THE EFFECT OF OPEN MARKET INTEREST RATES ON MALAYSIAN COMMERCIAL BANKS' INTEREST RATE SPREAD: AN EMPIRICAL ANALYSIS*

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ABSTRACT

In this paper we investigate the effect of changes in open market interest rates on the interest rate spread of Malaysian commercial banks. This is performed by examining the causality and patterns of reactions of banking rates with respect to variation in open market rates. Based on vector autoregression analysis we show that there is one-way causation running from the open market rates to banking rates. Changes in open market rates significantly cause changes in the spread and deposit rates. However, no significant causation is identified for lending rates. The impulse response functions indicate that spread declines following positive innovation in open market rates and this is mainly due to the greater sensitivity of deposit rates to open market rates. The response of lending rates is shown to be low and to occur with some lag, thus, contributing to the decline in spread. We also provide evidence of a dichotomy between banks' asset and liability rates by failing to support causality between the two rates. It is argued that this imbalance of sensitivity is partly due to the uneven process of interest rate liberalization that frees deposit rates more than lending rates. These results suggest that for the Malaysian banking firms, increase in open market rates hindered their activities and could affect bank performance. The findings are consistent with the role of banks as brokers as well as asset transformers.

JEL classification: E44, G10, G21

Key words: Interest rate spread, Bank profitability, Vector autoregression

1. INTRODUCTION

It is widely believed that fluctuations of market interest rates exert significant influence on the activities of commercial banks.[1] Earlier treatment of the issue provided by Samuelson (1945) indicates that under general conditions, bank profits increase with rising interest rates. "The banking system as a whole is immeasurably helped rather than hindered by an increase in interest rates," (Samuelson, 1945, 25). A more accurate measurement of how fluctuations in market interest rates affect banking firms largely depends on the sensitivity of banks' assets and liabilities (interest rates and volume) toward variations in open market rates. Later investigation by Hancock (1985) confirms Samuelson's conjecture that a higher level of market interest rates improves banking profitability. In addition, the effect of interest rate spread changes on banks' profitability is shown to be asymmetric with the effect originating from lending rates being greater than those of deposit rates.[2] The stochastic behavior of market rates is also argued to be a significant factor that determines the mode banks adopt in delivering their services. Desmukh et al. (1983) show that banks can either be brokers or asset transformers subject to interest rate uncertainty. In a volatile interest rate environment, banks minimize their risk exposure by performing the role of brokers, merely matching the arrival of assets and liabilities.

In this paper, we investigate the impact of open market rate changes on banks' interest rate spread, i.e., asset minus liability rates.[3] The impact of variations in market interest rates on banks' profitability is ambiguous; it largely depends on the degree of responses of asset and liability rates. In general, since both sides of banks' balance sheets are affected by market interest rates in a parallel fashion, the net impact on banks' profitability can be deduced by tracing the responses of both assets and liabilities as market interest rates change. Our results of the vector autoregression analysis indicate that banking spread moves inversely to the level of open market rates. It is shown that deposit rates of commercial banks are significantly affected by market interest rates but not for lending rates. The impulse response functions show that low and lagged response of lending rates contribute to the decline in banking spread following an increase in money market rates, thus, adversely affecting banking activities. Contrary to the above-mentioned findings, in Malaysia the high level of interest rates hindered banks' profitability. Further, we also provide evidence of a dichotomy between

banks' asset and liability rates consistent with Slovin and Sushka (1983). Causations between asset and liability rates are not supported for both directions. The presentation of the paper is as follows: Section 2 discusses the literature and existing findings related to the issue. This is followed by the description of data and methodology in Section 3. Empirical results of the analysis are discussed in Section 4, and the paper ends with a brief conclusion.

2. COMMERCIAL BANKING AND MARKET INTEREST RATES

Commercial banks' activities greatly rely on their intermediation services, filling the gap between suppliers and demanders of funds. Their profitability is partly due to the difference in interest rates charged on loans and what is paid to suppliers of funds, i.e., the interest rate spread.[4] Pyle (1971) argues that the larger the spread between loan and deposit rates, the more likely the necessary condition for intermediation to occur can be met.[5] Earlier explanations that allow positive spread to be maintained rest on the ability of commercial banks to minimize transaction costs in loans originating through their intermediation services. Benston and Smith (1976) suggest that transaction costs are central to the theory of financial intermediation and the ability of the financial intermediary to exploit the returns to scale implicit in the structure of the transaction costs by purchasing large blocks of securities, repackaging, and reselling them at a lower cost supports the existence of intermediaries. "The *raison d'etre* for this industry is the existence of transaction costs," (Benston and Smith, 1976, 215). Based on the transaction cost explanation, positive spread is consistent with banks' profitability since banks largely play the brokerage role intermediating between depositors and lenders. Contemporary banking theory, however, argues that traditional arguments based on transaction costs are insufficient and proposed the existence of banking institutions as a solution to informational asymmetries prevailing in the economy (see Leland and Pyle, 1977; Diamond, 1984; and Ramakrishnan and Thakor, 1984). Banks are viewed as providing a special role in the economy as asset transformers. The existence of banks minimizes the adverse selection and moral hazard problems, which are prevalent in direct financial transactions. Through maturity and liquidity transformation and their specialization in sorting and evaluating information, banks can properly evaluate loans that cannot be priced accurately by market participants. The maturity and liquidity intermediation causes the

maturity of a bank's balance sheet to be mismatched and therefore expose the bank to variation in market rates. The imbalance of adjustment of asset and liability rates toward changes in market rates (which cause changes in the spread) significantly affects the value of bank equity.[6] Regardless of the justifications forwarded, these authors imply that banking institutions are special and contribute to the efficiency of the economy, thus, positive spread remains as a main feature of banking activities.[7]

The impact of changes in market interest rates on banking activities can be analyzed in several frameworks. Numerous studies focus on the level of interest rate risk, i.e., uncertainty in banks' profitability, which is due to the imbalance of sensitivity of assets and liabilities of commercial banks toward changes in market interest rates (see Flannery and James, 1984; Yourougou, 1990; Bae, 1990; Akella and Greebaum, 1992; Brewer, et al., 1993; and Madura and Zarruk, 1995). Banks' balance sheets' maturity structure of 'borrowing short and lending long' is argued to be the main source of the interest rate risk faced by commercial banks.

Flannery (1981) explains that banks are exposed to fluctuations in market interest rates in two ways. First, the imbalance of maturity (duration) of assets and liabilities, i.e., 'borrowing short and lending long', subjects banks to a non-synchronized refunding schedule, which could be expensive during a high interest rate environment. In this respect, Tobin (1982) views banking decisions as solving precautionary portfolio allocation problems with banks attempting to minimize the cost of unexpected deposit withdrawals. Since penalty is imposed on deposit shortfall, banks have to properly weigh its probabilities in their allocations of assets into earnings assets (investment and loans) and defensive assets.[8]

Second, even if banks accurately matched the maturity of assets and liabilities, different degrees of market interest rate elasticities between assets and liabilities components could still exert significant effects on banks' profitability. Different degrees of elasticity lead to non-proportionate changes in the value of assets and liabilities as market interest rates change, which then affect the value of the banking firm. The behavior of interest rate spread is critical in analyzing this issue. Theoretically, Ho and Saunders (1981) indicate that maintaining a positive spread is crucial for banking firms as this will compensate them for taking the risk of providing immediacy of loans and deposits, that are viewed as stochastic, which arrive at different times. Their empirical estimate shows that the magnitude of 'pure spread' is

significantly affected by interest rate volatility.[9] In a related study, Slovin and Sushka (1983) modelled commercial loan rates as independent from deposit rates. This dichotomy of asset and liability rates is achieved as lending rates are shown to be sensitive to open market rates while deposit rates are not. Restrictions on interest rates (such as Regulation Q) are shown to be important factors that dichotomize lending and deposit rates. The authors fail to find any significant influence of deposits on loan rates. The coefficient for loan/deposit ratio indicates that the 'loaned up' position is not significant when regressed on loan rates. On a similar theme, Hancock (1985) shows that the change in banks' profitability generated by changes in loan rates is greater than the change generated by deposit rates. It is shown that the effect of spread changes is asymmetric and the increase in profit due to changes in loan rates is greater than changes due to deposit rates, indicating larger profit elasticity with respect to loans rather than deposits. These findings led to the suggestion for separate inclusion of loan and deposit rates instead of a single spread measurement in estimating the bank's profit equation.

The preceding discussion indicates the importance of understanding the behavior of banks' interest rate spread as open market rates change. The net impact on bank profitability can be examined by studying the behavior of interest rate spread and its components with respect to variations in market interest rates. Various analyses have been performed investigating this topic in advanced economies, especially in the United States, but studies on smaller economies are negligible. We performed this analysis on the Malaysian banking industry in order to shed some light on the issue for a small economy such as Malaysia. The process of interest rate liberalization that began in Malaysia in the early eighties gradually freed the interest rate from a controlled regime.[10] Asset and liability rates are now more exposed to market influence and can possibly affect banks' profitability. Freeing interest rate movement changes its stochastic properties that in turn might affect the role of banks in the economy. Thus, the net impact of changes in market interest rates on banks' interest rate spread is a crucial issue that needs to be investigated.

3. DATA AND METHODOLOGY

We perform the empirical analysis on the Malaysian banking industry covering an eleven-year period (1987:1-1997:8). The data set is extracted from the Monthly Statistical Bulletin of Bank Negara Malaysia (the Central Bank of Malaysia). We use seven measurements of money

market rates (four interbank rates (IBR) and three T-bill rates) as our proxy for the open market rates. In Malaysia, the Kuala Lumpur Interbank Rates (KLIBOR) normally reflects the liquidity status of the economy, and movement of interbank rates is closely watched by policy makers and financial analysts. In addition, we also use the T-bill rates to assure the consistency of our results. The interest rate spread for the commercial bank is derived by taking the difference between the Average Lending Rate (ALR) and the Average Fixed Deposit Rate (AFDR). We calculate the AFDR by taking the average of the monthly mode of fixed deposit rates of different maturities as reported in the bulletin.[11]

Figures 1a and 1b show the general patterns of the spread, lending, deposit rates, and market interest rates over the period tested. The close movement of deposit rates with open market rates can be seen in Figure 1a. We also observe three different phases of the interest rate cycle over the entire period with interest rates, in general, increasing from 1987 to 1991, declining from 1991 to 1994 and again increasing to the end of the period. Figure 1b indicates opposite movement between spread and open market rates. The greater sensitivity of liability rates compared to asset rates in responding to market movement as implied by Figure 1a is consistent with the new theory of financial intermediation explained in the preceding section. The active role of banks as asset transformers lead banks to have asset, which have long maturity and are less liquid. On the other hand, the liabilities are composed of short maturity and high liquidity components. Therefore the asset rates are less sensitive to market rates.[12] Patterns depicted in Figure 1a and 1b are also consistent with an earlier work by Ghazali (1990) which indicates that Malaysian commercial banks are exposed to greater interest rate risk as their balance sheets show the banks' greater tendency to borrow short and lend long for the post-1980 period. An imbalance in asset and liability rates' sensitivity is also indicated in the study. Despite these graphical illustrations identifying the exact relationships among these variables, we are still required to analyze them using proper econometric methods.

We conduct our analysis employing the vector autoregression (VAR) approach similar to Sims (1980). The method involves a simultaneous estimation of a system of variables that affect each other in an autoregressive pattern. A vector of m variables, $X_t = (x_{1t}, x_{2t} \ldots, x_{mt})'$ can be represented in a VAR system as follows:

(1) $AX_t = B(L)X_{t-1} + V_t$

where A is an m x m matrix of impact multipliers, $B(L)$ is a $k^{\text{th.}}$-order matrix of structural polynomials in the lag operator L; $B(L) = B L + B L^2 + \ldots B L^k$, V is an m x 1 vector of structural disturbances with zero mean, $E[V]^t = 0$; and covariance matrix $\Sigma = E[V, V]$ for all t, and the V's are serially uncorrelated.[13, 14]

The VAR methodology is appealing for this study since the variables used are interest rates (market and banking rates), which are possibly interrelated, i.e., causing each other in bi-directional patterns. Traditional single equation estimation could be misleading and precludes possible feedback from dependent to independent variable. The use of a system estimation such as the VAR allows researchers to identify the possible causation patterns among the variables involved in the estimation in line with Granger (1969). A variable, x is said to Granger-cause x if the information carried by the past and present of x improves the forecast of x. Formally, x is Granger-caused by x if the following condition is achieved:

$$(2) \qquad \sigma^2(x_{1t}|\Omega_t) < \sigma^2(x_{1t}|[\Omega_t \setminus \{x_{25}|S \le t\}])$$

where $\sigma^2(x_{1t}|\Omega)$ denotes the conditional mean squared error (MSE) of the optimal forecast x given information set (Ω) up to period t, and $[\Omega \setminus \{x \mid s = t\}]$ refers to all information that is in Ω but excluding that which is contained in the past and present x. Condition (2) indicates that the prediction of x carries a lower MSE when the information contained in the past and present x is incorporated into the data set. In the m variable system of (1) this can be tested by restricting a group of lag coefficients of a variable in any one of the system's equations to zero. An F-statistic can be used to test whether restricting a group of lag coefficients of a variable is binding or not. A significant F-statistic indicates rejection of the null hypothesis and the restricted variable Granger-caused the dependent variable of the equation tested.

In addition, the VAR analysis can also be useful in analyzing the dynamics of the variables based on the impulse response functions (IRF). Conceptually, IRF trace the sign and magnitude of the system's response over time to the shocks of a variable in the system. It is derived by specifying the VAR system (1) in the vector moving average (VMA) representation as follows:

$$(3) \qquad X_t = C(L)v_t = \sum_{s=0}^{\alpha} C_s v_{t-s}$$

where $C(L) = A^{-1} [I - B(L)]^{-1}$ and I is the identity matrix. The elements of C provide the dynamic response among the variables in the system. Plotting the element of C against time yields the impulse response functions. The IRF provide insights into the plausibility of the responses of each of the variables in the system toward innovation in one of them. We conduct the analysis in two stages. First we estimate the VAR using two variables, i.e., the interest rate spread and the open market rate. After identifying the relationship between the two we further estimate a three-variable VAR involving open market rates, lending rates and deposit rates. This is done in order to identify the reactions of each component of the spread toward open market rates, parallel with Hancock (1985). In addition we also provide some insights on the possible dichotomy between the asset and liability rates of commercial banks, as suggested by Slovin and Shuska (1983).

4. RESULTS AND DISCUSSIONS

The results of causality tests between open market rates, interest rate spread and banks' asset and liability rates are presented in Tables 1 and 2. Table 1 shows the F-statistics testing the null hypothesis that banking rates (spread, ALR, and AFDR) do not cause open market rates. Rejection of the null hypothesis indicates that banking rates play an important role in determining the movement of open market rates. Prior thoughts that suggest the status or decisions of the banking industry are critical in determining the path of open market rates can be tested based on this hypothesis. In general, the results fail to reject the null of no causation. None of the F-statistics are significant at the 5 percent level. The lag coefficients for ALR show some significance at 10 percent but only when the 7-day rate is used as a dependent variable. The rest of the estimations are not able to reject the null of zero values for all banking rates lag coefficients indicating no causation from the banking rates to open market rates.

The results for reverse causation from open market rates to banking rates are presented in Table 2. The endogeneity of interest rate spread with respect to open market rates is supported by the significance of the F-statistics reported in column one of Table 2. Variations in all open market rates except the 12-month, T-bill rates cause movement in the spread. The lag coefficients for the open market rates are all significantly different from zero at the 5 percent level. As discussed earlier, it is important for us to identify the sources of these causations

TABLE 1
F-Statistics for Granger Causality Test
(Null Hypothesis: Banking Rates $\rightarrow$ Open Market Rates)

Independent Variable / Dependent Variable	Spread	AFDR	ALR
Overnight Rate	1.048 (0.414)	0.795 (0.655)	1.324 (0.222)
7-Day Rate	1.146 (0.334)	0.856 (0.594)	1.725* (0.077)
IBR 1-month	0.767 (0.682)	0.588 (0.845)	1.183 (0.310)
IBR 3-month	1.296 (0.234)	0.910 (0.541)	1.408 (0.180)
T-bill 3-month	1.011 (0.446)	0.601 (0.835)	0.868 (0.582)
T-bill 6-month	0.519 (0.898)	0.359 (0.974)	0.520 (0.896)
T-bill 12-month	0.519 (0.844)	0.736 (0.712)	0.583 (0.850)

Notes: 1.   Figures in parentheses are the significance levels of the *F*-statistics.
       2.   * indicates significance at 10% level.

since variations in spread can be due to either variations in asset and/or liability rates. The *F*-statistics of columns 2 and 3 indicate that for Malaysia, the response of spread to changes in open market rates is mainly due to the sensitivity of the deposit rates to market interest rates. As shown, the null hypothesis that there is no causation from open market rates to deposit rates can be rejected for 6 out of 7 market rates tested. The *F*-statistics for four of them are significant at the 5 percent level and the other two are slightly above the 5 percent but below the 10 percent level. Changes in the 3-month IBR and T-bill rates affect deposit rates of commercial banks. However, causation from open market rates to lending rates is weakly supported for only two of the open market rates (7-day and 3-month IBR). The null hypothesis of no causation cannot be rejected for the rest. This indicates that lending rates of commercial banks are exogenous with respect to changes in open market rates. The response of spread is largely due to the sensitivity of deposit rates rather than lending rates.

It is interesting to note that in contrast to evidence provided by Hancock (1985) and Slovin and Shuska (1983), in the Malaysian banking industry interest rate spread changes are mainly due to high sensitivity of banks' liability rates rather than asset rates. Several explanations can be offered to justify this finding. The process of liberalization of interest rate determination in Malaysia, which is also prevalent in many other developing countries, could be one of the explanations. In many developing economies, banks are the main suppliers of credit and the ability of borrowers to get bank financing is seen as critical with respect to economic growth as well as political stability. In addition, a relatively small capital market plus limited access to it contributes to the need for the central bank to enforce selected controls on the interest rate charged on loans issued by banks. In Malaysia, terms on credit facilities (interest charges, volume issued, maturity, etc.) to selected categories of borrowers are until today being controlled by rules specified by the central bank.[15] These control measures prevent open market rates from significantly influencing commercial banks' lending rates. On the other hand, in Malaysia, controls on deposit rates were enforced in the sixties and seventies particularly to promote local banks' development. In the early years, a few large established foreign banks that had strong financial background dominated the banking industry. Development of domestic banking institutions without control on deposit rates seemed to be difficult as foreign banks possessed the distinct advantage of being well established and financially strong. Controls on deposit rates provided breathing

TABLE 2
F-Statistics for Granger Causality Test.
(Null Hypothesis: Open Market Rates ✗> Banking Rates)

Independent Variable \ Dependent Variable	Spread	AFDR	ALR
Overnight Rate	2.157** (0.020)	1.802* (0.062)	1.144 (0.338)
7-Day Rate	2.371** (0.010)	1.824* (0.058)	1.741* (0.074)
IBR 1-month	2.093** (0.025)	1.543 (0.127)	1.264 (0.257)
IBR 3-month	2.991** (0.001)	2.435** (0.010)	1.663* (0.091)
T-bill 3-month	2.788** (0.003)	2.918** (0.002)	0.719 (0.729)
T-bill 6-month	1.902** (0.044)	2.675** (0.005)	1.140 (0.341)
T-bill 12-month	1.586 (0.109)	1.973** (0.038)	1.227 (0.280)

Notes: 1. Figures in parentheses are the significance levels of the *F*-statistics.
2. ** indicate significance at the 5% level and * indicates significance at the 10% level.

space for the new locally incorporated banks.[16] By the end of the seventies, local banks had grown large enough and deposit rates were then free to be determined by each bank according to their strength and the market forces; thus, supporting the high sensitivity of deposit rates to open market rates.

It is possible that these control measures could contribute to the dichotomy of banks' asset and lending rates as suggested by Slovin and Shuska (1983). We proceed to test the causality between the lending and deposit rates and the result is described in Table 3. Not surprisingly, we fail to identify any causation between the interest rates of the two sides of commercial banks' balance sheets. None of the lag coefficients are significantly different from zero when either the lending or the deposit rates are used as dependent variables. Thus, parallel to Slovin and Sushka (1983) the dichotomy hypothesis is supported for the Malaysian banking firms.

Results of the Granger causality test reported above do not show the movement of the banking rates as open market rates change. The dynamics of banking rates due to shocks in open market rates are shown in Figure 2.[17] The pattern confirms the graphical illustration of Figure 1. Increases in the interbank rates and T-bill rates cause the interest rate spread to decline. The reduction in spread persists up to about eight to nine months following a shock in interbank rates and about twelve to fifteen months for the T-bill rates. Impulses of the lending and deposit rates provide further insights explaining the factors that contribute to the decline in the spread. The effects of open market rate variations on banks' asset and liability rates are significant for the intervals reported earlier but dissipate after that. The imbalance of initial reactions of these two rates causes the spread to decline following an increase in open market rates. Deposit rates are shown to be more affected by the open market rates as compared to the reaction of lending rates. An increase in open market rates causes the spread to decline since banks' liability rates are more affected than the lending rates. The greater sensitivity of deposit rates is strengthened by the causality test reported earlier in Table 2. Low and lagged response of lending rates hindered banks from benefitting from high open market rates. Thus, to the Malaysian bankers, high open market interest rates due to the tightening of monetary policy or other economic forces adversely affect their earning capacity. The adverse effect of an increase in market interest rates on banks' profitability is consistent with both the old and new theory of financial intermediation. With the old theory of intermediation that largely relies on the ability of banks to reduce the

TABLE 3

F-Statistics for Granger Causality Test Between Banks' Asset and
Liability Rates

Null Hypothesis Open Market Rates	AFDR - ALR	ALR AFDR
Overnight Rate	0.895 (0.555)	1.150 (0.334)
7-Day Rate	1.230 (0.278)	1.136 (0.344)
IBR 1-month	1.160 (0.326)	0.974 (0.481)
IBR 3-month	1.221 (0.284)	1.314 (0.228)
T-bill 3-month	0.872 (0.578)	1.350 (0.208)
T-bill 6-month	1.063 (0.402)	1.397 (0.185)
T-bill 12-month	0.831 (0.618)	1.656 * (0.093)

Notes: 1. Figures in parentheses are the significance levels of the *F*-statistics.
2. * indicates significance at the 10% level.

transaction cost, a reduction in spread following an increase in market rates adversely affects the banks' profit margin. The balance sheet maturity profile, due to the active role of banks as asset transformers (consistent with the new theory), implies that the equity value of banks is negatively influenced by the reduction in the spread. Further verification of the adverse effect could be derived from the empirical work investigating the response of banks' share prices to changes in open market rates and asset-liability interest rate spread.

5. CONCLUSION

The effect of changes in market interest rates on banks' profitability is investigated in this paper. Specifically, we investigate the reaction of banks' interest rate spread and its components to changes in open market rates. The analysis is crucial since both sides of a bank's balance sheet are subject to variations in open market rates. Thus, the degree of sensitivity and the path of responses of the spread and its components determine whether banks benefited or were hindered by the increase in the level of market interest rates.

Our empirical analysis on the Malaysian banking industry from 1987:1 to 1997:8 reveals that the spread is significantly caused by changes in market rates and the channel of influence is through the deposit rates. Lending rates are shown to be exogenous with respect to open market rates. In addition, we also support the dichotomy between lending and deposit rates. It is argued that despite liberalizing the interest rate regime, the Malaysian authorities still enforce selected controls on selected categories of loans issued by commercial banks; thus, contributing towards the insensitivity of lending rates to open market rates. In addition, the degree of liberalization for deposit rates is higher since the need to protect local banks from stiff competition of foreign banks is reduced following the growth of locally incorporated banks. The impulse response functions show that the spread declines following an increase in open market rates and this is supported by the immediate parallel reactions of deposit rates but low and lagged responses of lending rates. Our findings are consistent with both the old and new theory of financial intermediation. In the case of the Malaysian banking industry, the study concludes that an increase in open market rates hindered banks' activities and could be bad news to bankers.

ENDNOTES

1. We define market interest rates as interest rates determined in a competitive

market that reflects the liquidity status of the economy.

2.   In a related study, Flannery (1981) concludes that large money center banks are well hedged and their profitability is not affected by variations in open market rates. Ho and Saunders (1981) indicate that a bank's interest rate spread is affected by open market rates' volatility.

3.   We choose interest rate spread as this reflects a significant portion of Malaysian banks' earnings and is more likely to be affected by open market rates' variations. The contribution of non-interest rate components is quite small and, moreover, they are more affected by factors which are directly controlled by banks. On average, interest income from 1995 to 1997 represents about 88 percent of the Malaysian banking system revenue respectively. Non-interest income only represents a mere 12 percent of total revenue. The amount of net non-interest income is always negative for this three-year period parallel with the term 'burden' used in banking literature to reflect the negative contribution of this item (see Bank Negara Malaysia, 1995-1997). In addition, using net income would mix the effect of open market rate variations and internal efficiency factors, thus, defeating the goal of the study.

4.   Boyd and Gertler (1994) note the importance of fee-based activities in measuring the performance of U.S. banking firms. Greater competition forces banks to widen their scope of activities into fee-based activities. However, this does not reflect the Malaysian banking firm where net interest income is still a major contributor to banks' profits (see endnote 3). See Edward (1993) and Edward and Mishkin (1995) for related discussions on the role of banks in the changing competitive environment.

5.   Pyle (1971) also specified two other conditions that encourage intermediation; positive dependence between asset and liability rates and larger variance for deposit rates and lower variance for lending rates. See Baltensperger (1980) for some critics on Pyle's works.

6.   We would like to thank Bhagwan Chowdhry of the Anderson School, University of California Los Angeles, for highlighting the impact of changes in bank spread under the old and new theory of financial intermediation. For a review of intermediation theory, see Santomero (1984), Bhattacharya and Thakor (1993), and Franklin and Santomero (1998).

7.   Fama (1980) discusses the role of banks from the perspective of finance theory, and concludes that banks are passive economic agents which have no effect on the general equilibrium of the economy and that their activities fall under the Modigliani-Miller (1958) theorem on the irrelevance of pure financing decision. Fama (1985), however, agrees that commercial banks are special and that allows them to maintain a positive spread.

8.   Tobin (1982) provides the theoretical model that solves banks' precautionary portfolio allocation problems in line with Keynes precautionary motive for holding money. Defensive assets are assets of very high liquidity such as currency, deposits with central banks, funds loaned in the interbank market, government securities, etc. Net holding of defensive assets exceeding the reserve requirement is termed as defensive positions.

9.   Ho and Saunders (1981) define pure spread as interest margin due to transaction uncertainty. They describe four factors that affect spread, i.e., the degree of banks' risk aversions, market structure, transaction size and interest rate volatility.

10. However, under certain conditions, such as during the mid-eighties recession, the Malaysian authorities enforced temporary control on lending rates. In addition, a few restrictions still remain particularly on the lending terms to selected group of borrowers.

11. The ALR is reported monthly by the central bank. Fixed deposits account for almost 40 percent of banks' sources of funds. We use the average of fixed deposit rates to take into account movements of rates for all maturities. Post-1987 data is used to avoid the controlled regime in the mid-eighties.

12. See Footnote 6 for acknowledgement on this issue.

13. The estimation procedure for VAR is simplified by the autoregressive specification. Since all of the right-hand-side variables are predetermined and the same for each equation, ordinary least squares (OLS) yields a consistent and asymptotically efficient estimator. Seemingly unrelated regression (SUR) does not add to the efficiency of the estimation because of the identical regressors.

14. Sims (1980), Doan (1992), and Enders (1995) do not recommend differencing the data prior to VAR estimation even if they contain unit roots. It is argued that differencing in order to assure stationarity simply 'throws away' valuable information concerning the interrelationships of the variables in the system. The emphasis of VAR analysis is to trace the dynamic relationships among a set of interested variables, not the parameter estimates.

15. These measures are implemented on the ground of equal and fair access which leads to social and economic stability. A few are enforced to promote certain selected industries which are set as priorities in the nation's economic development.

16. In addition to interest rate restrictions, other measures such as limit on

new licensing, limited branching and additional capital requirement are also enforced.

17. We only show the impulses of IBR (1 and 3 months) and T-bills (3 and 12 months) in Figure 2 in order to conserve space. Impulses based on other open market rates are about the same and available upon request.

REFERENCES

Akella, S.R., and S.R. Greebaum. "Innovations in Interest Rates, Duration Transformation, and Bank Stock Returns." *Journal of Money, Credit, and Banking* 24 (1992): 27-42.

Bae, S.C. "Interest Rate Changes and Common Stock Returns of Financial Institutions: Revisited." *Journal of Financial Research* 13 (1990): 71-9.

Baltensperger, E. "Alternative Approaches to the Theory of the Banking Firm." *Journal of Monetary Economics* 6 (1980): 1-37.

Bank Negara Malaysia. "The Financial Sector: Performance of Banking System." *Annual Reports*, 1995 – 1997.

Bhattacharya, S., and A.V. Thakor. "Contemporary Banking Theory." *Journal of Financial Intermediation* 3, (1993): 2-50.

Benston, G.J., and C.W. Smith. "A Transaction Cost Approach to the Theory of Financial Intermediation." *Journal of Finance* 31, no. 2 (1976): 215-32.

Boyd, John H., and Mark Gertler. "Are Banks Dead? Or Are the Reports Greatly Exaggerated?" *Federal Reserve Bank of Minneapolis*, *Quarterly Review* 18, Summer (1994): 2-23.

Brewer, E., T.H. Mondschean, and P.E. Strahan. "Why the Life Insurance Industry Did Not Face an S&L Type Crisis." *Federal Reserve Bank of Chicago, Economic Perspectives* (1993): 12-24.

Desmukh, S., S.I. Greebaum, and G. Kanatas. "Interest Rate Uncertainty and the Financial Intermediary's Choice of Exposure." *Journal of Finance* 38, no. 1 (1983): 141-7.

Diamond, Douglas W. "Financial Intermediation and Delegated Monitoring." *Review of Economic Studies* 51, no. 3 (1984): 393-414.

Doan, Thomas A. *RATS User's Manual*, Estima, Evanston, IL., 1992.

Edwards, Franklin R. "Financial Market in Transition-or the Decline of Commercial Banking." In *Changing Capital Markets: Implications for Monetary Policy*. Federal Reserve Bank of Kansas City, 1993: 5-62.

——, and Frederick S. Mishkin. "The Decline of Traditional Banking:

Implications for Financial Stability and Regulatory Policy." *Federal Reserve Bank of New York*, *Economic Policy Review*, July (1995): 27-45.

Enders, W. *Applied Econometric Time Series*, New York: John Wiley & Sons, Inc., 1995: 269-352.

Fama, E. "Banking in the Theory of Finance." *Journal of Monetary Economics* 6, no.1 (1980): 39-57.

——. "What's Different About Banks?" *Journal of Monetary Economics* 15 (1985): 29-36.

Flannery, M.J. "Market Interest Rates and Commercial Bank Profitability: An Empirical Investigation." *Journal of Finance* 36 (1981): 1085-101.

——, and C.M. James. "The Effect of Interest Rate Changes on the Common Stock Returns of Financial Institutions." *Journal of Finance* 39 (1984): 1141-53.

Franklin, A., and A. M. Santomero. "The Theory of Financial Intermediation." *Journal of Banking and Finance* 21 (1998): 1461-85.

Ghazali, N. A. "Interest Rate Cycles: Impact on the Malaysian Commercial Banks' Lending and Deposit Rates." *Malaysian Management Review* (1990): 3-15.

Granger, C. W. J. "Investigating Causal Relations by Econometric Models and Cross Spectral Methods." *Econometrica* 37, no. 3 (1969): 424-38.

Hancock, D. "Bank Profitability, Interest Rates, and Monetary Policy." *Journal of Money, Credit, and Banking* 17, no. 2 (1985): 189-202.

Ho, T.S.Y., and A. Saunders. "The Determinants of Bank Interest Margins: Theory and Empirical Evidence." *Journal of Financial and Quantitative Analysis* 51, no. 4 (1981): 581-600.

Leland, H.E., and D.H. Pyle. "Information Asymmetries, Financial Structure and Financial Intermediaries." *Journal of Finance* 32, no.2 (1977): 371-87.

Madura, J., and E.R. Zarruk. "Bank Exposure to Interest Rate Risk: A Global Perspective." *Journal of Financial Research* 53, no. 1 (1995): 1-13.

Modigliani, F., and Merton H. Miller. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48, no. 3 (1958): 261-97.

Pyle, D.H. "On the Theory of Financial Intermediation." *Journal of Finance* 28 (1971): 737-47.

Ramakrishnan, Ram T. S., and Anjan V. Thakor. "Information

Reliability and a Theory of Financial Intermediation." *Review of Economic Studies* 51, no.3 (1984): 415-32.

Samuelson, P. "The Effects of Interest Rate Increases on the Banking System." *American Economic Review* 35 (1945): 16-27.

Santomero, A. " Modeling the Banking Firm: A Survey." *Journal of Money, Credit and Banking* 16, no.4 (1984): 576-602.

Sims, C. A. "Macroeconomics and Reality." *Econometrica* 48, no.1 (1980): 1-48.

Slovin, M.B., and M.E. Sushka. "A Model of the Commercial Loan Rate." *Journal of Finance* 38, no.5 (1983): 1583-1596.

Tobin, J. "The Commercial Banking Firm: A Simple Model." *Scandinavian Journal of Economics* 84, no.4 (1982): 495-530.

Yourougou, P. "Interest-rate Risk and the Principal Depository Financial Intermediary Common Stock." *Journal of Banking and Finance* 14 (1990): 803-20.
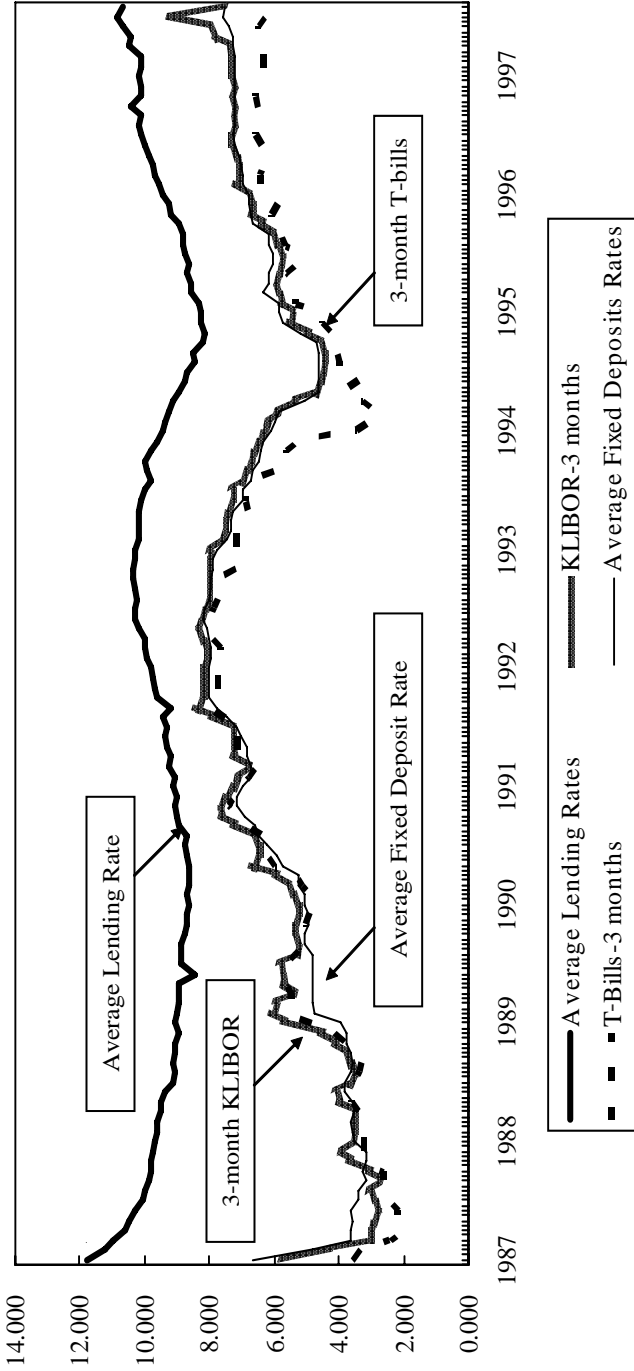
FIGURE 1a

FIGURE 1b
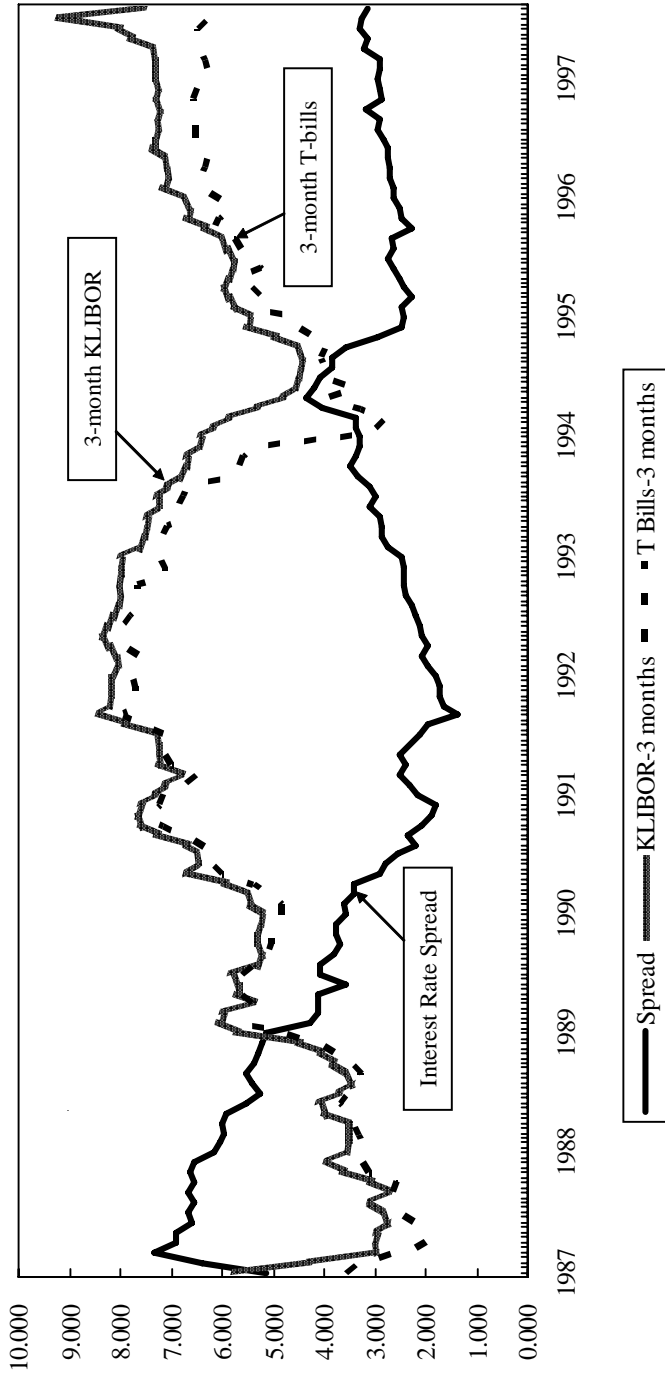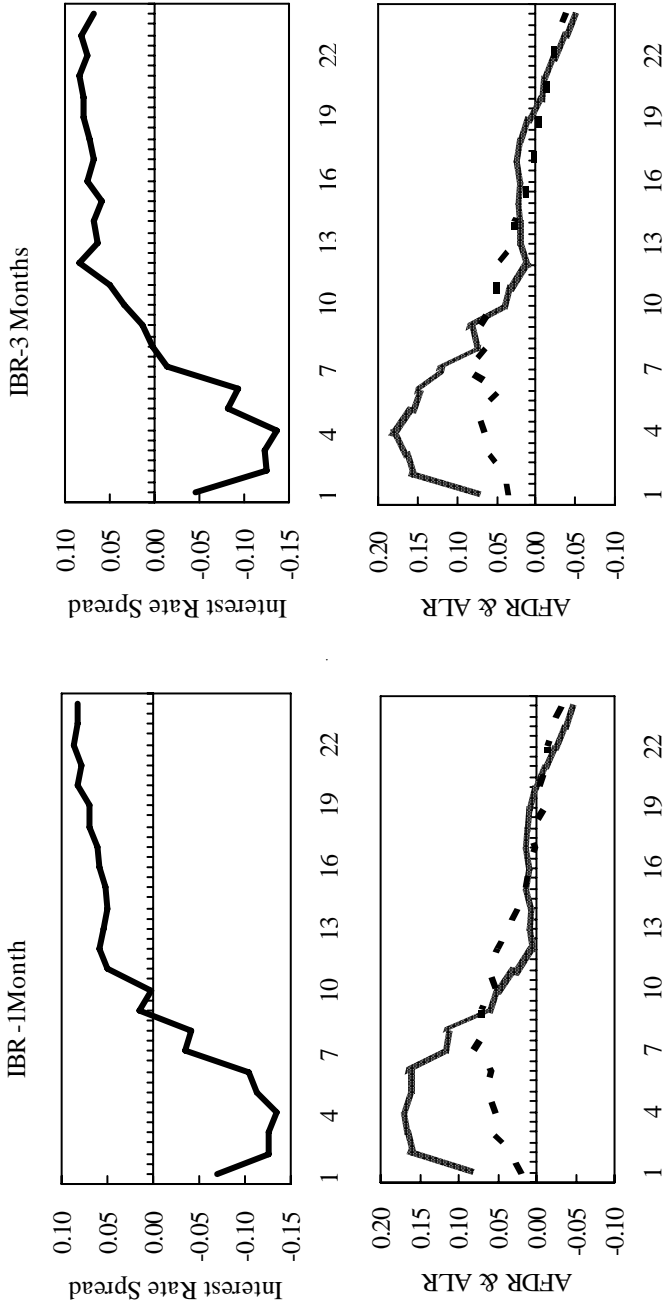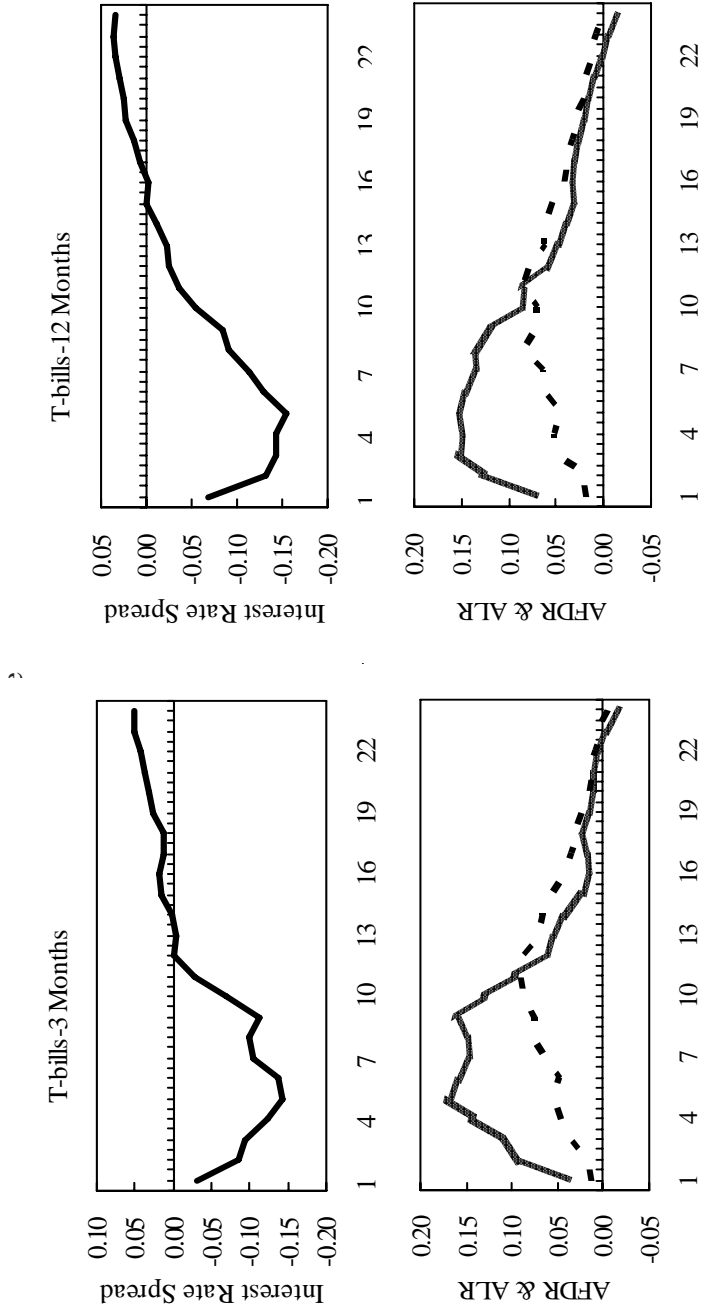Open Market Rates and Interest Rate Spread

FIGURE 2a

Response of Interest Rate Spread, Deposit and Lending rates to Open Market Rates

Note: Thick lines are responses of spread to open market rates, dotted lines are responses of deposit rates and dashed lines are responses of deposit rates and dashed

FIGURE 2b

Response of Interest Rate Spread, Deposit and Lending rates to Open Market Rates