Activity diversification and performance of Islamic banks in Malaysia

Chatti, Mohamed Ali and Kablan, Sandrine and Yousfi, Ouidad

CEROS, University of Paris Ouest Nanterre la Défense (France) and FIESTA ISG of Tunis (Tunisia)., UPEC et EconomiX, University of Paris Ouest Nanterre la Défense (France), CR2M, Univeristé de Montpellier 2, EconomiX in the Université de Paris Ouest Nanterre la Défense

23 January 2010

Activity diversification and performance of Islamic banks in Malaysia

Mohamed Ali Chatti[1], Sandrine Kablan[2] and Ouidad Yousfi[3]

Abstract

The current paper analyzes the performance and the choice of portfolio in Islamic banks. We consider a sample of 8 Malaysian universal Islamic banks between 2004 and 2008. We use the Herfindahl-Hirschman Index (HHI) as an indicator of the degree of diversification. The performance of the banks is measured by the return on assets ratio (ROA) and the Risk Adjusted Return On Capital ratio (RAROC). Finally, we use the Modern Portfolio Theory (MPT) of Markowitz to define the efficient frontier and the optimal portfolio.The results show that the corporate and investment activity increases significantly returns on assets. However, retail and commercial activity improves the results and performance of these banks. We find evidence that the level of diversification is not too high and recommend that they become concentrated on just one type of these activities. Finally, the MPT supports the idea that Islamic banks are not efficient.

Keywords: Diversification, performance, Islamic banks, HHI, MPT.

JEL classifications: C01, G11, G21.

[1] CEROS, University of Paris Ouest Nanterre la Défense (France) and FIESTA ISG of Tunis (Tunisia). Corresponding mail: chatti.mohamedali@yahoo.fr

[2] Erudite, UPEC et EconomiX, University of Paris Ouest Nanterre la Défense (France) ; e-mail : sandrinekablan@hotmail.com.

[3] CR2M, Univeristé de Montpellier 2, EconomiX in the Université de Paris Ouest Nanterre la Défense, and Fiesta in the ISG de Tunis.

INTRODUCTION

It is hard to pinpoint the start of Islamic banking. The financial transactions have existed until the 14th century, however no institutions exclusively devoted to banking. The growth of Islamic banking has been increasing ever since, not only in terms of number of countries it is operating in but also in terms of areas of finance it has ventured in.

The so-called Golden Age of the Islamic world took place between the 7th and 10th centuries in the Middle East countries and between the 11th and 14th centuries in North Africa. Although banks did not exist, innovative financial instruments were a part of commercial life. A frequently used expression is that they were "*bankers without banks*". The Golden age was followed by a period of stagnation and decline between the 15th and the 20th centuries. One among the reasons of this decline is the double break of the Islamic world not only with its past but also with the West. Moreover, during the 16th and 17th centuries, the colonization delayed the development of the Islamic financial models. Simultaneously, the first European banks were established in Turkey, Egypt and Iran at the end of the 17th century. By the end of the 19th century, most of the banks in the Islamic world were conventional/European banks.

The Islamic finance was introduced by Ahmed Al Najjar[4] on experimental basis in a small town of Egypt in 1963. Since then, many Islamic Banks were established in the Middle Eastern and Asian regions. Among Asian countries Malaysia has constructed a detailed plan to domestically develop Islamic finance into a full-fledged dual banking system by 2020. It represents along with Iran and Saudi Arabia, one of the key players in Islamic finance. At end-2008, there were 17 Islamic banking institutions and 16 Islamic banking operations conducted through windows by commercial banks, investment banks and DFIs (Financial Stability and Payment Systems Report, 2008). In 2008, Malaysia's Islamic banking assets worth USD 55 billion with a growth rate of 17,1 % (Source : CIBAFI, 2009) and estimated at US$ 68 billion (or 17.5% of total Malaysian banking assets) as of June 2009. They have been experiencing an average annual growth rate of 18-20% since 2007.

Malaysia is thus being erected as a center of important Islamic finance through cooperation with the Islamic financial centers of Bahrain and Dubai to jointly develop the global Islamic finance market. Besides, Malaysia's largest lender, Maybank, recently acquired Indonesia's sixth largest banking institution, Bank international Indonesia. Some conventional banks in Malaysia have Islamic banking windows and there are subsidiaries that operate solely to facilitate Islamic financial transactions.

Over more than 30 years, Malaysia has placed strong emphasis on the four core sectors in Islamic finance - Islamic banking, takaful, the Islamic capital market and the Islamic money market. This has resulted in the development of a comprehensive Islamic finance environment in which there are a many different financial institutions, and vibrant with continuous product innovation and market activity; as well as possessing an ingrained maturity that adds stability and robustness to the overall Islamic finance system[5].
The first Malaysian Islamic bank was established in 1983. In 1993, commercial banks, merchant banks and finance companies begun to offer Islamic banking products and services

---

[4] He started this experience in Egypt based on the German saving bank model because he had become familiar with during his studies in Germany and the Germans supported him. Despite the religious position in Egypt at that time, he used family contacts to get the official approval from the government. However, he never made any reference to Islam.
[5] http://www.mifc.com/index.php

under the Islamic Banking Scheme (IBS banks). These banks are "universal", i.e. they provide a full range of banking services: corporate banking; investment banking; retail or consumer banking; commercial banking; treasury and others activities. However, we have found that the Malaysian Islamic banks, analyzed in our study, do not apply a unified accounting and disclosure code. In fact, the regulatory environment is completed by the Malaysian Islamic Banking Act of 1983. It was established to govern Malaysia's Islamic financial practices. It is enforced by separate *Shari'ah* boards in both the Bank Negara Malaysia (the Central Bank) and the Securities Commission through centralized oversight. An effort is made to adopt Basel II capital requirements and international accounting standards are being applied to domestic Islamic financial transactions. Despite all those efforts on the regulatory framework, some financial entities like Standard and Poor's consider that financial disclosure practices of Islamic financial institutions often do not meet the standards of global best practices. Other analysts maintain that incomplete disclosure could hinder the growth of Islamic finance in the future. In 2008, the Islamic Financial Services Board (IFSB) which is the global standard-setting body for Islamic finance, capital markets and insurance has spearheaded global initiatives to standardize Islamic financial transactions. Standardization remains a significant challenge for practitioners, regulators and depositors, since there are a number of variations in regulations across markets and countries. As conventional banks, some Islamic banks are universal and offer many service like for example corporate banking, investment banking, retail or consumer banking, commercial banking and treasury. However, the activities of Islamic banks must be in accordance with the principles and ethic of Sharia. Consequently, they are more constrained than conventional ones, in the sense; they cannot operate in all the segments of the investment market. Accordingly, they are more exposed to shocks because diversification is not always possible. This may explain the losses incurred by the Islamic banks in real estate during the subprime crisis, even if these losses were limited.

In recent years, many Islamic Banks are interested in product diversification as a key element of the expansion of Islamic finance across the globe. Hence, the question raised in the paper is: How should Malaysian Islamic banks diversify their activities?

To answer this question, we estimated the risk-adjusted performance of Islamic malaysia banks using data of their actual banking financial statements over the period 2004-2008. Then we take into account the gains of diversification and the preferences in terms of risks and we deduce the efficient frontier and the optimal portfolio.

The main findings of our study are: first, the corporate and investment activity is the activity which gives the better return on assets. However, retail and commercial activity contributes better to the results and to the performance of the banks of our sample. Second, we found that these banks are moderately diversified, and that there are gains to concentrate their assets into one type of activity (varies depending on banks). Third, according to the modern portfolio theory, we found that the Islamic banks are not efficient.

Our paper is structured as follows. Section 2 presents the literature review on diversification and performance; section 3 provides our hypothesis and the model. The estimation and the results are discussed in Section 4. Section 5 concludes the paper.

2. LITERATURE REVIEW

Our study is related to two brand of the financial literature on banking.

The first one is diversification in banks. The topic of diversification was discussed in many papers but only in conventional banks. Most of these studies highlight the positive effect of diversification on the performance and on the decrease of the risks. For instance, Saunders and Walter (1994) conduct a simulation analysis of large mergers among the largest financial intermediaries in the US. Their results show that if these companies offer different financial services, their level of risk would be lower than specialized banks. Besides, Templeton and William (1992) provide evidence on the impact of increasing the level of diversification on decreasing risk, if the nonbanking activities are uncorrelated with the banking activities. Their results are consistent with the portfolio theory.

The Modern portfolio theory (MPT) was pioneered by Markowitz (1952). In his article, Markowitz described how to combine assets into efficiently diversified portfolios. He demonstrated that investors failed to account correctly for the high correlation among security returns. It was his position that a portfolio's risk could be reduced and the expected rate of return increased, when assets with dissimilar price movements were combined. Accordingly, diversification reduces the volatility since a diversified portfolio is less volatile than the average of the volatilities of its component parts/ each portfolio. The MPT allows investors to estimate both the expected risks and returns, as measured statistically, for their investment portfolios. In managing their portfolio, the investors try to maximize the overall portfolio return for a given level of overall risk. Alternatively, the investors can attempt to minimize overall portfolio risk for a given level of overall portfolio return.

Note that diversification is not a recent concept in both American and European banks. For instance, Cubo-Ottone and Nurgia (2000) pinpoint a significant positive relation between abnormal returns and the products of diversification in mergers and acquisitions of banks. Focarelli et al. (2002), using Italian balance-sheet data on mergers and acquisitions of banks, find an increase in the return on equity after a merger, and a long-run increase of profitability in acquired banks.

However, some papers find a low or a negative impact of the diversification on banks' performance. Mercieca et al. (2006) provide evidences that there is no direct benefit of diversification within and across business lines but there is negative relation between non-interest income and bank's performance. Goddard et al. (2007) found that for both the risk-adjusted and unadjusted returns measures, a positive direct exposure effect is outweighed by a negative indirect exposure effect for all but the largest credit unions. So the diversification strategies are not appropriate similarly for large and small credit unions.

The current paper is also related to the literature on Islamic banking which is more and more abundant, particularly literature on performance of Islamic Banks. For instance, Samad and Hassan (2000) compare the performance of the Bank Islamic Malaysia Berhad (BIMB) between 1984-1989 and 1990-1997 with conventional banks. Their results provide strong evidence that BIMB's performance increase but with lower rate than conventional banks. It seems that BIMB is less risky and more liquid than conventional banks.

Hassan and Bashir (2000) analyze the effects of some internal and external (such as economic environment) characteristics of Islamic bank on its performance. Their results show that controlling for macroeconomic environment, financial market structure, and taxation, the results indicate that high capital and loan-to-asset ratios lead to higher profitability.

Yudistira (2003) analyzed the impact of financial crises on the efficiency of 18 Islamic banks over 1997-2000. He found that the Islamic banks performed badly after the global crisis in 1998-1999 but they improved their performance after. In addition, small and medium sized banks faced diseconomies of scale and publicly listed banks are less efficient. Sufian (2007)

adopted the same approach as Yudistira (2003) to examine the efficiency in domestic and foreign Islamic banks in Malaysia between 2001 and 2004. He provided evidence that these banks improve their efficiency slightly in 2003 and 2004. Moreover, the domestic Islamic banks are found marginally more efficient than foreign Islamic banks.

Cihak and Hesse (2008) find that small Islamic banks are financially better than small commercial banks. However, large commercial banks tend to be financially stronger than large Islamic banks. Finally, small Islamic banks tend to be financially stronger than large Islamic banks, which may reflect challenges of credit risk management in large Islamic banks. Moreover, the market share does not have a significant impact on the financial strength of other banks.

However, to our knowledge, no paper analyzes the issue of diversification in the Islamic framework. The aim of the current paper is to study the effect of diversification on performance and optimal portfolios. We analyze the risk-adjusted performance used as a criterion for the allocation of assets and management compensation. We adopt the conventional measures of finance such as those of Sharpe, Treynor and Jensen to assess risk-adjusted performance.

3. METHODOLOGY

3.1) Risk adjusted performance

In conventional finance, financial engineering has created financial instruments to face market, credit and operational risks. The market risk arises when there are fluctuations in prices of financial instruments, conventional finance offers futures contracts which leads to speculation, prohibited by Islamic finance.

So, even if Islamic law endorses the principle for economic and financial coverage of operations, financial instruments that allow a party to loose while another one wins do not meet the requirements of the key principle of partnership.

Similarly, Islamic banking does not allow the forward sale of goods that we do not have since it raises another question about its actual availability. Thus, futures contracts such as options and futures used in the context of conventional finance are unsuited to Islamic finance through their principles. For example, conventional option is replaced by the contract of *Bai al-arboon*. This is a kind of purchase with payment of a certain amount that is lost if the purchase doesn't take place and deducted from the total if it runs. The objective is to maintain the balance of transactions and to prevent the weaker party is aggrieved. Thus, Islamic finance uses contractual options (of stipulation and choice) to manage risk. Regarding futures, Islamic financial engineering has invented products to achieve the same objective and consistent with Shariah. In this case, synthetic contracts are used. A synthetic *murabaha* (sale generating debt) includes a real medium with a profit, which is initially set. Therefore, it does not detract from the Islamic view of financial transactions. However, these equivalents do not provide exactly the same type of coverage than in conventional finance and can sometimes be a source of greater risks.

Regarding operational risk, it is the risk of loss from inadequate or failed internal processes, people and systems or external events. So, Islamic banks may be subject to operational risk since it relies mainly on partnership.

It may also be affected by the management principle of Islamic banks and the nature of their financial products. Thus, Islamic banks share the benefit of their investments with their depositors. But, projects' losses are therefore incurred supported by Islamic banks unlike their conventional counterparts.

Moreover, as in conventional banking, compliance is a priority but it is more complex in the context of Islamic banks. The latter rely on the decision of a Shariah Supervisory Board. This board checks whether the financed activity/securities are Sharia compliant or not. They ensure compliance with the rules of Islamic law.

Another element of the governance of Islamic banks is that, they are directed towards a social objective. They act like an economic and social organism. They are inserted into the local community bearing some responsibility for its prosperity. All these elements can affect the operational risk to which Islamic banks are subject.

Finally, the credit risk is the risk that the borrower may not repay his debt to the deadline. This risk is similar for Islamic and conventional banks, because there are no particular characteristics of Islamic finance as to the appropriate selection of borrowers. However, the good faith lending customers in Islamic banks may be punctuated by their Islamic religious faith.

In the banking literature, there are three measures of the risk-adjusted return: RORAC, RAROC and RARORAC. They are extension of financial index. They are flexible enough to be used as mean of integrating risk management from diverse areas. Providing that Islamic banks display market, credit and operational risks that can be encompassed by these ratios, we think they are the best instruments to **gauge** the risk management of Islamic banks.

a. RORAC (Return on Risk-Adjusted Capital):

The RORAC was initially conceived within Bankers Trust's trading business in the late 1970s. Risk-adjusted capital is capital that has been adjusted after balancing the five main risk metrics—alpha[6], beta[7], r-squared[8], standard deviation[9], and the Sharpe ratio[10]—against each other so that return can be calculated on a level playing field. As defined, it is generally used to evaluate projects or investments that have a high element of risk for the capital involved. Thus, the RORAC is given by:

$$RAROC = \frac{Net\ Income}{Allocated\ Economic\ Capital}$$

---

[6] The difference between the realized return and the average expected return.
[7] The risk that an asset tends to go along with the general market.
[8] It characterizes an asset's movement against a benchmark.
[9] It measures the dispersion of an asset's annual returns.
[10] It is a measure of the excess return (or Risk Premium) per unit of risk in an investment asset or a trading strategy.

It allows comparison of investments that have different levels of risk or different risk profiles. Here, the economic capital is adjusted for the maximum potential loss after calculating probable returns and/or their volatility. It is a very useful method of quantifying and managing acceptable levels of exposure to risk. RORAC is used when the risk may vary according to capital assets used, ie it is the capital itself that is adjusted for those risks, rather than the rate of return. Therefore, it should not be confused with RAROC.

b. RAROC (Risk-Adjusted Return on Capital)

RAROC is usually defined as the ratio of risk-adjusted return to the economic capital. Rather than adjust the risk of the capital (as in RORAC), it is the risk of the return itself that is adjusted and measured. It measures risk-based profitability that also enables a consistent comparison of the risky financial returns of a range of projects or investments. It is given by:

$$RAROC = \frac{Expected\ Return}{Economic\ capital}$$

c. RARORAC (Risk-Adjusted Return on Risk-Adjusted Capital):

The RARORAC is a combination of the RAROC and RORAC ratios with specific treatments in the return stream and capital charge to capture all the levels of risk in different lines of business. It is increasingly used as a measure to assess both the risk-adjusted economic capital and the risk-adjusted return on an investment. It becomes widely known when the Basel Committee on Banking Supervision began requiring banks to apply risk adjustments to the way they calculated their capital stock. It therefore uses the capital adequacy guidelines as defined by Basel II.

The RARORAC is calculated by dividing the risk-weighted return by the economic capital after including the diversification benefits. The risk-weighted return is given by the sum of the net profit before results on divestments, provisions for credit risks after replacing by estimated values, cycle-neutral expected losses on loans and investment securities.

The RARORAC equation is[2]:

$$RARORAC = \frac{Risk\ Adjusted\ Return}{Capital\ At\ Risk}$$

Or

$$RARORAC = \frac{Anticipated\ Net\ Revenue - Expected\ loss}{CaRMarkt + CaRCrt + CaROps + CaRReg + CaRPol + ect\ ...}$$

where CaR: Capital At Risk, Mrkt: Marketing, Crt: Credit, Ops : Operational, Reg : Regulation, Pol : Political,…

---

[2] KPMG, "Financial risk management: Protecting capital through Risk Adjusted Performance measures", p3, 2005. http://www.kpmginsiders.com/pdf/CapitalManagement.pdf

It is straightforward to see that a double risk adjustment is made, in both the numerator and the denominator.

These ratios present some advantages but also some limitations. They cannot cover systemic risks however, they cover market, credit and operational risks within a single comprehensive framework. Therefore, they capture the interrelationships between different sorts of risk and scenarios where there might be a too-high concentration of risks.

d) Calculations

In this section, we derive the RAROC indexes (hereafter, we use the accepted term RAROC even though we are actually estimating RORAC as well as RAROC indices).
In the current study, we use the Internal Systematic Risk approach, in which the "systematic risk of an activity is given by the covariance between this activity and all the activities of the bank.
Here, we examine both return and the current positions in all the activities the Islamic bank is investing on. This is why we focus on earning parameters and not on rates of return.
Three indices were used to measure the banks' performance in different activities:

1. First, extension of the Sharpe ratio, a RAROC index was derived for activity i that is considered to "stand alone". Thus the risk is expressed in terms of standard deviation, i.e., consistent with the definition of VaR (Value at Risk)[11]. Shimko (1997) has shown that RAROCS can be interpreted as a linear transformation of the Sharpe ratio where capital is measured using VaR. Accordingly, it is measured by:

$$RAROCS_i = \frac{\Pi_i - \Pi_{fi}}{\sigma_{\Pi_i}}$$

where Π_i is the average profits (net operating profit or net profit from ordinary items), Π_{fi} is the average of earnings in the risk free share of the activity i and σ_{Π_i} is the standard deviation of the profit of activity i during the whole period T (5 years). We can also write the numerator in (: $\Pi_i - \Pi_{fi} = \frac{1}{T}\sum_{t=1}^{T}\left(\Pi_{it} - R_{ft}.K_{it}\right)$ where K_{it} is the average investment in activity i and R_{ft} is the risk free rate in year t.

2. The first one is an extension of the Treynor measure. According to this measure, risk is measured by covariance, i.e., as component value at risk (CoVaR):

$$RAROCT_i = \frac{\Pi_i - \Pi_{fi}}{B_{\Pi_i}}$$

where B_{Π_i} is the risk index or the CoVaR in the activity i. It is written:

---

[11] It's a measure of the risk of loss on a specific portfolio of financial assets. For a given portfolio, probability and time horizon, VaR is defined as a threshold value such that the probability that the mark-to-market loss on the portfolio over the given time horizon exceeds this value (assuming normal markets and no trading in the portfolio) is the given probability level

$$B_{\Pi_i} = \frac{\sigma_{\Pi_i B}}{\sigma_{\Pi B}} = \frac{\sqrt{\sum_i \sum_j \sigma_{\Pi_{ij}}}}{\sum_i B_{\Pi_i}}$$

where $\sigma_{\Pi_i B}$ and $\sigma_{\Pi B}$ are respectively the covariance between the total earnings of the bank and the earnings of activity i earnings, and the standard deviation of bank earnings. The covariance $\sigma_{\Pi_i B}$ measures the systematic risk of activity i. It is the sum of the covariance between activity i and all other assets in the portfolio j; $\sigma_{\Pi_{ij}}$. The bank's total risk $\sigma_{\Pi B}$ is given by the sum of all the variance and covariance of the earnings terms of all the activities B_{Π_i}.

3. The second one is an application of the Jensen index which measures the performance of the activity i in terms of earnings: it is RAROCJ. It is given by:

$$RAROCJ_i = \frac{A_i}{K_i}$$

where

$$A_i = \Pi_i - \left[\Pi_{fi} + \beta_{\Pi_i} \left(\Pi_{Bi} - \Pi_{fi} \right) \right] \text{ and}$$

$$K_i = \frac{1}{T} \sum_{t=1}^{T} R_{bt} . K_{it} \text{ is the average investment in activity i.}$$

Notice that Π_{Bi} is now written $\Pi_{Bi} = \frac{1}{T} \sum_{t=1}^{T} \frac{\Pi_{Bt}}{K_{Bt}} . K_{it}$.

The index A_i can be considered to be a measure of the *Economic Value Added* (EVA) of the activity i; it has many uses in banking, particularly in capital budgeting (Uyemura et al., 1996).

To examine the performance of a specific activity, we estimate the performance of each activity and compared performance of each activity and compare among in the different banks and in the system as a whole.

We also compared performance in various activities at the bank, including the performance of the entire bank. First, we compare the performance of activities in each bank. Then we compare them in the whole banking system.

e. Data

The measures of the performance are estimated for eight universal Malaysian Islamic banks, using financial statements data between 2004 and 2008. There are few databases offering information about Islamic banks. To conduct our study, we rely on data available in Datastream and Bankscope but also on the annual reports of these banks.
In order to maximize the number of banks and to construct a representative sample, we consider that the activities of the corporate banking and the investment banking are one simple activity. Similarly, we grouped the retail banking and the commercial banking: they

constitute together only one activity. One explanation is that some banks in our sample have already grouped the retail and the commercial activities together, and in others, they put the corporate and the investment banking together.

Thus, in our empirical study, the total activity of the banking group will be divided into four components: corporate and investment banking; retail and commercial banking; treasury and others activities (Insurance, mortgage). Note that the data of the net operating profits (ordinary net income), the segmental results and the investments (segmental assets) in the different activities, are provided by the note on "Segment Information" that we have found in the annual financial statements of these banks.

The investment by the bank in activity i at time t is denoted variable K_{it}. The sum of the investments (amount of segmental assets) in each of the activities is equal to the total assets of the bank. Finally, as noted in equation (1), we must use in our calculations of the RAROC a well-defined variable, the risk-free rate R_{ft}.

However, for the Islamic banks, we haven't such rate since the interest is prohibited. That's why, we took as the risk-free rate for the Malaysian Islamic banks the rate of the sovereign Sukuk of Bank Negara Malaysia (Central bank of Malaysia). In contrast with many other Islamic countries, Malaysia is the only Islamic one where there is a yearly issuance of sovereign Sukuk between 2004 and 2008. Malaysian Islamic Banks are constrained by Malaysian authorities to disclose this rate[3].

Our sample is composed of eight Islamic banks:

Bank	Foundation	Total Assets (2008) Millions USD	Market Share (%) Total 2008 = 55,228
Affin Islamic Bank Berhad	2005	1741	3,15 %
Al Rajhi Banking & Investment Corporation Berhad	2005	1376	2,49 %
Bank Islam Malaysia Berhad (BIMB)	1983	6775	12,26 %
CIMB Islamic Bank Berhad	2003	5349	9,68 %
EONCAP Islamic Bank Berhad	2006	2035	3,68 %
Hong Leong Islamic Bank	2005	2329	4,12 %
Kuwait Finance House (KFH) Malaysia Berhad	2005	2764	5 %
RHB Islamic bank Berhad	1997	2687	4,86 %
TOTAL		**25056**	**45,36 %**

f. Results

Insert tables 1 and 2

Table 1 presents the average rates of ROA and the average profit of each of the four banking activities (business units) for the eight banks of our sample. ROA (Return on assets) indicates

---

[3] http://www.bnm.gov.my/index.php?ch=12&pg=623&eId=box1 and http://www.bnm.gov.my/index.php

the profitability on the assets of the firm once expenses and taxes are paid and gives an idea about the management performance (Van Horne 2005, Ross et al. 2005). It measures net earnings per unit of assets for a given asset. And it is a common figure used for comparing the performance of the financial institutions, such as banks, because the majority of their assets will have a carrying value that is close to their actual market value. Therefore, a high ROA implies that the use of assets is efficient and shows better managerial performance. It is increasing through the increase of margins of profits or turnover asset. Our statistics show that the Affin Islamic bank has the highest ROA (1.61%), which implies that it has the best performance of our sample.

EONCAP Islamic Bank Berhad has a negative ROA (-0.52%), since the corporate and investments activities have a negative impact on the bank's performance and despite the fact that the other activities, i.e. the retail and commercial and the treasury have a positive effect (respectively 2.51% and 0.58%). One explanation is that this bank was founded in 2006 and has some difficulties to attract customers and depositors.
We notice also that BIMB is the only bank of the sample which hasn't a treasury activity; in contrast with the other banks. All the others practice this activity.
Table 2, which presents the average profits, shows that the retail and commercial banking are the first activities that contribute significantly to the whole bank's profit (about 65% percent of the total profits of our sample). They are followed by treasury activity (28%) and the corporate and investment banking (only 9% of the total profit). Notice that BIMB and EONCAP had affected largely the results of the corporate and investment activity because these two banks have registered respectively - 46% and - 158%).

The banks in the sample show high standard deviation in all the activities (large dispersion in results for the different banks and for the different activities). Some of them are subsidiaries of large and multination group while the others were recently founded which implies that they face diseconomies of scale.

Insert tables 3a, 3b and 3c

The main findings in the three tables are:

- The performance measures (Sharpe and Treynor) show that BIMB had the best overall performance (1.17), followed by EONCAP Islamic Bank Berhad, Affin Islamic Bank and Kuwait Finance House Malaysia Berhad, while Al Rajhi, CIMB Islamic, RHB Islamic bank and Hong Leong Islamic bank have a negative value of the ratio.
- Some banks show a negative value of the ROA, which means that they generate an average rate of return lower than the risk-free rate (rate of souvereign sukuk).
- Note also that the risk-adjusted ratios provide different results. For instance, according to RAROCS and RAROCT, the BIMB is now ranked first while it was ranked seventh in the classification of ROA.
- Hereafter, we measure the contribution of each activity in the total performance of the bank. According to our measures, the retail and commercial banking have the highest effects on the bank's performance. However, the Treasury activity had registered the worst performance value, ratios show negative values: RAROCS = - 2,69, RAROCT = - 0,55 and RAROCJ = - 0,018, except for KFH Malaysia Berhad which recorded positive values, RAROCS = 0,24, RAROCT = 0,32 and RAROCJ = 0,0113 (see tables 3a, 3b, 3c). Note that this bank invests a great part of its assets in the treasury activity. For example, in 2008, the bank had put all his assets (100%) in the treasury activity.

Finally, the performance of each activity of the different banks is analyzed here. At an aggregate level, we compare the performance the four activities in each bank.

The main findings are:

- Affin Islamic Bank has registered a good performance due to the activities of retail and commercial, followed by the corporate and investment banking. One surprising result is that treasury activity has a negative impact on the performance despite the fact that Affin Islamic bank invests 66% of its assets in this activity. In fact,

  "…Treasury and Islamic money market operations are involved in proprietary trading in fixed income and foreign exchange, Islamic derivatives trading and structuring, managing customer-based foreign exchange and Islamic money market transactions, funding and investment in ringgit and foreign currencies" (the annual report of Affin Islamic Bank, 2008). We conclude that treasury activity is an investment which generates long term returns. The latter result may explain the liquidity problem of Islamic banks in general and specifically those of Affin Islamic Bank.

- The good performances of BIMB, CIMB and EONCAP depend on retail and commercial activity. This may explain why BIMB, for instance, have allocated about 1/3 of its assets to this activity (the bank has invested nearly 31% in 2008 and 35% in 2004, see Table 5). EONCAP invests also a big part of its assets in this activity (50% of the total investment in 2008 and 70% in 2006). The choice of these banks to invest mainly in the retail and commercial activity may be explained also by the relatively poor performance of the other activities: the corporate and investment banking in BIMB presents negative values of all the RAROC indexes (See Tables N°2).

- Moreover, correlations between the earnings of the retail, commercial, corporate and investment banking and the bank earnings are very high in the 8 banks: an average of 96% for the retail and commercial activity and 72% for the corporate and investment banking. This result may be explained by our choice at the beginning to add the retail activity with the commercial activity to have only one activity. Ce qui émet des doutes sur la fiabilité de tous nos résultats!!!!!

3.2. Optimal portfolio and efficient frontier:

a. The Modern Portfolio theory (MPT)

Hereafter, we estimate the optimal structure of the activity portfolios of the banks and compare them to the current portfolios of the banks in 2008 and 2004, (see Table 5).

According to Brown (2009), to calculate the optimal portfolio and the efficient frontier, the MPT assumes that the portfolio return is a weighted average of the assets in the bank's portfolio. The expected return of the portfolio $E(R_p)$ is therefore written:

$$E\left(R_p\right) = \sum_{i=1}^{m} w_i \, E\left(R_i\right)$$

Where $E(R_i)$ is the expected return of asset class i $(i = 1,...,m)$, w_i is the share of money invested in asset and m is the number of asset classes.

At a macroeconomic level, the equation can be written:

$$E(R_p) = W' [E(R)]$$

where $[E(R)]$ is the matrix of expected returns for the portfolio assets and W' is the transpose of the matrix of assets weights.

The portfolio risk entails systematic risk and unsystematic risk. The first one (systematic or nondiversifiable or market risk) is caused by factors that affect overall market risk, such as macroeconomic conditions, currency fluctuations… This risk cannot be reduced through portfolio diversification (Devinney et al., 1985). On the other hand, the specific risk depends on many factors (management, the quality of labor…) which are closely related to the characteristics of each asset.

The MPT deals with the specific risk and suppose that the portfolio's standard deviation σ_p is the appropriate measure of risk. The MPT assumes that the level of risk of a portfolio is lower than the sum of weighted risk of the assets.
The portfolio risk is written:

$$\sigma_p = \sqrt{\sigma_p^2} = \sum_{i=1}^{m} w_i^2 \sigma_i^2 + 2\sum_{i=1}^{m}\sum_{j=1}^{m} w_i w_j \sigma_{ij}$$

where σ_p is the portfolio standard deviation, σ_i is the standard deviation of returns from asset class i and σ_{ij} is the covariance of returns from asset classes i and j.

Accordingly, the overall portfolio risk is given by:
$$\sigma_p = W'.C.W$$

where C is the covariance matrix of asset returns.

The efficient frontier and the optimal portfolio are solution of the following optimization problem:

$$\begin{cases} Min \quad \sigma_p = W'CW \\ s/c \qquad W'\mu = \mu_p \\ \qquad\quad W'e = 1 \end{cases}$$

See Appendix E for more details.

b. Results for optimal portfolio Analysis

The results of the optimal portfolio analysis, concerning the performance of the banks in the various activities in terms of the direction of change between the existing allocation of investments and the optimal portfolio, were mostly consistent with our analysis in the previous section (RAROC indexes).

Insert tables 6a and 6b

Tables 6a and 6b provide the following results:

- First, Al Rajhi banking and Investment Corporation Malysia Berhad should invest higher share of assets in treasury activity. But simultaneously, it should decrease their investment in retail and commercial activities and reduce the activity of corporate and investment. Our result is inconsistent with the actual decline of the share of the treasury activity in the portfolio of the bank in the recent years (from 89% in 2005 to 31% in 2008) and the enhance of the share of the retail and commercial banking (from 11% in 2005 to 18% in 2008) and the corporate and investment banking activity (from 0% in 2005 to 51% in 2008) in the portfolio of the bank. Our results are also (in contradictory) not consistent with our findings in the first part of the study. Indeed, despite that the treasury activity have a positive value of the ROA (0,8%), all the RAROC indexes were negative and even the worst of the activities of the bank.

- Second, BIMB should increase substantially the corporate and investment banking and give a small boost to the other activities. However, a significant contraction of the retail and commercial banking must be done. These results are consistent with the movement of changes made in the bank, since the retail and commercial banking has decreased from 35% in 2004 to 31% in 2008, the commercial and investment activity has augmented from 65% to 69% and the other activities increased to 0.01% in 2008. However, these results are not consistent with the previous findings about the RAROC indexes. According to these indexes, the retail and commercial activity is the better activity of the bank. It, even, gives the best performance of these indexes regarding our sample in whole.

- Third, EONCAP Islamic Bank Berhad should make a real cutback of its treasury activity which captured at about 34 % of the bank's assets in 2008. On the other side, the retail and commercial activity should be the main activity of this bank. At the same time, the bank should invest more money in the corporate and investment activity. These results confirm our findings in the first part of this study since we found that the retail and commercial activity is the most profitable activity of the bank. Indeed, the RAROCS, RAROCT and RAROCJ were positive and have the higher values compared to the values of the other activities. Also, the ROA of this activity is the higher of the bank, 1,49%. However, these results are not consistent with the EONCAP's strategies in the sense that the retail and commercial activity (Tables 1 or 2) cut down from 70% in 2006 to 50% in 2008, while the optimal value of this activity according to the MPT, should be around 68%. Similarly, the corporate and investment activity has decreased from 20% in 2006 to 15% in 2008, while the optimal investment in this activity should be around 21%. Finally, the treasury activity should be diminished by 18 % in 2008 (decrease from 34% in 2008 to 16% (optimal investment)).

Finally, according to the optimization problem, Hong Leong Islamic Bank should cut back its corporate and investment banking. On contrary, this bank should focus basically on the retail and commercial activity (77%). As shown in the first section, the retail and commercial banking are the most profitable (RAROCS, RAROCT and RAROCJ are positive for this activity and negative for the other activities). Besides, the changes of the weighting of

14

activities in the portfolio of the bank between 2006 and 2008 are consistent with the actual increase of the retail and commercial activity and the decrease of the corporate and investment banking.

Insert tables 7a and 7b

We show that the 8 banks choose diversification and invest almost in all the lines of business. Besides, the optimal portfolios of these banks show that they have non-zero investments in all the activities. However, according to the Herfindahl-Hirschman Indexes (HHI)[12], some banks should diversify the allocation of their assets while others should be concentrated.

For Al Rajhi banking and Investment Corporation Malysia Berhad, the optimal HHI is equal to 0,4087. The value of this index is close to 0,333 (1/n with n is the number of business lines, 3 in our example) which corresponds to a situation where there is a perfect diversification, i.e. the same amount of assets is invested in each activity. Thus, if the bank follow the recommendations of the MPT, it should diversify more its activity between the different activities because the real HHI is equal to 0,604 (the bank is currently fairly diversified) and in order to make this index reaches the optimal value of 0,4087. The bank should therefore diversify more its assets allocation.

However, always according to the HHI, the other banks should concentrate their assets. The optimal HHI in BIMB is too close to 1 (the actual HHI = 0,5281). So, if the bank follows the recommendations of the MPT, it should concentrate its activity, particularly in the Corporate & Investment activity.

For EONCAP Islamic Bank Berhad, we found that the optimal HHI is equal to 0,5321 while the actual current value of the HHI is 0,4334. According to the MPT, it should invest basically on the retail and commercial activity.

Finally, for the Hong Leong Islamic Bank, the optimal HHI is equal to 0,8622 while the actual value of this index is 0,4346. So, the bank should concentrate more its activity, mostly in the retail and commercial activity.

c. Results for the efficient frontier analysis

Finally, we delineated the efficient frontier (in terms of ROA and standard deviation) of three banks of our sample and compared them to the actual positions of the banking groups in the period.

This provides us with another way of measuring performance: we compare the actual portfolios and the efficient ones across banks and also over time.

---

[12] The Herfindahl index, also known as Herfindahl-Hirschman Index or HHI, is a commonly accepted measure of the market concentration. Named after economists Orris C. Herfindahl and Albert O. Hirschman, this index is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers.
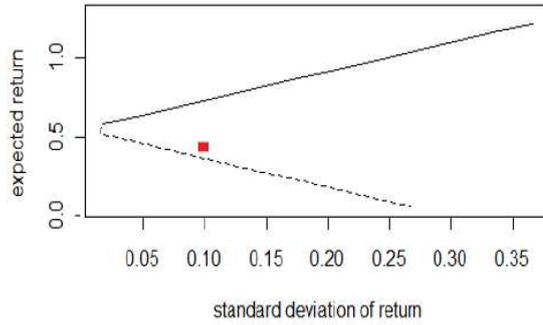
**Figure 1. Efficient frontier and actual portfolio Al Rajhi banking & Investment Corporation Malaysia Berhad**
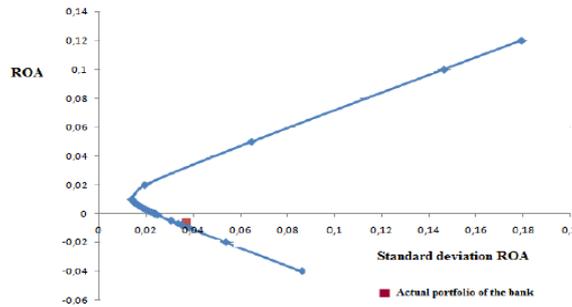
Figure 2. Efficient frontier and actual portfolio BIMB
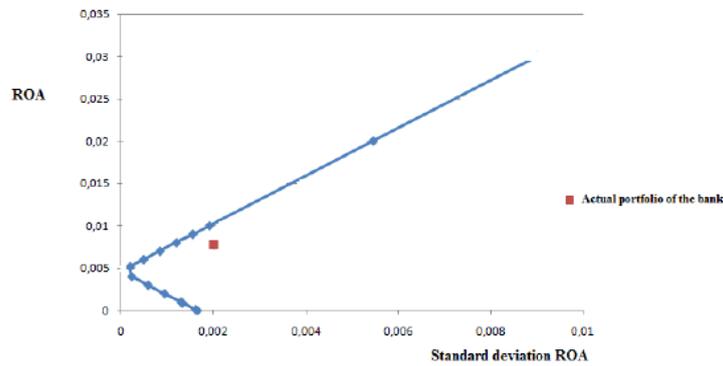
Figure 3. Efficient frontier and actual portfolio EONCAP

Figure 1, 2 and 3 show the efficient frontiers of Al Rajhi banking & Investment Corporation Berhad, BIMB and EONCAP Islamic Bank Berhad and their current positions.

We found that the current BIMB's portfolio is not efficient: it is above the efficiency frontier in the negative side. This implies that BIMB' return is negative. So, we found that the actual portfolio of BIMB has a negative return what is understandable because the actual return of this bank is negative.

The EONCAP Islamic Bank Berhad and Al Rajhi banking and investment Corporation Malaysia Berhad are also non efficient; their portfolios are below the efficiency frontier. Indeed, we are dealing with the normal representation. So, for a certain level of risk (σ_{ROA}), these banks have reached a positive rate of return (ROA) that is below the optimal value, thus these banks are not efficient but they can improve their performance.

16

5. SUMMARY OF THE MAIN RESULTS AND CONCLUDING REMARKS

This paper investigates two current important related topics in banking: the effects of diversification across financial products (business units) in terms of the efficient frontier and the optimal portfolio of the banking group and the related issue of risk adjusted performance of banks. Despite the limited data, we tried to derive interesting analysis of the diversification of Islamic banks. Sometimes the analysis couldn't be carried for all the eight banks of the sample. However whenever possible, our results were quite interesting and enriching.

Using the ROA and the RAROC indices we were able to analyse the risk adjusted performance of 8 malaysian Islamic banks. We found that the retail and commercial banking are the first activities that contribute significantly to the whole bank's profit (about 65% percent of the total profits of our sample). As a matter of fact those activities have the highest effects on the bank's performance. Besides, banks in the sample show high standard deviation in all the activities (large dispersion in results for the different banks and for the different activities). Another interesting result is the average high correlation between commercial and retail activities on the one hand and corporate and investments activities for all banks of the sample apart form EONCAP Islamic bank berhad, Hong Leong Islamic bank and RHB Islamic bank, on the other hand.

Concerning our findings for the optimal portfolio, the results are mitigated. Indeed, for Al Rajhi banking and Investment Corporation Malysia Berhad and BIMB, we found an overinvestment in the retail and commercial activities. Those banks should therefore reduce their investment despite the relative good performance of this activity, especially for the BIMB. However, our results suggest a substantial increase in retail and commercial activity for the other two banks (EONCAP Islamic bank Berhad and Hong Leong Islamic bank). Regarding the treasury activity, we found that all banks should increase their investment, except EONCAP Islamic Bank Berhad. Our recommendations are validated by the actual changes in the composition of the portfolios for BIMB and Hong Leong Islamic bank, but not for the other banks.

Finally, the efficiency frontier analysis for the portfolio of three banks (BIMB, EONCAP Islamic Bank Berhad and Al Rajhi banking and investment Corporation Malaysia Berhad) reveals that they are not efficient. For the latter two, however the analysis shows that they can improve their efficiency.

This study shows the importance of diversification of Islamic banks activities. Ideed, our results suggest that despite the weight of retail and commercial activities in the banks'portfolio, the analysis of efficiency frontier reveals that they are not efficient. Our recommendation is that banks studied in our sample should decrease their investment in retail and commercial activities and increase them in corporate and investment activities. However, the proportion of increase or decrease depends on the specificities of each banks, as shown in our analysis.

Appendix A

Table 1. ROA by activities of eight Malaysian Islamic banks between 2004 and 2008

Activities Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank
Affin Islamic Bank	2,64	1,73	0,45	1,72	1,61 (1)
Al Rajhi banking and Investment Corporation Malaysia Berhad	-1,62	0,81	0,8	0	0,00 (6)
Bank Islam Malaysia Berhad (BIMB)	-0,22	-0,9	0	93,14	-0,37 (7)
CIMB Islamic	1,02	0,96	1,05	-33,51	1,01 (5)
EONCAP Islamic Bank Berhad	2,51	-4,65	0,58	0	-0,52 (8)
Hong Leong Islamic Bank	2,19	1,77	-0,34	0	1,21 (3)
KFH Malaysia Berhad	0,68	2,13	0,92	-5,58	1,24 (2)
RHB islamic bank	1,14	1,61	0,54	1,57	1,10 (4)

The average rate of assets of activity i is $ROA_i = \dfrac{1}{T}\sum_{t=1}^{T=5} ROA_{it} = \dfrac{1}{T}\sum_{t=1}^{T=5} \dfrac{\Pi_{it}}{A_{it}}$ where ROA_{it} is the net profit of activity i in year t divided by average assets of activity i during the year.

Appendix B

Table 2. Average profits by activities of eight Malaysian Islamic banks between 2004 and 2008 (thousands US $)

Activities Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank
Affin Islamic Bank	4788 *(33)*	3097 *(21)*	4375 *(30)*	2302 *(16)*	14562
Al Rajhi banking and Investment Corporation Malaysia Berhad	-2307 *(-68)*	5862 *(173)*	-165 *(-5)*	0	3390
Bank Islam Malaysia Berhad (BIMB)	-6727 *(-45)*	-6849 *(-46)*	0	-1448 *(-9)*	-15024
CIMB Islamic	1927 *(15)*	3191 *(25)*	16396 *(127)*	-8603 *(-67)*	12911
EONCAP Islamic Bank Berhad	25530 *(262)*	-15383 *(-158)*	-413 *(-4)*	0	9734
Hong Leong Islamic Bank	21681 *(96)*	2763 *(12)*	-1923 *(-8)*	0	22521
KFH Malaysia Berhad	4392 *(28)*	9690 *(61)*	4190 *(26)*	-2400 *(-15)*	15872
RHB islamic bank	7374 *(22)*	8537 *(26)*	6440 *(20)*	10426 *(32)*	32777
Average Activity	**7964 (65)**	**1116 (9)**	**3504 (28)**	**-289 (-2)**	**12295**

( ) the contribution of the activity to the total profit of the bank in percentage.

Appendix C

Table 3a. RAROCS ("Sharpe" Index) by activities of eight Malaysian Islamic Banks

Bank \ Activities	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank
Affin Islamic Bank	1.39	0.79	-0.62	0.52	0.38 (3)
Al Rajhi banking and Investment Corporation Malysia Berhad	-0.61	-0.51	-1.58	Na	-0.28 (5)
BIMB	2.33	-0.18	Na	0.97	1.17 (1)
CIMB Islamic	0.34	-1.91	-2.57	-3.91	-1.12 (6)
EONCAP Islamic Bank Berhad	1.49	1.04	-0.72	Na	0.59 (2)
Hong Leong Islamic Bank	0.01	-1.82	-7.14	Na	-15.69 (8)
KFH Malaysia Berhad	0.23	0.48	0.24	0.55	0.23 (4)
RHB islamic bank	-0.65	-1.84	-6.48	-0.93	-4.97 (7)
Average activity	0.56	-0.49	-2.69	-0.56	

( ) the average rank

Table 3b. RAROCT ("Treynor" Index) by activities of eight Malaysian Islamic Banks

Bank / Activities	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank
Affin Islamic Bank	2.16	1.18	-0.16	0.81	0.38 (3)
Al Rajhi banking and Investment Corporation Malaysia Berhad	-0.91	-0.77	-2.61	na	-0.28 (5)
BIMB	2.98	-0.24	na	1.39	1.17 (1)
CIMB Islamic	0.46	-2.83	-3.58	-5.24	-1.12 (6)
EONCAP Islamic Bank Berhad	2.26	3.24	-1.18	na	0.59 (2)
Hong Leong Islamic Bank	0.01	-5.79	14.45	na	-15.69 (8)
KFH Malaysia Berhad	0.31	0.64	0.32	0.74	0.23 (4)
RHB islamic bank	-0.92	-39.44	-11.15	-1.34	-4.97 (7)
Average activity	0.79	-5.50	-0.55	-0.72	

( ) the average rank

Table 3c. RAROCJ ("Jensen" Index) by activities of eight Malaysian Islamic Banks

Bank \ Activities	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank
Affin Islamic Bank	0.023	0.013	-0.008	0.015	0.0003 (4)
Al Rajhi banking and Investment Corporation Malaysia Berhad	0.018	-0.017	-0.013	na	-0.011 (5)
Bank Islam Malaysia Berhad (BIMB)	0.041	-0.0021	na	0.78	0.015 (1)
CIMB Islamic	0.0290	-0.0290	-0.0292	-0.0343	-0.0225 (7)
EONCAP Islamic Bank Berhad	0.0164	0.0083	-0.016	na	0.007 (3)
Hong Leong Islamic Bank	0.00008	-0.0069	-0.040	na	-0.0171 (6)
KFH Malaysia Berhad	0.0177	0.0376	0.0113	0.0477	0.0120 (2)
RHB islamic bank	-0.0054	-0.0206	-0.0334	-0.0139	-0.0247 (8)
Average per activity	0.0174	-0.002	-0.018	0.15	

Appendix D

Table 4. Correlation coefficients of profits between banking activities with total Profit of banking groups and the system between 2004 and 2008

Activities \\ Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank
Affin Islamic Bank	0.96	0.99	0.98	0.95	1
Al Rajhi banking and Investment Corporation Malaysia Berhad	0.99	0.98	0.90	0	1
Bank Islam Malaysia Berhad (BIMB)	0.99	0.96	0	0.80	1
CIMB Islamic	0.99	0.90	0.95	0.99	1
EONCAP Islamic Bank Berhad	0.99	0.48	0.92	0	1
Hong Leong Islamic Bank	0.90	0.47	-0.74	0	1
Kuwait Finance House (KFH) Malaysia Berhad	0.97	0.99	0.98	0.99	1
RHB islamic bank	0.94	0.06	0.77	0.92	1
Average per activity	0.96	0.72	0.68	0.93	

Table 5. Composition of the actual Malaysian Islamic banks Portfolio December 31 2008

Activities Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank assets (2008) US 000$
Affin Islamic Bank	13% (13%)	15% (12%)	66% (68%)	0	100% 1723366
Al Rajhi banking and Investment Corporation Malaysia Berhad	18% (11%)	51% (0%)	31% (89%)	0	100% 1289795
Bank Islam Malaysia Berhad (BIMB)	31% (35%)	69% (65%)	0	0.01% (0)	100% 6769093
CIMB Islamic	14% (0)	20% (0)	60% (95%)	7% (5%)	100% 5190630
EONCAP Islamic Bank Berhad	50% (70%)	15% (20%)	34% (10%)	0	100% 2009291
Hong Leong Islamic Bank	47% (54%)	6% (9%)	47% (37%)	0	100% 2284224
Kuwait Finance House (KFH) Malaysia Berhad	35% (0%)	29% (0%)	33% (100%)	3% (0%)	100% 2678667
RHB islamic bank	25% (24%)	22% (22%)	50% (57%)	1% (-3%)	100% 2390197
Average activity	29% (26%)	29% (16%)	40% (57%)	2% (1%)	

( ) the percent of the activity in the beginning????

Appendix F

Mathematical development for the calculating of efficiency frontier and optimal portfolio

To determine the efficient frontier and the optimal portfolio, we must resolve the following system:

$$\begin{cases} \text{Minimize} & = \text{w'Cw} \\ \text{Subject to} & \text{w'}\mu = \mu_p \\ \text{And} & \text{w'e} = 1 \end{cases}$$

Where w is the weight vector of assets weights, μ the vector of assets returns, C the covariance matrix of asset returns and $e = [1\ 1\ 1\ \dots\ 1]$

To solve this system, we determine the following Lagrangian:

$$L = \text{w'Cw} + \lambda_1 (\mu_p - \text{w'}\mu) + \lambda_2 (1 - \text{w'e})$$

With λ_1 and λ_2 are the multipliers of Lagrange. The optimality condition of the first order is written

$$\partial L / \partial w = 2Cw - \lambda_1 \mu - \lambda_2 e = 0 \iff \boxed{w = \lambda_1/2\ C^{-1} \mu + \lambda_2/2\ C^{-1} e \qquad\qquad (1)}$$

With C^{-1} is the inverse of the matrix.

In combination with the 2 constraints, we have:

$$\begin{cases} \text{w'}\mu = \mu_p \\ \text{w'e} = 1 \end{cases} \iff \begin{cases} \mu\text{'w} = \mu_p \\ e\text{'w} = 1 \end{cases} \iff \begin{cases} \lambda_1\ \mu\text{'}C^{-1}\mu + \lambda_2\ \mu\text{'}C^{-1}e = 2\mu_p \\ \lambda_1\ e\text{'}C^{-1}\mu + \lambda_2\ e\text{'}C^{-1}e = 2 \end{cases}$$

We pose the following constants:

$$A = e\text{'}C^{-1}\mu = \mu\text{'}C^{-1}e;\ B = \mu\text{'}C^{-1}\mu \text{ and } C = e\text{'}C^{-1}e$$

The system to solve becomes:

$$\begin{cases} \lambda_1\ B + \lambda_2\ A = 2\mu_p \\ \lambda_1\ A + \lambda_2\ C = 2 \end{cases} \iff \begin{cases} \lambda_1 = 2\ (C\mu_p - A) / D \\ \lambda_2 = 2\ (B - A\mu_p) / D \end{cases}$$

With $D = BC - A^2$

Finally, we substitute λ_1 and λ_2 in equation (1), we obtain the weight of assets on the optimal portfolio:

$$w_p = g + h\mu_p$$

With $\quad g = 1/D\ [B(C^{-1}e) - A(C^{-1}\mu)]\quad$ and
$$ h = 1/D\ [\mathbf{C}(C^{-1}\mu) - A(C^{-1}e)]$$

Then, we can represent the efficient frontier (all the efficient portfolios) in the plane (μ_p, w_p) with

$$= \sqrt{(w'_p C w_p)} = \sqrt{1/D\ (C\mu^2_p - 2A\mu_p + B)}$$

Appendix F

Table 6a. Optimal composition of the Malaysian Islamic banks Portfolio, Directions of change

Activities / Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank assets (2008) US 000$
Al Rajhi banking and Investment Corporation Malysia Berhad	⇓	⇓⇓	⇑	-	100%
BIMB	⇓⇓	⇑⇑	⇑	-	100%
EONCAP Islamic Bank Berhad	⇑⇑	⇑	⇓⇓	-	100%
Hong Leong Islamic Bank	⇑⇑	⇓⇓	⇑	-	100%

⇑⇑/⇓⇓ Significant increase or decrease, respectively.

⇑/⇓ increase or decrease, respectively.

Table 6b. Optimal composition of the Malaysian Islamic banks Portfolio

Activities / Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	Others	Total bank assets (2008) US 000$
Al Rajhi banking and Investment Corporation Malysia Berhad	12.3%	37.89%	50%	0	100%
Bank Islam Malysia Berhad (BIMB)	5.93%	93.82%	0	0.2%	100%
EONCAP Islamic Bank Berhad	68%	21%	16%	0	100%
Hong Leong Islamic Bank	77%	-22%	47%	0	100%

Appendix G

Table 7a. the current value of HHI (in %)

Activities Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	HHI Assets
Al Rajhi banking & InvestmentCorporation Malysia Berhad	0,0162	0,3696	0,2182	0,604
Bank Islam Malaysia Berhad (BIMB)	0,1681	0, 36	0,0000	0,5281
EONCAP Islamic Bank Berhad	0,3481	0,0324	0,0529	0,4334
Hong Leong Islamic Bank	0,2601	0,0064	0,1681	0,4346

Table 7b. The optimal value of HHI (in %)

Activities Bank	Retail and commercial banking	Corporate & Investment banking	Treasury	HHI Assets
Al Rajhi banking & InvestmentCorporation Malysia Berhad	0,0151	0,1436	0,2500	0,4087
BIMB	0,0035	0,8802	0,0000	0,8837
EONCAP Islamic Bank Berhad	0,4624	0,0441	0,0256	0,5321
Hong Leong Islamic Bank	0,5929	0,0484	0,2209	0,8622

REFERENCES

Abdel-Hameed, (1999), « Risk and profitability measures is Islamic Banks: The case of two Sudanese banks", Islamic Economic Studies, Vol. 6, No. 2.

Bacha, (2008), "The Islamic Interbank Money Market and a Dual Banking System : The Malaysian Experience", MPRA Paper No. 12699.

Cubo-Ottone Alberto and Maurizio Murgia (2000), "Mergers and Shareholders Wealth in European Banking" *Journal of Banking and Finance*, 24 (6), 831-859.

Federal Reserve Bank of San Francisco (2009), Islamic finance, Malaysia's growing role, July.

Goddard, McKillop and Wilson, (2008), "The diversification and financial performance of US credit unions", Journal of Banking & Finance 32, 1836–1849.

Haron, (2004), « Determinants of Islamic bank profitability», Global Journal of Finance and Economics. USA, Vol 1, No 1.

KPMG International, (2007), « Growth and Diversification in Islamic Finance 1".

Mohd. Yusof and Abd. Majid, (2007) "Stock Market Volatility Transmission in Malaysia: Islamic Versus Conventional Stock Market », J.KAU: Islamic Econ., Vol. 20, No. 2, pp: 17-35.

Samad and Hassan (1998), "The performance of Malaysian Islamic banks during 1984-1997: an exploratory study », International Journal of Islamic Financial Services Vol. 1 No.3.

Saunders, Anthony and Ingo Walter (1994), "How Risky Would Universal Banks Be?" in *Universal Banking in the United States,* Oxford University Press, 183-207.

Shimko, D. (1997), "See Sharpe or Be Flat," *Risk,* June 10(6), 29.

Steve M., Klaus S., Simon W., (2007), "Small European banks: Benefits from diversification?", Journal of Banking & Finance 31, 1975-1998.

Stiroh K. J. (2002), "Do Community Banks Benefit from Diversification?".

Tahir and Abu Bakar, (2007), "Service Quality Gap and Customers' Satisfactions of Commercial Banks in Malaysia", International Review of Business Research Papers Vol. 3 No.4, Pp.327-336

Uyemura E.; C. Kantor, J. Pettit, (1996), "EVA for Banks: Value Creation, Risk Management and Profitability Measurement," *Journal of Applied Corporate Finance,* 9, 94–133.

Zaik, E.; J. Walter; G. Kelling; C. James (1996), "RAROC at the Bank of America: from Theory to Practice," *Journal of Applied Corporate Finance, 9 (2)* summer, 83-94.