THE DETERMINANTS OF INTEREST RATE SPREAD:

EMPIRICAL EVIDENCE ON THE MAURITIAN BANKING SECTOR

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ABSTRACT

This paper examines the determinants of interest rate spread in the Mauritian banking sector both analytically and empirically. Using balance sheets and income statements of commercial banks, the spread is decomposed into its various components. The empirical analysis shows that interest rate spread in Mauritius is used not only to cover the costs of operating expenses and required reserves but also reflects the prevalence of market power and compensates for the quality of loans.

Views expressed in this paper are those of the author and do not bind the Bank of Mauritius in any way.

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1. Introduction

The spread or margin between lending and deposit interest rates is a key variable in the financial system. It reflects the additional cost of borrowing related to intermediation activities performed by banks in linking borrowers with the ultimate fund lenders. When it is too large, it can contribute to financial disintermediation as it discourages potential savers with too low returns on deposits and limits financing for potential borrowers, thus reducing feasible investment opportunities and therefore the growth potential of the economy.

A number of factors have motivated researchers to investigate the level and determinants of interest rate margins. Firstly, there has been the need for a better understanding of the behaviour of interest rates following the mixed experiences of many LDCs with interest rate liberalisation. There has also been the concern that in many developing countries the level and structure of interest rates remained inflexible with high interest rate margins during the post-liberalisation period (Turtelboom, 1991). Last but not least, the use of interest rate margin as a parameter of bank profitability, intermediation cost and financial market efficiency gave impetus to further research.

Financial systems in developing countries normally exhibit significantly and persistently larger intermediation spreads on average than in developed countries. These high spreads have generally been attributed to high operating costs, financial taxation, lack of competition and high inflation rates. Thus, to the extent that the determinants of the spread are distortionary, these problems can be redressed so as to permit interest rate spreads to narrow with positive effects on economic growth and efficiency of resource allocation.

Despite the growing consensus about the factors that influence interest rate spreads, there is a dearth of literature quantifying the impact of the various known influences. This study seeks to investigate the issue for the case of Mauritius with a view to quantifying the influence of various hypothesised determinants of interest rate spread in Mauritius.

The paper is structured as follows: Section 2 provides an overview of the theoretical and empirical literature. Section 3 gives a brief description of banking reforms in Mauritius. In section 4, the interest rate spread is analysed and the components of the spread are disaggregated based on income statements and balance sheets of commercial banks. Section 5 develops the basic structure of the model, describes the data and methodology and gives the estimation results. Finally, section 6 presents the concluding remarks.

2. Survey of Literature

Various studies in the literature have discussed imperfect competition in the banking industry and found that it could be attributed to three different sources: wealth distortion, asymmetric information and the resulting adverse selection.

Borrowers in the market may be expected to have some inside information concerning themselves which the banks do not have. The asymmetrical distribution of information may lead to a process of loan screening using the loan interest rate, to eliminate high-risk borrowers. Jaffee and Roussel (1976) argued that a typical loan contract offered a truncated payoff function to the lender which might induce the borrower to default. Since the lender would not grant loan to a risky borrower if he knew that the borrower would default, the borrower would tend to hide information about his intention in order to obtain the loan. The information asymmetry would lead to equilibrium rationing. This argument was fully extended by Stiglitz and Weiss (1981) who examined the adverse selection effect of interest rate. They suggested that in order to reduce excess demand, banks should select borrowers to grant loans rather than cut the size of loans to all borrowers. The results suggest that the loan quality differentiation may prevent banks from competing with each other by reducing interest rate. Several empirical studies have reported the existence of imperfect loan markets and confirmed the relationship between market structure and interest rate margins (Feder and Just (1980), Ho and Saunders (1980), Nathan and Neave (1989)).

Although market structure is an essential variable in the determination of loan interest rate, this variable alone may not be sufficient to explain interest rate margins established by banks. From a bank's point of view, interest rate margin is a reward for the risk the bank bears. Not only does it compensate for loan default, but also for the risk related to cost of funding. Banks usually borrow short term funds from depositors and lend long term loans. Therefore, interest rate margins should cover both spot and future cost of funds. The margin may move up or down depending on the predictions of future short term interest rate.

Thomas et al (1981) developed a model of bank margin in which the bank was viewed as a risk-averse dealer. They showed that an interest margin was the result of transaction uncertainty faced by the bank and would always exist. They found that this pure margin depended on four factors: the degree of managerial risk aversion, the size of transactions undertaken by the bank, bank market structure and the variance of interest rates. It appeared that because of transaction uncertainty, hedging behaviour was perfectly rational within an

expected utility maximizing framework. Moreover, when they extended the model from a structure with one kind of loan and deposit to loans and deposits with many maturities, it led to further interesting insights into margin determination especially in terms of "portfolio" effects.

Hanson et al (1986) analysed the determinants of interest rate margins looking at the role of explicit and implicit taxes and also other factors like bank costs and profits, inflation, scale economies and market structure. Using aggregate interest rate data for 29 countries for the period 1975-83, they found a positive correlation between interest rate margins and inflation.

More recent studies in the literature discuss the issue of interest rate margins from a wider perspective. The issue of bank interest rate margins can be associated with various variables used by the regulatory authority. Some studies examine how deposit insurance is a subsidy to banks. In the particular case of markets with perfect competition, the insurance should tend to reduce interest rate margins. Another important regulation variable which affects bank interest rate margins is the minimum capital requirement. Higher equity positions reduce financial leverage. Hence, an increase in bank equity should induce banks to increase interest rate margins to cover the higher cost of capital. Madura et al (1992) have shown that the particular form of the bank decision-maker's preference function is an important variable in predicting the response of interest rate margins to variations of deposit insurance and bank capital standards.

Using Canadian data, Yu (1995) tested a number of hypotheses about bank interest rate margins based on risk-neutral bank objective function which was to maximize the return on equity capital. There appeared to be a consistent size-effect in the determination of interest rate margins which favoured large banks in Canada. He also showed that the margin increased with bank capital-to-asset ratio so that the increase in the cost of capital, which resulted from bank capital regulation seemed to be transferred to borrowers. However, no direct link between interest margins and bank noninterest expenses was identified.

Wong (1996) found bank interest margin to be positively related to bank’s market power, operating costs, credit risk and the degree of interest rate risk. Increase in bank’s equity was found to have a negative effect on margin when the bank faced little interest rate risk. Angbazo (1997) tested the hypothesis that banks with more risky loans and higher interest rate risk exposure selected loan and deposit rates which achieved higher net interest margins. Using Call Report data for different size classes of banks for 1989-1993, he showed that the net interest margins of commercial banks reflected both default and interest-rate risk premiums.

Barajas et al (1998) analysed the impact of financial liberalisation of the Colombian economy on ‘interest rate margin’ in the banking system. They found mixed results: liberalisation increased banking sector competition significantly, lowering market power and reduced financial taxation from its highest level of late 1970s. Their results also showed that banks appeared to be more responsive to changes in loan quality, which according to them might be an indication of an improvement in banking supervision and/or reporting (see appendix II).

Randall (1998) examined interest rate spreads over a six-year period in the Eastern Caribbean and found them to be persistently high compared with other low-inflation countries. He concluded that reserve costs, operational costs and provision for loans accounted for over 75 per cent of the observed margin.

3. Brief Overview of Banking Reforms in Mauritius

The banking industry in Mauritius is highly oligopolistic in nature with the two largest banks holding above seventy per cent of the total assets in the banking industry. In addition to a lack of competition, the Mauritian financial system was highly repressed in the seventies and early eighties in the presence of interest rate and credit ceilings. However, in the early eighties, policymakers initiated an ambitious and far-reaching financial liberalisation program and took several actions with the view to redefining the structure and operation of the financial system. As part of the economic reform program, interest rate ceilings were abolished and ceilings on credit allocation were phased out. Moreover, exchange controls were abolished and prudential norms were strengthened out. As part of the financial liberalisation program, the cash ratio was lowered from 12 per cent in the eighties to 5.5 per cent in 1998 and the liquid asset ratio was brought down from 30 per cent in the eighties to zero per cent in 1997.

These measures sought to increase financial intermediation, promote competitiveness, efficiency and stability

in the domestic financial system. As a result of financial liberalisation, considerable financial deepening has taken place as shown by the growth of broad money in relation to GDP in table 1. M2 as a proportion of GDP has almost doubled to 80% in 2000 from 39% in 1970. The change in M2 as a proportion of Gross Domestic Savings (GDS) has gone up from 1.3 in 1975 to about 1.8 in the nineties but has gone down to 1.4 in 2000 on account of a large increase in GDS in the year 2000. This shows a greater role of financial institutions in mobilising savings than before financial liberalisation. However, what is not directly apparent is how much progress has been made in increasing the efficiency and competitiveness of financial institutions.

Table 1: Indicators of Financial Deepening

	1970	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**
M2/GDP	0.387	0.511	0.441	0.445	0.626	0.784	0.803
Change in M2/GDS	-	1.336	1.262	0.995	1.848	1.838	1.419

Since these factors are expected to be reflected in the banking intermediation spread, the study of spread may allow us to assess the extent of efficiency and the level of competitiveness in the Mauritian banking sector.

4. Interest Rate Spreads in Mauritius, 1979-2000

Table 2 shows the evolution of interest rate spread in Mauritius during the period 1979 to 2000. Because of the unavailability of a long-term series on interest rate spread, an attempt has been made to construct one based on information available on the overall banking sector's deposits, loans, deposit rates and lending rates. An overall weighted deposit rate was obtained by averaging deposit rates (mid-rates) of different maturities weighted by the total amount of deposits in each maturity (column 1). Similarly an overall weighted average lending rate was constructed by averaging lending rates (mid-rates) to various sectors weighted by the total amount of credit allocated to the respective sectors (column 2). A spread was then constructed as reported in column 3. Column 4 displays the spread compiled by the IMF in the International Financial Statistics (IFS). However, these figures do not seem very realistic. Finally, column 5 gives the actual spread based on the average lending and deposit rates provided by commercial banks (weighted by respective amount of individual loans and deposits). The difference between the estimated and the actual spread arises from the use of consolidated data on the banking sector instead of individual rates in the construction of weighted deposit and lending rates.

The figures show that estimated interest rate spreads were relatively higher in the nineties as compared to the eighties. From an average of 4.3 per cent in the eighties, the spread rose to an average of 6.0 per cent in the nineties. Interest rate spreads have thus increased in the post-liberalisation period notwithstanding the efforts of policy makers to instill competition in the banking sector and to develop the financial market.

Table 2: Interest Rate Spread (Percentage points)

	Weighted Average	Weighted Average	Estimated	Spread	Spread
As at June	Deposit Rate(%) (Estimated)	Lending Rate(%) (Estimated)	Spread	(Source: IFS)	(Source:Bulletin)
	(1)	(2)	(3) = (2) - (1)	(4)	(5)
1979	8.5	11.9	3.3	-	-
1980	9.9	13.5	3.6	-	-
1981	9.8	14.0	4.2	-	-
1982	9.8	14.1	4.3	-	-
1983	9.8	14.6	4.8	-	-
1984	9.3	13.8	4.5	2.5	-
1985	9.4	14.1	4.6	3.8	-
1986	9.5	14.0	4.4	5.0	-
1987	9.4	13.9	4.4	4.0	-
1988	9.3	14.2	4.9	5.0	-

1989	10.8	15.4	4.7	5.0	-
Average	**9.6**	**14.0**	**4.3**	**4.2**	
1990	12.2	16.9	4.7	5.5	-
1991	12.1	17.8	5.8	5.5	-
1992	10.7	16.5	5.8	4.4	-
1993	7.7	14.4	6.7	8.3	-
1994	9.0	15.2	6.2	7.0	-
1995	9.3	15.5	6.2	9.8	-
1996	9.0	15.7	6.7	11.0	-
1997	8.9	15.1	6.2	5.5	-
1998	8.7	15.2	6.5	9.5	4.6
1999	9.9	15.5	5.6	9.5	4.0
2000	8.1	13.6	5.4	10.6	3.8
Average	**9.6**	**15.6**	**6.0**	**7.9**	

Source: IFS, Bank of Mauritius Annual Report & Monthly Statistical Bulletin, various issues.

A. Anatomy of the Spread

Following Randlall (1998) and others, the balance sheets and income statements of commercial banks have been used to derive an accounting framework in order to decompose interest rate spread. Such a framework provides a descriptive analysis of the determinants of the spread without any behavioural content.

The consolidated income statement of commercial banks defines profit before taxes (P) as interest income (II) plus non-interest income (NII) minus interest expense (IP), operating cost (OC) and provision for loan losses (Prov). This identity can be rearranged and expressed as the interest spread, that is, the difference between interest income and interest expense.

$II - IP = OC + Prov + P - NII$

Dividing this expression by total deposits (D) as a scaling-factor and using total loans (L) and assets (A), the following expression results:

$II/L * L/D - IP/D = OC/D + Prov/D + P/A * A/D - NII/D$

where,

P/A = Gross return on assets (ROA)

Using the fact that interest income is equivalent to the average lending rate times the average volume of loans and that interest expense is equivalent to the average deposit rate times average deposits as well as the fact that the ratio of loans to deposits is equal to one minus the required reserve ratio, an expression for the interest rate spread is obtained as given by equation 1.

$i_L - i_D = \rho * i_L + OC/D + Prov/D + ROA*A/D - NII/D + \varepsilon /D$ Eqn (1)

where,

ρ = Required Reserve Ratio

ROA = Return on assets

i_L =Interest Income on Loans / Total Loans

i_D =Interest Expense on Deposits / Total Deposits

$L/D = (1-\rho)$

ε = residual

The residual ε reflects errors that result from combining data from the income statements (flow data) and stock data from the consolidated balance sheet as well as the assumption that loanable funds are comprised of deposits net of required reserves. Table 3 gives the decomposition of the banking sector's interest rate spread into its various components according to equation 1, for the period 1994 to 1999.

From the table, it is found that interest rate spread ranges between 4.0 and 5.9 percentage points with an average value of 4.9 percentage points. On average, approximately 5.9 percentage points of the spread are attributable to various costs namely reserve costs, operational costs and provision for loan losses. Reserve costs have gone down from 3.5 percentage points in 1994 to 0.6 percentage points in 1999 as a result of a decline in total reserve requirements (on cash and liquid assets) from 33 per cent in 1994 to 5.5 per cent in 1999. Operating costs and costs borne towards provision for loan losses have remained more or less constant over the period under review.

Table 3: Anatomy of the Interest Rate Spread

	1994	1995	1996	1997	1998	1999	Average
i_L	10.7	13.3	13.4	12.7	11.0	11.6	12.1
i_D	6.6	7.6	7.5	7.3	7.0	7.5	7.3
Spread	**4.2**	**5.7**	**5.9**	**5.3**	**4.0**	**4.1**	**4.9**
$\rho * i_L$	3.5	4.4	3.8	0.8	0.7	0.6	2.3
OC/D	2.9	3.2	3.1	3.2	3.0	2.8	3.0
Prov/D	0.4	0.7	0.5	0.7	0.6	0.4	0.6
ROA*A/D	2.1	2.3	2.5	2.4	2.8	2.6	2.5
NII/D	2.4	2.5	2.3	2.3	2.6	2.1	2.4
Residual	-2.4	-2.4	-1.7	0.5	-0.5	-0.2	-1.1

5. Model Specification and Estimation

Let the supply for loans be given by:

$$L_{i,t} = a_0 + a_1 LR_{i,t} + a_2 COST_{i,t} + a_3 YLD_{i,t} + a_4 RR_{i,t} + a_5 PROV_{i,t} + a_6 NII_{i,t}$$

Eqn (2)

where,

$L_{i,t}$ = Loans

$LR_{i,t}$ = Lending interest rate

$COST_{i,t}$ = Operating Cost/ Total Assets

$YLD_{i,t}$ = Interest rate of a substitute, i.e yield on 91-day Treasury Bills

$RR_{i,t}$ = Reserve Requirement

$PROV_{i,t}$ = Provision for bad debts/ Total Loans

$NII_{i,t}$ = Non-interest Income/ Total Assets

Let the deposit demand function be given by:

$$D_{i,t} = b_0 + b_1 DR_{i,t} + b_2 MS_{i,t}$$

Eqn (3)

Where,

$D_{i,t}$ = Deposits

$DR_{i,t}$ = Deposit interest rate

$MS_{i,t}$ = Market share

From the balance sheet condition we obtain a relationship between loans and deposits, which shows how credit is constrained by the amount of reserves:

$D = L/(1-e)$

where e is the required reserve ratio.

Applying the above condition to equations 2 and 3, the spread equation can be written as,

$$SPR_{i,t} = LR_{i,t} - DR_{i,t} = \alpha_0 + \alpha_1 DR_{i,t} + \alpha_2 COST_{i,t} + \alpha_3 YLD_{i,t} + \alpha_4 RR_{i,t}$$

$$+ \alpha_5 PROV_{i,t} + \alpha_6 NII_{i,t} + \alpha_7 MS_{i,t}$$

Eqn (4)

Where,

$\alpha_0 = (-a_0 + b_0(1-e))/a_1$, $\alpha_1 = (-a_1 + b_1(1-e))/a_1$, $\alpha_2 = -a_2 / a_1$, $\alpha_3 = -a_3 / a_1$

$\alpha_4 = -a_4 / a_1$, $\alpha_5 = -a_5 / a_1$, $\alpha_6 = -a_6 / a_1$, $\alpha_7 = b_2(1-e) / a_1$

Theoretically, the coefficients are expected to take the following signs:

$\alpha_2 > 0$, $\alpha_3 < 0$, $\alpha_4 > 0$, $\alpha_5 > 0$, $\alpha_6 < 0$, $\alpha_7 > 0$

A. Data and Methodology

Because of the unavailability of average deposit and lending rates and thus a series on spreads for individual banks, the accounting framework presented in section 4A has been used for the calculation of interest rate spreads for respective banks. To avoid heteroscedasticity, ratios instead of the rupee value for the bank balance sheet accounts are used. Since data on non-performing loans are not available, provision for bad debts has been used to substantiate asset quality of individual banks.

The sample consists of panel data for the 10 commercial banks over the period 1994 to 1999. Yearly data have been extracted from the consolidated income statements and balance sheets of individual banks. The fact that different banks close their financial year in different months has been disregarded for the sake of simplicity. The econometric estimation has been carried out using the Limdep package.

While it is possible to estimate panel models using OLS, the conditions under which OLS will produce

consistent parameter estimates are quite limited and unlikely to be met in practice. One particular problem that occurs is that errors are likely to be correlated across time for each individual bank. For example, a particular bank may have higher demand for loans compared to other banks because of some particular management strategies or a higher demand for deposits because of the nature of the technology that the particular bank is using. In cases where individual banks are correlated across time, OLS estimation will produce inconsistent parameter estimates and other estimation techniques are required.

Panel data models are usually estimated using either pooled OLS, fixed effects or random effects techniques. These latter two techniques have been developed to handle the systematic tendency of individual specific components to be higher for some units than for others-the random effects estimator is used if the individual specific component is assumed to be random with respect to the explanatory variables; the fixed effects estimator is used if the individual specific component is not independent with respect to the explanatory variables.

To distinguish between models a series of statistics is used. The software provides hypothesis tests for selecting among the various models. The fixed effects model is compared to the pooled OLS estimation. The latter imposes zero restrictions on the parameters of the dummy variables of the fixed effects model. The F-test and the Likelihood Ratio Test are used to test these restrictions. The null hypothesis in both tests is that the parameter estimates are not significantly different from zero. If the null hypothesis is not rejected this would mean that the least squares dummy variables model is not different from the pooled OLS model. In such a case bank-specific and period-specific parameter estimates would give us no significant information.

The Breusch and Pagan Lagrange Multiplier test provides a statistic to distinguish between one factor models against the pooled OLS regression with no bank-specific effects. The null hypothesis of homoskedasticity implies that group specific effects are not important so that the rejection of null hypothesis implies that group specific effects are important and thus favours the one-way fixed effects models against the pooled OLS regression.

The Hausman test provides a statistic to distinguish between fixed and random effects models. The random-effect model requires the assumptions that individual error components are uncorrelated with each other and with the explanatory variables in the model. However, the fixed-effect model requires none of such assumptions. The Hausman test which tests for simultaneity indicates that if simultaneity is present, one or more of the explanatory variables will be endogenous and therefore will be correlated with the disturbance term. No simultaneity favours random-effect models against fixed-effect models.

B. Fixed-effect Model and Estimation

The fixed-effect model involves the recognition that the assumption of constant intercept and slope may be unreasonable if the model is estimated using the ordinary least squares pooling procedure. Dummy variables are thus introduced to allow the intercept term to vary over time and over cross-section units. The fixed effect model takes the following form:

$$SPR_{i,t} = \alpha_0 + \alpha_1 DR_{i,t} + \alpha_2 COST_{i,t} + \alpha_3 YLD_{i,t} + \alpha_4 RR_{i,t} + \alpha_5 PROV_{i,t} +$$

$$\alpha_6 NII_{i,t} + \alpha_7 MS_{i,t} + \beta_i W_{i,t} + \delta_i Z_{i,t} + \varepsilon_{i,t}$$

where

$W_{i,t} =$	1 for i^{th} bank, i=1,…,10
	0 otherwise

$Z_{i,t} =$	1 for t^{th} time period, t=1,…,6
	0 otherwise

The above model was first estimated in the one-way fixed-effect form where only group effect was

considered.

Next, the model was estimated in the two-way fixed-effect form where both the group and period effects were considered. Tables 4 and 5 give respective results of the one-way and two-way fixed effects models.

Table 4: One-way Fixed Effects Estimates

	1994-1999	
	Coefficient	**t-ratio**
DR	-0.17	-0.63
COST	0.10	2.29
YLD	-0.34	-2.42
RR	0.03	1.55
PROV	0.21	0.76
NII	-0.67	-0.92
MS	0.34	1.44
	R-squared = 0.699	

Source: computed

Table 5: Two-way Fixed Effects Estimates

	1994-99	
	Coefficient	**t-ratio**
DR	-0.26	-0.96
COST	0.12	0.34
PROV	0.20	0.72
NII	-0.28	-0.37
MS	0.37	1.57
Constant	4.16	1.19
	R-squared = 0.312	

Source: computed

C. Random-effect Model and Estimation

The inclusion of dummy variables represents a lack of knowledge about the model which is accounted for in the disturbance term. The random-effect model is a pooled cross-section and time-series model in which the error terms may be correlated across time and banks. The model takes the following form:

$$SPR_{i,t} = \alpha_0 + \alpha_1 DR_{i,t} + \alpha_2 COST_{i,t} + \alpha_3 YLD_{i,t} + \alpha_4 RR_{i,t} + \alpha_5 PROV_{i,t} +$$

$$\alpha_6 NII_{i,t} + \alpha_7 MS_{i,t} + \varepsilon_{i,t}$$

$$\varepsilon_{i,t} = u_i + v_t + w_{i,t}$$

where $u_i \sim N(0, \sigma_u^2)$ = cross-section error component

$v_t \sim N(0, \sigma_v^2)$ = time-series error component

$w_{i,t} \sim N(0, \sigma_w^2)$ = combined error component

Here, it is assumed that individual error components are uncorrelated with each other and are not autocorrelated across both cross-section and time-series units. The random-effects formulation is obtained from the fixed-effects model by assuming that the mean effect of the random time-series and cross-section variables is included in the intercept term and the random deviations about the mean are equated to the error components u_i and v_i respectively.

The random effects model can be estimated as a generalised least-squares regression. The estimation weights observations inversely to their variances. In the first stage the entire pooled sample is estimated using OLS. The OLS residuals are used to calculate sample estimates of the variance components. The estimated variances are then used in the second stage in which the generalised least-squares parameter estimates are obtained.

Table 6: One-way Random Effects Estimates

	1994-99	
	Random Effects Model: v(i, t) = e(i, t) + u(i)	
	Lagrange Multiplier Test Statistic=21.05 Hausman Test Statistic=50.27 Var(e)=0.25E+01 Var(u)=0.20E+01 Sum of Squares=0.17E+03 R-squared=0.31	
	Coefficient	**t-ratio**
COST	0.44	1.35
MS	-0.89	-1.58
PRO	0.40	1.42
NII	-0.42	-1.61
DR	-0.04	-1.75

Constant	9.65	3.94

Source: computed

Table 7: Two-way Random Effects Estimates

	1994-99	
	Random Effects Model: v(i, t) = e(i, t) + u(i) + w(t)	
	Var(e)=0.38E+00 Var(u)=0.27E+01 Var(w)=0.87E+00 Lagrange Multiplier Test Statistic=26.27 Hausman Test Statistic= 65.32 Sum of Squares=0.26E+03 R-squared=0.37E-01	
	Coefficient	**t-ratio**
COST	0.17	1.30
MS	0.02	0.44
Constant	5.15	6.26

Source: computed

The above model was first estimated in the one-way random-effect form where only group effect was considered. Next, the model was estimated in the two-way random-effect form where both the group and period effects were considered. Tables 6 and 7 give respective results of the one-way and two-way fixed effects models.

D. Discussion of Results

The large value of the Hausman statistic favoured the fixed effect model against the random effect model. Next, in order to discriminate between the one-way and the two-way models, the LM statistic, likelihood ratio test statistic, sum of squares and F-test statistic are considered.

The LM statistic being large favours the one-way fixed effect model. This result is supported by the likelihood ratio and F-test statistics and the sum of squares is minimum for the one-way fixed effect model among all other models estimated.

All coefficients have the expected signs. There seems to exist a positive relationship between operating expenses and spread and the coefficient of COST is significant at 5% level. Such a result supports the hypothesis that interest rate spread may rise with rising expenses.

As expected, there exists a significant negative relationship between interest rate spread and the yield on 91-day Treasury Bills. This is simply because when the yield on 91-day Treasury Bills goes higher, banks prefer to invest in a safe asset like Treasury Bills than in a risky asset like loans. As a result of this, the interest rate spread narrows.

The positive relationship between interest rate spread and reserve requirements was expected. It implies that the higher the reserve costs, the higher is the spread between the lending and deposit rates. The coefficient of reserve requirement, however, has been found to be statistically significant at 10 % level.

The provision of bad and doubtful debts which reflects the quality of loans is generally positively associated with spread. In other words, non-performing loans tend to transmit an additional cost thus widening the spread. Results show that asset quality measured by the provision of bad and doubtful debts was indeed positively related to spread but the coefficient was statistically insignificant. Non-interest income also seems to be a determinant of spread. Banks with high non-interest income can, in general, afford to narrow their spread. Thus an inverse relationship is expected between non-interest income and spread which was indeed observed. However, the coefficient was insignificant.

Lastly, the positive and significant relationship between market share and spread indicates that large banks can afford to charge higher interest rates on their loans while small banks accept a narrower margin.

6. Conclusion

Hence, this study provides evidence of the main determinants of intermediation spreads both analytically and empirically. The estimation results show that interest rate spread is used not only to cover the cost of operating expenses and required reserves but also reflects the prevalence of market power and compensates for the quality of loans.

Although the reduction in financial taxation/repression and the conduct of open market operations have been and will continue to be the key component of any successful liberalisation and modernisation of the Mauritian banking system, further progress needs to be made in achieving a more efficient and competitive financial system capable of operating with lower intermediation spreads. For instance, to make deposit and lending rates more market-conforming, it is imperative to have a wide range of instruments and an even wider range of financial intermediaries in order to promote sound competition in the domestic financial market.

APPENDIX I

Table 8: Consolidated Commercial Banks' Profits and Expenses

(Rs Million)

	1994	1995	1996	1997	1998	1999
Interest Income	3,726	5,306	6,121	6,761	7,599	8,989
Interest Expense	2,546	3,521	4,108	4,371	4,953	6,056
Net Interest Income	1,181	1,785	2,013	2,390	2,646	2,932
Non-interest Income	1,012	1,116	1,221	1,365	1,771	1,695
Operating Income	2,192	2,901	3,233	3,754	4,417	4,628
Operating Cost	1,143	1,412	1,669	1,909	2,090	2,222
Charge for Bad and Doubtful Debts	185	312	262	433	380	334
Profit Before Tax	864	1,177	1,303	1,412	1,946	2,072

Source: Commercial Banks' Annual Reports

APPENDIX II

The Columbian Case

After several decades of financial repression with some partial attempts at liberalisation, Columbian policymakers set out to completely liberalise their financial system in the early 1990s, reducing financial taxation, privatising certain state-owned banks, freeing interest rates, facilitating market entry and exit and removing certain capital account restrictions. These measures were expected to increase the efficiency and competitiveness of financial intermediation and therefore, reducing interest rate spreads historically high by international standards, was an implicit objective.

An approach based on bank profit maximisation was adopted which modeled interest rate spreads as a function of operational costs, financial taxation, market power and loan quality. Aggregate banking data for the pre-liberalisation period and panel data on 22 banks with monthly observations during the post-liberalisation period were used to estimate the model. The determinants of interest rate spreads were then analysed in the two periods and conclusions were drawn about the effects of liberalisation.

The results were mixed. Liberalisation seemed to have increased banking competition - significantly lowering market power - and reduced financial taxation from its highest levels of the late 1970s. In addition, banks' responsiveness to changes in loan quality seemed to have increased, perhaps an indication of an improvement in banking supervision and/or reporting. Finally, a significant difference was observed between the behaviour of private and state-owned banks in the post-liberalisation period. Although private banks seemed to possess some degree of market power, they consistently had lower spreads because they were subject to lower average financial taxation and had low operational costs and better loan quality. Although state-owned banks did not seem to have market power, their spreads were higher as a result of having much larger operational costs and poorer loan quality.

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