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EXAMINING THE RELATIONSHIP BETWEEN RISKS AND EFFICIENCY OF ISLAMIC BANKS IN MALAYSIA

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This paper aims to examine the efficiency level of Islamic banks in Malaysia and their relation to credit risk, liquidity risk and operational risk. Twelve Islamic banks were chosen as samples for this study which were taken by the availability of data, through each banks' annual report from 2008 to 2013. This study was carried by applying the Data Envelopment Analysis (DEA) and Multiple Regression Analysis to achieve its objectives. The finding shows that Islamic banks in Malaysia exhibited a total of 77.1% of overall efficiency of technical (OTE), 83.1% of Pure Technical Efficiency (PTE) and 92.6% of Scale Efficiency (SE). Despite the global financial crisis that occured during the middle year of 2007 to the end of 2009 which slightly affected Asian countries such as Malaysia, nevertheless, Islamic banks seem to be more robust during the crisis than conventional banks. This is because of its basic nature which prohibited interest payments (riba) in all transactions. This study shows that credit risk has a negative significant relationship with efficiency of Islamic banks, while liquidity was found to be positive related to efficiency of Islamic banks. This study also found that the size of the bank has positive significant relationship to efficiency. Finding from this study give contribution to the policy makers and regulators as well as to the managers of Islamic banks by providing empirical evidence on the performance of the Islamic banks in Malaysia towards the efficiency level and risks relationship.

Keywords: Credit risk, liquidity risk, operational risk, efficiency, Data Envelopment Analaysis, Islamic banks

INTRODUCTION

The banking industry is the spine and major component of the financial system. Thus, it will give impact to the stability of an economy. Any problems and interference that happen in the banking system will give implications for the economic conditions of a country (Akkizidis & Khandelwal, 2008). According to Ayub (2007), the name 'bank' comes from an Italian word, namely 'banco' which means shelf or bench. It is used to display coins and for trading money. Therefore, a bank is also known as institution authorized to take deposits from customers for their financial purposes in expanding their short term and long term finance facilities. He also described that the role of a bank is to keep money which is received from ordinary people, organizations, state or surplus units which is in circulation of economy in a country. Then, the bank will use this pooled money for making advances to others to get a return. Since bank is a very important component between surplus and deficit units in the economy, it needs to maintain and perform their services efficiently.

Malaysia has appeared as the first country which implement and performed a dual system in banking industries work. Dual banking system means where Islamic banking system and conventional banking system works and run with side-by-side way. Besides, the banking system model in Malaysian has been recognised by another countries where many Islamic countries used the Malaysian model as the model of the future. They also interested in adopting the Malaysian system model in their own countries (Ahmad Mokhtar, Abdullah & Alhabshi, 2008). Therefore, Malaysia adopting dual system in their operations.

In Malaysia, there are two types of banking system namely Islamic banking and conventional banking. Under the Islamic banking system, two types of banks are operating in parallel with each other, namely Islamic windows and full-fledge. Islamic windows mean conventional banking institutions, like the commercial banks which also offer Islamic banking services apart from their conventional service. Islamic banking in Malaysia is conceived of ten local banks and six foreign banks (BNM, 2015). Recently, according to the list of Licensed Banking Institutions by BNM, there are 16 registered Islamic banks operating in Malaysia that have been given license. It is provided in Appendix (Table 1) which is comprises a local and foreign ownership towards Islamic Banks in Malaysia. Besides, currently there are two domestic or local banks that operate full-fledged in Malaysia. They are Bank Islam Malaysia Berhad (BIMB) and Bank Muamalat Malaysia Berhad (BMMB). BIMB was the first Islamic bank established, in the year 1983, while BMMB is the second Islamic bank in Malaysia established in the year 1999.

According to Ernst and Young's World Islamic Banking Competitiveness Report (2012-2013), Islamic banking assets has grown from US$1.3 trillion in 2011 to US$1.8 trillion in 2013 globally. This asset growth shows the up-trend for the respective years. Meanwhile, the Ministry of Finance (2013) stated that the total Islamic banking assets has reached 20.6 percent to RM469.5 billion as end July 2012, which represented 24.2 percent of the assets of the country's banking system in Malaysia. This statistic shows that Islamic banking industries is moving in the right direction in order to become established in offering a various of products and services and expands in all parts of the world.

With respect to growth of development and advancement of Islamic banking in Malaysia, the central bank which is known as Bank Negara Malaysia (BNM) plays an important role to control, monitor and provides a framework to Islamic banking industries. Ahmad Mokhtar et al. (2008) concluded that the process of growth and advancement of Islamic banking in Malaysia can be classified into three phases. The first phase was from the year of 1983 to 1992, the second phase started from 1993 to 2003, and the third phase from 2004 onwards.

According to Zainol, Shaari and Ali (2008), Islamic banking is more established today due to globalisation and rapid growth of awareness among people and society. They are more alert about the practice of Islam and its way of life. However, Islamic banks not just provide their services for Muslim only but to non-Muslim customers as well. Islamic banking functions and operating modes is based on the rules of Shariah or Islamic law (Bakar & Engku Ali, 2008) where there is a restriction to acceptable deals which involves *haram* matters such as pork, alcohol and gambling (Ismail, 2010). In line with Shariah rules, the basic concept and principles of Islamic banking is that it has to be riba free. Riba is prohibited in Islam. Riba refers to an additional, expanded, interests or extra amount from the principal amount of a loan basis (Akkizidis & Khandelwal, 2008; Shanmugam, Perumal & Ridzwa, 2004). The prohibition of practice and collection of riba is stated in the Qur'an, in surah al-Baqarah, verse 275 and surah Ar-Ruum, verse 39. Another principle of Islamic banking is the profit and loss sharing principle. According to Ismail (2010), the main mechanism and unique operation in the Islamic banking system is they used a Profit And Loss Sharing (PLS) business model as a basis.

However, in order to provide and carry out services to consumers Islamic banks will be vulnerable to various risks. Risk is one of the factors that will affect efficiency of the bank. Hussain and Al-Ajmi (2012) mentioned that, the most essential risks facing by both Islamic and conventional banks are credit risk, liquidity risk and operational risk. Berger and Humphrey (1997) concluded that since early 1990s, the study about the efficiency of financial institutions grow to

be a crucial component of the banking history. One of the reason is because efficiency is the good measurement to measure the bank's success. It shows how the input resources in a company are used to produce output (Farrell, 1957). Risks and efficiency have their own relationship. They indicate how the banks manage their risks. The good management of risk will influence the efficiency to the bank.

Based on observation and previous study, efficiency study has been undertaken widely. However, there are limited study regarding the risk and efficiency of Islamic banks sector especially in Malaysia. This is supported by Chan, Karim, Burton and Aktan (2014) that "many of the most detailed studies in the area of bank efficiency and risk positioning are Europe based". Given this scenario, this research paper aims to study about the relationship between risks and efficiency of Islamic banking industries in Malaysia. In order to improve efficiency and to tackle the above issue in Islamic banking systems, the relationship between risks and efficiency of Islamic banks in Malaysia is necessary to examine. It is important to improve the Islamic banking performance in order to become more efficient and has good performance in the future. Hence, the study about the relationship between risks and efficiency of Islamic banks in Malaysia are deem important.

LITERATURE REVIEW

Efficiency can be used as a signal to appraise bank's progress, its accomplishment and success. Efficiency also can be applied as the indicator towards the bank's performance (Ahmad Mokhtar et al., 2008). In general, efficiency means to "how well" or "how effective" the decision making unit in that organization using the given inputs to produce a maximum outputs (Graham, 2004). In addition, efficiency is known as the relationship between input resources that banks used to produce the output with minimal cost and maximum of profits. In general, if that organization can minimize their capability to use input with maximum level of output, that organization will be considered to have a high level of efficiency in their management (Farrell, 1957; Ahmad Mokhtar et al., 2008). Besides, this definition of efficiency is in line with Kumbhakar and Lovell (2000) who stated:

> "*efficiency represents the degree of success which producers achieve in allocating the available inputs and the outputs they produce, in order to achieve their goals".*

Porcelli (2009) stated that there are several measurements which can be utilized to examine the efficiency of the bank. Essentially, there are two approach techniques for measurement of efficiency, namely the non-parametric approach and the parametric approach. According to Berger and Humphrey (1997), the most widely used of parametric approaches are the Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA) and the Thick Frontier Approach (TFA). Notwithstanding, according to Porcelli (2009), usually the non-parametric approach in evaluating efficiency goes under the descriptive title of Data Envelopment Analysis (DEA). DEA is known as a linear programming technique.

Based on previous research by Berger and Humphrey (1997), investigation towards efficiency in the banking sector is necessary and become an important part in order to get the needed information such as to know the impact of government policy and the market structure on banks efficiency. Studies on the relationship between efficiency of Islamic banks are important since there are rapid growth and expansion in Islamic finance industries. Nowadays, Islamic banking needs to face with challenges that keep increasing followed by the current global environment. Furthermore, Islamic banks act as important intermediaries between deficit units and surplus units. Besides that, the stability of Islamic banking industries will give impact to the economic condition of a country. Because of that, it becomes crucial to have more studies in this particular area. This is also important to the Islamic banks to maintain their efficiency in order to sustain the economic development. An efficient performance of Islamic banks will lead the good economy performance as well as the economic development.

Yudistira (2004) conduct an investigation into the efficiency of Islamic banking, and the empirical analysis of 18 banks' technical and scale efficiencies. This study covered the period from 1997 to 2000 towards 12 countries. The result proved that there are diseconomies of scales for small to medium Islamic banks. Applying Data Envelopment Analysis (DEA), the study shows that bank size in one of the contributing factor to scale inefficiency.

Meanwhile, Sufian (2007) analysed the relative efficiency of Islamic banking industry between foreign and domestic banks in Malaysia. The methodology used in this study to measure the efficiency is Data Envelopment Analysis (DEA) which suggests that the efficiency of Malaysia's Islamic banks were decrease in year 2002 in order to improve a bit in 2003 and 2004. In short, the findings from this study indicated that the domestic Islamic banks is more efficient differentiated to the foreign Islamic banks although a little. Besides that, this study also proposes that profitability is significantly and positively correlated to all efficiency measures.

Using the same method of evaluation, Sufian and Abdul Majid (2007) carry out the study about the performance of Islamic banks in Malaysian cased. This study found that from 2001 to 2005, scale inefficiency dominates pure technical inefficiency in the Malaysian Islamic banking sector. This study also found that foreign banks have higher technical efficiency compared to its domestic peers. The finding suggests that technical efficiency is significantly and positively relevant banks size, indicate that the larger the banks the more efficient that bank. Other than that, this study also indicates positive relationship between efficiency with profitability, implying that the more efficient the banks, the more profitable they are.

Tahir, Bakar and Haron (2011) on the other hand analysed the efficiency of Islamic banks in Africa, Far East and Central Asia, Europe and the Middle East in 2003 to 2008. In order to achieve the aim of this study, the technical and scale efficiencies of Islamic banks, the DEA was used. The result suggests that mean efficiency have declined over period 2003 to 2008 and pure inefficiency has largely resulted in the overall inefficiency for Islamic banks. Overall, they found that the larger the banks size, the more efficient the banks will be compared to medium and small sized banks. Hence, this result findings supported by Sufian and Abdul Majid (2007) where they stated that sizes of Islamic banks reflect their efficiency.

Said (2012) studied the efficiency of Islamic banks during economic troubles of 2006-2009 using the DEA method. This study suggests that during 2006 to 2008, large Islamic banks showed an increase in efficiency. However, their performance decline in 2009. On the other hand, small to medium Islamic banks maintain a lower level of efficiency. In addition, the results showed that in terms of efficiency, Islamic banks which operate in the Middle Eastern and non-Middle Eastern countries have increased during the economic crisis. This study also looked at the correlation between size and efficiency of Islamic banks. From this study, the result suggests that the medium and small size of Islamic banks has a better level of efficiency than larger size of Islamic banks during the financial crisis.

Ab-Rahim, Md-Nor, Ramlee and Ubaidillah (2012) studied about the cost efficiency in Malaysian banking by utilising Data Envelopment Analysis method between 1995 and 2010. They interpret the findings as indicated that population density, government ownership, demand density and market concentration are positively related with several measures of efficiency. However, other factors such as the year merger takes place, macroeconomic condition, capitalization, credit risk, asset quality and management quality have negative relationship with some measures of efficiency. In addition, the banking variables include of size enters the regression model in log transformation. The size of banks is found to have mixed sign positive coefficient with technical and pure technical efficiency while the negative relationship with scale efficiency, cost and allocative efficiency.

Next, Abdul Rahman and Rosman (2013) conducted a study to examine the efficiency of selected Islamic banks in Middle Eastern and North African (MENA), including Gulf Cooperation Countries, or GCC and Asian countries. A total of 63 Islamic banks were chosen as sample while the period of their performance was from 2006 to 2009. The research indicates that among the Islamic banks, the main source of technical inefficiency is the scale of their operations. In general, the Islamic banks reached a high score for pure technical efficiency which means that their

management able to manage and control costs with efficiently in terms of using the given input to maximize the outputs regardless of scale effect. On average, the study finds that Islamic banks from Asian countries relatively more efficient than the MENA Countries while the most efficient Islamic banks were from the GCC. In this study, Abdul Rahman and Rosman (2013) had noticed that the main determinant of Islamic banks efficiency is economic condition of a country. Based on the findings of this study, it has proven that the economic condition of a country is an important element to maintain the bank's efficiency performance.

Understanding the banking risk plays an important role in order to engage with effective management and supervision especially in Islamic banking industries. Have a few studies in banking institutions which emphasis and concentred on risk management. Bessis (2002) and Dima and Orzea (n.d.) defined banking risks as adverse as well as giving bad impacts where they will impact the profitability of different sources of uncertainty and unpredictability situation. Risk measurement is necessary to banks in order for them to understand, see and forward in capturing the source of uncertainty of its potential adverse effect on profitability. According to Bessis (2002) and Dima and Orzea (n.d.), they stated that the main risks faced by banks are as shown in the figure 2.1.

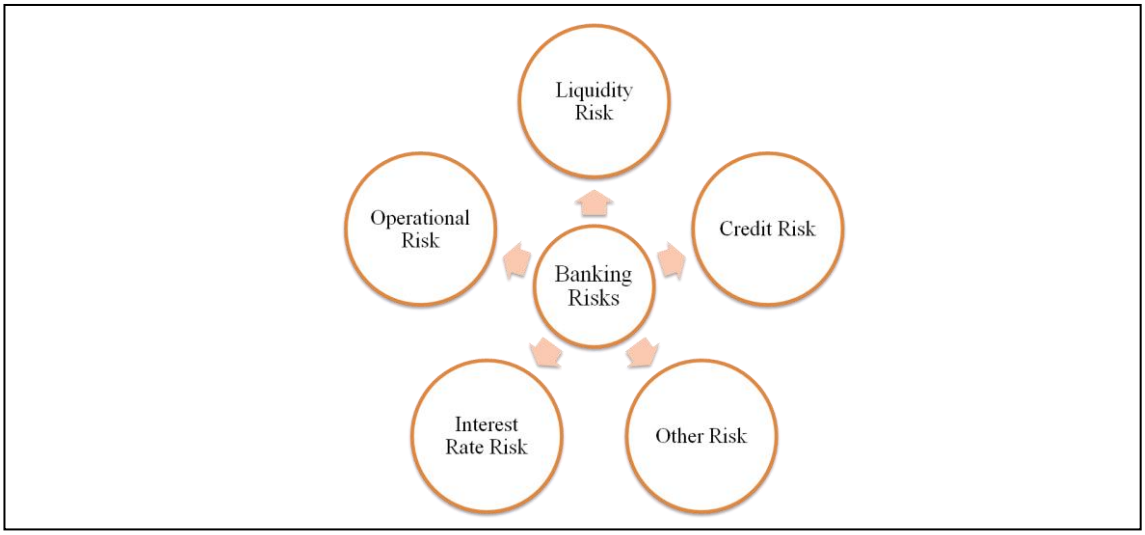

Figure 2.1
Main bank risks faced by banks
Sources: Bessis (2002) and Dima and Orzea (n.d.)

Figure 2.1 shows a group of risks that need to be faced by every organization. There are interest rate risk, operational risk, liquidity risk, credit risk, and other risk that involved in the banking operation like country risk and settlement risk. Thus, every type of risks will link and give effect to the operation of Islamic banks. The efficient management of risks will portray efficient performance by banks. However, this study will focuses on credit risk, liquidity risk and operational risk that related to the economic changes of the environment as well as to the efficiency in Islamic bank institutions in Malaysia. This is supported by Hussain and Al-Ajmi (2012) which stated that credit risk, liquidity risk and operational risk are the most important categories of risks facing by both Islamic and conventional banks compared to other risks. In addition, Said (2013) also conducted a study which focused only on this three main types of risks in Middle Eastern and North African (MENA) region.

Since Islamic banks offer a wide range of products, banks will be exposed with different modes of risks. According to Khan (2003), credit risk was the cause of 80% cases of failure. These indicate a high percentage of credit risk exposed to the Islamic banks compared to another risks. This has also proved that the one of the main risks that critically affect banks' future growth feasibility is credit risk. If credit risk is so high, banks will suffer and need to face with other problems like settlement and clearance in the operation and transaction.

According to McNeil, Frey and Embrechts (2005), credit risk happen when the borrowers did not fulfil their repayments and having default in their payment. This view is also supported by IFSB (2005) and Astrom (2013) discovery where credit risk arise when the counterparty, known as third party, fails to meet their obligation to make payment in agreed time. It means that when the borrowers do not perform their promise and breach the contract, it will expose and improve the potential of credit risk to the bank itself. This situation is not good to the bank's condition and consequently will affect the bank's efficiency. In addition, the bad management of costs in the organization will expose the organization towards credit risk (Berger & Humphrey, 1997). For instance, in the case of non-performing assets in the organization will cause the credit risk and will affect the bank's performance.

Besides, if banks do not have sufficient cash as well as the borrowing capacity to meet customers' withdrawals, loan demand and other cash demand by bank depositors and publics, they will face problems like liquidity risk. Liquidity risks arises when banks unable to turning their assets into cash. In general, bank also needs to give attention towards the unsafety condition. If financial institution confront with liquidity risk, they may be have to borrow emergency funds at excessive cost to meet its financial obligations (IFSB, 2005; Rose & Hudgins, 2013). Sufficient cash is very important to the banks to make sure that they can perform their operations and obligations by giving effective services to their customers.

Therefore, liquidity can be considered as "oxygen for a healthy market". Human need oxygen to survive but most of the time human do not aware of its presence. Nevertheless, without oxygen human is unable to survive and go on with their living (McNeil et al., 2005). This situation is similar in concept with bank and its liquidity scenario. For instance, Islamic banking industries unable to meet its obligations as the important institution among deficit unit and surplus unit in economy circle without the liquidity. Specially, with suffient and good management towards banks liquidity, banks will able to fulfil its short term obligations. In order to become more competitive, Islamic banks should be aware of this liquidity issues in order to get better returns and strongly performance.

Meanwhile, based on previous research by Hossain (2003) and McNeil et al. (2005), they have reviewed that operational risk is the risk arise from insufficient or unsuccessful people and systems, internal procedures designed, internal and external processes and reporting systems. If operational risk is not managed and controlled properly, it will cause the banks to have losses. Operational risk may be arises due to lacking of trained to the banks' staff. For instance, staffs need the latest training to make sure they can give a good service to their customers. Besides, bank also need to manage their operating expenses like wages and salaries properly. Ultimately, due to lack of market transparency, Islamic banks need to avoid cases of fraud in their operations. Besides, in order to be more competitive and efficient, Islamic banks need to be more alert with their surrounding area.

There are few studies discuss about the risks inherent in Islamic banking. Risks are a part of Islamic banking operations (Dima and Orzea., n.d). The changing banking environment will present risks in their activities and because of that, it is important to recognize, monitor and control the risks that is inherent in Islamic banks. Besides, banks need to manage the risks well in order to provide a good products and servives. Islamic products like Musharakah, Mudarabah, Ijarah and others that are being offered in Islamic banking industries also exposed to the various types of risks (Akkizidis & Khandelwal, 2008).

A study done by Sufian and Abdul Majid (2011) focussing on issues pertaining to the impact of economic freedom performance in MENA on Islamic banks sector for the period 2000 to 2008. This study found a negative result impact between credit risk and preference behaviour in MENA banking sector. On the other hand, Boumediene (2011) also investigated the credit risk issue, which tried is to see whether the percentage of credit risk in Islamic banks is higher compared to the conventional banking. This study covered five years, from 2005 to 2009 that was performed on nine samples from conventional banking and another nine were Islamic banks in Egypt, Kuwait, United Arab Emirates, Bangladesh, Bahrain, Pakistan and Qatar. According to Boumediene (2011), credit risk exists in both banking types and a matter that distinguish both banking types is investment tools. For instance in Islamic banks, they practiced the PLS

principles. However, these principles are not in practice in conventional banks. In this article, the result shows that Islamic banks has really lower compared to conventional banking in term of credit risk. Even though Islamic banks indicate lower risk, but as mentioned before, credit risk management can cause bank's insolvency. The bad management of credit risk will affect the bank's failure. Based on this study, the problem of management of this risk by Islamic banks is not due to shortage of risk management tools but the dilemma is how Islamic banks manage this risk like conventional banks. In reality, this is not consistent because both types of banks have different nature like the terms in contracts. The solution is in the strict applicability of Islamic contracts and a deep knowledge of their mechanisms as well as the options they offer.

Addressing a different dimension, Abedifar, Molyneux and Tarazi (2012) has pointed out the risk characteristics of Islamic banking stability. The sample consists of of 553 banks from 24 countries revising on year 1999 to 2009, the results showed that small Islamic banks that are based in a country with a majority Muslim population (more than 90%) indicate a lower credit risk compared to conventional banks. The credit risk relates to loan quality in banks' operations. With the insolvency risk, the results indicate that more small Islamic banks also become to be more fixed.

A study that focuses on the factors associated with credit risk of Islamic banks in the GCC countries was done by Al-wesabi and Ahmad (2013) who discusses on the credit risk. The study was done using website data covering 25 Islamic banks from the year 2006 to 2010. They found that the banks' income is significantly negatively related to credit risk. Besides that, some firm specific variables such as leverage and liquidity are also relevant variables for credit risk. Credit risk is also broadly affected by both macro and firm specific factors as found in other regions. Inflation and interest rates do not appear to be relevant towards credit risk in a Islamic banks sample in this study.

The Al-wesabi and Ahmad (2013) study is in line with Ahmad and Ahmad (2004), which focussing on the key factors which give effect to credit risk in Islamic banking operations. However, Ahmad and Ahmad (2004) were only focused on Malaysia's case. Thus, this study analysed the factors influencing credit risk. The findings show that management efficiency, size of total assets and risk-weighted assets have significant influence on credit risk of Islamic banking, while conventional banking credit risk are significantly affected by loan demolition to risky sectors, risk-weighted assets, loan loss provision and regulatory capital. While both observe similar effects of leverage, funding cost, risk-weighted on credit risk, Islamic banking experiences different impact of management efficiency, regulatory capital and loan loss provisions on their credit risk. It indicates that, Islamic banking in Malaysia was being affected by distinct factors differentiated to conventional banking.

Study by Shafique, Faheem and Abdullah (2012) examines the Islamic banking system during global financial crises 2008 in term of liquidity and risk analysis. During this time, many banks in the world were moving towards the bankruptcy situation. According to researchers the main cause of this scenario is because all these banks have less liquidity type of nature. However, based on the observation, Islamic banks were not really affected during this crisis because the nature of Islamic banks itself, which is having more liquidity. Hence, the purpose of this paper which is to analysis liquidity of Islamic banks has already proved that Islamic banks' highly liquid type in nature.

Izhar (2010) stated that one of the type of risk which can give significant losses to financial institutions is operational risk. Abdullah, Shamimi and Ismail (2013) examine the issues of operational risk in Malaysia's case expecially in Islamic banks and suggesting that the study on operational risk in Islamic banks is important and becoming more intricate than conventional banking. This is because of the unique features in Islamic banking itself. Islamic banks have unique contractual features like Ijarah financing, Mudharabah, Musyarakah, Murabaha and also general legal environment like PLS principle.

If banks confront and possess a problem in managing and regulating their internal cost, banks may be facing problems in the valuation of their credit risk. This verdict has been shown by a study done by Berger and De Young (1997) that

relate risks and efficiency. According to them, the inefficient management of financial costs will cause and goes along with more credit risk. This means that inefficiency shows that they do not manage their internal cost very well.

Moreover, Alam (2012) also analysed a study about the risk and efficiency from dual banking system. This study utilizes a large data set of 70 Islamic banks and 165 commercial banks from Malaysia, Bangladesh, Bahrain, Kuwait, Egypt, Turkey, Indonesia, Saudi Arabia, Pakistan, Qatar and UAE from 2000 to 2010. Empirical evidence shows that bank inefficiency and risk are positively related for conventional banks and inversely related for Islamic banks which clearly highlight the inherent difference between risk-efficiency relationships among these two distinct bank types. The mean cost efficiency scores for the conventional banking industry is higher than Islamic banking sector while, Islamic banks profit efficiency scores have outperformed conventional banks profit efficiency scores. Furthermore, evidence from this study shows that environmental factors can considerably affect the banking efficiency scores. While inefficient Islamic banks still maintain their lower risk level compared to the conventional banks because of cost resistance weakness which limit the ability of inefficient Islamic banks to take on more risks.

Said (2013) measured the correlation between risks and efficiency within Islamic banks in the MENA region for the period of study from 2006 to 2009. Three stages of analyses were used in this study. Firstly, by DEA technique, efficiency of those banks were measured. Secondly, credit risks, operational risks and liquidity risks were measured in order to analyse the risks by using financial ratios. Lastly, by employing the Pearson Correlation Coefficients, the study examine the correlation between credit, operational, liquidity risks to efficiency. The result of the analysis presents that credit risk has negative relationship to efficiency, while operational risk has found to be negatively correlated to efficiency too. Besides, it is found that liquidity risk showed insignificant correlation to efficiency in Islamic banks in MENA area.

In another study, Fan and Shaffer (2004) concluded the risk versus efficiency in large domestic US banks. They used the profit efficiency of a sample of large US commercial banks. Researchers explore on how this performance fluctuate with selected measures of bank risk describe aspects of credit risk, liquidity risk, and insolvency risk in this study. The result indicates that profit efficiency is sensitive to credit risk and insolvency risk. However, profit efficiency is not sensitive to liquidity risk or to the mix of loan banks products. This study highlight that these three kind of risks serve as indicators related to profit efficiency in US commercial banks case.

Meanwhile, Sun and Chang (2011) investigated the function of risk in find out and ascertaining the cost efficiency. This study covers of international banks in eight emerging Asian countries by using heteroscedastic stochastic frontier model. Besides, the study not only emphasised on credit risk but also in operational risk and market risk under a total of eight risk measures. The results reported that the level and variability of bank efficiency have significant effects influenced by risk measures. The empirical results from this study also indicate that these effects vary over time and across countries.

The study by Eken and Kale (2013) evaluated the efficiency of Turkish banks, a risk and profitability approach. Researchers in this study want to benchmark achievement of banks in comparison to risk taking preferences by using the DEA. This study found that profitability of banks does not necessarily parallel with their risk taking preferences. Besides, banks with low risk efficiency should look back towards their business style for improvement in the future. This is important for banks to gain a better performance in order to attain the good efficiency level in the future. It means that, the good business style as well as the good management must be practice by banks, as well as to perform the efficient performance and services to their customers.

Fiordelisi, Marques-Ibanez and Molyneux (2011) presented an inter-temporal relationship between bank efficiency, capital and risk. The study focused on the commercial banking industry in European countries by using the Granger-causality methodology. Besides, this study suggests that lower bank efficiency with respect to costs and revenues Granger-causes higher bank risk and that increases in bank capital precede cost efficiency improvements. Based on this

study, it was found that more efficient banks are more capitalized in European commercial banking industries. While the higher capital levels of banks will give good and positive effect towards the bank efficiency levels. This study also suggests that the more hinger capital level of banks are, the more efficient they will perform. Besides, it is very important to give attention and emphasize on the long term efficiency and not only focus on short term efficiency in order to support banks financial stability.

More recently, Chan, Karim, Burton and Aktan (2014) focus on the study of the efficiency and risk in commercial banking in Taiwan, China, Mongolia, Hong Kong, Korea, Japan, and Macau. This study analysed the various types of risks on the cost and profit efficiencies of commercial banks and the effects of off-balance sheet (OBS) activities between 2001 and 2008. By using the DEA approach, profit efficiency scores and cost efficiency scores are estimated. Tobit regression models that examined the risk exposures and effect of OBS activities on profit and cost efficiencies show that risk factors and OBS activities give effect to the cost and profit efficiency levels of East Asian banks in a number and identifiable ways.

DATA AND METHODOLOGY

This study want to examine the level of efficiency and to analyse the relationship between risks and efficiency. This study employs secondary data using financial data of Islamic banks in Malaysia banking industries from year 2008 to 2013 which covers six years observations. Data is extracted from the published annual report in order to measure and construct all the variables for the empirical analysis of each Islamic banks. The list of Islamic banks used as samples in this study is provided in Appendix (Table 3).

Data Envelopment Analysis (DEA)

There are two main approaches that can be applied by the researchers in effort to examine the efficiency of Islamic banks, namely parametric approaches and non-parametric approaches (Berger and Humphrey, 1997). What distinguishes between these two approaches is where in parametric approach, description and detail of the functions of production, profit and also costs as well as assumptions that relate with the error are needed.

However, in the non-parametric approach, this approach is contrary with parametric approach. In non-parametric approach, it does not need any earlier assumptions regarding the functional form of error or description and detail for production. The DEA analysis (non-parametric approach), is widely used in past studies by researchers in order to conduct the efficiency analysis (Abdul Rahman & Rosman, 2013; Ab-Rahim et al., 2012; Ahmad Mokhtar et al., 2008; Said, 2012; Sufian, 2007; Sufian and Abdul Majid, 2007; Tahir et al., 2011; and Yudistira, 2004). Therefore, this study employed the non-parametric approach to measure and calculate the efficiency level of Islamic banks in Malaysia.

Data Envelopment Analysis (DEA) was initiated by Farrell (1957) and extended as well as developed by Charnes, Cooper and Rhodes (1978) and thereafter modified by Banker, Charnes and Cooper (1984). According to Farrell (1957), DEA is a linear programming for frontier analysis. DEA used multiple inputs and multiple outputs in the programme. DEA will differentiate each producer unit with the optimal producer unit to measure and to know the inefficiency level of each producer. This producer unit call as Decision Making Unit (DMU). After that, each of DMU has a capacity of switch a set of inputs into a set of outputs. In general, there are two main approaches used in input-output specification which have been widely used, namely production approach and intermediation approach (Sealey and Lindley, 1977).

Under the production approach, the banks or also known as financial institution, for example banks is defined and called as a producer that produces some of the products and services for customers like for their depositors and account holders. As a producer in this scenario, bank will present and process the transaction on deposits account and perform the documents on behalf of their customers such as customer loan. Because of that, based on this approach the output is

considered as the number of accounts or related transaction that bank process. Hence, the input is the number of employee and physical capital (Sufian, 2007).

Under the intermediation approach, bank is assume as the intermediary, which act between the savers and the borrowers of funds as well as between the supplier and its customers. In addition, it strengthens deposits together with labour and physical capital are defined as inputs, while total loans and securities defined as outputs (Sufian, 2007). Besides, as claimed by Yusditira (2004), the intermediation approach is in line with Islamic financial system. This is because in Islamic banks, they practices the equity based financing. Hence, bank will participate in the enterprise or business. Therefore, in this study intermediation approach is used to examine efficiency of Islamic banking industries in Malaysia.

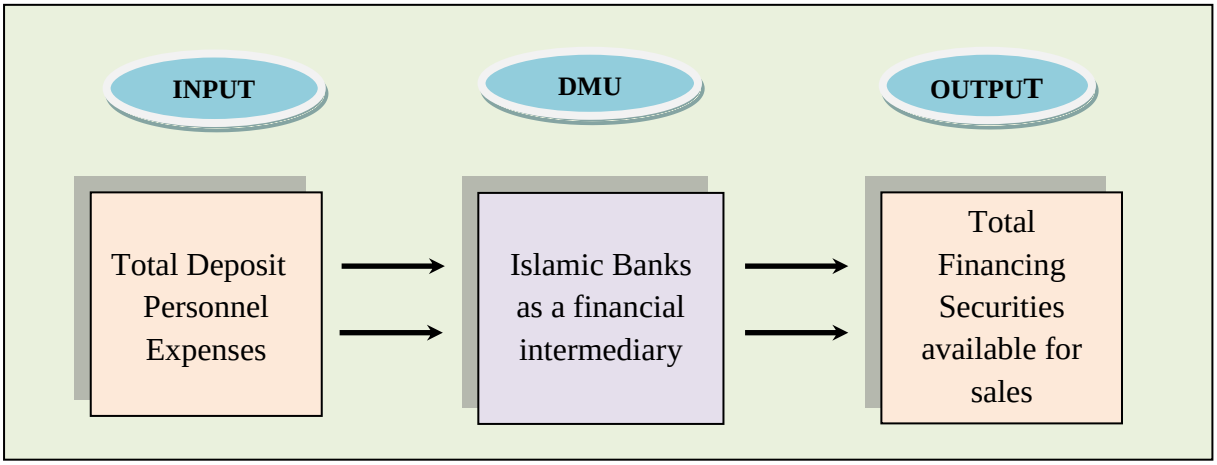

Figure 3.1
Input-output relationship in Islamic Banking (Intermediation Approach)
Source: Author's own.

Based on Figure 3.1, there are three elements involved in intermediation approach, namely input, Decision Making Unit (DMU) and output. In this study, DMU refers to the bank. Under the intermediation approach, we examining how efficient the DMUs transforming their input in order to generate the maximum level of output. After the study of Farrell (1957), Charnes et al. (1978) develop the DEA model based on constant return to scale (CRS), which referred the CCR model as a method of benchmarking and to measure the performance as well as the efficiency of each Decision Making Unit (DMU). Under the CRS model, it is assumed that all scale of scores for each DMU is constant and same. The result offer Overall Technical Efficiency (OTE) which does not look at the different scale for each DMU.

After that, Banker et al. (1984) developed a Variable Returns to Scale (VRS) and subsequently extended the CCR model, namely BCC model. Banker. et al., (1984) develop the BCC model which extending the CCR model (Charnes et al., 1978) with the intent to resolving problems with VRS. The measures of efficiency acquired from the BCC model at the same time are known as pure technical efficiency (PTE) scores and of scale efficiency (SE) outcome. PTE represent the result from the management of DMU and SE represents the result from the scale of DMU.

The CCR and BCC model has the same formulation except the added convexity condition in dual form. Both the CCR model and BCC models applied input orientation or else output orientation. However, according to Charnes et al. (1978), the CCR model is considered as CRS and only suitable when all Decision Making Unit (DMU) are working and perform at optimal scale.

The linear programming problem is specified in order to represent the input-oriented in the DEA model with VRS technologies as below:

$$
\begin{aligned}
&\min \varphi, \lambda, \varphi \\
&\text{subject to } -\varphi y_i + Y\lambda \geq 0 \\
&x_i - X\lambda \geq 0 \\
&N1' \lambda = 1 \\
&\text{and } \lambda \geq 0
\end{aligned} \tag{1}
$$

where λ is an N× 1 intensity vector of constants and φ is a scalar ($1 \geq \varphi \leq \infty$). $N1$ is an $N \times 1$ vector of ones. For N number of firms, y_i and x_i are the $M \times N$ and $K \times N$ output and input vectors, respectively. Y comprises the data for all N firms. Given a fixed level of inputs for the ith firm, the proportional increase in outputs to be reached the firm indicated by $\varphi - 1$. Note that without the convexity constraint $N1' \lambda = 1$, 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. In other words, each firm would produce on or to the right of the convex production possibility frontier.

If TE scores for a particular firm with or without the convexity constraint imposed are the same, then the firm is operating under CRS. If these scores are different, the firm operate under VRS technology. However, in such a case, it would be necessary to identify whether the firm 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 given as follows:

$$
\begin{aligned}
&\min \varphi, \lambda, \varphi \\
&\text{subject to } -y_i + Y\lambda \geq 0 \\
&\varphi x_i - X\lambda \geq 0 \\
&N1' \lambda \leq 1 \\
&\text{and } \lambda \geq 0
\end{aligned} \tag{2}
$$

Solution of the equation (2) reveals the nature of scale efficiencies. IRS exists if TE score obtained with NIRS technology differs from the TE estimates with VRS technology. If both of these efficiency scores are equal, then the corresponding firm operates with DRS. Amongst the advantages and strengths of using DEA to measure efficiency is that, it can works with small sample size, which means DEA can run with less data demanding. Besides, according to Farrell (1957), technical efficiency (TE) can be defined as the capability of firms or company to produces and acquire a maximums output from a selection and group of given inputs. Meanwhile, the Scale efficiency (SE) shows the capability and potential of firms in term of their work at its optimal scale. On the other hand, the pure technical efficiency (PTE) shows the ability of firms in producing a maximums output regardless of their scale of operations.

However, DEA also have weaknesses in order to measure the efficiency. For instance, DEA assumes all the data that use in this approach are free from measurement mistakes. In addition, due to efficiency is measured in a relative way, its approach is limited only to the sample set used by researcher. As said with limited, means that researcher cannot be compared the result of efficient DMU found in the analysis with other DMUs outside of the sample.

Regarding the all explanation above about DEA, this study will employs the DEA approach to measure the risk and efficiency of Islamic banks in Malaysia. This study conduct the efficiency analysis by using DEA computing software, namely DEAP version 2.1. The selection of this approach because of some reasons widely used by past researchers regards this technique to measure the efficiency of Islamic banks. Rather than that, according to Hassan (2013), DEA is a suitable approach for measure the efficiency level assessment as it measures the relative efficiency of each production unit. Regard to the efficient frontier that is build from the real data.

Input-Output Specification

In this study, two inputs and two outputs are selected in order to appraise the efficiency of Islamic banks in Malaysia. The selection of inputs and outputs in this study is based on previous studies which have been widely used. Hence, financing and securities available for sale represent as outputs, while the total deposits and personnel expenses represent as the inputs in this study (see Table 3.2).

Table 3.2

The outputs and inputs used in this study

OUTPUT	INPUT
Total Financing	Total Deposits
Securities Available for Sales	Personnel Expenses

Based on Table 3.2, each term has a definition by itself. The followings describe each output and input definition been employed in this study.

a) Outputs
   i. Total Financing
      Total financing consist of mostly Islamic transactions (Yusdistira, 2004). Financing is an agreement between bank and borrower or customers. It can be in written letter or oral form. It used as temporary transfer property with promises to pay back in a specific time. In the context of Islamic banking, total financing included the financing to customers and other financial institutions like Murabaha, Mudarabah and Ijarah financing.
   ii. Securities Available for Sales
      According to Sufian and Abdul Majid (2007), investment securities held to maturity, investment securities held for trading and investment securities available for sale include in investments as output to the bank. Securities available for sales is equity or debt security that is not categorized as a held to maturity security or held for trading. As be depicted by Islamic banks in the statements of financial position, under securities available for sale are Cagamas bonds, Islamic private debt securities and others.

b) Input
   i. Total Deposits
      Total deposits defined as deposits which include deposits from customers and other banks (Sufian and Abdul Majid, 2007). A total deposit is a total amount of deposits where bank get from their customers and also deposits and placements of banks and other financial institutions. Here, customers and others financial institutions placed their money into Islamic banking institution for purposes of safekeeping. They has the right to withdraw any deposited funds, followed in the terms and conditions stated in the account.
   ii. Personnel Expenses
      Personal expenses considered as expenses that banks pay for human physical and mental (labor) effort such as for the staff cost (Yusdistira, 2004). For instance in term of their salaries and wages and also the allowances and bonuses for staffs are consider as the personal expenses to the banks.

Financial Ratios

The financial ratios are employed in order to calculating the liquidity, credit and operational risks and size in this analysis. The result from Data Envelopment Analysis (DEA) and financial ratios will applied in the Multiple Regression Analysis to examine the level of efficiency of Islamic banks in Malaysia. Therefore, the risks would be measured as follows:

Table 3.3

The details of variables used as Independent variables

Independent Variables	Proxies	Expected Sign
Credit Risk	Ratio of Non Performing Financing to Total Financing (Non Performing Financing / Total Financing)	-ve
Liquidity Risk	Capital to Total Assets (Equity / Total Assets)	-ve
Operational Risk	Return on Total Asset (EBIT/ Net Total Assets)	-ve
Size	Log of Total Assets	+ve

Note: EBIT- Earning before interest and tax

The selection of the variables which is independent variables and each proxies used in this study is replicated from the previous studies. For credit risks, the proxy used is replicated from Ahmad and Ahmad (2004) while the proxy for liquidity risk is replicated from Said (2013) and Rosman, Abdul Wahab and Zainol (2014). Lastly, operational risk proxies is replicated from Said (2013). Other than that, according to Sufian (2007), he noticed that the relationship between various accounting measures of bank performance with various efficiency scores in order to complement the results of the efficiency measures is considered important determinant of bank efficiency. Hence, a new variable, namely bank size is included to examine its effect on efficiency. Although some banks have increased their size, its impact on efficiency and performance is still ambiguous. Hence, following (Rosman et al., 2014; Sufian, 2007; Sufian & Abdul Majid, 2007; Tahir et al., 2011; Yudistira, 2004), we use log of totals assets as a proxy for banks size. The log of totals assets variable is included in the regression model as a proxy for measure of size.

Bank loans are expected to be the main source of revenue and expected to impact profits positively to the Islamic banking (Sufian & Abdul Majid, 2007). However, in term of credit risk, Ahmad and Ahmad (2004) mentioned that when the probability of a borrower defaulting his loan commitments, credit risk will occur. Hence, the coefficient of ratio of non performing financing to total financing is expected to be negative relationship with the efficiency in this study. This is because the bad loans will reduce the Islamic banks profitability and efficiency.

Besides that, it is expected that liquidity risk have a negative relationship with the efficiency of Islamic banks. This is because when banks faced with difficulty in selling an asset quickly without incurring large losses, it means that banks have to deal with liquidity risk in their operations. In banking industries, liquidity risk includes both the risk of being unable to liquidate a position in a timely manner at reasonable prices and another one is the risk of being unable to fund portfolio of assets at appropriate maturities and rates. Therefore, the liquidity risk will affect the efficiency level of Islamic banks.

Besides that, operational risk will also affect the bank's performance. For instance, operational risk may arise in Islamic banking operation due to uncontrolled and managed properly in internal or external events of Islamic banks. Subsequently, it will affect the level of efficiency in Islamic banks itself. Next, as suggested by Ab-Rahim et al. (2012), Sufian (2007) and Sufian and Abdul Majid (2007) banks size lead to positively related to bank efficiency. The larger banks size indicate a more efficient of Islamic banks. Because of that, size is expected have a positive ralationship toward Islamic banks eficiency level score.

Pearson Correlation Coefficients

This study used the Pearson Correlation Coefficients to measure the correlation of risks to efficiency in Islamic banking in Malaysia during the period of 2008-2013. A correlation can vary in strength of the relationship (with the Pearson product-moment correlation coefficient that relationship is linear). Zero shows no relationship between the two measures variables (risks and efficiency) and r = 1.00 or r = -1.00 reveals a perfect relationship in the same or the opposite direction between risks and efficiency. Pearson Correlation Coefficients would be calculated with the following equation:

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2}\sqrt{n(\sum y^2) - (\sum y)^2}}$$

where;

n= is the sample size
r= linear correlation coefficient
x=efficiency score
y=risks

Multiple Regression Analysis

The relationship between dependent variables and independent variables cannot determinant by only used the correlations analysis. Because of that, Multiple Regressions is a method that frequently used in a data analysis to analyse the data that involve several independent variables with one dependent variable. The purpose of regression analysis is to investigate which one among the independent variables mostly contributed as well as influence to the dependent variables. In Multiple Regressions, the contribution percentages of R square is computed.

In this study, the independent variables and dependent variables will be tested using SPSS software. The standard regression has been used. The final result from this regression analysis will indicate and shows the result where which variable is more influence to the efficiency variable. Besides that, the multiple regression analysis was used and applied in order to test the hypothesis and it will determine. The following equation represents the Multiple Linear Regression analysis used this study:

$$\gamma = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \sum$$

Where;

γ = Efficiency of Islamic banks
α = Intercepts (constant value)
β = Unstandardized beta coefficient
X_1 = Credit risk
X_2 = Liquidity risk
X_3 = Operational risk
X_4 = Size
$\sum$ = Error term

ANALYSIS AND FINDINGS

This section discusses the empirical result, interpretation as per the objectives of the study and analysis obtained from the analysis using the technique that already mentioned in methodology. It will begin with the descriptive statistics of inputs and outputs that used in this study by employing Data Envelopment Analysis (DEA) and ends with the result of relationship by employing Multiple Regression Analysis. The outcome from the analysis shows the relationship between dependent variable and independent variables, the risks and efficiency for the selected period from 2008 to 2013.

Descriptive Statistics of Inputs and Outputs

Data expressed in descriptive statistics is obtained from the income statement and balance sheet from the Islamic banks annual report of each bank. All variables in this study are measured in millions of Malaysian Ringgit (RM). In this study, two inputs and two outputs have been selected in order to answer the first research objective which is to examine the level of efficiency of Islamic banks in Malaysia during the study period from 2008 to 2013.

Accordingly, this study used the Total Financing (y1) and Securities Available for Sales (y2) as output, while the Total Deposits (x1) and meanwhile Personnel Expenses (x2) were used as inputs in this study. Further, Table 4.1 below show the descriptive statistics of inputs and outputs used. Table 4.1 represents the descriptive statistics of input and outputs variables utilized in the Data Envelopment Analysis (DEA) method in this study from 2008 to 2013 for Islamic banks in Malaysia. Over the six year period, the average of total financing (y1) result from year 2008 to 2013 indicates an increasing trend of output. This is followed by average total deposits (x1), which also indicate an increasing trend of input during the study period.

Table 4.1

Descriptive Statistics of Outputs and Inputs of Islamic Banks in Malaysia, (2008 – 2013)

Source: Annual reports of sample banks (2008-2013)

YEAR		2008	2009	2010	2011	2012	2013
OUTPUTS AND INPUTS (RM)		**RM**	**RM**	**RM**	**RM**	**RM**	**RM**
Total Financing (y1)	MEAN	25 600 861	61 612 588	66 565 914	85 845 960	132 809 691	148 649 271
Securties available for sales (y2)	MEAN	6 068 575	4 753 615	10 069 307	17 792 603	34 276 410	49 086 431
Total Deposits (x1)	MEAN	131 983 863	153 487 999	163 364 889	175 214 692	207 936 715	214 799 431
Personnel Expenses (x2)	MEAN	1 629 164	1 643 308	2 352 773	2 068 034	2 215 889	1 682 756
Total Financing (y1)	MIN	1 368 041	1 911 270	2 342 145	2 886 463	3 936 712	4 614 687
Securties available for sales (y2)	MIN	6 526	185 866	330 665	174 521	320 117	99 698
Total Deposits (x1)	MIN	1 798 849	2 695 445	3 413 970	5 053 747	5 839 433	6 190 112
Personnel Expenses (x2)	MIN	614	1 494	3 616	7 414	9 932	10 297
Total Financing (y1)	MAX	249 827 727	673 649 925	721 029 028	936 500 793	1 480 590 537	1 648 699 828
Securties available for sales (y2)	MAX	61 461 157	36 974 449	94 373 699	187 695 108	380 833 148	557 509 107
Total Deposits (x1)	MAX	1 492 747 191	1 730 589 200	1 837 335 463	1 950 277 423	2 329 477 859	2 383 758 521
Personnel Expenses (x2)	MAX	19 060 935	19 123 248	27 338 288	23 966 313	25 630 094	19 125 614
Total Financing (y1)	SD	70 687 772.69	192 780 056.04	206 148 759.01	267 937 263.24	424 486 444.39	472 452 043.37
Securties available for sales (y2)	SD	17 475 373.67	10 414 565.36	26 768 340.49	53 585 707.54	109 194 304.77	160 147 652.31
Total Deposits (x1)	SD	428 563 327.80	496 708 181.90	527 217 221.78	559 061 158.12	668 173 136.29	683 127 671.16
Personnel Expenses (x2)	SD	5 489 969.85	5 505 107.66	7 869 248.57	6 896 763.85	7 374 300.22	5 494 384.83

Based on the table, the result recommends that the awareness among people and society during year 2008 until 2013 towards Islamic banking and finance products among Malaysian has been increased and more establish due to the growth in average total financing as well as average total deposits. This is endorsed by Zainol et al. (2008) who agreed that Islamic banking industries is more thriving today due to growth of awareness among people today parallel with globalization era today. Besides, typically Islamic banks engage with Shariah way of operations. However, this feature does not restrict Islamic banks to provide services only for Muslim, but for non-Muslims as well. Furthermore, the improvement on the amount of average of the Islamic banks financing between 2008 and 2013 in this study proved that Islamic banks are actually going up and acquiring as well as additional market shares. In addition, Islamic financing accounted for 20.2% of the total loans of the banking system at the end of July 2009 (Economy Report, 2009/2010). Hence, this finding provides an increasing level of trend result in financing and total deposit for Islamic banks from one year to another year.

Henceforth, average personnel expenses (x2) for Islamic banks in Malaysia indicate a fluctuation trend even though they revolve from time to time. As an employer, banks need to spend money for their staff expenses like for paying for their salary. This may suggests that, Islamic banks are investing in human resources as well as new technology following their current need and situation.

In addition, concerning the average securities available for sales (y2), the result indicates a decreasing trend with RM 6,068,575 and RM 4,753,615 respectively in year 2008 to 2009. Nevertheless, it was slightly increased as much as RM 10,069,307 in 2010, RM 17,792,603 in 2011, RM 34,276,410 in 2012 and RM 49,086,431 in 2013 over the year period of study. This may suggest that Islamic banks rolling and obtained funds are through investment such as in Islamic private debt securities and Cagamas bonds as output to the bank. The fluctuation in current situation market may be one of the reason indicates the result scores by securities available for sales. However, regarding to this factor, it is still in control and can be adopted and handled by Islamic banks effectively. Other than that, Malaysia is also well known as the earliest country which issued an international sukuk and a leader in the field of Islamic finance. Malaysia's sukuk market is the largest and covers over 60% of the worlds sukuk market (Economy Report, 2009/2010).

Efficiency of Islamic Banks in Malaysia

This part elucidates the efficiency result of Islamic banks in Malaysia from year 2008 until 2013 respectively in term of Overall Technical Efficiency (OTE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE). All the availability of data has been measured using Data Envelopment Analysis (DEA) to identify the level of efficiency of Islamic banks in Malaysia. The value of OTE, PTE and SE is explained in Table 4.2.

Table 4.2

The Result of Efficiency of Islamic Banks in Malaysia, (2008-2013)

YEAR	NUMBER OF ISLAMIC BANKS	OTE (MEAN)	PTE (MEAN)	SE (MEAN)
2008	12	0.792	0.959	0.832
2009	12	0.924	0.976	0.948
2010	12	0.912	0.962	0.949
2011	12	0.861	0.927	0.932
2012	12	0.931	0.957	0.973
2013	12	0.934	0.960	0.972
2008 - 2013	72	0.771	0.831	0.926

Notes: OTE : (Overall technical efficiency); PTE :(Pure technical efficiency); SE: (Scale efficiency)

Table 4.2 shows the empirical result for the Overall Technical Efficiency (OTE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE) level of Islamic banks in Malaysia under study for the year 2008 until 2013. Based on the table, the level mean of overall technical efficiency for the year 2008 for the total of 12 Islamic banks in Malaysia is 79.2%. It means that, all the sample in this study had reached a mean technical efficiency scores as much as 79.2% and the rest, 20.8% of the technical efficiency is being wasted by Islamic banks during this year. In terms of pure technical efficiency, the result indicates that the efficiency score of Islamic banks is as much as 95.9% while the scale efficiency score is 83.2%. Therefore, the results show that the source of inefficiency of Malaysian Islamic banks in 2008 was scale inefficiency, suggesting that Malaysian Islamic banks have been operating at the wrong scale of operations in this year.

In the following year, Islamic banks exhibited a mean overall technical efficiency of 92.4%. This result recommends that the Islamic banks could have saved 7.6% of the inputs to produce the same amount of outputs that they produced during this year. On average, the pure technical efficiency and scale efficiency indicate a total of 97.6% and 94.8% respectively in 2009. The efficiency score of overall technical efficiency of Islamic banks during the year 2010 is 91.2%. Hence, it shows that 8.8% of the technical efficiency is being wasted by Islamic banks in this year. This result recommends that the Islamic banks could have saved 8.8% of the inputs to produce the same amount of outputs that they produced. Besides that, it is also found that Islamic banks in Malaysia exhibited pure technical efficiency and scale efficiency average level score of 96.2% and 94.9% respectively during this year.

In 2011, the result shows that the average overall technical efficiency scores is 86.1%. It shows a declining trend of overall technical efficiency of the Islamic banks in Malaysia from 2010 to 2011. Therefore, this result recommends that the Islamic banks could have saved 13.9% of the inputs to produce the same amount of outputs that they produced during this year. Besides, as can be seen from Table 4.2, Islamic banks in Malaysia perform better in term of scale efficiency compared to overall technical efficiency and pure technical efficiency (92.7%), which indicate the scale efficiency result score for the year 2011 is as much as 93.2%.

On the other hand, the average mean score overall technical efficiency for Islamic banks for 2012 shows an increasing level of scores from the previous year. The result shows that the overall technical efficiency of Islamic banks in 2011 is 86.1% before it rose up to 93.1% in 2012. Specifically, average scores for pure technical efficiency and scale efficiency Islamic banking has increased to 95.7% in pure technical efficiency as well as 97.3% in scale efficiency during this year. The overall technical efficiency for year 2013 shows the highest level score of overall technical efficiency compared to other years, which is 93.4%. The result in 2013 shows that only 6.6% of input is being wasted by Islamic banks to produce the outputs in this year. Hence, this indicates that Islamic banks are more efficient during this year when it comes to the highest score level of mean overall technical efficiency compared to other years. Indeed, in term of average scores for pure technical efficiency and scale efficiency for Islamic banks the result provide as much as 96.0% and 97.2% respectively.

As we can see in the finding of the result, it shows a fluctuation trend on average overall technical efficiency in all periods under study. However, it can be concluded that Malaysia's Islamic banks are quite efficient. Overall, the results show that the highest score overall technical efficiency for Islamic banks in Malaysia in year 2013 is as much as 93.4% while in year 2008 shows the lowest score of overall technical efficiency that is 79.2%. The result in 2008 shows the lowest score because the impact of financial crisis but Islamic banks seem more robust recovery because of its basic nature like prohibited any interest payments (riba) in their transactions. Otherwise, the result in 2013 shows the highest score because of some reason like good economic condition during this time. Meanwhile, over the six period, which is start from 2008 until 2013, Islamic banks exhibit a total of 77.1% of the overall technical efficiency. This is suggesting that the mean input waste by Islamic banks are of 22.9%. In other words, the Islamic banks have produces the same amount of output by only using 77.1% of the amount of input it uses. Meanwhile, from 2008 to 2013 Islamic banks in Malaysia reaching a total of 83.1% for pure technical efficiency. The result also proved that, the scale efficiency result obtained from the DEA model indicate as much as 92.6% for the year 2008 to 2013. As a

whole, it shows that scale efficiency contributed more towards overall technical efficiency Islamic banks in Malaysia during the six years' time line compared to the pure technical efficiency. The trend of efficiency score under overall technical efficiency (OTE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE) for Islamic banks in Malaysia from 2008 to 2013 can also be seen in Figure 4.1 below.

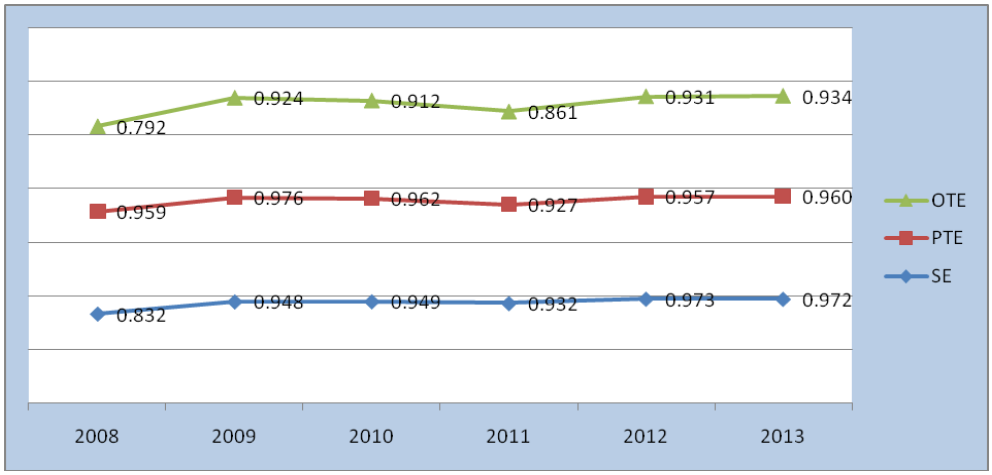

Figure 4.1
Trend of Overall Technical Efficiency (OTE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE) of Islamic banks, 2008 to 2013.
Source: Author's calculation

Figure 4.1 above presents the averages of efficiency scores, under the overall technical efficiency, pure technical efficiency and scale efficiency of Islamic banks sample in Malaysia during the period 2008 to 2013. The result shows that Islamic banks in Malaysia moved to reach a peak trend during year 2008 to 2009. With 79.2% and 92.4% of efficiency scores respectively, this result recommends that the Islamic banks could have saved 20.8% in 2007 and 7.6% in 2009 of the inputs to produce the same amount of outputs that they produced. However, the overall technical efficiency level of Islamic banks in Malaysia decreased consecutively from 2009 to 2010 and 2011 (that is a drop from 92.4% in 2009, 91.2% in 2010, and 86.1% in 2011). Thus, it shows the declining trend for those three years. Meanwhile, in overall technical efficiency, the efficiency scores slightly increased as much as 7% from 86.1% in 2011 to 93.1% in 2012. The result also shows that it has increased slightly to 93.4% in the following year.

In terms of pure technical efficiency, it increased from 2008 to 2009 and slightly declined in the years 2010 and 2011. Moreover, in 2012 the level score reached as much as 95.7% and 96.0% in 2013 respectively. Therefore, the highest score of pure technical efficiency is in 2009 as much as 97.6% and the lowest score of pure technical efficiency is in 2011 indicate by 92.7% of score. In terms of scale efficiency, it increased from 2008, 2009 and 2010 with score level 83.2%, 94.8% and 94.9% respectively. After that it slightly declined in 2011 to 93.2%, before increasing again in 2012 and a little bit declined in 2013 as much as 97.2%. The highest score of scale efficiency is at 2012 and the lowest score is at 2008.

Pearson Correlation Coefficients
This section elucidates the correlation among risks and efficiency result. In addition, the values of Pearson Correlation Coefficients are reported in Table 4.3 below:

Table 4.3
Result of Pearson Correlation Coefficient

		EFFICIENCY	CREDIT_ RISK	LIQUIDITY_ RISK	OPERATIONAL_ RISK	BANKS_ SIZE
EFFICIENCY	Pearson Correlation	1	-.288	.362*	.361**	.338*
	Sig. (2-tailed)		.058	.011	.007	.012
	N	58	44	49	54	55
CREDIT_RISK	Pearson Correlation	-.288	1	-.112	-.288*	.341*
	Sig. (2-tailed)	.058		.449	.038	.013
	N	44	53	48	52	52
LIQUIDITY_RISK	Pearson Correlation	.362*	-.112	1	.513**	-.018
	Sig. (2-tailed)	.011	.449		.000	.893
	N	49	48	57	56	57
OPERATIONAL_RISK	Pearson Correlation	.361**	-.288*	.513**	1	.187
	Sig. (2-tailed)	.007	.038	.000		.146
	N	54	52	56	65	62
LOG_SIZE	Pearson Correlation	.338*	.341*	-.018	.187	1
	Sig. (2-tailed)	.012	.013	.893	.146	
	N	55	52	57	62	66

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

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

Table 4.3 shows the correlation coefficients between the efficiency scores and the explanatory variables. Levels of significance are also shown. As the results indicate, efficiency is positively and statistically significantly associated with all explanatory variables except credit risk. It reveals that credit risk has a negative significant correlation with efficiency of Islamic banks as much as -.288. Nevertheless, liquidity risk, operational risk and banks size is proved to have a positive significant correlation on the efficiency of Islamic banks with .362, .361 and .338 respectively. This result also proved that liquidity risk has a highest correlation towards efficiency of Islamic banks with .362 compared to operational risk and banks size. In sum, the statistically and significantly different from zero correlation coefficients suggest that the efficiency measures are also associated with other related variables, i.e. they are robust and are not 'meaningless' of the technique used.

Risks and Efficiency of Islamic banks in Malaysia

This section elucidates the relationship among risks and efficiency result. All the availability data has been measured by employing the Multiple Regression Analysis to analyze the relationship among risks and efficiency of Islamic banks in Malaysia from year 2008 to 2013. Multiple Regression Analysis was employed on four independent variables, namely, credit risk, liquidity risk, operational risk and banks size towards efficiency. The result is shown in the Table 4.4.

Table 4.4

Result of Multiple Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.419	.464		-.904	.372
CREDIT_RISK	-3.162	1.395	-.372	-2.267**	.030
LIQUIDITY_RISK	2.805	1.129	.401	2.484**	.018
OPERATIONAL_RISK	-3.661	4.435	-.161	-.825	.415
BANKS SIZE	.154	.066	.376	2.324**	.026

Dependent Variable: = EFFICIENCY
**Significant at 5 percent levels.

Table 4.4 presents the results of Multiple Regression Analysis employed in this study. In order to analyze the relationship between risks and efficiency, Multiple Regression is used to test the relationship between the determinants namely credit risk, liquidity risk, operational risk and banks size towards efficiency of Islamic banks in Malaysia from 2008 to 2013. The result shows that analysis of variance indicated that F statistic produced the result as much as 4.028, where it is found to be significant ($p = 0.008$) with R^2 (standardized R-Square) value is 0.309. This indicates that approximately 30.9% of the variance in efficiency was explained by independent variables entered into regression model which are credit risk, liquidity risk, operational risk and banks size.

The result reveals that credit risk has a negative significant relationship with efficiency of Islamic banks (B = -3.162, Sig. = 0.030). Nevertheless, liquidity risk is proved to have a positive significant relationship on the efficiency of Islamic banks (B = 2.805, Sig. = 0.018). On the other hand, operational risk did not prove to be a significant predictor on the efficiency of Islamic banks by the path model (B = -3.661, Sig. = 0.415). Moreover, the result also indicates that banks size also has a positive significant relationship with the efficiency of Islamic banks (B = 0.154, Sig. = 0.026).

The results of this study indicate that there is negative significant relationship between credit risk and efficiency of Islamic banks in Malaysia during the year 2008 to 2013. This result is consistent with previous studies (for example: Ab-Rahim et al., 2012; Sufian and Abdul Majid, 2007; Said, 2013) which found a negative relationship between credit risk and efficiency. Nevertheless, this finding is in contradiction to previous studies (Rosman et al., 2014) which found a positive relationship between credit risk and efficiency. This finding suggests that a higher credit risk will cause lower level of efficiency in Islamic banks efficiency. It indicates that if Islamic banks faced with high level of credit risk, banks will suffer and need to face with difficulties in order to run the activities like problems that occur in the banks operation and transactions. Accordingly, this will lead to Islamic banks inefficiency performance. Therefore, banks need to manage and regulating their internal cost very well in order to avoid the credit risk problem (Berger and De Young, 1997) as well as to operate in a good performance.

With regards to liquidity risk, this study revealed that liquidity risk has a positive significant relationship with the efficiency of Islamic banks in Malaysia. Regarding liquidity relationship, it indicates that if Islamic banks maintained a high liquidity, they will not suffer and does not have to face with difficulties problems like not having sufficient cash by serving their customers. For instance, bank is the important financial institutions in economy circle and act as intermediaries among surplus unit and deficit unit. Because of that, the sufficient cash is very important in order for banks to perform their obligations such as for loan demand and meet customers withdrawals and others. Banks that have a good management towards liquidity will able to fulfill their functions and obligations.

However, banks cannot hold excessive liquid assets. This is because for reason like the returns in short term assets is lower compared to return comes from long term assets such as financing. For instance, in money market instruments which is a short term assets, their return accounted lower to the banks while in long term assets, their return is more higher than short term assets.

With respect to this study, the positive significant relationship between liquidity risk and efficiency indicates that the higher liquidity risk, the better efficiency of Islamic banks in Malaysia. In this scenario, it means that when Islamic banks hold less liquid assets, it will expose them to liquidity risk. Islamic banks have a lower proportion of assets in short term assets and this means that Islamic banks have more proportion of assets in long term assets. Meanwhile, Islamic banks with more financing (long term assets) will be more efficient in terms of returns they will get. Hence, Islamic banks will become efficient and more competitive in the future as well as getting better returns. This finding is in contrast with Said (2013), who found that the insignificant correlation between liquidity risk and efficiency in MENA area.

Furthermore, this study depicted that, banks size and efficiency of Islamic banks in Malaysia have positive relationship among each other. It indicates that the bigger the bank's size indicate a more efficient Islamic banks compared to small banks size. In this study, banks size is measured by their total assets. In addition, the size of total asset for that company also indicates how efficient that company is. It is because total assets donate the total amount of assets for that company. For instance, if their total asset is higher, it will provide future benefit for the company because assets represent the value of ownership and it can convert into cash (Koh, Ser-Keng, Brigham & Ehrhardt, 2014). This empirical results is in conformity with the previous study (for example: Ab-Rahim et al., 2012; Sufian, 2007; Sufian and Abdul Majid, 2007; Tahir et al., 2011; Yudistira, 2004) who found that larger banks size indicate a more efficient level of efficiency of Islamic banks. Meanwhile, if anything could be delved from the results is that, larger Islamic banks tend to make more loans and in the process Islamic banks have become more efficient. The positive sign suggests that as the banks get larger, it has resulted in higher efficiency of Islamic banks. Besides, the results imply that due to Islamic bank which has a larger banks size or total assets being more professionally managed with better-diversified asset portfolios.

CONCLUSION

As conclusion, the result in this study exhibited a total of 77.1% of overall technical efficiency (OTE) accomplished by Islamic banks during the period of study. Hence, the findings found that on average the OTE for Islamic banks in Malaysia indicate the amount of 79.2%, 92.4%, 91.2%, 86.1%, 93.1% respectively from year 2008 while in year 2013 it shows the score of 93.4%. This reveals the fact that the overall efficiency results suggest that the efficiency across 12 Islamic banks in Malaysia is considerable as quite efficient even though in 2008 shows a quite lower level scores of overall technical efficiency but it is still consider in efficient level across sample period of this study, 2008 to 2013. Subsequently, in year 2013 the findings indicate a higher level scores of technical efficiency. It means that during the period of study which covered from 2008 to 2013, in year 2013 indicate higher scores of technical efficiency compared to another year. Indeed, it proved that Islamic banks in Malaysia were operating at the most productive level of technical efficiency by utilizing their input and output very well without much wastage of practice.

Meanwhile, the finding show that on average the PTE for Islamic banks in Malaysia indicate the result of 95.9%, 97.6%, 96.2%, 92.7%, 95.7% and 96.0% respectively from 2008 to 2013. Overall, the result shows that Islamic banks exhibited a total of 83.1% of PTE during the study period. However in term of SE, Islamic banks exhibited as much as 83.2%, 94.8%, 94.9%, 93.2%, 97.3% and 97.2% of SE respectively. Overall, the result shows that Islamic banks exhibited a total of 92.6% of SE during the study period. Therefore, these results show that the SE contributed more to OTE compared to PTE of Islamic banks.

From the findings we can notice that apparently, in recent years, Islamic banks are not really effected during the financial crisis towards banks efficiency and have several risks that significant to the bank's efficiency, credit risk (negative relationship), liquidity risk (positive relationship) and bank's size (positive relationship). It is well known that a scene of the major financial crisis or Subprime crisis which happened in two years, 2008 and 2009, hit the conventional financial system in its entirety. Nevertheless, Islamic banks were not much threatened and effected as a

result of this financial crisis (Ftiti, Nafti & Sreiri, 2013). Because of that, the finding in this study show that Islamic banks are still to be considered efficient even during the crisis. This may suggest that Islamic banks are more efficient the impact does not really seen especially in terms of their overall technical efficiency (OTE) during the financial crisis. As such, Islamic banks operation is based on assets based (Bakar & Engku Ali, 2008).

This study could be an initial effort to analyze the relationship between risks and efficiency of Islamic banks in Malaysia. More significantly, it is the use of DEA to examine the level of efficiency of the banking industry in Malaysia and employed the Multiple Regression analysis to look at the relationship between the risks and efficiency during the period of study. In addition, the findings of this study have significant contributions to several interested parties, such as in informing the policy makers like Bank Negara Malaysia (BNM) or the related ministries and regulators on the relative efficiency of Islamic banks. This research also gives implication to the management of Islamic banks who will identify the type of risks that influence the level of efficiency in their bank's operations. It is essential to improve the bank's operations in managing the internal banks factors effectively and efficiently. Besides, this study also helps Islamic banks to develop and build-up their own strategies from the operational and management point of view in order to perform the high level scores of performance efficiency by using their input to produce more level of output.

Due to its limitations, the outcome of this study does not represent all Islamic banks available in Malaysia since it focused on selected banks based on the availability of data. Hence, any future research may extend the sample size of the study. Hence, it is suggested that, any future studies can extend the study by utilizing any data from conventional banks as well. By doing so, the study will not only benefit the bank in the aspect of efficiency and risks but a comparison with conventional banking could be established. This is because in reality Islamic banks have to compete with conventional banks in order to perform their best of performance. Ultimately, the positive perception towards Islamic banks will affect the level of risk that the banks need to face.

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APPENDIX

Table 1
List of Islamic Banks in Malaysia

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

Source: BNM, 2015 retrieved on 03 January 2015

Table 3
List of sample Islamic banks used in this study

No	Name of Islamic Banks	Ownership
1	Affin Islamic Bank Berhad	Local
2	Alliance Islamic Bank Berhad	Local
3	AmIslamic Bank Berhad	Local
4	Asian Finance Bank Berhad	Foreign
5	Bank Islam Malaysia Berhad	Local
6	Bank Muamalat Malaysia Berhad	Local
7	HSBC Amanah Malaysia Berhad	Foreign

8	Kuwait Finance House (Malaysia) Berhad	Foreign
9	OCBC Al-Amin Bank Berhad	Foreign
10	Public Islamic Bank Berhad	Local
11	RHB Islamic Bank Berhad	Local
12	Standard Chartered Saadiq Berhad	Foreign

Source: BNM, 2015 retrieved on 03 January 2015