yang terdapat di Malaysia ini dari tahun 2008 sehingga tahun 2016. Selain itu, kertas kajian ini juga membuat perbandingan kecekapan di antara bank Islam tempatan dan bank Islam asing dalam tempoh kajian yang sama. Kaedah kajian ini, menggunakan kaedah Data Envelopment Analysis atau DEA. Data mengenai bank Islam yang terdapat di Malaysia diperolehi melalui bank scope dan laporan tahunan bank Islam dari tahun 2008 sehingga tahun 2016. Sample kajian pula, terdiri daripada 16 bank Islam yang terdapat di Malaysia. Hasil kajian ini mendapati bank-bank Islam ini menunjukkan kecekapan dari tahun kajian yang telah dijalankan. Di samping itu juga, hasil kajian ini juga menunjukkan bank Islam tempatan mempunyai tahap kecekapan yang lebih baik berbanding bank Islam asing. Diharapkan semoga hasil kajian ini, mampu memberikan sumbangan kepada pihak yang berkepentingan dan penggubal polisi dengan memberikan informasi mengenai prestasi bank Islam dan tahap kecekapan bank Islam yang terdapat di Malaysia ini secara bukti empirical.

Keywords: Kecekapan, Bank Islam, Data Envelopment Analysis

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LIST OF ABBREVIATIONS

IDB	Islamic Development Bank
OIC	Organization Islamic Countries
KLSE	Kuala Lumpur Stock Exchange
IFSA 2013	Islamic Finance Services Act 2013
BNM	Bank Negara Malaysia
UAE	United Arab Emirates
DCIBF	Dubai Center for Islamic Banking & Finance
KFH	Kuwait Finance House
US	United State of America
GST	Good Service Tax
SST	Sales Service Tax
DEA	Data Envelopment Analysis
TE	Technical Efficiency
ROA	Return on Asset
MENA	Middle Eastern & African
GCC	Gulf Cooperation Council
DMU	Decision Making Unit
SE	Scale Efficiency
PTE	Pure Technical Efficiency
OLS	Ordinary Least Square

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

1.1.1 History of Bank

The word bank is derived from the Italian word "*banco*" (long beach), because the Jewish bankers sat there while providing currency exchange and loan services, normally in popular areas such as markets or preaching halls. Bank may also trace its origins from Germany word "*banch*" meaning "a pile". The term that Germans used is to represent a kind of public debt. Historically, banks functioned to provide deposit, loan, and currency exchange services. With time, these banking services became crucial to a nation's economic advancement. Jews who immigrated to England during the reign of William the Conqueror (1028-1087) dominated the banking business. Jewish bankers provided loans to businessmen and demanded collateral such as land, diamonds, gems, and precious objects, but with a very high interest rates.

In 14th century, goldsmiths from Florence, Venice and Genoa took over the Jewish banking, goldsmith, and pawnshop businesses. These banks were located at Lombard Street, and by the 17th century, they were providing nearby firms with secure good owns for gold and cash. During the Industrial Revolution in 18th century, the administration and management of banking in England had grown considerably. Early in the following century, banker broadened their operations to offer several types of deposits and cashier cheques also to issues conveyable promissory notes. During the process, they

introduced banknotes. The well-developed techniques of the English banks became the global model for modern commercial banks.

1.1.2 Development of Islamic Banks in the World

Islamic bank can be consider as financial institution that provide various type of financial products that based on the Shariah ruling. The main resources of the Shariah laws are from the Quran and As-Sunnah. Islamic bank in the world begin in 1963 when the establishment of the first Islamic bank in Egypt. Ahmad al-Najjar was the chief founder of this bank and the key features are profit sharing on the non-interest based philosophy of the Shariah law. In 1974, the Organization of Islamic Countries or commonly known as OIC launched another Islamic bank that known as Islamic Development Bank or IDB. The core business model of this bank was to provide financing and support on profit sharing. In 1975, the first private commercial bank was established in Dubai, the Faisal Islamic bank of Sudan in 1977 and Bahrain Islamic bank was established in 1979.

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1.1.2 Islamic Banking System Overview in Malaysia

Islamic banking system in Malaysia begins in 1963, when the Malaysia government introduce Pilgrimage Fund Board or commonly called as Lembaga Tabung Haji. This institution plays important roles in collect, and manages the fund from Muslims people in Malaysia that have the intention to perform the Hajj in Makkah. The main objective from Lembaga Tabung Haji is to encourage Muslims in Malaysia to reserve or saving their money to perform the pilgrimage in Makkah. Besides that, it gives the opportunity to Muslims in Malaysia especially to participate in Islamic transaction that based on the Sharia law.

In 1982, Malaysia government introduce new Islamic banking act that known as Islamic Banking Act 1982. Then, in 1983 the first Islamic bank was established known as Bank Islam Malaysia Berhad. After 10 years, the second full-fledged Islamic banks were established known as Bank Muamalat Malaysia Berhad. In 1984, the first Takaful company was established by Malaysia government that known as Syarikat Takaful Malaysia Berhad. These developments were then expanded with the introduction of Islamic windows by conventional banking institution in 1993.

The movement of Bank Islam Malaysia Berhad is very fast particularly within 10 years of operation and it was proved to be a viable banking institution with its business operation expanded rapidly throughout the country. Bank Islam Malaysia Berhad was listed on the Main Board of the Kuala Lumpur Stock Exchange (KLSE) on 17 January 1992 (Akram Laldin, 2012). In 2013, Malaysia government introduced new Islamic banking act known as Islamic Finance Services Act 2013 or commonly known as IFSA 2013.

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1.1.3 Foreign Islamic Banks in Malaysia

According to Akram Laldin (2012), Malaysia as one of the Islamic finance hub, the Malaysian government opens its markets to international players of the same field. Malaysia begins with allowing international banks which provide Islamic finance product to open their branches in Malaysia.

In 2006, Kuwait Finance House (Malaysia) Berhad, and Asian Finance Bank started it operation in Malaysia. Then, in 2007 Al-Rajhi banks open its first branch in Malaysia (BNM, Kuwait Finance House, Islamic Banking Research (2010)).

Islamic finance is experiencing moving very fast over the world and Malaysia is a powerhouse in its own path. Identified by Ernst and Young as one of the most important markets to drive further globalisation of the Islamic banking industry alongside Qatar, Indonesia, Kingdom of Saudi Arabia, United Arab Emirates (UAE), and Turkey (Ernst & Young World Islamic Banking Report 2014).

According to the report by The Economist, over 20% of Malaysia banking system was fully shariah and shariah compliant and the country seems set on its course to capture a larger slice of the global sukuk or Islamic bonds market in 2014 (The Economist, 2013).

Additionally, these achievements are remarkable since the country only has 30 million people with Muslim only 60% of the number. This is different if compared to Indonesia where only 4% of the financial sector in that country is shariah compliant, despite being home to the largest Muslim population in the world (The Economist, 2013).

Based on the data that released by Bank Negara Malaysia (2009), presented that there are about 16 Islamic banks in this country consisting both local and foreign Islamic banks and these include the Affin Islamic Bank and HSBC Amanah. According to Global Finance, a magazine for international bankers mentioned that Maybank Islamic Berhad as one of the World's Best Islamic Financial Institutions in 2013. Other than that, Maybank is the largest Islamic bank in Malaysia in terms of total assets and market share according to Global Finance (Global Finance, 2013).

Until nowadays, Islamic banks in Malaysia continuously growing with the total number of the Islamic banks is about 16 Islamic banks including the foreign Islamic banks in this country with the total net asset is about 65.6 billion USD with an average growth rate of 18%-20% annually.

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1.1.4 Latest Statistic about Islamic Bank

According to the report titled Islamic Banking: Growth, Efficiency and Stability that released by The Dubai Center for Islamic Banking and Finance (DCIBF), focuses on the efficiency performance of 131 Islamic banks operating globally and other various key facets of Islamic banking. Out of the total Islamic institutions research, DCIBF's report stated that an Islamic bank from Kuwait emerged as the world's most efficient. Meanwhile, The Kuwait Finance House (KFH) received the highest efficiency score among all Islamic banks stated in the report, followed by Al-Inma Bank from Saudi Arabia, which obtained the top score in terms of the most cost-efficient Islamic bank in the world. Meanwhile, the top 20 most efficient Islamic banks come from seven countries including the UAE, Qatar, Malaysia, and Bahrain in addition to Kuwait and Saudi Arabia. As an additionally, out the GCC region, it is only Malaysia that made it to the top 20 list.

Based on the data provided, more than 400 Islamic banks and financial institutions are now operating in over 60 countries from different regions, including Europe, Americas, South Asia, Far East, Africa and Australian. The report points out that the development and competitiveness of Islamic banking is being driven by numerous factors such as size, brand, ability to enter new markets, microfinance, combating poverty, strategic alliances, and the development of Islamic finance as an integral part of the global halal economy. Currently, the global Islamic Financial services industry valued at $2trillion. Even though, Islamic financial services is expected that Islamic banking will continue to grow globally, the study mentioned that it may face challenges especially in countries that heavily rely on oil and other commodity prices.

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1.2 Problem Statement

Since early 1990s, research that was focused on the efficiency of banking has become an important thing of banking literature (Berger and Humphrey, 1997). Perhaps, one of the reasons is, efficiency can be used as an indicator to measure a banks success. Specifically, using the efficiency criterion, the performance of Islamic banks as well as the industry can be gauged. Another reason is that the efficiency can also be used to investigate the potential impact of government policies on banks efficiency. Indeed, it is of regulators interest to know the impact of their policy decisions on the performance and efficiency of the bank, as they will enormously affect the economy. While there has been extensive literature examining the efficiency of the US and European conventional banking industries over the recent years (Berger and Humphrey, 1997; Goddard et al, 2001), the empirical work on Islamic Banking efficiency, particularly in Malaysia, is still in its infancy. So, this is a need to look and study about the efficiency of the Islamic banks in Malaysia especially.

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Islamic banks in Malaysia was begin in 1984 when the establishment Bank Islam Malaysia Berhad. In 1994, the second full-fledged Islamic bank known as Bank Muamalat Malaysia Berhad was established. In late 1990s most of the conventional banks in Malaysia started offered Islamic products in their premises. So, most of the conventional banks in Malaysia especially implement the dual banking system in their business operation. This condition affects the rise number of the Islamic banks in Malaysia. Meanwhile, foreign Islamic banks emerged in Malaysia Islamic financial market in 2006 when Kuwait Finance House started it first operation in Kuala Lumpur. Until nowadays, Malaysia have about 16 Islamic banks including local Islamic banks and foreign Islamic banks. In order to be more competitive, the Islamic banks must improve their efficiency and effectiveness to be on par with the world-class players

(BNM, 2001). Thus, there is a need to study the efficiency of the Islamic banks in Malaysia.

The liberalization of financial industry at a global scale, the rise of the technology, and the information revolution have put competitive pressure on banking both domestically and internationally(Carvallo and Kasman, 2005). This competitive pressure is particularly important for banks in the emerging markets as they constitute the main financial intermediaries to channel savings and investment. The competitive advantage is enhanced if banks can function efficiently. In this regard, conventional banks gained more advantages compare than the Islamic banks. The gale of economic liberalization currently sweeping across the world provides the reason for looking into the efficiency of Islamic banks in Malaysia since 2007; trade liberalization will require Malaysian domestic Islamic banks to compete with other foreign Islamic banks in term of their efficiency.

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In 2008, Malaysia economy growth slowly due to the impact of the sub-prime mortgage crisis that happen in United States of America. This economy crisis was caused by hedge funds, financial institutions and insurance companies. The first two, created mortgage-backed securities. The role insurance companies covered them with credit default swaps. The demand for mortgages led to an asset bubble in housing. When the Federal Reserve increased the funds rate, it increased the mortgage interest rates skyrocketing. That sent home prices plummeting, and borrowers. Derivatives had spread the risk into every corner of the globe. That caused the 2008 financial crisis, and the great recession. It created the worst recession since the great depression. Sub- prime economy crisis that happen in United States also give impact to the Malaysia economy. In 2008, Malaysia economy also faces with the recession. This problem happened, Malaysia most goods such as electric and electronic homes appliances devices were

imported to US country. Malaysia and America had a very good bilateral trade relationship since Malaysia achieved the independence. This economy crisis that happened in this country also gives impact to the overall business operation in Malaysia. This crisis also gives impact to the Malaysia financial services provider. This economy crisis affects the efficiency of the banks especially local Islamic banks and non-local Islamic banks.

In 2015, Malaysia government introduce new taxation scheme that known as Goods Service Tax or GST.GST was introduced by the Malaysian previous government aims to increase the Malaysia revenue. Before that, Malaysia government applied the Sales Service Tax or commonly known as SST. Sales Service Tax in Malaysia was implemented since 1970s and has gone through few improvement. Sales tax only charge to the manufacturer or consumer level. Meanwhile, service tax is imposed to consumers who are using taxed services. Commonly SST is charged between 5% until 10%. This SST is totally difference from the GST. GST taxation is imposed to each level of distribution which are the manufacturers, wholesalers, retailers and consumer. Even though the GST tax rate is only at 6%, but this tax is imposed to overall goods and services. Therefore, this increased the cost of the business operation and the cost of living too. Besides that, the implemented GST tax on 1 April 2015 give impact to most Islamic banks in Malaysia. The GST tax rise the operation cost of the Islamic banks. The increasing cost of the Islamic banks give challenges to the organization to run their business efficiently. The new taxation scheme that established by the previous government give impact to the efficiency of the Islamic banks as well.

Currently, fintech is used to describe new tech that seeks to improve and automate the delivery and use of financial services. At its core, fintech is utilized to help companies, business owners and consumers better manage their financial operations, processes and

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lives by utilizing specialized software and algorithms that are used on computers and, increasingly, smartphones. Fintech, the word, is a combination of financial technology. When fintech emerged in the 21st Century, the term was initially applied to technology employed at the back-end systems of established financial institutions. Since then, however, there has been a shift to more consumer-oriented services and therefore a more consumer-oriented definition. Other than that, fintech also includes the development and use of crypto-currencies such as bitcoin. Therefore, fintech may influence the performance and efficiencies of the Islamic banks in Malaysia.

1.3 Research Question

1. Are all Islamic banks in Malaysia perform efficiently?

2. Which banking system in Malaysia performs more efficient whether local Islamic banks or foreign Islamic banks?

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1.4 Research Objective

1. To measure the efficiency of Islamic banks in Malaysia.

2. To differentiate which Islamic banks in Malaysia perform more efficient whether local Islamic banks or non-local Islamic banks.

1.5 Significance of Study

Most research in Islamic banking and finance has focused primarily on the conceptual issues underlying no interest financing (Ahmed, 1981; Karsen 1982). These include the viability of Islamic banks and their ability to mobilise saving, pool risks and facilitate

transactions. Much less research has been done regarding the efficiency of the Islamic banking compared than the conventional banking.

Until nowadays, Islamic banks in Malaysia continuously develop widely. As an example, the increasing the total number of the Islamic banks and the rise of the total asset of the Islamic banks. It is really interesting to measure the performance of the all Islamic banks in Malaysia throughout their efficiency.

Lastly, the efficiency study may be as an indicator to prove whether the Islamic banks in Malaysia is competiveness in the Malaysia financial industry.

1.6 Scope and Limitation of the Study

This study only focused the general efficiency of the Islamic banks in Malaysia. This study measure the efficiency for the local Islamic banks and foreign Islamic banks in Malaysia. This research not involves measure the efficiency the conventional banks in Malaysia or comparison between the Islamic banks and the conventional banks. Other than that, this research measures the efficiency of the Islamic banks in Malaysia within the period of 8 years between the years 2008 until 2016. That year is selected due to the changes of the global economic condition. Therefore, it is interesting to look out for the efficiency the overall of the Islamic banks in Malaysia.

1.7 Organization of the Thesis

Chapter One describes about the introduction of the study, background of the research and mentioned about the problem statement of the study. It then outlines the research questions, objectives of the study, the significance of the study, the scope of the study and finally it presents the organization of the research. Meanwhile, next chapter contains the literature review from the previous study.

Chapter Three can be consider as the framework of the research and it states the hypothesis. Besides that, it provides the research methodology and justifies method that applies in this study. This chapter then discusses the operational definition of the study.

Chapter Four discussed about the data analysis by using Data Envelopment Analysis (DEA). Lastly, chapter five presents a brief introduction followed by the summary of findings. Chapter Five also discussed about the research implications, recapitulation of the entire study and discusses its findings, including the research implications and contributions. Finally, it then elaborates the research limitations and recommendations followed by a conclusion.

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CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter describes about the relevant literature review that related with this study. According to Sekaran (2003), the literature review can be consider as a documentation of an inclusive reviews of the ready and published work in which the researcher can be obtained from the secondary sources of data in the specified areas of that researcher. So, in this chapter will particularly describe about the literature reviews regarding the efficiency study of the Islamic banks from the previous study.

2.1 Theory of the Efficiency

Efficiency measurement is one aspect of investigating a firm's performance. Efficiency can be measured in three ways; maximisation of output, minimisation of cost, and maximisation of profits. The concept of determine the efficiency was first discussed by Farrell (1957). Commonly, efficiency is divided into two components (Kumbhakar and Lovell, 2003). That is technical efficiency and allocative efficiency. A firm is regarded as technically efficient if it is able to obtain maximum outputs from given inputs or minimise inputs used in producing given outputs. The objective of firm here is to avoid waste. Koopmans (1951) stated that a firm is considered technically efficient if, and only if, it is impossible to produce more of any output without producing less of some other output or using more of some inputs. According to Farrell (1957), the concept of efficiency measurement can be divided into two types, which are technical efficiency (TE) and allocative efficiency; technical efficiency is the organization or company able to generate maximal output from a given set of inputs, while allocative efficiency is its ability to use inputs in optimal proportions, given their respective prices and production

technology. Meanwhile, allocative efficiency refers as economic efficiency where the objective of producers is to attain a high degree of economic efficiency (cost, revenue or profit efficiency). Other than that, allocative efficiency relates with the optimal combination of inputs and outputs at a given price. The main aim the most company is to produce given outputs at minimum costs; to utilise given inputs so as to maximise revenue; and to allocate inputs and outputs so as to maximise profit. These types of production are commonly known as economic efficiency where the main aim of firms becomes one of attaining a high degree of economic efficiency (cost, revenue or profit efficiency). According on Farell's (1957), the combination of the two components gives the measure of overall economic efficiency.

2.2 Studies of Efficiency in Banking

Berger and Humphrey (1997) state that in their survey of 130 studies on efficiency analyses found that most of these studies were done in the United States of America banking industry. Despite the fact that efficiency research are well researched area in the developed countries like USA and Europe, there are still limited studies focusing on the efficiency of Islamic banking. According to Berger and Mester (1997) mentioned that, the two most important economic efficiency concepts are cost and profit efficiency in their study of the efficiency and productivity change in the United States (US) commercial banking industry. They state that profit measures give a more comprehensive view of efficiency and productivity change in the industry than the cost measures. According to Berger and Humprey (1997), cost efficiency analysis provides one overall cost-efficiency factor showing the relative difference in cost level compared to an average bank cost which could be obtained by curve fitting costs to level of bank input and output factors. Most of the research over the 1990s has focused mainly on estimates of cost efficiency (Berger, Hunter and Timme, 1993; Resti, 1997).

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2.3 Studies of Efficiency in Islamic Banking

The study by Hassan and Hussien (2003) is among the earliest to examine the efficiency of Islamic banks by using frontier efficiency method. Their study focussed on the efficiency of the Sudanese banking system during the year of 1992 until 2000. They apply a variety of parametric and non-parametric methods to a panel of 17 Sudanese banks.

Yudistira (2004) study about the performance of 18 Islamic banks over the year 1997 until the year 2000, where the Islamic banks suffer slight inefficiencies during the global crisis of 1998 until 1999. Yudistira (2004) found that the level of inefficiency in 1998 was due to pure technical inefficiency rather than scale inefficiency. According to Yudistra (2004) the contributing factor to scale inefficiency was bank size. Besides that, this study also found that profitability and risk taking did not have significant effect on the overall technical efficiency of these Islamic banks.

Meanwhile, Sufian (2006, 2007) determined the efficiency of the Malaysia Islamic banking sector during the period 2001 until 2005 using method Data Envelopment Analysis or DEA. His findings mentioned that the scale inefficiency dominated pure technical inefficiency in the Malaysia Islamic banking sector. This study also mentioned that the local Islamic banks are more efficient compared to the non-local Islamic banks. This research also suggested the better capitalised banks are more efficient, and that risk has positive relationship with both overall and pure technical efficiency.

Another studies that conducted by Hamim et al. (2007) study about the factors that may influence the efficiency of the full-fledged Islamic banks and Islamic window banks in Malaysia for the year 1997 until 2003. However, this research only focused on the technical efficiency and cost efficiency. By using the Data Envelopment Analysis

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method, this research suggested that the average technical efficiency and cost efficiency score of the Islamic Banks were lower compared to the conventional banks. Other than that, the efficiency analysis based on the bank types showed that the full-fledged Islamic banks were more efficient than the Islamic windows in both technical efficiency and cost efficiency.

Other than that, compared to Malaysian conventional banks, Rosly and Bakar (2003) suggested that during 1996 until 1999, Islamic dual banking system in Malaysia especially have higher profitability as measured by Return-on-Asset (ROA), but lower it asset utilization and investment margin ratios. Performance comparisons between Islamic dual banking system and full-fledged Islamic banks over 1996 until 1999 using financial ratios found that the former is more efficient in terms of capital structure, assets, deposit structure and profitability (Hamid and Ahmad, 2002).According to Hassan (2005) study about the relative cost, profit efficiency and productivity of the Islamic Banking Industry in the world. Employing a panel of banks during the year 1993 until 2001, he used both the parametric (Stochastic Frontier Approach) and non-parametric (Data Envelopment Analysis) method as medium to determine the efficiency of the sample banks. The results state that the Islamic banks are more profit efficient, with an average profit efficiency score of 84% under the profit efficiency frontier compared to 74% under the stochastic cost frontier. His study found that the main source of inefficiency is allocative rather than technical. Similarly, his study identify that the overall inefficiency was output related. The results also suggest that all five efficiency measures are highly correlated with ROA and ROE, suggesting that these efficiency measures can be used concurrently with the conventional accounting ratios in determining Islamic banks performance.

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According to Bader et al (2008) found that Islamic banking efficiency studies are mostly from emerging markets and less developed countries while conventional banking efficiency includes studies from both developed and less developed countries. Meanwhile, another study that conducted by Majid et al (2005) compared the relative cost efficiency of two commercial bank sets that are Islamic and mainstream in Malaysia during the period of 1993 until 2000. This study found that the efficiency of Islamic banks was not statistically different from the conventional banks. Mokhtar et al (2008) suggested that the full-fledged Islamic banks are more efficient than the Islamic windows and the Islamic windows of the foreign banks tend to be more efficient than the domestic banks over the period of 1997 until 2003.

Research that conducted by Abdul Majid, Md Nor and Said (2005) compare the relative cost efficiency of Islamic and conventional banks in Malaysia during the period of 1993 to 2000 The results show that Islamic banks are marginally more efficient than conventional banks. This study is further and supported by Kamaruddin, Safa and Mohammad (2008), this research suggests that Islamic banking operators are relatively more efficient at controlling costs than the foreign counterpart. On contrary findings, Mohd Zamil (2007) finds that the managerial efficiency of conventional commercial bank is higher than Islamic commercial bank during the study period of 2000 to 2004.

Meanwhile, study by Ahmad Mokhtar, Abdullah and Alhabshi (2007) research about the technical and cost efficiency of 20 Islamic window banks, two full-fledged Islamic banks and 20 non-Islamic banks over a period of 1997-2003. The DEA results find that the full-fledged Islamic banks are more efficient than banks that offer Islamic window; nevertheless, the Islamic banks are still considered as underperformed relatively to non-Islamic banks. The researchers further that foreign Islamic banks are more efficient than domestic Islamic banks.

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Sufian and Noor (2009) provided a comparative analysis of the efficiency of Islamic banking sectors in the Middle Eastern and African (MENA) and Asian countries by utilising Data Envelopment Analysis (DEA) to estimate the technical, pure technical and scale efficiency for each bank during the year 2001 until the year 2006. The study found that the Islamic banks in MENA exhibit higher mean technical efficiency relative to the Islamic banks in Asian countries. In addition, the pure technical inefficiency outweighed the scale inefficiency in both MENA and Asia banking sectors, and the banks from MENA countries were found to be global leaders by dominating the efficiency ratings during the period of study. They also found there are positive effects of size, capitalization and profitability on the efficiency of Islamic banks. The risk factor proxy of loan loss provision to total loan was found to have a negative effect on efficiency. Same study that conducted by Abdul Rahman and Rosman (2013) measured and compared the efficiency of Islamic banks in the MENA countries, including the GCC and Asian countries, using the DEA for the year 2006 until the year 2009. The sample comprised 63 Islamic banks across the countries. The result of the study found that the main source of technical inefficiency among the Islamic banks was their scale inefficiency, while Islamic banks from Asian countries were found on average to be relatively more efficient than those in MENA countries.

Next study by Aik and Tan (2012) research about the cost and profit efficiency of the full-fledged Islamic banks and dual Islamic banks window system of local and non-local banks in Malaysia. Using the DEA method, the research paper begins from the year 2002 until year 2008. The same study that examined by Ahmad Mokhtar, Abdullah and Alhabshi (2007) and Batchelor and Wadud (2004) mentioned that full-fledged Islamic banks are more efficient than Islamic window banks, nevertheless, their results showed that local Islamic banks (full-fledged and Islamic window) are more efficient

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than non-local Islamic banks. The results are in line with Sufian (2007), the researcher confirmed that over the year of 2001-2004; the domestic Islamic banks are more efficient than the foreign Islamic bank albeit marginally.

Meanwhile, Johnes et al. (2014) study about the performance of Islamic banks and non-Islamic banks prior to, during, and immediately after the 2008 financial crisis. The result of the research included the observation that during the financial turmoil, both Islamic and conventional banks suffered a drop in their efficiency levels. However, the Islamic banks against with the crisis better than the conventional banks. Another research conducted by Said (2013) then examined the overall technical efficiency of Islamic banks operating in the MENA region during the financial crisis of 2007-2009. The researcher found that during the crisis, Islamic banks in the other MENA countries and North Africa were on average relatively inefficient. The latest by Rosman et al. (2014) examined the efficiency of Islamic banks during the financial crisis in Middle Eastern and Asian countries from the year 2007 to the year 2010 by adopting DEA method to measure technical efficiency which included 79 Islamic banks across a number of countries. His research found that Islamic banks were able to sustain the financial crisis, but most were scale inefficient where they were operating at a decreasing to scale. Besides that, this study states that capitalisation and profitability were the main determinants of Islamic banking efficiency.

Next, Belanès et al. (2015) study about the impact of the subprime crisis on the efficiency of Islamic banks in the GCC region for the year 2005 and 2011. His study stated that the crisis led to slight decreases in Islamic banking efficiency. However, most of the Islamic banks perform efficient, because only some of the Islamic banks had relatively minor declined in their efficiency levels.

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Aghimien, Kamarudin, Hamid, and Noordin (2016) investigate the efficiency level of 43 Gulf Cooperation Council (GCC) banks on technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency over the period from 2007 until 2011. PTE and SE represent the potential factors that influence the efficiency of the GCC banks. By using the DEA approach, on average, the results show that many GCC banks are operating within an optimal scale of efficiency. Nevertheless, the results also show managerial inefficiency in the use of resources.

Kamarudin et al. (2016) provides new empirical evidence on the revenue efficiency of Islamic and conventional banks with the impact of country governance. The empirical analysis is confined to Islamic and conventional banks operating in the Gulf Cooperation Council (GCC) countries banking sectors during the period of 2007 to 2011 using DEA method. They conclude that Islamic banks operating in the GCC countries banking sectors have been relatively less efficient compared to their conventional bank counterparts on all three efficiency measures (statistically significant at the 1% level in all cases).

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Lastly, Bahrini (2017) shows the technical efficiency of Islamic banks in the MENA region by adopting bootstrap Data Envelopment Analysis (DEA) approach. It finds that GCC Islamic banks have more stable efficiency compared to MENA Islamic banks particularly throughout the global financial crisis period (2007-2008) and even in the early post-crisis period (2009-2010).

Following the thorough literature review, this study is expected to extend the previous literature by providing empirical evidence of the efficiency of Islamic banks in Malaysia Additionally, this research paper evaluates the sources of technical inefficiency and subsequently describes the main determinants of efficiency, including bank-specific factors, risk factors and macroeconomic factors.

2.4 Conclusion

This chapter can be classified into three parts. First part discussed about the theory of the efficiency, next it describes about the early study of the efficiency in banking. Last part, mentioned about the efficiency study of the Islamic bank from the previous study. As conclusion, the literature review is the important element in the research to further another chapter of the research.

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CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Chapter three describes about the data, research designs and conceptual framework, as well as method of analysis to be used in this research.

3.1 Research Design

3.1.1 Data Collection

In measuring the efficiency of the Islamic banks in Malaysia, this research paper will utilize the output-input data which consists of 16 Islamic banks in Malaysia from 2008 until 2016. As stated in the first chapter, there are about 16 Islamic banks in Malaysia.

Table 3.2.1 List of Licensed Islamic Banks in Malaysia

No	Name	Ownership
1	Affin Islamic Bank Berhad	L
2	Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	F
3	Alliance Islamic Bank Berhad	L
4	AmBank Islamic Berhad	L
5	Bank Islam Malaysia Berhad	L
6	Bank Muamalat Malaysia Berhad	L
7	CIMB Islamic Bank Berhad	L
8	HSBC Amanah Malaysia Berhad	F
9	Hong Leong Islamic Bank Berhad	L
10	Kuwait Finance House (Malaysia) Berhad	F
11	MBSB Bank Berhad	L
12	Maybank Islamic Berhad	L
13	OCBC Al-Amin Bank Berhad	F
14	Public Islamic Bank Berhad	L
15	RHB Islamic Bank Berhad	L
16	Standard Chartered Saadiq Berhad	F

Source: Bank Negara Malaysia, 10 Aug 2018

NOTE: L=Local Islamic Banks, **F** = Foreign Islamic Banks

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3.1.2 Source of Data

The data for this research paper will be gained from the Bank scope and Annual Report of the bank from 2008 until 2016. The calculation of the efficiency will take into consideration the assumptions of variable returns to scale (VRS). To investigate the efficiency measure, this study will apply the DEAP version 2.1, developed by Coelli (1996). Two inputs and one output were chosen to determine the efficiency using the DEA method. This research is based on the input-oriented measures. The inputs are total deposits and fixed assets and the outputs refer to total financing and these are used to measure the efficiency of the 16 Islamic banks in Malaysia.

3.1.3 Data Analysis

3.1.3.1 Data Envelopment Analysis

To measure efficiency in this study, the Data Envelopment Analysis (DEA) is the best choice here because it does not requires us to specify the functional form or distributional forms for errors. Data Envelopment Analysis (DEA) is a linear programming technique to evaluate how a particular decision making unit (DMU, or bank in this study) operates relative to the other banks in the sample. This method creates a frontier set by efficient banks and compares it with inefficient banks to produce efficiency scores. Besides that, banks are bordered between zero and one scores; with completely efficient bank has an efficiency score of one. In DEA techniques, the most efficient bank (with score of one) does not necessarily generate the maximum level of output among other banks in the sample.

This technique was originally developed by Farrell (1957). According to Iqbal and Molyneux (2005), the DEA is the non-parametric method that it simply constructs the frontier of the observed input-output ratios by linear programming techniques. Farrell (1957) suggested that DEA is a linear programming for frontier analysis of multiple

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inputs and multiple outputs. In other word, DEA technique compares each producer unit with the optimal producer unit to find out the inefficiency level of each producer. This producer unit known as Decision Making Unit. Here, each of DMU has a function of converting a set of inputs into a set of outputs.

The main objective of DEA method used in this study is to investigate which banks are operating on their efficient frontier and which banks are inefficient. If the banks input-output combination lies on the DEA frontier, the bank is considered efficient and the bank is consider inefficient if the banks input-output combination lies inside the frontier.

Besides that, DEA technique can measure efficiency under the assumption of constant returns to scale (CRS) and variable return to scale (VRS). The CRS model developed by Charnes, Cooper and Rhodes (1978) is stated that CRS and only appropriate when all DMUs are operating at optimal scale. Other than that, factor like imperfect competition and constraints in finance may influence banks not to operate at optimal scale. The efficiency estimate attained from the CRS model are normally known as overall technical efficiency (OTE) scores and are confounded by scale efficiencies.

Therefore, the established bank literatures that apply linear programming techniques to measure the efficiency tend to apply the VRS assumption as proposed by Banker, Charnes and Cooper (1984). The BCC model extended the CRS model with the purpose of resolving problem with VRS. The efficiency measures generated from the BCC model are known as pure technical efficiency scores and without of scale efficiency effects. If there exists to be a difference between the TE and PTE scores of a particular DMU, then it consider the existence of scale inefficiency.

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The linear programming problem is determined in order to represent the input oriented in the DEA techniques with VRS technologies as below:

$$\min_{\varphi\ ,\ \lambda,\ \varphi}$$

$$\text{subject to } -^{\varphi}y\,i + Y\lambda, \quad \geq 0$$

$$xi - X\lambda \geq 0$$

$$N1'\lambda = 1$$

$$\text{and } \lambda \geq 0 \qquad (1)$$

Source: A Guide To DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program

where λ is N×1 intensity vector of constant and φ is a scalar ($1 \geq {}^{\varphi} \leq \infty$). *N*1 is an *N*×*1* vector of ones. For N number of firms, *yi* and *xi* are the *M*×*N* and *K*×*N* output and input vectors respectively. *Y* comprises the data for all N of firms. Given a constant level of input for the *i*th firm. Note that without the convexity constraint *N*1'λ=1, equation (1) becomes a DEA model with CRS technology. The convexity constraint implies that an inefficient firm is benchmarked against firms of a similar size and therefore the projected point of that firm on the DEA frontier will be a convex combination of observed firms. Other than that, each firm would produce on or to the right of the convex production possibility frontier. If technical efficiency (TE) scores for a particular firm with or without the convexity constraint imposed are similar, then the firm is operating under CRS. If these scores are different, the firm operate under VRS technology. Although, in such a case, it would be necessary to identify whether the firm

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or the DMU operates with IRS or DRS. To do this, assumption of non-increasing returns to scale (NIRS) is imposed in (1) and the convexity constraint $N1'\lambda=1$ is substituted with $N1' \leq 1$. This is showed as follows:

$$\min_{\varphi, \lambda, \varphi}$$

$$\text{subject to } -\varphi y_i + Y\lambda, \geq 0$$

$$\varphi x_i - X\lambda \geq 0$$

$$N1'\lambda \leq 1$$

$$\text{and } \lambda \geq 0$$

Source: A Guide To DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program

Solution of the equation (2) reveals the nature of scale efficiencies. IRS appears if TE score obtained with NIRS technology differs from the TE measures with VRS technology. If both of these efficiency scores are same, then the corresponding firm operates with DRS.

The advantages of using DEA method to determine efficiency is that DEA allows calculating parameters such as the overall technical efficiency. DEA techniques also assist in understanding and computing the pure technical and scale efficiencies. According to Farrell (1957), technical efficiency (TE) can refer as the firm's ability to obtain as large as possible an output from a combination of inputs. Scale efficiency (SE) denotes to the firm's ability to work at its optimal scale while pure technical efficiency (PTE) refers to the firm's ability to avoid waste by producing as much output as input usage allows or by using as little input as output production allows.

Meanwhile, the disadvantages of the DEA method, is that it assumes data are free from measurement errors. Additionally, since efficiency is determined in a relative way, its analysis is confined to the sample set used. So, this means that an efficient DMU found in the analysis cannot be compared with other DMUs outside of the sample.

In short the DEA process is describes in figure 3.1.1 below

3.1.3.2 Malmquist Index

The Malmquist index was first created by Sten Malmquist in 1953 to measure productivity. But in its development, Malmquist index was introduced by Caves et. Al (1982). There are two things that are calculated in Malmquist index measurement that is catch-up effect and frontier shift affect. The catch-up effect measures the rate of change in relative efficiency from period 1 to period 2. Meanwhile the frontier shift effect measures the rate of technological change that is combination of input and output from period 1 to period 2. The frontier shift effect is often called an innovation effect.

The Malmquist index is a bilateral index used to compare production technologies of two economic elements. The Malmquist index is based on the concept of a production function that measures the maximum production function with defined input limits. In the calculation this index consists of several results: efficiency change, technological change, pure efficiency change, economic scale change and TFP change.

The Malmquist index has some favourable characteristics. First, this index is a non-parametric method so it does not require specification of production function form. Secondly, the Malmquist index does not require the assumption of the economic behaviour of production units such as cost minimization or profit maximization, so it is useful if the goals of the producers are different or unknown. Third, the calculation of this index does not require data prices that are often not available. Fourth, the

Malmquist productivity index can be broken down into two components: efficiency change and technological change. According to Avenzora (2008) this is very useful because the analysis can be done more specifically by component.

In the first generation model developed by Caves et. Al (1982), there are 2 (two) Malmquist productivity index models (Bjurek, 1996). The first is 'Malmquist input quantity index' and the second is 'Malmquist output quantity index'. Malmquist input quantity index for a production unit, at observation time t and t+1, for tech reference in period k, k=t and t+1. The Malmquist input quantity index measures only the change in the quantity of inputs observed between time t and t+1, where:

$$MIk\ (yk,\ xt+1\ ) = Ek\ I\ (yk,xt)\ Ek\ I\ (yk,xt+1)\ ,\ k = t,\ t + 1 \quad (1)$$

Next, for the Malmquist quantity output index for a production unit, at observation time t and t+1, for tech reference in period k, k=t and t+1. This Malmquist quantity output index measures only the change in the observed quantity of output between time t and t+1, where:

$$MOk\ (yt,\ yt+1,\ xk) = Ek\ O\ (yt+1,)/Ek\ O\ (y\ ,k)\ ,\ k = t,\ t + 1 \quad (2)$$

Bjurek (1996) introduces a new definition of the Malmquist productivity index for the production unit between t and t+1 based on the technological level at k, k=t and k=t+1, following the tradition of most productivity indices. Adjusting the Tornqvist productivity index, the index constructed is the between an output index and an input index:

$$MTFPk = MOk(yt,yt+1,xk)/MIk(yk,xt,xt+1) = EkO\ (yt+1,xk)/EkO\ (yt,xk)\ Ek\ I\ (yk,xt)/Ek\ I\ (yk,xt+1)\ ,\ k = t,\ t + 1 \quad (3)$$

The equation above illustrates the ratio between the output index and the Malmquist input index. If the value of the productivity index is greater than the number 1, then there has been an increase in productivity. If the index value is less than 1, the productivity level decreases, where if it equals 1, the productivity level does not change.

Figure 3.1.1 DEA process

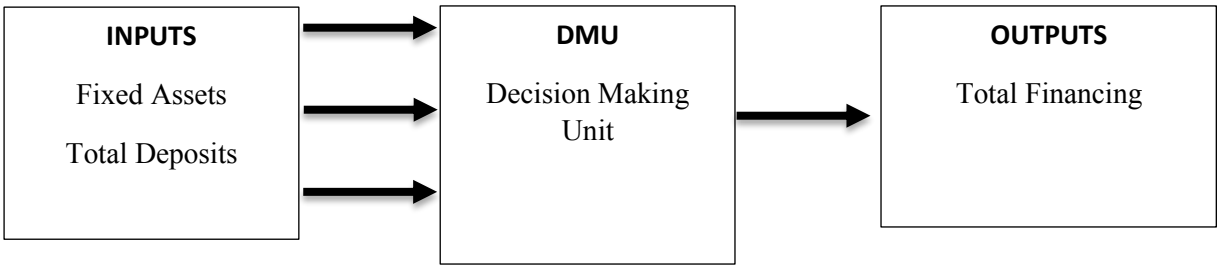

Figure 3.1.1 describes about that DEA is a linear programming techniques to assess how making a particular decision for a unit which means decision making unit (DMU). Other than that, the figure above describes that the output obtained in relation to the resources employed. Production process can be defined as a process that can turn a set of resources into desirable outcomes of production units. At the processing level, efficiency is utilized to measure how well a production unit is performing by using its resources to generate the derived outcomes. Each of the various DEA models seeks to determine which of the decision making unit define an envelopment surface that represent the best practice, referred to as the empirical production function or the efficient frontier. Units that lie on the surface are considered efficient in DEA, while those units that do not, are called inefficient. As an example, Islamic banks operation is considered to be efficient if the value of efficiency equal 1 or near 1.

The main aim of this efficiency measurement is to illustrate the concept of economic efficiency measurements as proposed by Farrell (1957) seminal paper using an input-orientation, and the other one is to describes how it may be measured relative to a given

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technology, which is normally represented by some form of frontier function and the other objective is to review the various method used in estimating the frontier.

According to Rogers (1988) stated that, is principally for a single firm that produces one output using a single input, the ratio of output to input is a measure of the productivity level. In this case, it is easy to measure productivity. Another study conducted by Diewert (1992) stated that the measurement of an output-input ratio is difficult in the case of many outputs and inputs in a production process. Thus, there are various approaches have been practised by most researchers in order to estimate the changes of productivity and efficiency in many types of organizations, and levels of decision making unit (DMUs) as well.

Meanwhile, in terms of technical efficiency, a producer will be considered as technical efficiency if the output increase, which require a reduction in at least one other output or an increase in at least one input, and if a reduction in any input requires an increase in at least one other input or a reduction in at least one output (Koopmans, 1951).

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Commonly, technical efficiency exists when one set of inputs given is utilized to produce an output. The firm can be considered as technically efficient, when the firm is able to produce maximum output from the limitation quantity of inputs such as labour and capital. As example, if the firm employed many workers over than necessary or a firm utilized outdated capital, the firm would be considered as technically inefficient. In this research paper, Islamic banks are considered inefficient if Islamic banks unable to provide more financing from the deposits that the Islamic banks have. Hence, a producer must produce the same outputs with less of at least one input, or could use the same inputs to produce more at least one output to achieve the technical efficiency.

Other than that, the measurement of input-output oriented is the equivalent measure of technical efficiency when constant returns to scale exist. As suggested by Farrell (1957), the efficiency of a firm comprises of two elements which is technical efficiency and allocative efficiency. Technical efficiency can be describes as a firm that able to achieve maximum output from a given set of input in optimal proportions, given their respective prices and the production technology. These two measures are combined in order to provide a measure of total economic efficiency.

3.1.3.3 Inputs and Outputs Description

There are three ways in identifying input and output, which are intermediation approach, the production approach and the value added approach. According to intermediation approach, bank is considered as the intermediary between the supplier and the consumer of funds. In the production approach, the bank is refers as a financial institutions that provides some services for its clients such as depositors and account holders. Meanwhile, value added approach or operating approach in which the banks is assumed as a business entity that its main aim is to gain revenue from the total expenses or total cost to operate the business.

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There is no general consensus on how to identifying inputs and outputs as variables in analysing efficiency. According to Sealey and Lindley (1977), stated that, two distinct theories are seen to be producing rivalling concepts such as the production and intermediation approach. Then, Mester (1997) also suggested that the literature on bank efficiency has two prominent approaches which are production and intermediation approach.

This research paper employs the intermediation techniques. Kwan (2002), stated that the intermediation approach is the commonly used to measure the efficiency. The intermediation approach assumes that financial institutions act as intermediary between

depositors and borrowers, and it deposits total financing and securities as outputs, while deposits along with labour and physical capital are defined as inputs.

In this research, the selection of the outputs and inputs for this research paper is replicated from Sufian (2007) and Ramananthan (2007). The outputs and inputs that are applied in this research are illustrated in table 3.1.2.

Table 3.1.2 The Outputs and Inputs Used In This Study

Outputs	Inputs
	Fixed Assets
Total Financing	**Total Deposit**

Based on the Table 3.1.2 above, the outputs in this research paper refer to total financing whereas the inputs are fixed assets and total deposits. The definition of each term is described below:

a) Outputs

i. Total financing

Total financing can be describes as an agreement in written or oral for a temporary transfer property from the lender to a borrower who promises to pay back in a stipulated time and commonly with interest for its use.

b) Inputs

i. Total deposits

Total deposits are money placed into a banking institution for safekeeping. The depositors have the right to withdraw any deposited funds, as set forth in the terms and condition of the account.

ii. Fixed Assets

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> In general, fixed assets are a long-term tangible piece of property that a firm owns and uses in the production of its income and is not expected to be consumed or converted into cash any sooner than at least one year time.

Previous research frequently defines total deposits and fixed assets as input, and total financing as their output. Fixed asset and total deposits is a productivity tools for Islamic financial institutions to maximize their income. Fixed asset gained from the not productivity activity such as real estate, land and investment. Meanwhile, the deposit gained when the customers place their money for safekeeping. By using this tools, Islamic banks able determine how much to produce more or less financing to generate more income for future. Total financing that produce by the Islamic banks is depend on the asset that owe by the Islamic banks. Islamic banks that have huge total deposit and fixed asset able to provide more total financing. Hence, it give advantages to the Islamic banks to generate more profit, at the same time it ensure the efficiency of the Islamic banks.

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3.2 Conclusion

As a conclusion, this chapter mentioned about the research design of this study. Research design of this research paper elaborate detail about data collection method, source of the data and the data analysis. This research paper will apply inputs-outputs data of the all 16 Islamic banks in Malaysia from the year 2008 until 2016. The source of the data is generated from the annual report and the bank scopes of the Islamic banks from the year 2008 until 2016. Meanwhile, for the data analysis of this study is using the DEA method. DEA method is the suitable techniques to measure the efficiency of the Islamic banks. In simple words, this chapter elaborates about the way this research paper was conducted.

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CHAPTER FOUR

EMPIRICAL RESULTS AND ANALYSIS

4.0 Introduction

The objective of this present chapter is to interpret the finding of this study. The interpretation includes two objective of this study that is firstly, to study the efficiency of Islamic bank in Malaysia between the years 2008 until year 2016. Second objective is to examine individual Islamic Bank efficiencies among local Islamic banks in Malaysia from year 2008 to 2016. Lastly, the third objective is to examine the Islamic bank efficiencies among foreign Islamic banks in Malaysia from year 2008 to 2016.

In order to achieve these objectives, the Data Envelope Analysis (DEA) methodology is utilized, as being explained in Chapter Three. The results of the analysis will be interpret in detail in the next section of this chapter. The following section will discuss on the efficiency of Islamic bank in Malaysia and the interpretation for DEA results. While the last section is the conclusion of this chapter.

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4.1 Empirical Result of Efficiency for Islamic Banks in Malaysia

The empirical results from DEA efficiency are discussed in several sub-sections. First sub-section is explained the first objective, followed by the second sub-section is explained the second objective and third sub-section is explained third objective of this study.

This study use Malmquist DEA Model. The efficiency of Malaysian Islamic banks is measured using the secondary data from 2008 until 2016 across 16 Malaysia Islamic banks. Production approach based on output orientation is used to estimate the efficiency of the Malaysian Islamic banks in the Malmquist DEA models.

4.1.1 Research Objective 1: The Overall Efficiency of Islamic Banks in Malaysia

The descriptive statistics of the output and inputs in Malmquist DEA model are reported in Table 4.1. The table shows the results for 16 Islamic banks from year 2008 until 2016. Referring to the Table 4.1, the results report that the output, the mean of the total financing among 16 Islamic banks in Malaysia from year 2008 to 2016 is about RM 21 138.37 million. This implies that, on average, each Islamic banks in Malaysia could produce RM 21 138.37 million total financing from year 2008 until 2016. On the other hand, for the inputs, the mean of total fixed assets is RM 171.19 million, while the mean for total deposits is RM 27 089.19 million.

Referring to standard deviation value (Column 5), if the standard deviation value is high, indicating that the variation of the amount of total financing, fixed assets and total deposits for each Islamic banks is high. This is reflected from the large difference between the minimum and maximum value of the number of total financing, fixed assets and total deposits among Islamic banks in Malaysia (refer to column 2 and 3 in Table 4.1).

Table 4.1: Descriptive Statistics of Inputs-Output for All Malaysian Islamic Banks

	Number of observation	Minimum (RM million)	Maximum (RM million)	Mean (RM million)	Std. deviation
Inputs:					
Fixed assets (RM million)	16	0.10	6485.20	171.19	878.762
Total deposit (RM million)	16	1492.80	281510.10	27089.19	46415.739
Output:					
Total financing (RM million)	16	249.80	224994.10	21138.37	39223.348

To measure the efficiency of Islamic banks in Malaysia per year, the computer program DEAP version 2.1 is employed in order to estimate the nonparametric programming model. The empirical result of Malmquist-DEA scores are evaluated based on DEA and presented in Table 4.2.

Referring to the Table 4.2, the result of DEA scores records that the most number of efficient Islamic banks in Malaysia throughout the study period is in year 2016, amount of 8 Islamic banks from 16 Islamic banks observed are efficient (50%) including local and non-local Islamic banks. The banks are 1) Al-Rajhi Islamic Bank Bhd, 2) Alliance Islamic Bank Berhad, 3) Ambank Islamic Bank Berhad, 4) HSBC Amanah Malaysia Berhad, 5) MBSB Bank Berhad, 6) Maybank Islamic Bank Berhad, 7) Public Islamic Bank Berhad and 8) Standard Chartered Saadiq Berhad.

Whereas the least number of efficient Islamic banks over the period of study is in year 2012, amount of four (4) Islamic banks from the total observation (25%) regardless local Islamic banks are efficient and foreign Islamic banks are not. These banks are 1) Alliance Islamic Bank Berhad, 2) Ambank Islamic Bank Berhad, 3) MBSB Bank Berhad and 4) Maybank Islamic Bank Berhad.

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Table 4.2: Summary Result of DEA Average Efficiency for Islamic Banks in Malaysia from Year 2008 Until 2016

Year	No of observation	No of efficient Islamic bank in Malaysia	% of efficient Islamic banks in Malaysia
2008	16	6	37.5%
2009	16	6	37.5%
2010	16	5	31.25%
2011	16	5	31.25%
2012	16	4	25%
2013	16	5	31.25%
2014	16	6	37.5%
2015	16	7	43.75%
2016	16	8	50%

This is implies that Islamic banks in Malaysia whether full-fledged Islamic banks or Islamic window banks can perform efficiently as stated by the previous study. Additionally, based on the above result we may state that half of the Islamic banks that operate in Malaysia perform efficiently. This argument may support by study that conducted by Majid et al (2005), found that the efficiency of Islamic banks was not statistically different from the non-Islamic banks. Further study by Abdul Majid, Md Nor and Said (2005) found that Islamic banks are more efficient than conventional bank.

4.1.2 Research Objective 2: The Efficiency of Local and Foreign Islamic Banks in Malaysia

Subsequent, this sub-section discuss in detail the result of Malmquist DEA model to compare the efficiency between local and non-local Islamic banks in Malaysia throughout the year of 2008 until 2016.

The summary of the DEA scores for local Islamic banks in Malaysia is recorded in Table 4.3. According to the Table 4.3, one can observed that between four (4) to five (5) local Islamic banks are efficient each year. In details, year 2008, 2009, 2015 and 2016 recorded five (5) local Islamic banks are efficient with average efficiency are 0.734, 0.741, 0.927 and 0.924, respectively. While the remaining years from year 2010 until 2014 recorded four (4) local Islamic banks are efficient with average efficiency is between ranges 0.770 to 0.910.

Table 4.3: Summary of DEA result for local Islamic bank in Malaysia form year 2008 until 2016.

Year	Number of local Islamic bank	Number of efficient bank	Average efficiency	Percentage %
2008	11	5	0.734	45.45%
2009	11	5	0.741	45.45%
2010	11	4	0.770	36.36%
2011	11	4	0.798	36.36%
2012	11	4	0.852	36.36%
2013	11	4	0.694	36.36%
2014	11	4	0.910	36.36%
2015	11	5	0.927	45.45%
2016	11	5	0.924	45.45%

Meanwhile, Table 4.4 showed the DEA result for local Islamic banks from year 2008 until 2016.According to the table, showed that Alliance Islamic Bank, Ambank Islamic Bank Berhad, MBSB Bank Berhad and Maybank Islamic Bank Berhad recorded consistency efficiency and complete efficiency from year 2008 to 2016 with score 1. Islamic banks consider complete efficiency if the score is one.

Table 4.4: DEA result for local Islamic Banks from year 2008 until 2016

Local Islamic Banks	2008	2009	2010	2011	2012	2013	2014	2015	2016
AffinIslamic Bank Bhd	0.45	0.513	0.607	0.582	0.57	0.428	0.718	0.871	0.929
Alliance Islamic Bank Berhad	1	1	1	1	1	1	1	1	1
Ambank Islamic Bank Berhad	1	1	1	1	1	1	1	1	1
Bank Islam Malaysia Berhad	0.463	0.381	0.442	0.588	0.742	0.463	0.839	0.866	0.865
Bank Muamalat Malaysia Berhad	0.499	0.472	0.484	0.531	0.586	0.432	0.794	0.756	0.745
CIMB Islamic Bank Berhad	0.361	0.706	0.776	0.848	0.929	0.586	0.947	0.942	0.901
Hong Leong Islamic Bank Berhad	0.624	0.487	0.55	0.627	0.726	0.536	0.907	0.876	0.849
*MBSB Bank Berhad	1	1	1	1	1	1	1	1	1
Maybank Islamic Bank Berhad	1	1	1	1	1	1	1	1	1
Public Islamic Bank Berhad	1	1	0.807	0.866	0.942	0.631	0.87	1	1
RHB Islamic Bank Berhad	0.674	0.591	0.803	0.732	0.874	0.556	0.934	0.89	0.871
mean	**0.734**	**0.741**	**0.770**	**0.798**	**0.852**	**0.694**	**0.910**	**0.927**	**0.924**

On the other hand, the summary of DEA scores for foreign Islamic banks in Malaysia from year 2008 until 2016 is recorded in Table 4.5. Referring to the Table 4.5, during year 2016, there are three (3) foreign Islamic banks in Malaysia are efficient with

average efficiency is 0.885. In year 2008 until year 2013 only one Islamic banks performed efficiently with average efficiency is between 0.732 to 0.941.While in year 2012, none foreign Islamic banks consider as efficient.

Table 4.5: Summary of DEA result for Foreign Islamic bank

Year	Number of foreign Islamic bank	Number of efficient bank	Average efficiency	Percentage %
2008	5	1	0.781	20%
2009	5	1	0.814	20%
2010	5	1	0.941	20%
2011	5	1	0.877	20%
2012	5	0	0.911	0%
2013	5	1	0.732	20%
2014	5	2	0.960	40%
2015	5	2	0.933	40%
2016	5	3	0.885	60%

Table 4.6: DEA result for foreign Islamic Banks from year 2008 until year 2016

Foreign Islamic Banks	2008	2009	2010	2011	2012	2013	2014	2015	2016
AlRajhi Bank	0.653	0.828	0.974	0.924	0.899	1	1	1	1
HSBC Amanah Malaysia Berhad	0.69	0.866	0.951	1	0.987	0.588	0.943	1	1
Kuwait Finance House	0.878	0.848	0.868	0.826	0.992	0.742	0.984	0.951	0.736
OCBC Al-Amin Bank	0.682	0.527	0.912	0.878	0.882	0.615	0.872	0.846	0.69
Standard Chartered Saadiq Berhad	1	1	1	0.757	0.793	0.717	1	0.867	1
mean	0.781	0.814	0.941	0.877	0.911	0.732	0.960	0.933	0.885

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According to the Table 4.6 showed that in year 2008, 2009,2010,2014 and 2016 showed that Standard Chartered Saadiq Berhad are more efficient foreign Islamic banks compare with other foreign Islamic banks. Meanwhile, HSBC Amanah Malaysia Berhad perform efficiently in year 2011. AlRajhi Bank perform efficiently in year 2013 until 2016.

Based on table 4.3 and 4.5 the percentage show that, the local Islamic banks recorded the consistency the total number of the Islamic banks consider as efficiency during the period of the study in year 2008 to 2016 with percentage is about 36.36% to 45.45%. The foreign Islamic banks showed that, the percentage is about 0% to 60% during the

same period of the study. The number of the local Islamic banks in Malaysia has more compare than with non-local Islamic banks. The local Islamic banks in Malaysia are about 11 banks; meanwhile the foreign Islamic banks have about 5. This give advantage to local Islamic banks have better result efficiency compare than non-local Islamic banks.

Even though, the foreign Islamic banks have huge capital compare than with local Islamic banks, mostly Malaysia peoples more prefer and comfortable to transact with local banks. This is because, the local Islamic in Malaysia exist are longer than non-local Islamic banks. The overall results showed that the local Islamic banks have better efficiency than non-local Islamic banks. This is indicate that local Islamic banks in Malaysia perform efficiently as stated by the previous researcher by Batchelor and Wadud 2004, and Sufian 2007 regarding study about the efficiency of the local Islamic banks and non-local Islamic banks in Malaysia by using the same methodology.

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4.2 Conclusion

This chapter discusses about the analysis of data and findings of this study. In addition, this chapter addresses all the research questions that have been mentioned in previous chapters. Using the DEA methodology, this study examines the overall efficiency of Islamic banks in Malaysia. The total number of Islamic banks in Malaysia is about 16 Islamic banks. Study on the efficiency of Islamic banks in Malaysia is carried out from 2008 until 2016. In this study also found that local Islamic banks showed better efficiencies than foreign Islamic banks in the country. This is because local Islamic banks have long been in Malaysia compare than foreign Islamic banks.

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CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.0 Introduction

The objective of this research paper is to determine the efficiency of the all Islamic banks in Malaysia during the year 2008 to 2016. At the same time, this study elaborates about the efficiency of the local Islamic banks and foreign Islamic banks by using DEA method to measure the both Islamic banks.

5.1 Summary of Findings

This section summarises the findings according to the objectives of the research.

Objective 1: To determine the efficiency of the Islamic banks in Malaysia between the year 2008 until 2016.

Over the study period of 9 years from 2008 to 2016, most of the Islamic banks in Malaysia perform efficiently. In year 2016 most of the Islamic banks perform efficiently with 8 Islamic banks from 16 Islamic banks observed (50%) including local Islamic banks and foreign Islamic banks. In year 2012, Islamic banks in Malaysia are recorded least efficient with the number of the Islamic banks is about 4 Islamic banks from the 16 Islamic banks observed with the percentage is about 25% lower than compare with other year the period of the study.

Malaysia is a well-known country that promotes Islamic banking widely in the world. This gives advantage to Islamic banks to operate with efficiently and promote their services to the Malaysia citizen. Nowadays, most of the Malaysia citizen aware about Islamic banks products services in their country. An additionally, most of the Malaysia citizen is a Muslim people. The potential for them to consume Islamic banking product services is high. This give opportunity to local Islamic banks and non-local Islamic

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banks to create the products and services that enable to fulfil the Malaysian needs hence, able to generate profit and able to perform with efficiently to ensure the Islamic banks able to sustained in the market. As an example, in late 2010 most of the Islamic banks in Malaysia especially, provide e-banking or normally known as internet banking transaction to their customer. Internet banking provides fast service and fast transaction to the customers. Internet banking enables the customer to do their transaction with bank easily and peace of mind. At the same time, it enables Islamic banks to reduce their operation cost and generate more profit.

In 2015, some of the Islamic banks in Malaysia introduce mutual separation scheme (MSS) or voluntary separation scheme (VSS) as their alternative way to decrease their cost and perform with efficiently. The Islamic banks that offered VSS to their staff include Hong Leong Islamic Banks, CIMB Bank Berhad, and RHB Islamic Bank Berhad. According to Hong Leong Bank Berhad and Hong Leong Islamic Bank Berhad group managing director and chief executive officer, Mr. Tan Kong Khoon stated that Hong Leong Bank Berhad and Hong Leong Islamic Bank Berhad are offering employees a VSS as part of its move to strengthen operational efficiencies and adapt to maintain the organization competitiveness. The MSS, offered to permanent staff at all levels, functions and locations, would create an opportunity for both the bank and employees (BERNAMA, 2015).

Furthermore, the discussion of efficiency score of Islamic banks between local and non-local Islamic banks in Malaysia will be discussed further in the next sub-section.

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Objective 2: To differentiate which the Islamic banks in Malaysia perform better efficiency whether the local Islamic banks or foreign Islamic banks.

In this study, the total number of local Islamic banks observed are 11 Islamic banks and the total number foreign Islamic banks observed are 5. This research found that, the local Islamic bank in Malaysia performs better efficiency compare than non-local Islamic banks. As an example, in year 2008, 2009, 2015 and 2016 recorded four (5) local Islamic banks are efficient with average efficiency are 0.734, 0.741, 0.927 and 0.924. In year 2010 until 2014 recorded only four local Islamic banks are efficient with score is between ranges 0.770 to 0.910. Meanwhile, the total number of non-local Islamic banks perform efficient are recorded by year 2008, 2009, 2010, 2011 and 2013 is 1 non-local Islamic banks out of 5 non-local Islamic banks with score efficiency is range 0.732 to 0.941. Another year such as, 2014 and 2015 are recorded the 2 total numbers of foreign Islamic banks perform efficiently with the average efficiency between 0.933 to 0.960. In year 2012, none foreign Islamic banks recorded as efficient. Meanwhile, in year 2016 recorded 3 total number foreign Islamic banks perform efficiently with average efficiency about 0.885. This result proven that, local Islamic banks are better efficiency than foreign Islamic banks.

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Local Islamic banks in Malaysia are more efficient compare than foreign Islamic because Islamic banks in Malaysia are established well and exist in late 1980 in Malaysia financial market. As an example, Bank Islamic Malaysia Berhad, (BIMB) was established in 1984 when the Malaysia government introduced the Islamic Banking Act 1983. The establishment the first Islamic Bank in Malaysia in 1984, show that Malaysian government seriously to take part in Islamic banking transaction by provided the capital, facility and human capital development.

That why the local Islamic banks able to perform well compare than the foreign Islamic banks. An additionally, the Malaysia citizen more preferred and common with the local Islamic banks.

5.2 Contribution and Policy Implication

From the analysis we know that most of the Islamic banks whether local Islamic banks and foreign Islamic banks perform efficiently. Furthermore, Islamic banks has been around longer in Malaysia and most Malaysian aware and motivated to consume Islamic banking product. Besides that, Malaysia government play important roles to provide good facilities to ensure that the Islamic banks develop widely in this country.

This study may useful to management of the Islamic banks to develop their action plan, business strategies and policy to sustain their business operation. This to ensure that Islamic banks able to operate with maximum output by using minimum input. At the same, time Islamic banks able to increase their profit and compete with the conventional banks.

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For policymakers, such as Central Bank of Malaysia may utilize this information to monitor the performance and profit of the Islamic banks in Malaysia. Hence, helps the Central Bank of Malaysia to develop policy that suit with Islamic banks in Malaysia. This to ensure that Islamic banks able to compete with fair and justice in Malaysia financial market. At the same time, it may help improve the growth of the Islamic banks in Malaysia especially. These initiatives to ensure that Islamic banks in Malaysia still relevant at the international level and be a role model the other countries in the world.

This information is need by potential investors and potential foreign investors to review the performance of the Islamic banks in Malaysia especially. Perhaps it may help and guide them to make decision to consider and invest their fund in Malaysia Islamic

financial institutions. They may consider open new Islamic banks or provide more fund to Islamic banks growth their business. This will create more opportunity to Malaysia to move forward in Islamic banking sectors. At the same time, it may provide a job creation to local peoples in Malaysia.

5.3 Limitation of the Study

This research paper has a few limitations. Firstly, this research paper conducted in Malaysia only with short period from 2008 until 2016. Secondly, this research paper just involve Islamic banking sector only in Malaysia not the conventional banking sector. Lastly, this research paper use limitation inputs and outputs.

5.4 Recommendation for Future Study

For future study, the researcher may consider to conduct the research the efficiency of the Islamic banks at another country or other region in the world as their purpose of the study. The future research may consider making comparative study efficiency between Islamic banks and conventional banks. Another point, the latest study may to cover another period of the study. Lastly, it is recommended for further analysis by utilizing the other approach methodology such as Stochastic Frontier Analysis or extended to the second stage such as Multivariate Regression Analysis, Tobit or Ordinary Least Square (OLS).

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REFERENCES

A Guide to DEAP Version 2.1. (1996). Retrieved December 09, 2018, from http://www.owlnet.rice.edu/~econ380/DEAP.PDF

Affin Islamic Bank. (2008-2016). *Annual Report Affin Islamic Bank.* Kuala Lumpur: Affin Islamic Bank.

Ahmad, N. B., Noor, M. N., & Sufian, F. (2010). Measuring Islamic Banks Efficiency: The Case of World Islamic Banking Sectors. *Munich Personal RePEc Archive Paper No 29247.*

Ahmad, S., & Abdul Rahman, A. (2012). Efficiency of Islamic Banks. International Journal of Islamic and Middle Eastern Finance and Management Vol 5, 241-263

Aliyu, S., & Yusof, R. M. (2016). Profitability and Cost Efficiency of Islamic Banks: A Panel Analysis of Some Selected Countries. *International Journal of Economics and Financial Issues, 6(4), 1736-1743.*

Alliance Islamic Bank Berhad. (2008-2016). *Annual Report.* Kuala Lumpur: Alliance Islamic Bank Berhad.

Al-Rajhi Bank Berhad. (2009-2016). *Financial Report Al-Rajhi Bank Berhad.* Kuala Lumpur: Al-Rajhi Bank Berhad.

AmIslamic Bank Berhad. (2008-2016). *Annual Report AmIslamic Bank Berhad.* Kuala Lumpur: AmIslamic Bank Berhad.

Ascarya, & Yumanita, D. (2008). Comparing The Efficiency Of Islamic Banks In Malaysia And Indonesia. *Buletin Ekonomi Moneter dan Perbankan.*

Bank Muamalat Malaysia Berhad. (2008-2016). *Annual Report Bank Muamalat Malaysia Berhad.* Kuala Lumpur: Bank Muamalat Malaysia Berhad.

BERNAMA. (2015). Hong Leong, Hong Leong Islamic Offer Employees MSS. Kuala Lumpur: BERNAMA.

Universiti Utara Malaysia

CIMB Islamic Bank Berhad. (2008-2016). *Annual Report CIMB Islamic Bank Berhad.* Kuala Lumpur: CIMB Islamic Bank Berhad.

Hassan, M. (2002). The X-Efficiency In Islamic Banks.*Islamic Economic Studies Vol. 3(2).*

Hong Leong Islamic Bank. (2008-2016). *Annual Report Hong Leong Islamic Bank.* Kuala Lumpur: Hong Leong Islamic Bank.

HSBC Amanah Malaysia Berhad. (2008-2016). *Annual Report HSBC Amanah Malaysia Berhad.* Kuala Lumpur: HSBC Amanah Malaysia Berhad.

Kuwait Finance House. (2008-2016). *Annual Report Kuwait Finance House.* Kuala Lumpur: Kuwait Finance House.

Maybank Islamic Berhad. (2008-2016). *Annual Report Maybank Islamic Berhad.* Kuala Lumpur: Maybank Islamic Berhad.

MBSB Bank Berhad. (2008-2016). *Annual Report MBSB Bank Berhad.* Kuala Lumpur: MBSB Bank Berhad.

Universiti Utara Malaysia

Md. Saad, N., Majid, M. A., Yusof, R. M., Duasa, J., & Abdul Rahman, A. (2006). Measuring Efficiency of Insurance and Takaful Companies In Malaysia Using Data Envelopment Analysis, DEA. Review of Islamic Economics, 10 (2), 5-26.

Mokhtar, H. S., Abdullah, N., & AlHabshi, S. (2007). Technical and Cost Efficiency of Islamic Banking In Malaysia. *Review of Islamic Economics,* 11 (1), 5-40.

OCBC Al-Amin Bank Berhad. (2008-2016). *Annual Report OCBC Al-Amin Bank Berhad.* Kuala Lumpur: OCBC Al-Amin Bank Berhad.

Public Islamic Bank Berhad. (2008-2016). *Annual Report Public Islamic Bank Berhad.* Kuala Lumpur: Public Islamic Bank Berhad.

Rahim, S. M., Abu Bakar, J. B., & Ganapathy, T. a. (2015). How Efficient Are Islamic Banks In Malaysia?. *Journal of Business Studies Quarterly*,6 (3).

RHB Islamic Bank Berhad. (2008-2016). *Annual Report RHB Islamic Bank Berhad.* Kuala Lumpur: RHB Islamic Bank Berhad.

Rosman, R., Wahab, N. A., & Zainol, Z. (2013). Efficiency of Islamic Banks during the Financial Crisis : An Analysis of Middle Eastern and Asian Countries. *Pacific-Basin Finance Journal.*

Standard Chartered Saadiq Berhad. (2008-2016). *Annual Report Standard Chartered Saadiq Berhad.* Kuala Lumpur: Standard Chartered Saadiq Berhad.

Sufian, F. (2006). Size and Returns to Scale of the Islamic Banking Industry in Malaysia: Foreign versus Domestic Banks. IIUM Journal of Economics and Management, 12 (2), 147-175.

Sufian, F. (2007).The Efficiency of Islamic Banking Industry In Malaysia: Foreign vs Domestic . *Humanomics Article,* 23 (3), 174-192.

Sufian, F. (2006 : 2007). The Efficiency of Islamic Banking Industry : A Non-Parametric Analysis with Non-Discretionary Input Variable. *Islamic Economic Studies,* 14 (1) (2), 53-87.

Sufian, F., Noor, M.A.M., & Majid, M. Z.A. (2008) . The Efficiency of Islamic Banks : Empirical Evidence from the MENA and Asian Countries Islamic Banking Sectors. *The Middle East Business and Economic Review,* 20, 1-19

Website Bank Negara Malaysia retrieved at www.bnm.gov.my

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APPENDIX

DEA Methodology

A-out (1).txt - Notepad

File Edit Format View Help

```
 Results from DEAP Version 2.1

Instruction file = A-ins.txt.
Data file        = A-dta.txt

 Output orientated Malmquist DEA

 DISTANCES SUMMARY

year =      1
   firm        crs te rel to tech in yr         vrs
    no.        ************************         te
                t-1          t          t+1
     1       0.000       0.397       0.434       0.450
     2       0.000       0.585       0.640       0.653
     3       0.000       1.000       1.136       1.000
     4       0.000       1.000       1.093       1.000
     5       0.000       0.389       0.426       0.463
     6       0.000       0.424       0.464       0.499
     7       0.000       0.304       0.332       0.361
     8       0.000       0.621       0.679       0.690
     9       0.000       0.543       0.594       0.624
    10       0.000       0.762       0.834       0.878
    11       0.000       0.150       0.164       1.000
    12       0.000       0.839       0.918       1.000
    13       0.000       0.633       0.693       0.682
    14       0.000       1.000       1.108       1.000
    15       0.000       0.581       0.636       0.674
    16       0.000       0.461       0.477       1.000

mean         0.000       0.605       0.664       0.748

year =      2
   firm        crs te rel to tech in yr         vrs
    no.        ************************         te
                t-1          t          t+1
     1       0.439       0.480       0.517       0.513
     2       0.695       0.761       0.820       0.828
     3       0.767       0.839       0.904       1.000
     4       0.977       1.000       1.005       1.000
     5       0.342       0.375       0.404       0.381
     6       0.425       0.465       0.501       0.472
     7       0.572       0.646       0.659       0.706
     8       0.710       0.777       0.837       0.866
     9       0.427       0.467       0.503       0.487
    10       0.746       0.816       0.879       0.848
    11       0.348       0.381       0.410       1.000
    12       0.914       1.000       1.077       1.000
```

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