

# Key Risk Determinants of Listed Deposit-Taking Institutions in Malaysia

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## ABSTRACT

*Risk management is a critical function in banking operations in the wake of several banking crises. However, we find few studies on risk management and a lack of empirical investigation on factors affecting the risk of Malaysian banks. These gaps have motivated us to identify the main factors associated with the risk of locally listed deposit-taking institutions. The findings show that three factors were significantly associated with unsystematic risk, while the systematic risk and the total risk of these deposit-taking institutions were significantly affected by four main factors. These four factors namely non-performing loans, cost of funds, loan to deposit ratio and inter-bank offered rate however, were found to have a more profound effect on the total risk than on the systematic risk or the unsystematic risk of Malaysian deposit-taking institutions.*

**Keywords:** bank risk, problem loans, deposit-taking institutions  
**JEL Classification:** G21; G28

## ABSTRAK

*Pengurusan risiko menjadi satu fungsi yang penting dalam operasi bank berikutan daripada beberapa krisis perbankan masa kini. Namun, kajian mengenai pengurusan risiko dan penyelidikan untuk mengenal pasti faktor-faktor yang mempengaruhi risiko bank-bank di Malaysia adalah kurang. Kekurangan ini mendorong kajian dilakukan untuk mengenal pasti faktor-faktor utama yang mempengaruhi risiko bank-bank tercatat di Malaysia. Hasil kajian menunjukkan tiga faktor utama mempunyai hubungan yang signifikan dengan risiko bukan sistematik manakala, risiko sistematik dan risiko keseluruhan sesebuah institusi tabungan dipengaruhi secara signifikan oleh empat faktor utama. Faktor utama seperti pinjaman bermasalah, kos dana, nisbah pinjaman-deposit dan kadar faedah antara bank, mempunyai impak yang lebih besar ke atas risiko keseluruhan berbanding impaknya ke atas risiko sistematik dan risiko tidak sistematik.*

## INTRODUCTION

Risk is defined in finance theory as the uncertainty, or the possibility, that the actual return (from holding an asset such as a loan by a financial institution) will deviate from the expected return. The greater the deviation, the higher is the risk (Van

Horne, 2002; Mishkin & Eakins, 1998; Sinkey, 1998). Total risk, which reflects the overall risk exposure of a firm, can be decomposed into systematic risk and unsystematic risk (Van Horne, 2002). Systematic risk refers to the variability of a firm's excess returns to that of the overall market portfolio. This risk depends on changes

in external factors such as changes in the market or the economy, which affect all stocks. Unsystematic risk is the variability of a firm's returns due to changes in a firm's specific factors (internal factors). While systematic risk cannot be controlled, unsystematic risk can be controlled or mitigated since a bank can manage the changes in its internal factors. In practice, a bank can do this through the proper diversification of asset portfolio and efficient management of bank operations. Thus, a bank's exposure to total risk depends on the combined effects of its exposure to systematic risk and unsystematic risk.

Rapid changes in the present financial landscape have posed a great deal of uncertainties to a bank, thus making risk management a critical function in bank operations. A bank with greater exposure to total risk would experience fluctuations in its profits or even incur losses, both of which might affect the bank's market value and survival. In the wake of several major bank failures, studies on risk management in banking began to receive the serious attention of practitioners and researchers. There are two strands of literature concerning bank risk management studies. One strand appears to suggest internal variables as potential determinants of unsystematic risk (see Hassan, 1993; Brewer, Jackson, & Mondschean, 1996; Gallo, Apilado, & Kolari, 1996; Berger & DeYoung, 1997; Angbazo, 1997). The second strand of literature highlights changes in external variables in the financial markets, regulations and economic conditions as affecting the systematic bank risk (Hein & Mendez, 1992; Hassan, Karels, & Peterson, 1994; Corsetti, Pesenti, & Roubini, 1998). Both streams provide evidence of significant relations among the internal variables, external factors and bank risk.

We find several gaps in these past studies. Firstly, the studies mainly concentrate on large commercial banks (Shrieves & Dahl, 1992; Hassan, 1993; Hassan et al., 1994; Galloway, Lee, & Roden, 1997). Secondly, few empirical investigations have been conducted on banking institutions in developing countries although financial institutions in these countries experienced very high risk from the after-effects of the 1997 Asean

Financial Crisis. For instance, studies on risk determinants of deposit-taking institutions in Malaysia have not been widely explored.

The gaps in the literature motivated us to investigate the factors that have significant influence on the risk formation of financial institutions. The focus was on the Malaysian deposit-taking financial institutions listed on the Kuala Lumpur Stock Exchange. These institutions were selected primarily because they are listed and have been granted licenses from Bank Negara Malaysia to accept deposits from the public. As licensed deposit-taking institutions, they play a vital role in the capital market and in the credit creation process of the economy. Since the nature of the banking business involves taking risks, it is how well a bank manages its risk that, to a large extent, determines its performance.

A bank that performs poorly may not be able to play an effective role in the credit creation process. Therefore, we envisaged the identification of key factors that determine their risks as a necessary step in assisting banks to manage their risks adequately. We hope to contribute vital information about the significant impact of these factors on risks so that the management can minimize these risks, and thus, maximize bank profits and shareholder wealth. In addition, this study contributes additional research in the risk management of Malaysian banks. Hence, the objectives of the study were:

- (i) to provide descriptive statistics of the listed deposit-taking institutions' risk predictors.
- (ii) to investigate key determinants of systematic risk (that is, risk due to external factors); unsystematic risk (that is, risk due to changes in internal factors) and total risk (that is, the overall risk exposure) of listed deposit-taking institutions.
- (iii) to highlight policy implications from the research findings.

This paper is organized into five sections. Section 2 reviews relevant theories and evidence relating to the determinants of the risk of financial institutions. Section 3 describes the methodology used. Section 4 provides a discussion on the results and Section 5 concludes the paper.



were found to be significant but negatively related to risk. However, non-fixed rate mortgage loan was significant and positively related to risk.

Galloway, Lee, and Roden, (1997) used standard deviation of weekly share returns as a proxy for bank risk while market to book value, operating leverage, capital, real size and highrisk, a dummy variable were five independent criterion variables used. The study shows that capital was significantly but negatively related to risk. In contrast, operating leverage (OPLEV) and Size had mixed results. OPLEV coefficient was positive in the pre-deregulatory periods but negative in the deregulatory periods. However, it was significant and positively related to risk in the post deregulation and re-regulation periods. Size (measured by market value of equity) was positive and was significantly related to risk during the regulatory period but was negatively significant during the deregulatory regime when restrictions were imposed on banks following the too-big-to-fail policy. In contrast, Gallo, Apilado, and Kolari (1996) found no significant relation between leverage and risk. However, bank loan to total assets was significant and positively related to the firm's systematic risk and systematic industry risk.

Berger and DeYoung, (1997) found lagged risk-weighted asset (RWA) significantly and positively related to risk measured by NPL to total loans. (NPL, as a proxy of bank risk was also identified in Corsetti, Pesenti & Roubini, 1998). Berger and DeYoung (1997) rationalized that a relatively risky loan portfolio would result in higher non-performing loans. Lagged Capital measured by equity capital to total assets showed mixed results for different types of banks. In the case of thinly capitalized banks, lagged Capital coefficient estimate was significantly but negatively related to risk. This finding supports the moral hazard hypothesis, and suggests that, on an average, thinly capitalized banks take more risky loans, which potentially could lead to higher problem loans. However, for the all-banks sample, the lagged Capital coefficient was positive and significant. The researchers suggest that a possible reason could be that banks may raise the capital in advance to provide a cushion against possible loan loss arising from NPL increases.

Ahmed, Takeda and Shawn, (1998) found loan loss provision (LLP to total asset) to be positive and significantly associated with NPL. Hence, a higher LLP indicates an increase in risk and deterioration in loan quality. A study of banks in NAFTA countries by Fisher, Gueyie and Ortiz (2000) found similar results where LLP was positively related to risk (measured by the standard deviation of stock price returns). In Canada and Mexico, leverage was found to be significant and positively related to risk. In the U.S., Size (measured by natural logarithm of total assets) was significant and negatively related to risk.

A recent study by Lim (2001) showed that the average lending rate, inflation, and credit growth were negatively related but that loans to property sector and loan for purchase of securities were positively associated with a banking crisis. These factors were significant at the 5 percent level.

## METHODOLOGY

### *Data and Variables*

The data comprises the daily closing share prices, the daily KLSE Composite Indexes and the yearly financial ratios of the listed deposit-taking institutions. The study period was 7 years (1994 to 2000). The deposit-taking institutions consisted of three bank holding companies (BHC), two merchant banks, two finance companies and nine commercial banks. The 16 institutions are listed in Table 1. The daily prices and indexes were obtained from EXTEL and the databases in two stock-broking companies. The prices have been adjusted for bonus, rights issues and dividends. The financial ratios were computed from the annual reports of the listed deposit-taking institutions.

Three risk measures were employed namely (i) systematic risk (measured by beta) as used by Friend and Lang (1988); Shrieves and Dahl (1992); Davis (1993) and Hassan (1993), (ii) unsystematic risk (measured by standard deviations of regression residuals) as used in Gallo et al. (1996) and (iii) total risk (measured by standard deviations of share price returns) as used in Galloway et al. (1997); Hassan, et al. (1994);

**Table 1**

Malaysian Listed Deposit-taking institutions as at end 2000\*

| Financial Institutions                                 | Shareholder Equity<br>(RM' 000) | Total Assets<br>(RM' 000) |
|--|---------------------------------|---------------------------|
| Affin Holdings Berhad (AFFIN) <sup>1</sup>             | 961,597                         | 104,810,680               |
| Arab Malaysian Finance (AMFIN)                         | 851,534                         | 13,408,297                |
| Arab Malaysian Merchant Bank (AMBB)                    | 879,540                         | 14,901,418                |
| Ban Hin Lee Bank (BHL)                                 | 365,364                         | 4,113,062                 |
| Commerce-Asset Holdings Berhad <sup>2</sup> (COMMERCE) | 1,708,305                       | 58,232,510                |
| Hong Leong Bank (HLEONG)                               | 1,643,056                       | 17,395,787                |
| Malayan Banking Berhad (MAYBANK)                       | 7,711,747                       | 78,615,874                |
| Pacific Bank Berhad (PACIFIC)                          | 308,470                         | 7,075,429                 |
| Public Bank Berhad (PUBLICB)                           | 2,757,689                       | 27,459,672                |
| Public Finance Berhad (PUBLICFIN)                      | 1,135,899                       | 11,887,671                |
| RHB Berhad (RHB)                                       | 448,657                         | 48,891,091                |
| RHB Sakura Merchant Bank Berhad (RHB-SAK)              | 645,948                         | 2,851,052                 |
| Southern Bank Berhad (SBB)                             | 1,461,456                       | 9,793,005                 |
| Bank Islam Berhad (BISLAM)                             | 978,453                         | 8,492,306                 |
| Utama Banking Group (UTAMA) <sup>3</sup>               | 6,448                           | 8,727,527                 |
| Phileo Allied Bank (PHILEO)                            | 539,822                         | 7,861,587                 |

\* Statistics of individual financial institution before bank mergers and restructuring exercise of the banking sector.  
1. BHC of Affin Bank Berhad. 2. BHC of Bumiputra-Commerce Bank Berhad. 3. BHC of Utama Bank Berhad.

**Table 2**

Definitions of Bank-Specific Variables

| Variable         | Definition  |
|------------------|---|
| NPL              | NPL/TL (NPL is the current NPL for the year. TL= total loans and advances for the year)                     |
| NPLlag           | $NPL_{t-1} / TL_{t-1}$ (1 year lag)   |
| MGT              | Earning asset/ Total assets   |
| LEV              | Tier 2 capital/(Tier-1 capital +Tier-2 capital)   |
| CON              | [Loan concentration in (Property + share financing + credit consumption)] / Total Loans                     |
| REGCAP           | Tier-1 capital /Total Loans   |
| LLP              | Loan loss provisions/Total loans  |
| FCOST            | (Interest expense + non-interest expense)/Total assets  |
| SPREAD           | (Total interest income/total earning assets) – (Total interest expense/ Total interest bearing liabilities) |
| GAP              | (All assets < 1 year – all liabilities <1 year) / Shareholders' fund  |
| IBOR             | 3-month December –end Kuala Lumpur Inter-bank Offered Rate  |
| RWA              | Risk weighted assets/Total assets   |
| LNTA(RM billion) | Natural log of total assets   |
| LD               | Total loans/ (Fixed Deposits + Negotiable Instruments of Deposits.  |

Cummins, and Sommer, (1996) and Fisher, Gueyie, and Ortiz (2000).

The independent variables comprise internal and external factors as identified in the literature review. The definition of each variable and the expected signs of the coefficient estimates are summarized in Table 2.

### Hypothesis

The null hypothesis is:

$H_0$ : *There is no significant relation between the internal and external variables of the financial institution and risk.*

### Test Model

The hypothesis is tested on the three risk measures: beta (for systematic risk), standard deviation of residuals (for unsystematic risk) and standard deviation of returns (for total risk). The model developed is an extension of earlier studies by Hassan (1993); Hassan et al. (1994); Angbazo (1997); Gallo et al. (1996); Berger and DeYoung (1997); Fisher, Gueyie and Ortiz (2000); and Lim (2001). These studies are extended by incorporating other variables such as non-performing loan, loan concentration in risky sector, leverage and loan-to-deposit ratio. The rationale is that these variables have been cited as having influence on the risk of banks (Obiyathullah, 1998; Thilainathan, 1997). However, the impact of these factors on the risk of listed deposit-taking institutions has not been statistically tested in Malaysian cases. The general form of the model is stated below.

$$RISK_{jt} = \lambda_0 + \lambda_1 \ln NPL + \lambda_2 \ln NPLt-1 + \lambda_3 \ln MGT + \lambda_4 \ln LEV + \lambda_5 \ln CON + \lambda_6 \ln REGCAP + \lambda_7 \ln LLP + \lambda_8 \ln FCOST + \lambda_9 \ln SPREAD + \lambda_{10} \ln GAP + \lambda_{11} \ln IBOR + \lambda_{12} \ln RWA + \lambda_{13} \ln LD + \lambda_{14} \ln LNTA + \epsilon_{j,t} \quad (2)$$

where,  $RISK_{jt}$  stands for the 3 dependent variables - systematic risk (beta), unsystematic risk and total risk of bank  $j$  for year  $t$ . The definition of each risk predictor is presented in Table 2.  $\epsilon_{j,t}$  is a random error term of bank  $j$  for year  $t$ .

Beta was computed using Single Index Model (Sharpe, 1963) as in Ariff, Shamsher, and Annuar, (1998). The share price returns ( $R_{jt}$ ) and the market returns ( $R_{mt}$ ) were specified as log returns to ensure that data distribution is normal. The returns were adjusted for non-synchronous trading using Dimson (1979) with 2-day lags and 1-day lead.

## RESULTS

### Descriptive Statistics

Table 3 is a summary of descriptive statistics. The mean values of risk measures are: 1.26 (systematic risk); 0.05 (unsystematic risk) and 0.54 (total risk). The beta value of 1.26 reflects the risky nature of the banking business and the vulnerability of Malaysian banks to market changes during the 1994 to 2000 test period. Table 4 shows the vulnerability of the listed banks to systematic risk where RHB Sakura Merchant Bank has the highest average beta of 1.75 while Southern Bank has the lowest average beta of 0.86. Maybank, the largest commercial bank, has an average beta of 1.17, which is higher than that of Public Bank, which has a beta value of 0.91. This suggests that Maybank experienced higher systematic risk than Public Bank during the study period.

The average NPL ratio (credit risk) of the deposit-taking institutions is 0.087 or 8.7 percent, which is four times higher than the international standard of 2 percent. This high average is partly due to an escalation of NPL from the after-effect of the 1997 financial crisis. The mean ratio of CON is 0.430. This statistic indicates that, on average, 43 percent of loans of the financial institutions were disbursed to risky sectors: property, share financing, and consumption credits sectors. These statistics suggest that there exists non-compliance to the 30 percent guideline issued by BNM. However, this did not apply across the board as the standard deviation of CON (0.2507) suggests that there are marked differences amongst the individual institution's loan exposure to risky sectors. The variable with the highest standard deviation is GAP (2.323), which indicates that there is a big variance in interest rate risk exposure between banks during this period.

**Table 3**  
Descriptive Statistics

| Dependent Variables   | MEAN    | STDEV   |
|-----------------------|---------|---------|
| BETA                  | 1.26498 | 0.56956 |
| $\sigma$ RESIDUALS    | 0.05305 | 0.02142 |
| $\sigma$ RETURNS      | 0.54901 | 0.23522 |
| Independent Variables |         |         |
| lnNPL                 | 0.08683 | 0.06801 |
| lnNPLLAG              | 0.08507 | 0.07313 |
| lnMGT                 | 0.86603 | 0.19755 |
| lnREGCAP              | 0.13883 | 0.06952 |
| lnCON                 | 0.43046 | 0.25074 |
| lnFCOST               | 0.05784 | 0.01789 |
| lnLLP                 | 0.01698 | 0.01401 |
| lnLEV                 | 0.23254 | 0.18622 |
| lnGAP                 | 0.51776 | 2.32322 |
| lnIBOR                | 0.05741 | 0.02344 |
| lnRWA                 | 1.10044 | 1.27967 |
| lnSPREAD              | 0.03094 | 0.02462 |
| lnLD                  | 1.32285 | 0.76572 |
| LNTA (RM BIL)         | 9.57430 | 0.94213 |

**Table 4**  
Beta of Deposit-taking Institutions: 1995-2000

| Institutions   | 1995 | 1996  | 1997 | 1998 | 1999 | 2000 | Average |
|----------------|------|-------|------|------|------|------|---------|
| AFFIN          | 1.55 | 1.71  | 1.54 | 1.52 | 1.32 | 1.02 | 1.44    |
| AMFIN          | 1.40 | 1.56  | 1.45 | 2.49 | 1.28 | 2.03 | 1.70    |
| AMBB           | 0.81 | 1.52  | 0.55 | 2.10 | 1.63 | 2.00 | 1.43    |
| BHL            | 1.13 | 0.50  | 0.18 | 1.54 | 0.93 | 1.04 | 0.89    |
| COMMERCE       | 1.42 | 1.18  | 1.25 | 1.81 | 1.71 | 1.14 | 1.42    |
| HLEONG         | NA   | 1.42  | 1.14 | 1.30 | 1.31 | 1.20 | 1.17    |
| MAYBANK        | 1.01 | 1.15  | 1.20 | 1.56 | 1.15 | 0.92 | 1.17    |
| PACIFIC        | 1.75 | 0.24  | 3.20 | 1.18 | 0.76 | 0.88 | 1.34    |
| PUBLIC-B       | 1.52 | 0.44  | 0.43 | 1.22 | 1.33 | 0.54 | 0.91    |
| PUBLIC-F       | 1.04 | 1.22  | 1.26 | 1.50 | 1.07 | 1.34 | 1.24    |
| RHB            | 1.69 | 1.91  | 1.22 | 1.71 | 1.58 | 1.90 | 1.67    |
| RHB-SAKURA*    | NA   | NA    | NA   | NA   | 1.94 | 1.57 | 1.75    |
| SBB            | 0.98 | 0.52  | 0.40 | 0.70 | 0.48 | 2.08 | 0.86    |
| BISLAM         | 1.48 | 0.26  | 0.34 | 1.63 | 0.59 | 1.46 | 0.96    |
| UTAMA*         | NA   | NA    | NA   | NA   | 1.11 | 1.43 | 1.27    |
| PHILEO         | 2.29 | -0.12 | 0.89 | 0.68 | 0.68 | 1.83 | 1.20    |
| Av. of all FIs | 1.39 | 0.96  | 1.07 | 1.56 | 1.18 | 1.40 | 1.28    |

\* Stocks were only listed since 1999.

### *Multicollinearity and Econometric Treatment Result*

In order to ensure that all regression assumptions are met, each variable is tested for linearity and normality. Initial tests indicate that the variables are heteroskedastic and nonlinear. Based on Hair, Anderson, Tatham, and Black, (1998),

heteroskedasticity and nonlinearity can be remedied through data transformation. Thus, all variables were transformed into log form to ensure linearity and homoskedasticity. Correlation analysis and collinearity diagnostic were then carried out to assess the extent of collinearity between the independent variables.

**Table 5**  
Correlation Matrix of Risk Predictors

|        | NPL     | NPLLAG  | MGT     | REGCAP  | CONS    | FCOST  | LLP   | LEV    | GAP   | IBOR  | RWA   | SPREAD | TA   | LD |
|--------|---------|---------|---------|---------|---------|--------|-------|--------|-------|-------|-------|--------|------|----|
| NPL    | 1       |         |         |         |         |        |       |        |       |       |       |        |      |    |
| NPLLAG | .520**  | 1       |         |         |         |        |       |        |       |       |       |        |      |    |
| MGT    | .181    | .031    | 1       |         |         |        |       |        |       |       |       |        |      |    |
| REGCAP | -.193   | -.244*  | -.111   | 1       |         |        |       |        |       |       |       |        |      |    |
| CONS   | .226    | .061    | -.141   | .076    | 1       |        |       |        |       |       |       |        |      |    |
| FCOST  | -.053   | -.305** | -.071   | .121    | .132    | 1      |       |        |       |       |       |        |      |    |
| LLP    | .572**  | .076    | .005    | -.022   | .126    | .190   | 1     |        |       |       |       |        |      |    |
| LEV    | .282*   | .316**  | .151    | -.555** | -.074   | -.183  | .094  | 1      |       |       |       |        |      |    |
| GAP    | -.108   | .051    | -.051   | -.031   | -.411** | .197   | .014  | .039   | 1     |       |       |        |      |    |
| IBOR   | -.371** | -.609** | -.055   | -.069   | -.063   | .313** | -.116 | -.083  | -.001 | 1     |       |        |      |    |
| RWA    | .171    | -.033   | .717**  | -.348** | -.218   | -.022  | .056  | .298** | -.037 | .223  | 1     |        |      |    |
| SPREAD | .051    | -.082   | -.066   | .139    | .178    | .223   | .216  | -.080  | .045  | .062  | -.089 | 1      |      |    |
| TA     | .165    | .148    | .199    | .171    | -.148   | .094   | .224  | .015   | -.066 | -.181 | .141  | .120   | 1    |    |
| LD     | .048    | .095    | -.350** | -.116   | -.098   | -.007  | .158  | .101   | .010  | .017  | -.159 | .036   | .215 | 1  |

\*\*Significant at the 0.01 level (2-tailed).

\* Significant at the 0.05 level (2-tailed)

**Table 6**  
Collinearity Statistics

| Variable | Collinearity    | Statistics |
|----------|-----------------|------------|
|          | Tolerance Value | VIF        |
| NPL      | .374            | 2.676      |
| NPLLAG   | .398            | 2.513      |
| MGT      | .359            | 2.782      |
| REGCAP   | .550            | 1.817      |
| CONS     | .599            | 1.669      |
| FCOST    | .676            | 1.480      |
| LLP      | .520            | 1.922      |
| LEV      | .620            | 1.613      |
| GAP      | .666            | 1.502      |
| IBOR     | .463            | 2.159      |
| RWA      | .321            | 3.115      |
| SPREAD   | .864            | 1.157      |
| TA       | .667            | 1.499      |
| LD       | .717            | 1.395      |



According to Hair et al. (1998), there is substantial collinearity if the correlation is generally above 0.9, the tolerance value is below 0.19 and the Variance Inflation Factor (VIF) is greater than 5.3. The results in Table 5 and Table 6 show that the correlation is below 0.9, the tolerance value is above 0.19, and the VIF is less than 5.3. Hence, these statistics indicate an acceptable level of correlation and no multicollinearity problem between the risk predictors. This enabled us to proceed with identifying the key risk determinants of the listed deposit-taking institutions. We

subsequently ran Stepwise regressions with Akaike Selection Criterion. The variables were regressed against each risk measure using generalized least square (GLS) regression instead of OLS, after it was corrected for heteroskedasticity. Auto-correlation was corrected using Newey-West (1987) HAC Standard Errors and Covariance (EViews User Guide, 1998). The results also indicated that there was no serial correlation as indicated by Durbin-Watson statistic of 2.5, 1.89, and 1.82 for systematic risk, unsystematic risk, and total risk model, respectively (see Table 7).

**Table 7**  
Regression Result of Parsimonious Model

| Independent Variables | BETA                  | $\sigma$ RES          | $\sigma$ RET           |
|-----------------------|-----------------------|-----------------------|------------------------|
| LnNPL                 | 4.159<br>(5.057)***   | 0.096<br>(2.277)**    | 1.080<br>(3.625)***    |
| LnCON                 | -0.925<br>(-3.344)*** |                       |                        |
| LnFCOST               | 9.885<br>(2.545)***   | 0.404<br>(4.091)***   | 5.443<br>(6.517)***    |
| LnIBOR                |                       | -0.795<br>(-8.479)*** | -7.881<br>(-11.994)*** |
| LnLD                  | 0.676<br>(4.345)***   |                       | 0.143<br>(3.493)***    |
| Constant              | 0.221<br>(0.817)      | 0.071<br>(0.753)      | 0.484<br>(6.346)***    |
| R2 adjusted           | 0.279                 | 0.621                 | 0.746                  |
| DW                    | 2.450                 | 1.890                 | 1.820                  |
| F-value               | 6.645*                | 24.913*               | 43.959*                |
| Prob(F-statistic)     | 0.000                 | 0.000                 | 0.000                  |
| N                     | 74                    | 74                    | 74                     |

### Regression Results

Table 7 shows the stepwise regression results of the 3 test models. We found that there was a significant relation between the financial institutions' internal and external variables and their risk. Thus, the null hypothesis of no significant association between the variables and risk was rejected at a 5 percent significant level. The adjusted R-squared values, which indicate the strength of the relation between the determinants and risk are: 0.75 (F-statistic = 43.96) for total risk; 0.62 (F-statistic =

24.91) for unsystematic risk and 0.28 (F-statistic = 6.65) for systematic risk. The results suggest that the model best explains the variations in total risk.

Four variables namely, *lnNPL*, *lnFCOST*, *lnLD*, and *lnCON*, are significant determinants of systematic risk (beta). The four variables collectively explain a 28 percent variation in systematic risk. This result shows a stronger association between bank specific variables and beta of Malaysian deposit-taking institutions

compared to the U.S. results in Hassan (1992) with a R-square value of 11 percent. The coefficients of *lnNPL*, *lnFCOST*, and *lnLD* were positive and significant. The signs of the coefficients were consistent with the predicted signs where an increase in NPL, FCOST, and LD would lead to an increase in beta or systematic risk of the sample banks. The result indicates that FCOST has the highest explanatory power followed by NPL in explaining the variation in beta.

As for unsystematic risk, three factors were significant; *lnNPL*, *lnFCOST* and *lnIBOR*. The coefficients of *lnNPL* and *lnFCOST* were positive, and were significantly related to beta implying that an increase in the unsystematic risk is significantly contributed by an increase in NPL and FCOST of the banking industry. However, *lnIBOR*, which was a very significant factor, to our surprise, was negatively related to unsystematic risk. One possible explanation for this inverse relationship is that it might be due to time specifics. During the study period, the central bank made several changes to monetary policies and interest rates as measures to improve the Malaysian economy<sup>1</sup>. These changes had contributed to the reduction of bank risks.

Four variables were identified as significant determinants of *total risk*. These were *lnNPL*, *lnFCOST*, *lnLD*, and *lnIBOR*. With the exception of *lnIBOR*, the first three variables were significantly and positively correlated to total risk. This indicates that an increase in NPL and FCOST would result in an increase in total risk, which is consistent with the banking theory. The coefficient of *lnLD* was positive and significant, which suggests that a higher LD ratio indicates excessive gearing. This finding supports intuitive insights of Thilainathan, 1997, and Obiyathullah, 1998; that the increase in bank risk during the study period was contributed by excessive lending.

IBOR was significant and was negatively related to total risk. This result appears to show that the policy changes related to interest rates introduced during the study period contributed significantly to the reduction in the total risk of deposit-taking institutions. In contrast, the usual significant risk determinants in developed

markets such as LEV, Gap and LLP were not significant in our tests. However, we observed that the signs of these coefficients supported past findings.

## CONCLUSION AND POLICY IMPLICATION

Managing risks is a very challenging task for financial institutions especially in a business environment that is rapidly changing and creating many uncertainties. Banking literature cites that risk is generated from two sources - changes in external factors and changes in the internal factors of the bank.

However, the lack of empirical investigations in determining the factors contributing to the risk of Malaysian banks motivated us to undertake this study. The main objective of this paper is to identify key factors affecting the risk of Malaysian listed deposit-taking institutions from during 1994 to 2000. The risks were divided into three parts namely systematic risk and unsystematic risk (that is, risks due to changes in external and internal factors respectively) and total risk (the combined effects of systematic and unsystematic risk). We tested the hypothesis that there is no significant relation between internal and external variables and the risk of financial institutions.

The results indicated that there was a significant relation between the internal and external variables and risk. The null hypothesis was rejected at a 5 percent significant level. The overall findings show that the internal factors which are significant determinants of the three risk measures are non-performing loans and funding costs. The key external variable was the 3-month Kuala Lumpur inter-bank offered rate, which appears to have a very significant impact on the unsystematic risk and total risk of the Malaysian deposit-taking institutions.

On individual risk measure, the key determinants of systematic risk that this study identified were non-performing loans, loan exposure to risky sectors, funding cost, and loan to deposit ratio. This implies that all the sample banks were

affected by these factors in terms of their share price returns. On the other hand, the unsystematic risk was significantly dependent on three factors: non-performing loans, funding cost and KLBOR. The findings show that these three factors and the loan to deposit ratio are significant contributors to the changes in the total risk exposure of the Malaysian banks.

The nature of the banking business is about taking risks and how to benefit from the uncertainties in the business environment. Hence, the main concern addressed here is not for banks to eliminate risk but rather to manage them in order to maximize returns. We hope the identification of the key determinants of risk would assist the bank management to focus on managing these factors better especially problem loans, banks' funding costs, and short-term interest rate changes. Higher funding costs would lead banks to higher total risk and greater vulnerability to bankruptcy (Lepley, 1998).

Since unsystematic risk can be reduced through diversification, the implication is that banks can mitigate this risk if they can reduce their high loan concentration in pro-cycle economic sectors and move towards having a balanced loan portfolio - diversified across growth sectors, geographical locations and risk classes. Together with this we would like to suggest that banks have adequate databases, which are currently lacking among many local banks. These databases and technology should be linked to credit and other bank operation processes in order to provide timely and accurate risk management information. This will assist banks to reduce adverse selection problems, to have better risk management, which will enable them to make right and timely financial decisions.

## ENDNOTES

<sup>1</sup> The measures include the capital controls, pegging of the currency (RM3.80=USD1), Dana harta and Danamodal set-ups, decreases in SRR ratio and re-computation of BLR (from the basis of 3-mth KLIBOR + 2.5 percent administrative margin to BNM intervention rate +2.25 percent administrative margin

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