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The Impact of Financial Risks on Profitability of Malaysian Commercial Banks: 1996-2005

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***Abstract*—**This paper examines the relationship between financial risks and profitability of the conventional and Islamic banks in Malaysia for the period between 1996 and 2005. The measures of profitability that have been used in the study are the return on equity (ROE) and return on assets (ROA) while the financial risks are credit risk, interest rate risk and liquidity risks. This study employs panel data regression analysis of Generalised Least Squares of fixed effects and random effects models. It was found that credit risk has a significant impact on ROA and ROE for the conventional as well as the Islamic banks. The relationship between interest rate risk and ROE were found to be weakly significant for the conventional banks and insignificant for the Islamic banks. The effect of interest rate risk on ROA is significant for the conventional banks. Liquidity risk was found to have an insignificant impact on both profitability measures.

***Keywords*—**Credit risk, interest rate risk, liquidity risk, market risk, profitability.

I. Introduction

PROFITABILITY is the ultimate test of the effectiveness of risk management. It is the bottom-line of any financial institutions and thus "Superior risk management practices are really good for the bottom line" [1]. Therefore knowing the impact that the financial risks have on the profitability of the bank is an important agenda for all financial institutions as it would enable the bank to manage those risks effectively. Moreover, a strong and profitable banking system promotes broader financial stability and increases the economy's resilience to adverse macroeconomic shocks. The trade off between risk and return is well acknowledged - the higher return comes with higher risk. Therefore in order to increase the return, banks should know which risk factors have greater effect on profitability. Furthermore, it is also a well known fact that the amount of risk faced by banks is of substantial nature and is of great concern to the policymakers.

The importance of studying bank risks is also reflected in the Basel Committee's [2]-[4] and the Central Bank's [5] constant and ongoing effort to account for it in the risk based capital adequacy guidance. In this particular study, the focus is on the major financial risks such as market risk-interest rate risk and liquidity risk, and credit risk in both the conventional and Islamic banks in Malaysia. Despite the fact that banks are exposed to a wide array of risks, these risks stand out and are often interrelated. Interest rate is often the trigger for other forms of risk [6]. An increase in interest rate would trigger credit risk as it leads to an increase in the number of loan defaults, the increase in interest rate could also lead to liquidity problems.

This paper is organized as follows. The next section provides a survey of previous studies on conventional and Islamic banks' performance and the determinants of profitability. This is followed by a discussion on the contributions of the study. Section III discusses the methodology and data used for this study. Section IV presents the results, the analysis and discussion of the findings while the last section concludes.

II. Previous Studies and Significant Contributions

A. Conventional Banks

Numerous studies on bank performance and the determinants of profitability have been conducted in various countries around the world. The studies are either single country studies or many countries studies. Some of the single country studies are those conducted by [7] and [8] on United States of America, [9] on United Kingdom, [10] on Greece, [11] on Tunisia while some of the many countries studies have been conducted by [12] on European banks, [13] on 80 countries and [14] on South Eastern European countries.

These studies look at the internal and external factors that affect the conventional banks' performance. They form the basis for the development of the models of the current study on the impact of risks on profitability. An empirical exposition of the relationship between bank net interest margins and interest rate risk, default risk, and off-balance sheet banking activities of US banks for the period of 1989-2003 was sampled by [8]. The result for the pooled sample documents that default risk, the opportunity cost of non-interest bearing reserves, leverage and management efficiency are all positively associated with bank interest spread. The profitability of European banks during the 1990s was investigated by [12]. The models of determinants of profitability incorporate size, diversification, risk and ownership type, as well as dynamic effects. The size of the bank was utilised to control for scale and scope economies. There is a positive relationship between profit and bank size as larger banks may benefit from scale or scope economies. The study also investigates the persistence of profits in banks. Their findings show that there is persistence of abnormal profits from year to year and a positive relationship between off-balance sheet business and profitability for the banks in the United Kingdom.

Reference [10] examines the impact of bank-specific, industry specific and macroeconomics determinants on bank profitability over a period of 17 years. The bank specific factors

considered are operating efficiency, financial risk, firm size, ownership status while the industry specifics are the industry concentration, and the macro variables are inflation and business cycle. The results indicate that with the exception of size and ownership all bank-specific determinants significantly affect bank profitability. The macroeconomic determinants, consumer prices and business cycle have a strong, positive effect on banks' profit, with the latest especially affecting profits when the cyclical output lies above its trend. This suggests that even if we control for other bank-specific determinants bank profitability is still shaped by the macroeconomic conditions regardless of each banks' managerial decisions.

Reference [9] investigates the determinants of profitability of UK commercial banks. They look at the impact of bank's characteristics, macroeconomics conditions and financial structure on bank's net interest margin (NIM) and return on average assets. The results of the study show that liquidity is negatively related to NIM but positively related to ROA while loan loss reserves has a positive impact on NIM and statistically significant whether bank characteristics alone is considered or not. The relationship between size and performance is significant only in the case of NIM but not significant for ROA. Both inflation and GDP growth have a positive impact on performance. All the above studies use panel data and the method of analysis is generalised least square models with fixed effects and random effects. However, [10], [12], [14] take one step further in looking at the dynamic effects using the GMM model. Using the GMM model, Goddard et al. find evidence of significant persistence in bank profits data.

B. Islamic Banks

Although extensive empirical studies have been conducted to determine the factors that affect the performance and profitability of conventional banks, quite a number of similar studies have also been carried out on Islamic banks. Some of the studies are carried out by [15]; [16]; [17]; [18]; [19]; [20]; [21] on the Malaysian banking industry, [22] on Bahrain Islamic Bank, [23] on Middle Eastern countries, [11] on Tunisian banking industry, [24] on Bahrain's banking industry and [25] on Islamic banks of Muslim countries.

Reference [22] investigated quantitatively and also at micro levels the claim that Islamic banking offers high performance and stability. The research was conducted on Bahrain Islamic Bank (BIB) through three different methods: financial ratio analysis of various profitability ratios and their risk levels, stock analysis and portfolio analysis. According to him the financial ratio analysis and stock analysis both revealed that BIB offers a higher return and a lower coefficient of variation than the other commercial banks. Portfolio analysis indicated that BIB's stock is the best for the purpose of portfolio diversification. Based on his findings, he concludes that bankers may achieve an above average performance at a moderate level of risk by using the profit sharing concept as compared to the interest based banking.

Reference [15] evaluated the performance of BIMB in profitability, liquidity, risk and solvency and community involvement. They conducted intertemporal performance evaluation between two periods of 1984-89 and 1990-97. They also conducted an interbank performance evaluation. Comparisons were made between BIMB & Bank Pertanian and BIMB & Affin Bank. They used financial ratios to represent the above four variables. Their findings indicate that Islamic bank is still less risky and more solvent. The difference in risk measured in debt-equity is statistically significant.

Reference [23] analyses how bank characteristics and the overall financial environment affects the performance of Islamic banks. He closely examines the relationship between profitability and the banking characteristics after controlling for economic and financial structure indicators. The study uses regression analysis to determine the underlying determinant of Islamic bank performance. The factors analysed include bank size, leverage, loans, short term funding, overhead and ownership. Among the controlled factors are the external factors such as foreign ownership, taxes, and the market capitalization. The data used in this study are the cross-country bank-level data, compiled from income statements and balance sheets of 14 Islamic banks each year in the year 1993 – 1998 in eight Middle Eastern countries. The analysis of determinants of Islamic bank profitability confirms previous findings whereby the results indicate that high capital and loan-to-asset ratios lead to higher profitability. The regression results also show that implicit and explicit taxes affect the bank performance measure of some financial and policy indicators that impact the overall performance of Islamic banks. The findings show that Islamic banks' profitability measures respond positively to the increase in capital and negatively to loan ratios. The findings also seem to suggest that reserve requirement does not have a strong impact on profitability measures and that favourable macroeconomic environment does stimulate higher profit. However bank size has negative impact on profitability.

A similar study on the determinants of profitability was conducted by [11] on Tunisian banking industry for the period of 1980-2000 using Generalized Least Squares (GLS) regression models. The study finds that macroeconomic indicators such as inflation and growth rates have no impact on bank's interest margins and profitability. The findings are consistent with [23] and [25] whereby the size has negative impact on profitability and that profitability is associated with banks with large capital and high overhead.

A comparative study of the performance and credit risk of banks in Egypt and Lebanon was conducted by [26]. The study covers the 1990's. They also investigated the impact of liquidity, credit and capital on bank profitability in each country's banking sector. They conducted a regression analysis with three independent variables of liquidity, credit and capital and profitability as the only dependent variable. The result shows that the return on equity (proxy for profitability) is a direct and increasing function of the banking lending activities irrespective of Lebanon or Egypt. There is a strong link

between capital adequacy and commercial bank return with high capitalization acting as a hindrance to return.

Reference [25] conducted a study on profitability and efficiency of Islamic banks worldwide during 1994-2001. They analysed and examined the performance indicators of these banks using a variety of internal and external banking characteristics. Generally the findings confirm previous findings and indicate a strong positive correlation between profitability and overhead.

Reference [17] also studied on the performance of Islamic and conventional banks in Malaysia. They use financial ratios to evaluate the performance of the Islamic Banking Scheme (IBS) in addition to using t-test in testing the hypotheses. The findings show that IBS had outperformed conventional banks in terms of profitability measures such as ROA.

Reference [27] examines the factors affecting credit risk and identifies the risk predictors of Bank Islam Malaysia (BIMB) and the Islamic windows of 6 anchor banks as well as risk predictors of the 6 anchor banks (for Islamic banking) from their conventional banking performance (for conventional banking). A comparison of those factors was made between Islamic and conventional banking operations. She uses regression analysis to determine the underlying factors influencing risk of Islamic banking and that of the major six anchor banks on interest-based system. Her findings are that the credit risk of Islamic banking followed closely the trend of the industry and that of the conventional banking.

Reference [24] examines the comparative performance of Bahrain's interest free Islamic banks and interest-based conventional commercial banks during the post Gulf War period with respect to profitability, liquidity risk and credit risk. He uses nine financial ratios in measuring the performances. By using the student's t-test to the financial ratios for Islamic and conventional banks for period 1991- 2001, he comes to the conclusion that there is no major difference in performance between Islamic and conventional banks with respect to profitability and liquidity. Nevertheless, the study finds that there exists a significant difference in credit performances.

Many Muslim countries including Malaysia, practice dual banking system. Reference [19] examines the relationship between Islamic financing and the three bank risks of interest rate risk, liquidity risk and interest rate risk, in a dual banking system. The study was conducted on Malaysian commercial banks based on annual data collected from 1988-1996. Univariate tests were conducted to determine the relationship between Islamic financing and bank risks. At the same time, multiple ordinary least squares (OLS) regressions between each of the three bank risks and their determinants were run to gauge the existence of interactions between the independent variables. Their main finding is that commercial banks with Islamic financing facilities have significantly lower credit risk and liquidity risks but significantly higher interest rate risk compared to banks without Islamic financing facilities. They also conclude that bank size is the significant determinant of credit risk while the significant determinants of liquidity risk are off-balance sheet financing, the extent of securitization, loan volatility, bank capital and bank size. As for the interest rate risk, the differences in interest rate risk across banks are explained by the proportion of loan sales to total liabilities and bank size.

The latest study on Islamic banking was presented by [20]. She examines the relationship between the capital structure and the performance of banks offering Islamic banking using panel data regression analysis. The measures of profitability are return on equity, return on assets and net interest margin. There is a mixed result for the relationship between capital structure and profitability i.e. positive effect for ROA and ROE and negative effect for NIM. It is found that none of the controlled variables are significantly related to ROA or ROE except for GDP per capita which is negatively related to NIM. A summary of the relationship between profitability and the independent variables of selected prior studies is tabulated in Table I.

TABLE I
SUMMARY OF THE SIGN OF THE COEFFICIENTS OF INDEPENDENT VARIABLES FROM SELECTED PREVIOUS STUDIES

Independent Variable	ROA as the dependent variable	ROE as the dependent variable	NIM as the dependent variable
Credit Risk	(-) [10],[28]	(-) [10],[28]	(+) [28], [9]
Interest Rate Risk			(-) [8]
Credit Risk*Interest Rate Risk			(+) [8]
Liquidity Risk			(-) [8], [9],[29]
Off balance Sheet Activities		(+) [28]	(+) [8]
Lagged profitability	(+) [10]	(+) [10], [28]	
Bank Size	(-) [9], [12], [28]	(+) [28]	(-) [9]
Bank Capital	(+) [10]		(+) [29]
GDP Growth	(+) [9]		(+) [9]

C. Significant Contributions

With the recent development in the global financial market, all banks including Islamic banks are exposed to financial risks. Therefore in trying to practice good risk management, it is necessary that an empirical study be conducted on evaluating the impact that these risks may have on profitability. Many studies have been conducted on risks and factors contributing to risks of the conventional financial institutions, however, for the Islamic banking, it has not been widely investigated and documented. Most of the earlier studies on Islamic banking revolve around the conceptual issues underlying the interest free system. However, as Islamic banks evolve, quite a number of empirical studies have been initiated especially on Islamic banks' performance and profitability. The initiatives have been

undertaken by researchers such as [16], [17], [22], [23], [25], [28] and [30].

Earlier studies on profitability in Malaysia conducted by [16] and [17] on Islamic banks and the Islamic Banking Scheme use cross sectional data of the banks to compare financial ratios. Previous studies do not incorporate specific risks in their models.

In studying the determinants of profitability, most of these studies examined the internal and external factors of the banks. These studies conclude that internal factors explain a large proportion of banks profitability; however, the results are not constant across countries or different periods within the same country. As there are differences in the findings in the banking sectors among the different countries, it is still worthwhile to observe if the previous results are applicable to Malaysia.

This study extends the earlier work of [8], [10], [12] and [25] by incorporating the financial risk factors using panel data analysis. It covers both conventional as well as Islamic banks in Malaysia and is thus different from the earlier studies with respect to the variables that were being utilized, years of coverage and the methods employed.

Additional information about the risk factors and the impact that the major banking risks have on the profitability and performance of the banks is useful to the policymakers and regulators. In fact, its importance cannot be denied. The importance of studying bank risk to the policymakers and regulators is readily reflected in the Basel committee's constant and ongoing effort to account for it in the risk based capital adequacy guidance. The findings from the study would be useful to the policy makers and regulators in making informed decision and formulating policies that will indeed contribute to the bottom-line of the banks and indirectly help to prevent systemic risk.

III. Empirical Framework and Method of Data Analysis

A. Objectives

Many people have mistakenly believed that risk management inherently reduces the profitability of the banks. However [31] rebutted the argument that risk management reduces profitability of the bank. His case study on Harrington bank shows that controlling the interest rate risk and credit risk through on and off-balance sheet hedges such as the interest rate swap and options stabilizes the Harrington's bank income and net worth. In this research the focus is on the relationship and the extent to which financial risks affect bank profitability and, in particular, whether that impact differs across banks. Thus the hypotheses are:

H1: The financial risks have an impact on the profitability of the banks.

Sub Hypotheses:

H1a: Credit risk has an impact on the profitability of the banks

H1b: Market risk has an impact on the profitability of the banks

H1c: Liquidity risk has an impact on the profitability of the banks

For hypotheses H1 and sub hypotheses H1a, H1b and H1c the method employed was panel data regression analysis.

B. Data Sources

The production of secondary data was through the annual reports and audited financial reports of all the commercial banks in Malaysia including the Islamic banks and the foreign licensed banks in Malaysia. As for the Islamic Banking Scheme (IBS), the data was produced from the financial statements of the Islamic Banking Scheme of the anchor banks. The other secondary source is the Bank Negara Malaysia Annual Reports. The duration of study was for a period of 10 years that is from 1996 to 2005. This period of study was chosen because complete data were available for most banks during this period.

In this study, a panel data set was employed. The set comprises of 36 Malaysian banks for which the same variables were collected annually for ten years. Thus this pooled data contains a total of 360 (36 x 10) observations.

Panel data is used because of its many advantages over either cross-section or time series data [32],[33]. Firstly, by combining time series and cross-section observations, panel data gives more informative data with more variability but less collinearity among the variables. Furthermore, it provides an increased number of data points and hence generates additional degrees of freedom and more efficiency [34]. Thus it is suitable for the present study as it enhances the quality and quantity of data whereby the time series is short (10 years) and the number of banks is small. Secondly, by incorporating information relating to cross-section and time series variables, heterogeneity is explicitly taken into account by allowing for individual-specific variables [35],[34] as panel data suggest that individuals, firms, or countries are heterogeneous. According to [34], if heterogeneity is not controlled, there is the possibility of running into the risk of obtaining biased results. Thirdly, by incorporating information relating to both cross-section and time series variables, it can substantially reduce the problems that arise from omitted variables [33].

This study employs Generalized Least Squares (GLS) regression This is preferred over the Ordinary Least Squares (OLS) system because under certain assumptions, GLS will turn out to be asymptotically more efficient than OLS system [33]. In estimating the panel data regression models, two models of Generalized Least Squares (GLS) regression were used, namely, GLS model with fixed effects (model I) and GLS model with random effects (Model II). Hausman specification test was used to identify the most suitable model between the two.

C. Generalised Least Squares with Fixed Effects Model

The model of GLS with fixed effects model (FEM) is also known as Least Square Dummy Variable (LSDV). In this model it is assumed that the coefficients are constant and time invariant.

The basic equation for the model is as follows:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \mu_{it} \quad (1)$$

Where Y_{it} = a dependent variable which represents bank profitability

X_{it} = a vector of financial risks and bank specific characteristics which have an impact on profitability.

μ_{it} = the residual term to reflect all other market imperfections and regulatory restrictions affecting profitability.

α_i, $i = 1,..., N$, are constant coefficients specific to each bank

$i = 1,\ldots, N$, is the ith cross-sectional unit

and $t = 1,..., T$, is the tth time period,

We assumed that there are a maximum of N cross-sectional units and a maximum of T time periods. If each cross-sectional unit has the same number of time series observations then we deal with a balanced panel data. However if the number of observations are missing for certain years then we deal with an unbalanced panel data of N x T whereby the number of observations differs among panel members. In other words, for the unbalanced panel data, the number of time series observations is not the same for all of the cross-sectional units. As for the fixed effects models the slopes are constant but the intercepts differ according to the cross-sectional unit. There are no significant temporal effects but there are significant differences among the cross-sectional units. Since i-1 dummy variables are used to designate the particular cross-sectional unit, this model is also known as the Least Squares Dummy Variable model. It is also possible to have constant slopes but intercepts that differ according to time effects. In this case the model has no significant cross-sectional unit differences but might have autocorrelation owing to time-lagged temporal effects. Another possible fixed effects model is where the slope coefficients are constant but the intercept varies over the cross-sectional units as well as time effects. Thus we have a regression model with i-1 dummies and t-1 dummies.

White's procedures were employed to ensure that the coefficients are not heteroskedastic. This involves the regression of the estimated residual $\hat{u}^2_{it}$ on all the explanatory variables, their squares and cross products.

D. Generalized Least Squares with Random Effects Model

As for the GLS with the random effects model (REM), the model is defined as:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \mu_{it} \quad (2)$$

$i = 1, \ldots, N$; and $t = 1,\ldots,T_i$

where Y_{it} = a dependent variable which represents bank profitability

X_{it} = a vector of financial risks and bank specific characteristics which have an impact on profitability.

$\mu_{it} = \varepsilon_i + \upsilon_{it}$ reflects the error component disturbances.

Here μ_{it} is the composite error term that consists of two components, ε_i which is the cross-section, or the individual-specific, error component, and υ_{it} which is the combined time series and cross-section error component.

The random effects model (REM) is also known as the error components model (ECM) due to the fact that the composite error term μ_{it} consists of two (or more) error components [35]. The usual assumptions made by ECM/REM are that

$$\varepsilon_i \sim N(0,\sigma_\varepsilon^2)$$
$$\upsilon_{it} \sim N(0,\sigma_\upsilon^2)$$
$$E(\varepsilon_i \upsilon_{it}) = 0 \qquad E(\varepsilon_i \varepsilon_j) = 0 \quad (i \neq j)$$
$$E(\upsilon_{it}\upsilon_{is}) = E(\upsilon_{it}\upsilon_{jt}) = E(\upsilon_{it}\upsilon_{js}) = 0$$
$$(i \neq j; t \neq s)$$

The above equation means that the individual error components are not correlated with each other and are not autocorrelated across both cross-section and time-series units.

D. Model Specifications

Following the work of [8], [12], [10], [14], [25], [28], [36] and other similar studies in this area, the basic model was specified as follows:

PROFITABILITY = F (RISKS, MACRO, BANK)

RISK represents the three major risks of the banks namely credit risk, liquidity risk and interest rate risk while MACRO and BANK are the control variables which denotes a set of macroeconomic variables reflecting the state of the economy and bank specific variables respectively. The measures of profitability that were employed are return on equity (ROE) and return on assets (ROA).

Specifically the models are:

Model 1: ROA as the dependent variable

$$ROA_{it} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 CR_{it} + \beta_3 IRR_{it} + \beta_4 (CR * IRR)_{it} + \beta_5 LIQ_{it} + \beta_6 OBS1_{it} + \beta_7 OBS2_{it} + \beta_8 BSIZE_{it} + \beta_9 BCAP_{it} + \beta_{10} GDP_t + \beta_{11} D_t + \mu_{it} \quad (3)$$

Model 2: ROE as the dependent variable

$$ROE_{it} = \beta_0 + \beta_1 ROE_{it-1} + \beta_2 CR_{it} + \beta_3 IRR_{it} + \beta_4 (CR * IRR)_{it} + \beta_5 LIQ_{it} + \beta_6 OBS1_{it} + \beta_7 OBS2_{it} + \beta_8 BSIZE_{it} + \beta_9 BCAP_{it} + \beta_{10} GDP_t + \beta_{11} D_t + \mu_{it} \quad (4)$$

Where

ROA_{it}	=	Return on Assets of bank i for year t
ROE_{it}	=	Return on Equity of bank i for year t
$ROE_{i,t-1}$	=	Return on Equity of bank i for year t-1
$ROA_{I,t-1}$	=	Return on Assets of bank i for year t-1
CR_{it}	=	Credit Risk of bank i for year t
IRR_{it}	=	Interest Rate Risk of bank i for year t
LIQ_{it}	=	Liquidity risk of bank i for year t
$OBS1_{it}$	=	Off Balance Sheet Activities (credit related activities) of bank i for year t
$OBS2_{it}$	=	Off balance sheet activities (derivatives) of bank i for year t
$BSIZE_{it}$	=	Log of Total Assets of bank i for year t
$BCAP_{it}$	=	Bank Capitalization of bank i for year t
GDP_t	=	GDP Growth Rate for year t
D_t	=	1 for observations after the crisis (1998-2005), 0, otherwise (i.e. for observations in 1996-1997)
β_i	=	Coefficients of the variables
μ_{it}	=	Error term

E. Dependent Variables

The dependent variable in this study is profitability. Theoretically the measures of profitability are Return on Equity (ROE) and Return on Assets (ROA) while a measure of spread is the Net interest/income margin (NIM). For the current study, these measures are chosen based on the literature of [8], [10], [14], [23], [26], [28] and [37]. ROE measures profitability from the shareholders perspectives while Return on assets (ROA) reflects the ability of a bank's management to generate profit from the bank's assets. It measures bank profits per dollar of assets and is defined as the ratio of net income to average of total assets. Accounting ROE gives the measurement for bank accounting profits per dollar of book equity capital. However, in general ROE is defined as net income divided by average equity or by the period ending figure. It can be decomposed into leverage factor (equity multiplier, or EM) and return on assets [38]. This can be expressed as:

ROE = ROA x EM

On the other hand, equity multiplier, EM provides an indication of a bank's leverage and is measured by the ratio of average assets to average equity or the ratio of total assets to total equity.

A risk return framework conceptualizes the overall bank performance. The bank performance can be decomposed into two major elements of risk and return whereby the return on equity (ROE) is on the return side while the risk or ROE variability are on the risk side. The decomposition of return on equity and its variability are the key elements as they provide insights regarding bank risks and returns [38].

Banks with lower leverage (higher equity) will generally report higher ROA but lower ROE. Therefore an analysis of ROE not only disregards the greater risks associated with high leverage, but also since EM is often determined by the regulation; ROA emerges as the key ratio for the evaluation of bank profitability.

F. Independent Variables

The independent variables namely liquidity risk, credit risk and interest rate risk and off balance sheet activities have been selected on the basis of their potential relevancy to this model and also because of their importance in depicting a bank's real financial position.

Liquidity risk: The proxy for liquidity risk that is used in this study is the ratio of liquid assets to total liabilities, which is also the proxy that is usually used by other studies [8]; [26], [29]. It shows a bank liquid asset as a percentage of its liabilities. As liquidity risk is the risk of not having sufficient cash or borrowing capacity to meet deposit withdrawals or new loan demand, the banks are forced to borrow emergency funds at excessive cost. Therefore as the proportion of funds invested in cash or cash equivalents increases, a bank's liquidity risk declines. This leads to the prediction that the higher the ratio, the lower the liquidity risk, other things being equal. Therefore the expected relationship with profitability is negative.

Credit Risk: A proxy for credit risk that will be used is the proportion of allowance for loan loss to total asset [8]; [7]; [19] whereby provisions are liability accounts formed as reserved potential on actual losses emanating from bad or substandard loan.

Credit risk is chosen because among the different banking risks, credit risk has a potential social impact because of the number and diversity of stakeholders affected. This is due to the fact that business failures and bankruptcies not only affect the banks as lenders, but also shareholders, managers, suppliers, clients, financial community, government, competitors and regulatory bodies among others.

Theory suggests that increased exposure to credit risk is normally associated with decreased firm profitability. Hence we expect a negative relationship between profitability and loan loss provision ratio.

Interest rate risk (IRR): The proxy for interest rate risk is the maturity gap which is measured by the ratio of the difference between the dollar value of liabilities subject to repricing within one year and the dollar value of assets subject to repricing within the same time period to total capital [19].

Gap = Rate Sensitive Assets – Rate Sensitive Liabilities

Thus: Interest Rate Risk

$$= \frac{Rate\ Sensitive\ Assets - Rate\ Sensitive\ Liabilities}{Total\ Capital}$$

Items like floating rate loans, variable rate deposits, loans maturing within the year, marketable securities within one year, money market deposits accounts are all considered as rate sensitive while the non rate sensitive assets and liabilities are cash, liquidity reserves, physical assets and liabilities such as share holders' equity and long term borrowings [6]. There is no a priori expectation as we have not come across any studies conducted on the impact of interest rate risk on the profitability measure. However, there are some studies done on the relationship between interest rate risk and net interest margin and also the relationship between interest rate risk and efficiency. Ref. [39] found that the interest rate volatility has a positive impact on net interest margin while [8] in his study found a mixed result for the relationship between interest rate risk and net interest margin. Ref. [40] also found that there is a mixed result on the effect of interest rate risk on operating efficiency. Thus, it can be seen that it is unclear whether it will give a positive or a negative impact on profitability measures. In the present study, the interest rate risk is predicted to have a positive relationship as the profitability is expected to increase with a positive increase in interest rate risk exposure.

Credit risk and Interest Rate risk: We examined the interaction between interest rate risk and credit risk. This study extends the [41] model and [8] which investigated the interaction between interest rate risk and credit risk. The credit risk and interest rate risk have co-founding effect on each other. We expects it to have a positive relationship with profitability.

Off Balance Sheet: Off balance sheet activities can be categorised into lending (or credit-related) products such as loan commitments and letters of credit, derivative (or risk management) products such as futures, options and swaps [8]. The off balance sheet activities is represented by the ratio of OBS to total assets [42].

A testable implication is that OBS activities should increase profitability since they permit banks to expand in investments that would be passed up if restricted to equity or deposit financing. However, the increased activities in OBS would lead to greater exposure to risks.

G.Controlled Variables

In order to isolate the effects of risk factors on performance, it is necessary to control for other factors that are expected to have some influence on profitability. Several controlled variables are included in this study. These variables are included because prior studies have shown that they have significant association with profitability. The control variables which are expected to influence bank's profitability are:

Bank size: Size of the bank is being measured using year end natural log of total assets [8]; [9]. When loan demand increases, smaller banks may have the tendency to lend more aggressively compared to larger banks by taking on more risky projects with the anticipation of higher returns. This would mean that the banks would be more exposed to credit risk. Based on the premise that credit risk exposure is size related, larger banks are expected to have lower credit risk. In relation to profitability, it is expected that bank size is positively related to profitability.

Bank capital: As used by [29], [39] and [41] this variable is represented by the bank's ratio of equity to total assets. Well capitalized banks have higher net interest margins and are more profitable. Banks with higher capital ratios tend to face lower cost of funding as they need to borrow less. Thus we can say that they are less exposed to liquidity risk, so the higher the ratio the lower the liquidity risk exposure of the banks. Bank capital is thus expected to have a positive relationship with profitability.

Lagged ROA or ROE: Ref. [10] included the profit persistence in banking in his model. This is due to the fact that some specific reasons may cause the bank profitability not to adjust quickly enough to its normal level competitive profits, when an exogenous shock occurs [10]. In this study the persistence is accounted for by including the one period lagged profitability measure among the explanatory variables.

GDP Growth: The macroeconomics variable (MACRO) that is used to control for the effect of the economic environment on banks' profitability is growth. This is measured by the GDP growth [20]; [28] and it is expected to have a positive impact on the profitability according to well documented literature on the association between economic growth and financial sector performance.

Dummy: A dummy variable is used to take into consideration the financial crisis in 1997. Thus the data is divided into two periods, the period before the crisis is from 1996 to 1997 while the period after the crisis is from 1998 to 2005. The choice of period is based on the study conducted by [43] which identified that there is a structural break with a break date of about middle to late 1997. Thus they split their sample into two sub-samples with July 1997 as the end point of the first sample. This is further reinforced by another study by [44] which found that the structural break for GNI per capita series for Malaysia, Indonesia, Thailand and Singapore occurred in 1997, which coincided with the Asian financial crisis. Therefore for this current study, year 1997 has been chosen as the cut of point.

TABLE II
VARIABLE DEFINITIONS, NOTATION AND THE EXPECTED EFFECT OF THE INDEPENDENT VARIABLE OF THE MODELS TO BANK PROFITABILITY

Variable		Measure	Notation	Expected Effect
Dependent	Profitability	net income/total assets	ROA	
		net income /equity	ROE	
Independents	Lagged ROA/ROE	Previous year ROA/ROE	ROA(-1)	
			ROE(-1)	
	Credit Risk	Loan loss provision/loans	CR	-ve
	Interest Rate Risk	Rate Sensitive Assets-Rate sensitive liabilities/ total capital	IRR	+ve

	Credit Risk*Interest Rate Risk	Interaction between credit risk and interest rate risk	CR*IRR	+ve
	Liquidity Risk	Liquid assets/total liabilities	LIQ	-ve
	Off Balance Sheet Activities	Non interest income/total asset	OBS1	+ve
		Derivatives/total asset	OBS2	+ve
	Bank Size	ln total assets	BSIZE	+ve
	Bank Capital	Equity/total assets	BCAP	+ve
	Growth	GDP growth	GDP	+ve

IV. Results and Discussion

This section provides empirical evidence on the relationship between financial risks and profitability of the Malaysian commercial and Islamic banks. The analysis started off by looking at the descriptive statistics and the correlation coefficients of the variables. Panel unit root test was then performed to check for stationarity of the data which was then followed by the regression models. Two regression models of FEM and REM were performed for the aggregate data of all the commercial banks and the disaggregate data of conventional and Islamic banking with ROA as the dependent variable. The same process was repeated with ROE as the dependent variable. Therefore 18 regression equations have been performed in order to analyse and compare the impact that the independent variables have on the profitability measures of the conventional and Islamic banking. In choosing between the fixed effect model and random effect model, specification test was conducted on the regression results. The findings are discussed in the following section for the regression with ROA and ROE as the dependent variable, respectively.

A. Descriptive Analysis

A normally distributed data is an efficient, unbiased and consistent estimator [35]. A normally distributed data is reflected in its descriptive statistics. Table III summarises the mean and standard deviations of the dependent and independent variables used in the study for all the commercial and Islamic banks. The values of Jarque-Bera are significant. Thus it can be concluded that the data is not normally distributed. Hence Ordinary Least Squares (OLS) estimation method is not a better estimation method to be used as compared to Generalized Least Squares (GLS) method [35].

TABLE III
DESCRIPTIVE STATISTICS
MALAYSIAN COMMERCIAL BANKS 1996-2005

Variables	All Commercial Banks		Conventional Banks		Islamic Banks and Islamic Banking Scheme	
	Mean	SD	Mean	SD	Mean	SD
ROA	0.026909	0.017750	0.031821	0.018649	0.018494	0.012178
ROE	0.154673	2.965692	0.083338	3.728897	0.276879	0.247576
Bank Capital	0.129605	0.168820	0.129949	0.132220	0.129014	0.218347
Bank Size	15.2094	1.974667	16.0378	1.4883	13.7901	1.9000
Credit Risk	0.007767	0.011533	0.008608	0.012849	0.006327	0.008698
Interest Rate Risk	0.022776	0.021351	0.024224	0.008633	0.020295	0.033247
Liquidity Risk	1.485935	5.530576	1.194981	0.721494	1.984372	9.062465
GDP Growth	0.045592	0.046567	0.046689	0.046905	0.043713	0.046114
OBS1	0.357526	0.3086175	0.460898	0.241438	0.180438	0.3308732
OBS2	0.739408	1.577269	1.168982	1.855747	0.003498	0.012318
No of observations	331		209		122	
Jarque-Berra	347.3466		493.1182		34.4433	
Probability	0.0000		0.0000		0.0000	

Note. SD=standard deviation

B. Correlation Coefficients

Table IV shows the correlation matrix of all the variables in the study. There is a negative correlation between credit risk and ROE and ROA, negative correlation between liquidity risk and ROA and ROE while a positive relationship between interest rate risk and ROA and ROE. It can be seen that the variables are not highly correlated with each other.

C. Panel Unit Roots Test

It is a well known fact that time series data are non-stationary. The presence of non-stationary variables might produce spurious regression results. Following the work of [45], before doing the panel data regression analysis, the standard unit root test was performed to check for the stationarity of the data. Hence each variable was subjected to panel unit root tests of ADF-Fisher and [46]. ADF-Fisher test assumes individual unit root process and uses chi square test statistics while [46] test assumes common root process and uses t-test.

The results of these tests are presented in Table V. The ADF and LLC agree in classifying BCAP, CR, GDP, IRR, LIQ, OBS1 and ROA as variables which do not have unit roots, meaning that they are stationary at level. They also classify BSIZE as non-stationary at level but become stationary after first differencing.

TABLE IV
CORRELATION MATRIX FOR MALAYSIAN COMMERCIAL BANKS

	ROA	ROE	CR	IRR	LIQ	OBS1	OBS2	BCAP	BSIZE	GDP
ROA	1.0000									
ROE	0.2700	1.0000								
CR	-0.3478	-0.2549	1.0000							
IRR	0.2189	0.0417	0.0735	1.0000						
LIQ	-0.0883	-0.0034	-0.0466	-0.0647	1.0000					
OBS1	0.1692	0.0116	0.1700	0.0907	-0.0786	1.0000				
OBS2	0.2659	0.0234	-0.0526	0.0067	-0.0261	0.0945	1.0000			
BCAP	0.0236	0.0138	-0.1248	-0.1071	0.3162	-0.1226	0.0642	1.0000		
BSIZE	0.1605	-0.0053	0.1189	0.0578	-0.2548	0.3586	-0.0629	-0.2905	1.0000	
GDP	-0.0843	-0.0200	-0.2400	-0.0836	0.0396	0.0087	0.0440	0.0340	0.0711	1.0000

TABLE V
ADF AND LLC PANEL UNIT ROOTS TESTS

Variable	Levin, Lin and Chu (*t*)		ADF-Fisher (χ^2)	
	At level	First difference	At level	First Difference
BCAP	-169.151***		99.894***	
BSIZE	-1.002	-11.779***	41.409	116.700***
CR	-6.1466***		113.804***	
GDP	-29.2504***		336.786***	
IRR	-125.688***		85.236*	
LIQ	-6.335***		128.057***	
OBS1	-11.056***		104.888***	
OBS2	-1.420*	-4.310***	46.309	60.914**
ROA	-8.317***		100.339***	
ROE	-4.087***		73.337	154.057***

Note. ***, **, * indicate significance at 1%, 5% and 10% levels, respectively. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

For OBS2 and ROE, the two tests yield conflicting results. While it is stationary in level under LLC, it is stationary in the first difference under ADF test. Consequently, the correlogram of ROE and OBS2 were plotted to explore their stationarity property. It was noted that the autocorrelation function of the level OBS2 gradually declined, which is indicative of a non-stationary process while in the case of ROE, there is no sign of autocorrelation. Thus to proceed, the first difference of OBS2 and BSIZE were employed while ROE was taken at level.

D. Multivariate Result

Table VI shows the multivariate regression analysis for the aggregate data of all the banks (Panel A) and the disaggregate data of conventional banks (Panel B) and Islamic banks (Panel C).

TABLE VI
RESULT WITH ROA FOR ALL MODELS

Panel A: All banks

	Specifications		
	Non Effect Model 1	Fixed Effect Model 2	Random Effect Model 3
ROA(-1)	0.4016***	0.1753**	0.4016***
	(0.0000)	(0.0113)	(0.0000)
C	0.0177***	0.024126***	0.0177***
	(0.0001)	(0.0000)	(0.0000)
IRR	0.0872**	0.1102	0.0872**
	(0.0246)	(0.3305)	(0.0172)
LIQ	0.0017	0.0004	0.0017
	(0.3202)	(0.4841)	(0.2916)
CR	-1.2321***	-1.2783***	-1.2321***
	(0.0000)	(0.0000)	(0.0000)
CR*IRR	24.421***	20.5269***	24.4214***
	(0.0000)	(0.0090)	(0.0000)
BCAP	0.0057	0.0060	0.0057
	(0.2912)	(0.2400)	(0.2628)
DBSIZE	-0.0079***	-0.0052***	-0.0079***
	(0.0000)	(0.0030)	(0.0000)
GDP	-0.0320*	-0.0424***	-0.0320*
	(0.0749)	(0.0022)	(0.0588)
OBS1	0.0054*	0.0079*	0.0054**
	(0.0553)	(0.0518)	(0.0421)
DOBS2	-0.0060	-0.0032	-0.0059
	(0.1775)	(0.2716)	(0.1525)
D	-0.0004	0.0005	-0.0004
	(0.8944)	(0.6839)	(0.8880)
No of observation	295	295	295
Adj R^2	0.5066	0.5617	0.5066
F-statistics	28.4397***	9.1915***	28.4397***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	1.7956	1.8059	1.7956

Panel B: Conventional Banks

	Specifications		
	Non Effect Model 1	Fixed Effect Model 2	Random Effect Model 3
ROA(-1)	0.2671***	0.1350***	0.2671***
	(0.0000)	(0.0089)	(0.0000)
C	-0.0049	-0.0003	-0.0049
	(0.4947)	(0.9752)	(0.5875)
IRR	1.2416***	1.1348***	1.2416***
	(0.0000)	(0.0000)	(0.0000)
LIQ	0.0034	0.0027	0.0034
	(0.2450)	(0.5399)	(0.5901)
CR	-0.7399***	-0.7625***	-0.7399***
	(0.0002)	(0.0000)	(0.0002)
CR*IRR	-1.7434	-4.3471	-1.7434
	(0.7945)	(0.3929)	(0.7885)
BCAP	-0.0121***	-0.0103**	-0.0121
	(0.0029)	(0.0196)	(0.1502)
DBSIZE	-0.0012	0.0009	-0.0012
	(0.7534)	(0.8066)	(0.7633)
GDP	-0.0024	-0.0183	-0.0024
	(0.9200)	(0.5409)	(0.9121)
OBS1	-0.002869	0.004603	-0.002869
	0.5883	0.5778	0.5167

DOBS2	0.0027**	0.0024***	0.0027***
	(0.0120)	(0.0048)	(0.0081)
D	0.0048**	0.0055***	0.0048
	(0.0107)	(0.0021)	(0.1175)
No of observation	187	187	187
Adj R^2	0.6436	0.6563	0.6436
F-Statistics	31.5367***	12.1013***	31.5367***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	2.0149	2.0650	2.0149

Panel C: Islamic banking

	Specifications		
	Non Effect Model 1	**Fixed Effect Model 2**	**Random Effect Model 3**
ROA(-1)	0.2932**	0.17743	0.2932***
	(0.0334)	(0.1339)	(0.0001)
C	0.0121**	0.0149***	0.0121**
	(0.0163)	(0.0000)	(0.0329)
IRR	0.0149	0.0254	0.0149
	(0.8196)	(0.6932)	(0.6156)
LIQ	0.0014	0.0006	0.0014
	(0.2244)	(0.2722)	(0.2602)
CR	-1.0009***	-1.1754***	-1.0009***
	(0.0021)	(0.0001)	(0.0000)
CR*IRR	31.8195***	33.9035***	31.8195***
	(0.0079)	(0.0013)	(0.0000)
BCAP	0.0182	0.0186*	0.01812***
	(0.1027)	(0.0692)	(0.0036)
DBSIZE	-0.0056**	-0.0053**	-0.0056***
	(0.0246)	(0.0113)	(0.0003)
GDP	-0.0408***	-0.0390***	-0.0408**
	0.0002	(0.0000)	(0.0443)
OBS1	-0.0032***	0.0007	-0.0032
	(0.0003)	(0.5690)	(0.2337)
DOBS2	-0.1252	-0.1441	-0.1252
	(0.2178)	(0.1923)	(0.2763)
D	0.0034	0.0033	0.0034
	(0.4419)	(0.2969)	(0.4676)
No of observation	108	108	108
Adj R^2	0.3842	0.4344	0.3841
F-statistics	7.0671***	4.4238***	7.0671***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	1.5103	1.71480	1.5103

Note: ***, **, * indicate significance at 1%, 5% and 10% levels, respectively.
p-values are in the parentheses.

The table reports the estimated coefficients of the panel regression for the fixed effect models (FEM) and the random effect models (REM) with Return on Assets (ROA) as the dependent variable. The first regression in each panel is the Panel Least Squares with no effects which acts as a benchmark while the second and third regression models are the FEM and REM, respectively. Looking at the models, it can be said that the models seems satisfactory for looking at the relationship between financial risks and profitability. Furthermore the F test results generated show the significance of the models

Table VII shows the multivariate regression analysis with return on equity (ROE) as the dependent variable for the aggregate data of all the banks (Panel A) and the disaggregate data of conventional banks (Panel B) and Islamic banks (Panel C).

TABLE VII
RESULT WITH ROE FOR ALL MODELS

Panel A: All banks

	Specifications		
	Non Effect Model 1	**Fixed Effect Model 2**	**Random Effect Model 3**
ROE(-1)	-0.0469**	-0.1160*	-0.0469
	(0.0213)	(0.0979)	(0.3366)
C	1.1822**	0.9501	1.1822
	(0.0115)	(0.1140)	(0.1748)
IRR	-19.9993	-20.0812	-19.9993**
	(0.2877)	(0.2272)	(0.0124)
LIQ	-0.2560**	-0.1130	-0.2560
	(0.0257)	(0.2490)	(0.4763)
CR	-380.1158	-416.4070	-380.1158***
	(0.1546)	(0.1212)	(0.0000)
CR*IRR	11137.28	11857.86	11137.28***
	(0.1934)	(0.1585)	(0.0000)
BCAP	0.6735	1.155074	0.6735
	(0.5699)	(0.4546)	(0.5462)
DBSIZE	0.0780	-0.0543	0.0780
	(0.6396)	(0.8666)	(0.8376)
GDP	1.66145	0.2491	1.6615
	(0.5875)	(0.9262)	(0.6528)
OBS1	0.5744**	1.4299	0.5744
	(0.0135)	(0.1686)	(0.3170)
DOBS2	-1.5391	-2.5135	-1.5391*
	(0.2859)	(0.2392)	(0.0851)
D	0.0890	0.0259	0.0890
	(0.5751)	(0.9065)	(0.8803)
No of observation	295	295	295
Adj R^2	0.2959	0.3094	0.2959
F-statistics	12.2319***	3.8639***	12.2319***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	2.1438	2.2488	2.1438

Panel B: Conventional Banks

	Specifications		
	Non Effect Model 1	**Fixed Effect Model 2**	**Random Effect Model 3**
ROE(-1)	-13.4250	-18.3855	-13.4250
	(0.2767)	(0.3354)	(0.2759)
C	5.1640**	8.8175**	5.1640**
	(0.0320)	(0.0474)	(0.0317)
IRR	-72.1093*	-92.0740**	-72.10927*
	(0.0533)	(0.0491)	(0.0529)
LIQ	-1.5542	-3.6500	-1.5542
	(0.3428)	(0.2088)	(0.3420)
CR	-587.5505** *	-627.2736*	-587.5505***
	(0.0000)	(0.0683)	(0.0000)
CR*IRR	17459.64***	18075.57	17459.64***
	(0.0000)	(0.1203)	(0.0000)
BCAP	0.2515	0.2061	0.2515
	(0.9096)	(0.7179)	(0.9094)
DBSIZE	0.9914	1.2724	0.9914
	(0.3556)	(0.1355)	(0.3548)
GDP	0.2890	-4.4715	0.2890
	(0.9605)	(0.5491)	(0.9604)
OBS1	-0.0858	-0.2370	-0.0858
	(0.9412)	(0.7841)	(0.9411)
DOBS2	-0.5868**	-0.3899	-0.5868**
	(0.0284)	(0.1780)	(0.0281)
D	-0.1704	-0.3715	-0.1704
	(0.8314)	(0.1305)	(0.8311)
No of observation	187	187	187
Adj R^2	0.4371	0.4390	0.4371

F-statistics	14.1292***	5.5484***	14.1292***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	2.2758	2.5054	2.2758

Panel C: Islamic Banking

	Specifications		
	Non Effect Model 1	**Fixed Effect Model 2**	**Random Effect Model 3**
ROE(-1)	0.0497	-0.0400	0.0497
	(0.3670)	(0.5925)	(0.3332)
C	0.5379***	0.5989***	0.5379***
	(0.0000)	(0.0000)	(0.0000)
IRR	-0.1853	-0.3458	-0.185
	(0.6857)	(0.4454)	(0.6641)
LIQ	-0.0006	0.0014	-0.0005
	(0.9789)	(0.9331)	(0.9773)
CR	-7.8644**	-12.0250***	-7.8644**
	(0.0172)	(0.0002)	(0.0107)
CR*IRR	138.0168	221.3433*	138.0168
	(0.2409)	(0.0873)	(0.2085)
BCAP	-0.4484***	-0.4911***	-0.4484***
	(0.0000)	(0.0024)	(0.0000)
DBSIZE	-0.0541**	-0.0581	-0.0541**
	(0.0191)	(0.0142)**	(0.0121)
GDP	-0.4148	-0.4562	-0.4148
	(0.1862)	(0.0214)	(0.1563)
OBS1	-0.0272	-0.06208	-0.0272
	(0.5044)	(0.0126)**	(0.4739)
DOBS2	-0.9102	-1.2910	-0.9102
	(0.6069)	(0.4014)	(0.5809)
D	-0.1685**	-0.1733***	-0.1685**
	(0.0222)	(0.0009)	(0.0143)
No of observation	108	108	108
Adj R^2	0.2497	0.3483	0.2497
F-statistics	4.237***	3.3830***	4.2365***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	1.6130	1.7391	1.6130

Note: ***, **, * indicate significance at 1%, 5% and 10% levels, respectively
p-values are in the parentheses.

The table reports the estimated coefficients of the panel regression for the fixed effect models (FEM) and the random effect models (REM). The first regression in each panel is the Panel Least Squares with no effects which acts as a benchmark while the second and third regression models are the FEM and REM, respectively.

E. Specification Test

The random effects estimator is the asymptotically efficient estimator while the fixed effects estimator is unbiased and consistent but not efficient[1]. In order to specify the model, in the static panel data analysis, a model specification test was performed. In choosing the model between the Fixed Effect Model (FEM) and the Random Effect Model (REM), this study employs the specification test developed by [47]. The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with other regressors in the model. The test statistics has an asymptotic χ^2 distribution. If the null hypothesis is rejected, it means that the effects are correlated, thus a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions; the conclusion is that REM is not appropriate and that it is better off using FEM [35].

Table VIII presents the results of the Hausman specification test done on the FEM and REM in Table VI and VII.

TABLE VIII
HAUSMAN MODEL SPECIFICATION TEST

	Types of banks		
	All banks Model 1	**Conventional Model 2**	**Islamic Model 3**
Return on Asset			
χ^2	65.4408	25.8719	19.7467
Degrees of freedom	11	11	11
Probability	0.0000***	0.0068***	0.0489**
Justification	FEM	FEM	FEM
Return on Equity			
χ^2	40.4926	13.7108	27.4846
Degrees of freedom	11	11	11
Probability	0.0000***	0.2494	0.0039***
Justification	FEM	REM	FEM

Note. ***, **, * indicate significance at 1%, 5% and 10% levels, respectively
FEM=Fixed Effect Model, REM=Random Effect Model.

It can be seen that the application of the Hausman specification test rejected the random effect model in favour of the fixed effect model at 1% significance level for the aggregate data. As for the conventional banking data, the Hausman test rejected the random effect model in favour of the fixed model for ROA as the dependent variable and accepted the random effect model for ROE as the dependent variable. In the case of Islamic banking, Hausman test statistics shows that they are significant at the 5% level for ROA as the dependent variable while it is significant at 1% level of ROE as the dependent variable, thus the random effect models are rejected in favour of the fixed effect model.

F. Multivariate Result with ROA as the Dependent Variable

Table IX exhibits the coefficient estimates of the regression analysis for the aggregate data of all banks and the disaggregate data of the conventional and Islamic banks with ROA as the dependent variable. The conventional banks data consists of 187 observations on 22 banks while the Islamic banks data consists of 108 observations of 14 full fledged Islamic banks, Islamic banks subsidiaries and Islamic banking scheme.

TABLE IX
MULTIVARIATE RESULT WITH ROA AS THE DEPENDENT VARIABLE

	Types of banks		
	All banks FEM	**Conventional FEM**	**Islamic Banks FEM**
ROA(-1)	0.1753**	0.1350***	0.17743
	(0.0113)	(0.0089)	(0.1339)
C	0.024126***	-0.0003	0.0149***
	(0.0000)	(0.9752)	(0.0000)
IRR	0.1102	1.1348***	0.0254

[1] RAE, C.R. Linear Statistical Inference, Wiley 1973, as quoted in Hausman (1978).

	(0.3305)	(0.0000)	(0.6932)
LIQ	0.0004	0.0027	0.0006
	(0.4841)	(0.5399)	(0.2722)
CR	-1.2783***	-0.7625***	-1.1754***
	(0.0000)	(0.0000)	(0.0001)
CR*IRR	20.5269***	-4.3471	33.9035***
	(0.0090)	(0.3929)	(0.0013)
BCAP	0.0060	-0.0103**	0.0186*
	(0.2400)	(0.0196)	(0.0692)
DBSIZE	-0.0052***	0.0009	-0.0053**
	(0.0030)	(0.8066)	(0.0113)
GDP	-0.0424***	-0.0183	-0.0390***
	(0.0022)	(0.5409)	(0.0000)
OBS1	0.0079*	0.0046	0.0007
	(0.0518)	(0.5778)	(0.5690)
DOBS2	-0.0032	0.0024***	-0.1441
	(0.2716)	(0.0048)	(0.1923)
D	0.0005	0.0055***	0.0033
	(0.6839)	(0.0021)	(0.2969)
No of observation	295	187	108
Adj R^2	0.5617	0.6563	0.4344
F-statistics	9.1915***	12.1013***	4.4238***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	1.8059	2.0650	1.71480

Note: ***, **, * indicate significance at 1%, 5% and 10% levels, respectively
p-values are in the parentheses.

The effect of credit risk on ROA is negative and is highly significant at 1% level of significance for the full sample and the sub-samples of conventional and Islamic banks. The finding concurs with [10] and [28]. The result may be justified by the fact that as more banks are exposed to high risk loan, the higher the accumulation of unpaid loans, the higher the loan loss provision, implying that these loan losses have produced a decreased return for many commercial banks.

The effect of liquidity risk on ROA is found to be positive but insignificant for the full sample and the sub samples of conventional and Islamic banks.

The effect of interest rate risk on ROA is positive. However, the effect is significant at 1% level of significance to conventional banks but insignificant for the full sample and the sub sample of Islamic banking. No previous studies have looked at the relationship between interest rate risk and ROA. Only [8] had looked at the relationship between interest rate risk and net interest margin and found that they have an inverse relationship.

As for the effect of the interaction of credit risk and interest rate risk on ROA, there are mixed results. It is found to be significant and positively related to ROA for the full sample and Islamic banks but insignificant negative impact for the conventional banks. Ref. [8] also had mixed result in his comparative study on the relationship between the interaction of credit risk and interest rate risk and net interest margin.

The off balance sheet activities are divided into two parts namely the non interest income which are credit related (OBS1) and the derivatives activities (OBS2) of the banks. Looking at the effect of the off balance sheet activities which are credit related, the estimated coefficients are positively related to ROA for all the banks, conventional and Islamic banks but weakly significant for all banks at 10%.

As for OBS2, there are mixed results. The relationship is found to be negative but insignificant for the aggregate data of all the banks and also the Islamic banks. However, for the conventional banks, OBS2 is found to have a direct and significant relationship with ROA.

The result shows that the coefficients of GDP growth on ROA are negative and highly significant at 1% for all banks and Islamic banks but insignificant for conventional banks.

The effect of bank size on ROA is significantly negative at 1% and 5% for all the banks and the Islamic banks, respectively. This finding is in line with the findings of [28] and [9]. It is however inconsistent with the findings of the conventional banks as the effect is positive but insignificant. Bank size is usually used to capture potential economies and diseconomies of scale in the banking sector. Positive relationship between size and profitability means that the banks benefit from the scale and scope of economies and there is risk diversification according to the size of the bank [48] and [12].

As for the effect of bank capital on ROA, bank capital has a positive effect on ROA for all banks and weakly significant positive effect at 10% for Islamic banks. The effect however is negative and significant at 5% for conventional banks.

The lagged dependent variable of ROA shows a positive effect on the current one. The effect is highly significant (1% level of significance) for the conventional bank and significant (5% level of significance) for the full sample. The result is consistent with the findings by [10]. The highly significant coefficient of the lagged ROA variable for the conventional banks shows that there is dynamic character of the specification. This implies that there is profitability persistence which means that the current profitability has a strong effect on the future profitability of the banks.

Inflation is a widely used proxy for the effect of the macroeconomic environment on bank profitability. Originally the variable was included in the preliminary model. However, the variable was dropped from the model when it was found to be insignificant and has no effect on both ROE and ROA.

The coefficient of the dummy variable is positive and significant for the conventional banks with ROA as the dependent variable. This implies that ROA is significantly affected after the financial crisis.

G.Multivariate Result with ROE as the Dependent Variable

Table X reports the coefficient estimates of the regression analysis for the aggregate data of all banks and the disaggregate data of the conventional and Islamic banks with ROE as the dependent variable.

TABLE X
MULTIVARIATE RESULT WITH ROE AS THE DEPENDENT VARIABLE

	Types of banks		
	All banks FEM	**Conventional REM**	**Islamic bank FEM**
ROE(-1)	-0.1160*	-13.4250	-0.0400
	(0.0979)	(0.2759)	(0.5925)
C	0.9501	5.1640**	0.5989***
	(0.1140)	(0.0317)	(0.0000)
IRR	-20.0812	-72.10927*	-0.3458

	(0.2272)	(0.0529)	(0.4454)
LIQ	-0.1130	-1.5542	0.0014
	(0.2490)	(0.3420)	(0.9331)
CR	-416.4070	-587.5505***	-12.0250***
	(0.1212)	(0.0000)	(0.0002)
CR*IRR	11857.86	17459.64***	221.3433*
	(0.1585)	(0.0000)	(0.0873)
BCAP	1.155074	0.2515	-0.4911***
	(0.4546)	(0.9094)	(0.0024)
DBSIZE	-0.0543	0.9914	-0.0581**
	(0.8666)	(0.3548)	(0.0142)
GDP	0.2491	0.2890	-0.4562
	(0.9262)	(0.9604)	(0.0214)
OBS1	1.4299	-0.0858	-0.06208**
	(0.1686)	(0.9411)	(0.0126)
DOBS2	-2.5135	-0.5868**	-1.2910
	(0.2392)	(0.0281)	(0.4014)
D	0.0259	-0.1704	-0.1733***
	(0.9065)	(0.8311)	(0.0009)
No of observation	295	187	108
Adj R^2	0.3094	0.4371	0.3483
F-statistics	3.8639***	14.1292***	3.3830***
	(0.0000)	(0.0000)	(0.0000)
DW-statistics	2.2488	2.2758	1.7391

Note: ***, **, * indicate significance at 1%, 5% and 10% levels, respectively
p-values are in the parentheses.

The effect of credit risk on ROE is negative and highly significant at 1% for the conventional and Islamic banks however, it is not significant for the aggregate data. The finding concurs with [10] and [28]. The result may be justified by the fact that as more banks are exposed to high risk loan, the higher the accumulation of unpaid loans, the higher the loan loss provision, implying that these loan losses have produced a decreased return for many commercial banks.

Although there is a mix effect of liquidity risk on ROE whereby the relationship is found to be negative for the aggregate data of all banks and the disaggregate data of conventional banks and positive for the Islamic banks however, the effect is insignificant. Previous studies by [49] found a positive and significant relationship between liquidity risk and ROE while [8] in his study also found the liquidity risk to be negatively related to the net interest margin.

The interest rate risk is found to be negatively related to ROE and weakly significant at 10% for conventional banks. This implies an inverse relationship between interest rate risk and profitability.

However, in relation to ROE, the interaction between credit risk and interest rate risk is positively related to ROE, highly significant at 1% for conventional banks but weakly significant at 10% for Islamic banks. Ref. [8] also had mixed result in his comparative study on the relationship between the interaction of credit risk and interest rate risk and net interest margin.

In the case of off balance sheet activities, OBS1 (credit related activities) has a significant relationship with ROE for Islamic banking while for OBS2 (derivatives related activities), the relationship is negative and significant (5%) for the conventional banks but insignificant for the Islamic banks as the Islamic banks do not heavily use the derivatives in managing their risks.

GDP growth does not have any significant impact on ROE of the Malaysian banks implying that favourable GDP growth does not significantly improve the banks' ROE.

Bank size is usually used to capture potential economies and diseconomies of scale in the banking sector. High profitability tends to be associated with banks that hold a relatively high amount of capital. Thus a positive relationship between size and profitability means that the banks benefit from the scale and scope of economies and there is risk diversification according to the size of the bank [48] and [12]. The results however show that the bank size of the conventional bank is positively associated with ROE, however the effect is insignificant. On the other hand, there is an inverse significant (5% significant level) negative relationship between bank size and ROE for the Islamic banking. The negative correlation between the banks size and ROE suggests that large size is associated with less profitability in Islamic banks. The possible reason could be that the size is not the optimal one that could contribute to higher profitability.

The relationship between bank capital and ROE is positive but insignificant for all banks and conventional banks while it is negative and highly significant at 1% for Islamic banks. A positive relationship suggests that a higher equity capital gives the banks the opportunity to increase their return on equity and hence their profitability. Hence the indirect relationship between the bank capital of Islamic bank and ROE implies that higher equity capital need not necessarily leads to higher profitability. The possible reason could be that there are limited investment instruments that are *Shari'ah* (Islamic Law) compliant that would enable the Islamic banks to invest in.

The lagged ROE shows that there is a negative effect on the current ROE. It is weakly significant for the aggregate data of all the banks but are insignificant for the Islamic and conventional banks. This could mean that the current ROE will not have a significant influence on the future ROE. It does not show the trend that if the current ROE is high, the following year's ROE would also be high. This finding is inconsistent with the previous findings of [12] and [10] whereby the current ROE is positive and significantly related to the previous year's ROE. Perhaps this inconsistency could be due to the different financial landscape and architecture that the banks are exposed to and also the different nature and behaviour of the Malaysian stock market.

The coefficient of the dummy variable which represents the period after the financial crisis shows that it is highly significant for the Islamic banks but insignificant for all the banks and the conventional banks. This implies that the return on equity of the Islamic banks is highly affected after the financial crisis.

V. Conclusion and Further Research

The preceding empirical analysis shed some light on the relationship between the financial risks and the profitability measures in conventional and Islamic banks. Based on the

empirical evidence, it cannot be concluded that the financial risks have an impact on the profitability of the banks (see Table XI). This is due to the fact that liquidity risk does not have an impact on the profitability of the banks. However, the credit risk variable which is the ratio of the loan loss reserves to total assets have a negative impact on profitability measures and is statistically significant indicating that higher risks result in lower margin. Interest rate risks of the conventional banks significantly affect the return on assets positively and return on equity negatively. Although Islamic banking does not deal with interest- based transactions, the banks are also exposed to interest rate risk However; interest rate risks have no significant impact on the profitability of the Islamic banking.

TABLE XI
SUMMARY OF THE FINDINGS

Hypothesis		Findings
H1:	The financial risks have an impact on the profitability of the banks.	Inconclusive
Sub-hypotheses:		
H1a:	Credit risk has an impact on the profitability of the banks	Significant
H1b:	Interest rate risk has an impact on the profitability of the banks	Significant
H1c:	Liquidity risk has an impact on the profitability of the banks	Not Significant

As a summary it can be said that both ROA and ROE of conventional banks are affected by interest rate risk, credit risk and the off balance sheet activities of the banks in relation to derivatives. ROA are also affected by previous year ROA, bank capital, and also the financial crisis. While the ROE are also affected by the interaction between credit risk and interest rate risk.

In the case of Islamic banks, the profitability measures of ROA and ROE are affected by credit risk, the interaction between credit risk and interest rate risk, bank size. The ROA of Islamic banks are affected by GDP growth while the ROE are also affected by bank capitalization, the off balance sheet activities that are credit related and the financial crisis.

As for the profitability study, several extensions would be useful. At the present moment, the Islamic banks are still in their infancy stage, hence the study could not employ the dynamic models effectively, however, it is possible to extend the study period in the future. It would also be of interest to use quarterly data so that a clearer sense of the dynamic responses of bank profitability movements can be obtained. It is therefore suggested that future research cover a wider cross-section, a longer and different time period and include a wider range of variables.

The main limitation is the short span of the period of study, as most of the Islamic banks in Malaysia are still new. Thus it is not feasible to do the study using the dynamic panel data regression analysis at the present moment.

There are still a lot of avenues and opportunities to explore further in this area. As a matter of fact, further studies should not be limited to the banking industry only but should also be extended to other industries as well.

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