THE RELATIONSHIP BETWEEN COMMERCIAL BANKS' INTEREST RATES AND LOAN SIZES: EVIDENCE FROM A SMALL OPEN ECONOMY

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Abstract

Traditional finance theory argues that as the size of a loan obtained from a financial institution increases, the interest rate on that loan rises to accommodate the increased risk associated with the loan. However, utilising firm-level data of the Barbadian banking industry, it is observed that for all six banks studied especially the small ones, the smaller the loan's size, the greater the interest rate applied, and vice versa. Using a fixed effect panel data framework, this study also shows that the interest rate differences among loan sizes can be mainly explained by the demand for smaller loans, administrative expenses and monetary policy as set by the Central Bank.

JEL: C33, G19, G21

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1. Introduction

The traditional analysis of the commercial banking sector postulates that the assets of the banks should mainly be of a short-term maturity, as this would allow banks to effectively meet their demand deposit liabilities when required (see, for example, Roussakis, 1977). Thus, it was realised that larger loans with greater maturity periods would be charged a higher per-dollar rate of interest than smaller loans with lower maturity periods.

However, in response to changing private sector credit demand, increased technology in the banking industry and new banking techniques, commercial banks' portfolios have shifted towards consumer, mortgage, and business loans, with a concomitant increase in maturity periods (see Roussakis, 1977 and Codrington and Coppin, 1987). Thus, modern commercial banks are much less constrained to holding short-term liquid assets. As a result of this shift in commercial banking policy, it has been argued that commercial banks are biased against certain types of borrowers. For example, because of the relatively greater risk (be it real or perceived) of small businesses, they are usually charged higher rates of interest in comparison to larger businesses (see, for instance, Strahan, 1999). This hypothesis is closely related to the credit rationing literature based on the contributions of Keeton (1979) and Siglitz and Weiss (1981). These models assume that the same loan contract is offered to loan applicants exhibiting differing risks of insolvency. It is then shown that equilibrium credit rationing can occur in credit markets with imperfect information if the positive effect of an increase in the interest rate on bank's profit, is outweighed by the negative adverse selection effect induced by a declining average probability of loan repayment.

The main goals of this study are to empirically test the hypothesis that loans with a smaller absolute dollar value are charged relatively higher rates of interest in comparison to loans with a greater dollar value, and to investigate the determinants of the differences in interest rates on various loan sizes. These are achieved using commercial bank-level data obtained from the Central Bank of Barbados' Research Department. To these authors knowledge this is the first such attempt to examine the differences in interest rates and their relationship with loan sizes. The closest study found that resembles the approach taken in this paper was done by D'Auria, Foglia and Reedtz (1999) who investigated the effect of banking relationships on the cost of credit in Italy. Three groups of factors were hypothesised to have influenced the pricing policies of banks: the operating characteristics and risk preferences; size and riskiness of borrowers, and; the structure of credit relationships and bank competition. The authors found that the closeness of lending relationships, measured by a bank's share of customer debt, was the main determinant of individual interest rates. The empirical study presented here differs from that of D'Auria, Foglia and Reedtz (1999) in the following aspects: (i) it does not attempt to examine credit relationships, but, what impact loan size has on average interest rate differences implemented by banks, and; (ii) it explores a different set of determinants for the interest rate differences observed deriving a theoretical model in the process, which then serves as a starting point for the econometric specification.

The importance of this paper rests in the role that interest rates play in the domestic economy as a tool of monetary policy. It has long been recognised that interest rates affect investment and savings and thereby the real economy. For the purpose of this paper it is important to note that since interest rates are a significant determinant of funds borrowed and borrowed funds are used for such purposes as consumer durable purchases, business investment and government financing, interest rates skewed towards larger loans would bias commercial bank lending to certain types of business investment and consumption purchases. For example, by accruing financial economies of scale to large businesses, allowing them to access capital for investment and working capital purposes at relatively lower interest rates, this could act as a limiting factor in small business growth and development.

The structure of the paper is as follows. In Section 2 the conceptual framework of the relationship between loan size and interest rates charged is presented. Then, in Section 3 the econometric model and some data measurement issues are examined. In Section 4, the empirical results are given. Finally, in Section 5, conclusions are made.

2. The Conceptual Framework

2.1 Background

The commercial banking sector in Barbados consists of seven banks. Except for two indigenous banks, all banks are branches of larger overseas financial institutions. Although a number of new financial institutions have arisen to provide increased competition to commercial banks (for example, credit unions), commercial banks' loans still remain the largest proportion of total financial sector assets. In 1988 commercial banks' loans and advances were approximately 57% of the total financial sector loans and advances. By 1998 this figure had risen to 73%. The characteristics of total deposits present a similar picture. In 1988, deposits in commercial banks were 77% of the financial sector deposits, and by 1998 it had grown to 89%. It is clear from the figures above that commercial banks in Barbados exert a significant influence over the local financial system. Thus, this study focuses on the commercial banking sector.

2.2 Commercial Banks' Lending Policies

A Board of Directors usually sets the general lending policy of a bank. A loan committee is established with responsibility for the day-to-day lending activities of the bank. However, it is not uncommon for branch managers and/or officers to have the authority to issue loans below a certain amount. This strategy reduces loan-processing delays and leads to better customer relations. If the loan request is above the limit it is referred to the bank's loan committee.

Related to the lending policy of commercial banks is the collection policy. Loan officers through plant or site visits, examination of financial statements and financial advisory services, keep in close contact with borrowers and monitor their financial activities in the process. One distinguishing feature of Barbadian commercial banks is that their collection, fixed and operational costs are quite high when compared with the international standards of low inflation countries, suggesting that banks may have kept wide interest rate spreads to maintain large profit margins (see Haynes and Howard (1992) for more details).

The distribution of commercial bank loans is generally guided by the competitive situation of the banking sector, bank-borrower relationships, anticipated changes in economic activity and Central Bank policies. For example, increased competition in the commercial banking sector could limit the use of control devices like credit ratings and constrain the bank to utilising changes in the interest rate and maturity periods instead. Hence, expectations of increased credit demand could lead to rising interest rates and shorter maturity periods and vice versa.

Another noteworthy aspect of the commercial banks' lending policies is their bias against small loans mainly because they tend to relate loan size with the borrowers' creditworthiness. Such situations lead to banks granting a large amount of relationship loans, which may disadvantage less informationally opaque firms such as small businesses (see Strahan, 1999). All the factors highlighted above (relationship lending, management policies, collection of operational costs and the bank administration) may have a significant influence on commercial banks' interest rates and their relationship amongst loan sizes.

2.3 The Theoretical Framework

The theoretical model used here to analyse the relationship between loan size and interest rates is based on the price discrimination framework presented in Varian (1989). It relies on the following assumptions:

1. There are two consumers {type 1 (t_1) and type 2 (t_2)}, and a profit maximising bank with some degree of market power who wants to sell L_1 of its loan portfolio to t_1 borrowers and the remainder, L_2, to t_2 borrowers.

2. The utility of consumers t_i is represented by:

$$u(L_i,t_i)+y_i \tag{1}$$

where y_i is the consumption of the numeraire good that is assumed to be zero. In addition,

$$\begin{aligned} &u(L_1,t_2)>u(L_1,t_1) \quad and \\ &\partial u(L_1,t_2)/\partial L_1 > \partial u(L_1,t_1)/\partial L_1 \end{aligned} \tag{2}$$

that is, t_2 consumers are willing to pay more per loan dollar than t_1 consumers (non-crossing condition).

3. Each consumer wants the amount L_i and is willing to pay the price R_i, the revenue from loan size L_i. This leads to the domain of the problem expressed as the following two inequalities:

$$\begin{aligned} &u(L_1,t_1)-R_1 \geq 0, \\ &u(L_2,t_2)-R_2 \geq 0. \end{aligned} \tag{3}$$

Moreover, each consumer must prefer his consumption bundle to that of the other persons' bundle

$$\begin{aligned} &u(L_1,t_1)-R_1 \geq u(L_2,t_1)-R_2 \\ &u(L_2,t_2)-R_2 \geq u(L_1,t_2)-R_1. \end{aligned} \tag{4}$$

From equations (3) and (4), R_1 and R_2 can be expressed as

$$\begin{aligned} &R_1 = u(L_1,t_1) \\ &R_2 = u(L_2,t_2)-u(L_1,t_2)+u(L_1,t_1) \end{aligned} \tag{5}$$

If the profit function for the bank is given as

$$\pi = \omega_1[R_1-\{c_a+c_b(\rho)\}L_1]+\omega_2[R_2-\{c_a+c_b(\rho)\}L_2]-\gamma(L_1,L_2,d) \tag{6}$$

where c_a is the administrative cost per dollar of the loan, c_b is the cost of holding funds at the Central Bank, which is assumed to be a function of ρ, the cash reserve requirement ratio set by the Bank, γ is the cost of holding deposits, that is, the interest rate the commercial bank must pay on its deposit liabilities, and it depends on loan size L_i and d, where d is the deposits not lent to customers of the bank or on account at the Central Bank, $0<\omega_i<1$ is the proportion of the bank's loan portfolio utilised by L_i. Inserting equation (5) into equation (6) gives

$$\pi = \omega_1[u(L_1,t_1) - \{c_a + c_b(\rho)\}L_1] + \omega_2[u(L_2,t_2) - u(L_1,t_2) + u(L_1,t_1) - \{c_a + c_b(\rho)\}L_2] - \gamma(L_1,L_2,d) \quad (7)$$

Since the commercial bank is assumed to be a profit maximiser, Equation (7) is maximised with respect to L_1 and L_2 to give:

$$\frac{\partial\pi}{\partial L_1} = \omega_1\left[\frac{\partial u(L_1,t_1)}{\partial L_1} - \{c_a + c_b(\rho)\}\right] + \omega_2\left[\frac{\partial u(L_1,t_1)}{\partial L_1} - \frac{\partial u(L_1,t_2)}{\partial L_1}\right] - \frac{\partial\gamma(L_1,L_2,d)}{\partial L_1}$$

$$\frac{\partial\pi}{\partial L_2} = \omega_2\left[\frac{\partial u(L_2,t_2)}{\partial L_2} - \{c_a + c_b(\rho)\right] - \frac{\partial\gamma(L_1,L_2,d)}{\partial L_2} \quad (8)$$

The first equation implies that the low-demand consumer, t_1, has a marginal value for loans that exceeds its marginal cost (the cost of issuing the loan and the cost of holdings funds at the Central Bank of Barbados plus the cost of deposits). In the second equation, the high-demand consumer, t_2, has a marginal value for the loan equal to the marginal cost as defined above. If it is assumed that the bank charges the interest rate that consumers are willing to pay then:

$$R_1 = MC_1 + \zeta; \quad \xi > 0$$

$$R_2 = MC_2 \quad (9)$$

One will realise that the interest rate for loan size L_1 is greater than for L_2. Thus, it should be expected that the interest rate on smaller loans, or for low demand consumers, would be on average greater than that on larger loans.

3. The Econometric Model and Some Measurement Issues

3.1 Econometric Model

The results derived from the theoretical framework above forms the basis for the econometric model presented in this section. Equation (8) implies that the difference between interest rates on various loan sizes can be written implicitly as:

$$\frac{\partial\pi}{\partial L_1} - \frac{\partial\pi}{\partial L_2} = \psi(\omega_i, \rho, d, c) \quad (10)$$

From Equation (10) the following empirical model is formulated:

$$SPRED_{ijt} = \alpha_{ij} + \beta_1(NOS)_{ijt} + \beta_2(DEPOSITS)_{jt} + \beta_3(ADMINEXP)_{jt} + \beta_4(RHO)_t + \varepsilon_{ijt} \quad 11)$$

This is a fixed effects panel data model where the dependent variable, $SPRED_{ijt}$, is the difference between the interest rate on loans under $5,000 and four other larger loan sizes, i, for each bank j, i = 1,2...4; j =1...6 and t = 1986:4.... 1998:3. The explanatory variables are: a group specific constant term (α_{ij}), the number of loans for a given loan size (NOS_{ijt}), the level of deposits at a given bank ($DEPOSITS_{jt}$), the cost of loans for each bank ($ADMINEXP_{jt}$) and the cash reserve requirement ratio set by the Central Bank of Barbados (RHO_t).

The fixed effects model assumes that differences across units can be captured in the constant term, and is usually used when the sample under study is representative of the entire population as is the case here. The other explanatory variables concentrate on the demand for loans in a given loan category, the availability of loanable funds and the cost of providing credit. The demand for loans is measured by the number of loans in a given loan category. If it is assumed that the usual law of demand holds, it is expected that the interest rate on a given loan size will grow as the demand for loans increases, ceteris paribus. From the theoretical model, small borrowers place a higher per dollar value on loans. Consequently, if there is a significant difference between interest rates on small and larger loans, β_1 should be positive.

Now to the availability of loanable funds proxied by the amount of deposits at a given bank. The lesser this amount is, the higher the spread between the various loan sizes as commercial banks try to ration credit to smaller borrowers with a larger perceived risk of non-repayment. However, greater deposits also lead to higher interest expenses for the given bank, and by implication larger interest rate spreads. Hence, the impact of deposits on interest rate spreads is postulated to be ambiguous.

From the previous paragraph, it is suggested that the higher the cost of providing loans for a given bank (measured here by the administrative cost of loans), the greater the interest rate difference between large and small loans. However, the impact of this variable on interest rate spreads could also be negative, since increased bank costs could reduce interest rate spreads if the elasticity of demand on larger loans is greater than that on smaller loan sizes. The effect of administrative costs is therefore unclear.

The cash reserve requirement ratio is another variable that is included in Equation (11). It is used to capture the effect of holding non-interest paying deposits at the Central Bank to the commercial bank. The greater the amount of deposits held at the Central Bank the greater the cost to the particular bank. According to Equation (7) this cost is passed on to the consumers of the various loan sizes through higher interest rates. Similar to the analysis above, this could either result in higher of lower interest rate differences.

3.2 Measuring Interest Rate Differences across Loan Sizes and its Dispersion within and between Banks

The firm level data on each bank was obtained from confidential submissions to the Central Bank of Barbados by commercial banks. It is divided into five ranges of loan sizes: $L_1 < \$5,000$; $\$5,000 < L_2 < \$25,000$; $\$25,000 < L_3 < \$100,000$; $\$100,000 < L_4 < \$500,000$ and $L_5 > \$500,000$. Within each of these categories loans are further dis-aggregated by interest rates charged and estimates of the weighted average interest rates (r_{wj}), for the five loan sizes calculated using the following formula:

$$r_{wj} = \sum_{i=1}^{29}\left\{\left(\frac{L_j}{\sum_{j=1}^{5} L_j}\right) * r_i\right\} \tag{12}$$

where L_j is the dollar value of loans for a given loan size j and interest rate r_i, where i = 1...29 and j = 1...5.

Having obtained the average interest rates on a given loan size for each bank, the data is examined further to observe if there is a statistically significant difference between the interest rates and the various loan sizes. This involves calculating the dispersion of the interest rates between various loan sizes amongst banks and within banks, which is done using the second moment of the distribution or the square of the coefficient of variation (CV). The CV is chosen because it is mean independent (that is, it is invariant to proportional changes in all groups), it has the useful property of decomposability and it is commonly used to measure the dispersion of a distribution (see, for example, Shorrocks, 1982). The following is the CV formula employed to investigate the differential in interest rates on the various loan sizes:

$$CV_j = \frac{1}{\bar{r}_w}\left[\frac{1}{j}\sum_{j=1}^{5}(r_{wj} - \bar{r}_w)^2\right] \qquad (13)$$

where $\bar{r}_w$ is the mean interest rate on all loan sizes and the other variables are defined as above. The decomposability property mentioned above suggests that equation (13) can be divided into within – the variation in interest rates on various sizes of loans within a given bank – and between – the variation in interest rates for the same loan size between banks. This result is utilised in the next section.

4. Empirical Results

4.1 Average Interest Rates

This subsection analyses the interest rate data and gives the first clues to interest rate differences between small and large loans. It starts by discussing the average interest rates calculated from Equation (12) and presented in Table 1. During the 1986 to 1989 period interest rates were relatively flat. The average difference in interest rates between loans under $5,000 (the lowest amount) and loans over $500,000 (the largest amount) was approximately 1%. Only in the first quarter of 1988 was there any significant fluctuation which resulted mainly from a 1% point increase in deposit rates in February of 1988.

For the period 1990 to 1992 interest rates rose then declined in 1993 and remained relatively constant over the years 1994 to 1995 and increased again between 1996 and 1998. Between 1990 and 1992 the Barbadian economy was experiencing falling growth rates and persistent deficits on the current account of the balance of payments. In an attempt to protect the balance of payments a number of monetary measures were introduced. First, the bank rate was raised from 13.5% to 16% in August 1991, and was increased further to 18% later in the year. In addition to changes in the bank rate, the required holding of treasury bills was expanded from 14% to 16% and then to 17% in August and October respectively of 1991. The savings rate and mortgage rate were also increased, magnifying the effect of the policies above. These measures expanded the cost of lending for commercial banks, which was reflected in rising average interest rates on all loan sizes. The general augmentation in interest rates was also indicative of the difficulty in obtaining credit during this period. The increased cost of loans was also reflected in the maximum average interest rates charged. For example, in the 1986-1989 period the maximum average interest rate charged was 12.7% in comparison to a maximum average interest rate of 15.6% during the 1990-1993 years.

Not only was there a general expansion in average interest rates during the 1990-1993 era, but the spread between the interest rates on the various loan sizes also increased. The average interest rate spread for loans under $5,000 and loans over $500,000 was approximately 1.4 percentage points during the period 1990-1993 compared to 1% during the 1986-1989 years. However, the differences in interest rates declined in the 1993-1995 period, but escalated to a maximum interest rate difference of 6.9 percentage points in the period that followed (1996-1998). This was mainly due to a extraordinary increase in interest rates on consumer loans under $5,000.

4.2 Interest Rate Differentials

The section above indicated that interest rates between various loan sizes differ but failed to check if these differences were significant. To do this, the current section examines the dispersion between interest rates for the various loan sizes amongst and within banks as well as provides formal statistical measures to test the significance of observed interest rate differences. Using Equation

(13), the coefficient of variation was calculated to examine the dispersion between interest rates within each commercial bank and these are presented in Table 2. Generally, there seems to be a correlation between the dispersion in interest rates and the bank's size, measured by the value of deposits. For the three largest banks the average value of the CV was 0.0766, while for the three smaller banks, the average value of the CV was 0.3432. This implies that for smaller banks there is a greater dispersion between interest rates on loans. This finding can be seen also by examining Table 3. Not only was there a larger dispersion in the interest rates on the various loan sizes, but it was also found that small banks normally charged relatively higher interest rates on smaller loans. For the six banks studied loans under $5,000 were usually charged the highest interest rate, followed by loans between $5,000 and $25,000, then loans between $25,000 and $100,000, loans between $100,000 and $500,000 and finally, loans over $500,000.

The coefficient of variation was then calculated to measure the dispersion in interest rates between various banks. From the results presented in Table 4 it was found that there was a greater variation in interest rates on small loans between banks, in comparison to larger loans. This finding indicates that small borrowers are subject to the largest fluctuation in interest rates.

The above analysis is a static one. However, to examine the issue of interest rate differentials over time plots of the coefficient of variation are depicted in Charts 1 and 2 for within banks and between banks, respectively. For the within banks case, of the six banks studied it can be seen that there is relatively little variation between interest rates within larger banks on various sizes of loans. This suggests that larger banks in setting interest rates usually utilise a fixed interest rate band for pricing loans according to size instead of a loan-by-loan pricing policy. However, for the two smallest banks (Banks B and D) there is significant variation in interest rates over the review period.

In the case of between banks, loans under $5,000 exhibited the largest variation in interest rates over the years investigated. Also noteworthy is that during the 1990-1993 recession period when there was a general increase in average interest rates, as noted earlier, interest rates on smaller loans exhibited a greater rate of fluctuation. The coefficient of variation for loans under $5,000 was 0.10, larger than that on loans between $5,000 and $25,000 (0.05), $25,000 and $100,000 (0.08), $100,000 and $500,000 (0.06) and loans over $500,000 (0.06) between the 1990-1993 period.

To test if the results obtained above are statistically significant, that is, if there is a statistically significant difference in interest rates charged on various loan sizes in a given bank, tests for equality of medians and means were calculated for each bank and the findings are given in Table 5. The parametric Analysis of Variance test for equality of means and, the Kruskal-Wallis and the van der Waerden non-parametric statistics for the equality of medians, indicate that, except for one bank (in the case of the means test), there is a significant difference between the mean and median interest rates on the five loan sizes.

4.3 Panel Regression Results

In the previous sub-section it was found that interest rates usually differ according to the given loan size. In this section, some possible factors that could influence the interest rate differences are presented. That is, the estimation results of the fixed effect panel data model outlined in Section 3 is discussed. Four spread variables were first obtained, SRED25 – the difference in interest rates between loans under $5,000 and interest rates on loans between $5,000 and $25,000; SPRED100 – the difference in interest rates on loans under $5,000 and interest rates on loans between $25,000 and $100,000; SPREDU500 – the difference in interest rates on loans under $5,000 and interest rates on loans between $100,000 and $500,000; SPREDOV500 – the difference in interest rates on loans under $5,000 and interest rates on loans over $500,000. These interest rate differences were calculated for each bank and regressed on the number of loans for the five loan sizes highlighted earlier to capture the impact of the demand for various loan categories on interest rate differences. In addition, the deposits for each bank, the reserve requirement ratio set by the Central Bank of Barbados and administrative expenses were included to identify the effect of the availability of loanable funds and individual bank cost on interest rate spreads respectively.

The fixed effects panel data model, Equation (11), was estimated using the method of Generalised Least Squares, corrected for heteroskedasticity utilising White's heteroskedastic consistent standard errors and covariances. The panel contains 276 (quarterly) observations covering the period 1986 Q1 – 1998 Q3. Estimation was performed with the computer programme EVIEWS. The results are given in Tables 6-10. The model seems to provide a good explanation of the variation in interest rate differences between the given loan sizes. For each of the equations estimated, more than 50% of the variation in interest rate differences was explained by the variables used. In addition, the F-statistic for each equation was significant. The coefficient of the variables UN5NOS (number of loans provided by each bank under $5,000) and UN25NOS (number of loans provided by each bank between $5,000 and $25,000) were significant and positive in each equation. The positive sign of these coefficients agree with the prior results presented in Section 3.1, which postulate that the number of loans provided by a given bank increases interest rate differences. However, except for UN100NOS, the impact of the larger loan sizes (UN500NOS and OV500NOS) was usually statistically insignificant. This finding indicates that the interest rate charged on smaller loans is usually more responsive to the demand for a particular loan size, that is the elasticity of supply for small loans is larger than that for larger loan sizes.

The deposits of each bank were not significant for any of the four equations estimated. Not-surprisingly, this implies that the supply of loanable funds is not a significant determinant of interest rates in Barbados. This is not entirely implausible since many local commercial banks are satellites of larger banks based in Canada and the United Kingdom and is able, when required, to request financing from overseas to supply domestic requirements. This suggests that local commercial banks usually have enough resources to supply the needs of customers. As a result, loan price decisions are based on other factors besides the amount of funds available.

Administrative expenses were found to have a negative and significant impact on interest rate spreads in each equation. The negative sign of this coefficient indicates that the elasticity of interest rates on the larger loan sizes in relation to administrative expenses is much greater when compared to the smaller loan sizes. However, this result could also reflect a need to decompose administrative cost into the cost on small and large loans. This was not done since data was not available. Surprisingly, however, a few industry officials indicated that the Barbadian experience suggests that increased administrative expenses are shared roughly equally among all the loan sizes.

The reserve requirement ratio was significant and negative in all the equations estimated. The negative sign indicates that as the reserve requirement ratio increases the interest rate differentials falls between small loan size (UNDER $5,000) and other larger loan sizes (for example, OVER $500,000). This suggests that as the monetary authority tries to restrict credit through the use of the reserve requirement ratio, the cost of interest revenue forgone by commercial banks rises, and the interest rates on larger loans converge to that charged on the smaller loan sizes. These results lead one to conclude that the 'feed-through' effect (the impact of monetary policy on specific commercial bank variables), which monetary policy depends on to be successful, 'feeds-through' quite quickly on the monetary system to influence interest rates.

In Table 10 the results of an aggregated model are presented. The spread (SPREDUN25OV25) is the average interest rates for loans under $25,000 (small loan sizes) subtracted from the average interest rate for loans over $25,000 (large loan sizes). This series is then regressed on the number of loans under $25,000 (NOSUN25), the number of loans over $25,000 (NOSOV25), the deposits and administrative expenses of each bank and the cash reserve requirement ratio. The findings are quite similar to those obtained for the disaggregated equations. More than 80% of the variation in interest rates is explained by the variables chosen. The impact of the number of loans under $25,000 was significant and positive while the influence of the number of loans over $25,000 was statistically insignificant. The coefficient of deposits, administrative expenses and the reserve requirement ratio were significant and negative as in the earlier equations except deposits. This is probably associated with the administrative structure of banks where the decision to give a loan to a consumer, to a certain extent rests in the hands of the loans officer, while overall interest rate setting is set by the management of the bank which may be influenced by the amount of deposits on hand. The similarity of the results between the aggregated model and the more disaggregated models strengthens the validity of the previous deductions.

5. Conclusions

The main aim of this paper has been to examine interest rate differentials between loans of various sizes in the bank industry of the small open economy of Barbados. The point was made that loans under $5,000 generally are charged a higher interest rate, especially by smaller banks, followed by loans between $5,000 and $25,000, then loans between $25,000 and $100,000, after that loans between $100,000 and $500,000 and finally loans over $500,000. Using the square coefficient of variation to measure the dispersion in interest rates it was found that there was a statistically significant greater dispersion between interest rates on loans from smaller banks, as ranked by deposit size. In addition, the smallest loans seem to exhibit the greatest rate of fluctuation.

It was shown using a panel data framework that the differences observed in interest rates on the various loan sizes are due mainly to the demand for the smaller loan sizes (number of loans under $5,000 and the number of loans between $5,000 and $25,000), administrative expenses and monetary policy changes as measured by the cash reserve requirement ratio. This finding that the reserve requirement ratio usually feeds through to affect the interest rates on all loan sizes could serve to inform future monetary policy decisions by utilising the elasticity coefficients.

The main significance of this paper is that empirical proof of the interest rate differential between various loan sizes was obtained. In addition, some of the major determinants of these interest rate differentials were presented. Therefore, this study should improve the general understanding of how commercial banks price loans in small open economies like Barbados. The next logical step for research in this area is to examine the impact of interest rate differences on the economy, which could serve to inform policy makers of the potency of monetary policy.

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Table 1: Average Interest Rates for Five Loan Sizes

PERIOD	LOAN SIZE				
	UNDER $5,000	$5,000-$25,000	$25,000 - $100,000	$100,000 - $500,000	OVER $500,000
1986:1	10.1	10.5	10.3	10.2	9.4
1986:2	10.3	10.3	10.1	9.9	8.9
1986:3	10.3	10.1	9.9	9.8	8.9
1986:4	10.4	10.0	9.9	9.5	9.1
1987:1	10.3	9.9	9.8	9.8	8.8
1987:2	10.2	9.9	9.8	9.8	8.8
1987:3	10.0	9.9	9.8	9.7	8.9
1987:4	9.8	9.9	9.8	9.8	8.9
1988:1	10.6	10.5	10.4	10.5	9.6
1988:2	9.8	10.1	9.9	10.8	8.6
1988:3	10.3	10.4	10.3	10.5	9.8
1988:4	10.2	10.4	10.6	10.4	9.7
1989:1	10.7	10.5	10.5	10.4	9.7
1989:2	10.7	10.6	10.4	10.4	9.9
1989:3	10.9	10.4	10.5	10.4	9.6
1989:4	12.7	11.8	11.8	12.1	11.8
1990:1	11.9	11.8	11.9	12.1	11.7
1990:2	12.3	11.2	11.4	11.6	10.9
1990:3	12.0	11.3	11.5	11.5	10.9
1990:4	12.0	11.4	11.4	11.5	10.9
1991:1	12.7	11.3	11.3	11.5	10.7
1991:2	12.5	11.3	11.3	11.5	10.6
1991:3	13.9	13.0	13.2	13.5	13.0
1991:4	15.6	14.4	14.7	15.2	14.7
1992:1	15.6	14.3	14.5	15.0	14.7
1992:2	15.5	14.2	14.3	15.0	14.8
1992:3	13.5	12.1	11.9	11.8	11.7
1992:4	12.9	12.0	11.8	12.0	11.5
1993:1	12.2	11.3	11.2	11.2	10.7
1993:2	10.9	10.0	9.8	9.6	8.9
1993:3	11.6	10.3	10.0	9.8	9.4
1993:4	11.6	10.6	10.5	10.4	9.8
1994:1	11.2	10.6	10.5	10.5	9.8
1994:2	11.7	10.5	10.4	10.1	9.7
1994:3	11.3	10.4	10.3	10.2	9.7
1994:4	12.4	11.2	11.1	11.0	10.5
1995:1	12.8	11.2	11.2	11.2	10.3
1995:2	13.3	11.8	11.3	11.2	10.3
1995:3	14.7	11.4	11.3	11.2	10.2
1995:4	15.8	11.5	11.3	11.3	10.4
1996.1	15.2	11.1	11.1	11.1	10.2
1996.2	15.2	11.5	11.1	11.1	10.1
1996.3	15.0	11.4	11.4	11.3	10.4
1996.4	17.1	11.6	11.5	11.3	10.2
1997.1	16.7	11.6	11.5	11.4	10.8
1997.2	15.3	11.2	11.2	10.8	10.1
1997.3	16.1	11.0	10.7	10.6	9.5
1997.4	14.5	11.5	10.2	10.5	9.7
1998.1	14.2	11.3	10.3	10.5	9.5
1998.2	15.8	11.2	10.8	10.7	9.6
1998.3	13.7	11.2	10.8	10.7	9.7
1998:4	13.8	11.2	10.8	10.7	9.6

Table 2: The Coefficient of Variation Within Banks

BANK	COEFFICIENT OF VARIATION	SIZE OF BANK
Bank A	0.0582	1
Bank B	0.7921	5
Bank C	0.1032	4
Bank D	0.1342	6
Bank E	0.0968	3
Bank F	0.0749	2

Note: The size of a given bank was ranked by the amount of deposit liabilities, with 1 representing the largest bank and 6 assigned to the smallest bank.

Table 3: Average Interest Rates for each Bank

BANK	LOAN SIZE				
	UNDER $5,000	**$5,000 - $25,000**	**$25,000 - $100,000**	**$100,000 - $500,000**	**OVER $500,000**
Bank A	11.79	11.17	11.54	11.12	10.20
Bank B	12.66	10.65	9.99	10.43	9.95
Bank C	12.94	11.39	11.19	11.04	10.19
Bank D	13.78	11.33	10.95	10.75	10.29
Bank E	13.02	11.42	11.84	12.00	11.28
Bank F	11.51	10.95	10.60	11.04	9.98

Table 4: Coefficient of Variation between Banks

LOAN SIZE	COEFFICIENT OF VARIATION
Under $5,000	0.1443
$5,000-$25,000	0.0504
$25,000-$100,000	0.0700
$100,000-$500,000	0.0615
Over $500,000	0.0730

Table 5: Results of Tests of Equality of Means

Bank	Test Statistics[1]		
	ANOVA F-Statistic	Kruskal-Wallis	van der Waerden
Bank A	8.7**	51.9**	56.2**
Bank B	22.6**	59.8**	64.6**
Bank C	11.3**	32.5**	36.2**
Bank D	31.7**	68.0**	69.4**
Bank E	5.4**	12.1**	13.8**
Bank F	7.75*	38.7**	39.7**

1 ** Significant at the 1% level.
ANOVA F-Statistic test based on (4,195) degrees of freedom, Kruskal-Wallis and van der Waerden tests based on 4 degrees of freedom.

Table 6: Fixed Effects Panel Estimates – Dependent Variable: SPRED25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG (UN5NOS)	1.946497	0.120277	16.18340	0.0000
LOG (UN25NOS)	2.077746	0.161323	12.87946	0.0000
LOG (UN100NOS)	-1.840807	0.547917	-3.359644	0.0009
LOG (UN500NOS)	0.120857	0.637750	0.189505	0.8498
LOG (OV500NOS)	0.161885	0.140984	1.148256	0.2520
LOG (DEPOSITS)	0.393465	0.261563	1.504281	0.1338
LOG (ADMINEXP)	-0.156059	0.051264	-3.044228	0.0026
LOG (RHO)	-0.993298	0.317671	-3.126811	0.0020
Fixed Effects				
Bank A	-18.56017			
Bank B	-15.08273			
Bank C	-18.47409			
Bank D	-13.53211			
Bank E	-16.62455			
Bank F	-19.83296			
Diagnostic Tests				
R-squared	0.616250			
Adjusted R-squared	0.596453			
S.E. of regression	1.789697			
F-statistic	57.81101			
Prob(F-statistic)	(0.000000)			

Table 7: Fixed Effects Panel Estimates – Dependent Variable: SPRED100

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG (UN5NOS)	2.157027	0.133147	16.20038	0.0000
LOG (UN25NOS)	1.994203	0.168364	11.84457	0.0000
LOG (UN100NOS)	-1.547370	0.554903	-2.788542	0.0057
LOG (UN500NOS)	-0.168782	0.645249	-0.261577	0.7939
LOG (OV500NOS)	0.482372	0.161666	2.983765	0.0031
LOG (DEPOSITS)	-0.031603	0.260002	-0.121551	0.9034
LOG (ADMINEXP)	-0.129635	0.053413	-2.427041	0.0159
LOG (RHO)	-1.894754	0.300606	-6.303112	0.0000
Fixed Effects				
Bank A	-14.40973			
Bank B	-10.13108			
Bank C	-14.01148			
Bank D	-8.880027			
Bank E	-12.57560			
Bank F	-15.27214			
Diagnostic Tests				
R-squared	0.596698			
Adjusted R-squared	0.575892			
F-statistic	53.26308			
Prob(F-statistic)	0.000000			

Table 8: Fixed Effects Panel Estimates – Dependent Variable: SPREDU500

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG (UN5NOS)	1.814890	0.124134	14.62045	0.0000
LOG (UN25NOS)	1.603156	0.161023	9.956057	0.0000
LOG (UN100NOS)	-1.489591	0.444111	-3.354096	0.0009
LOG (UN500NOS)	-0.556774	0.541232	-1.028716	0.3046
LOG (OV500NOS)	0.007662	0.115309	0.066449	0.9471
LOG (DEPOSITS)	0.050599	0.224764	0.225122	0.8221
LOG (ADMINEXP)	-0.187317	0.038553	-4.858623	0.0000
LOG (RHO)	-1.956049	0.257829	-7.586626	0.0000
Fixed Effects				
Bank A	-6.071339			
Bank B	-3.068437			
Bank C	-5.332990			
Bank D	-1.731534			
Bank E	-5.301861			
Bank F	-6.818171			
Diagnostic Tests				
R-squared	0.605566			
Adjusted R-squared	0.585218			
S.E. of regression	1.851406			
F-statistic	55.27003			
Prob(F-statistic)	0.000000			

Table 9: Fixed Effects Panel Estimates – Dependent Variable: SPREDOV500

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG (UN5NOS)	1.709446	0.129739	13.17607	0.0000
LOG (UN25NOS)	1.830554	0.168645	10.85448	0.0000
LOG (UN100NOS)	-1.626237	0.416575	-3.903826	0.0001
LOG (UN500NOS)	0.217324	0.588697	0.369161	0.7123
LOG (OV500NOS)	0.031598	0.118262	0.267182	0.7895
LOG (DEPOSITS)	-0.069450	0.241791	-0.287232	0.7742
LOG (ADMINEXP)	-0.161790	0.053493	-3.024482	0.0027
LOG (RHO)	-3.116389	0.316666	-9.841249	0.0000
Fixed Effects				
Bank A	-5.588591			
Bank B	-2.766035			
Bank C	-5.116080			
Bank D	-1.353671			
Bank E	-4.500077			
Bank F	-6.650595			
Diagnostic Tests				
R-squared	0.776829			
Adjusted R-squared	0.765316			
S.E. of regression	1.022216			
F-statistic	125.3111			
Prob(F-statistic)	0.000000			

Table 10: Fixed Effects Panel Estimates – Dependent Variable: SPREDUN25OV25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG (NOSUN25)	1.347761	0.407484	3.307519	0.0011
LOG (NOSOV25)	0.913292	0.709039	1.288070	0.1988
LOG (DEPOSITS)	-3.306722	0.398385	-8.300327	0.0000
LOG (ADMINEXP)	-0.910572	0.315454	-2.886541	0.0042
LOG (RHO)	-13.04254	1.057863	-12.32913	0.0000
Fixed Effects				
Bank A	49.34524			
Bank B	51.38294			
Bank C	48.98912			
Bank D	49.32813			
Bank E	49.03948			
Bank F	49.94986			
Diagnostic Statistics				
R-squared	0.820922			
Adjusted R-squared	0.814165			
S.E. of regression	2.492781			
F-statistic	303.7011			
Prob(F-statistic)	0.000000			

Chart 1: The Coefficient of Variation Within Banks: 1986 - 1998

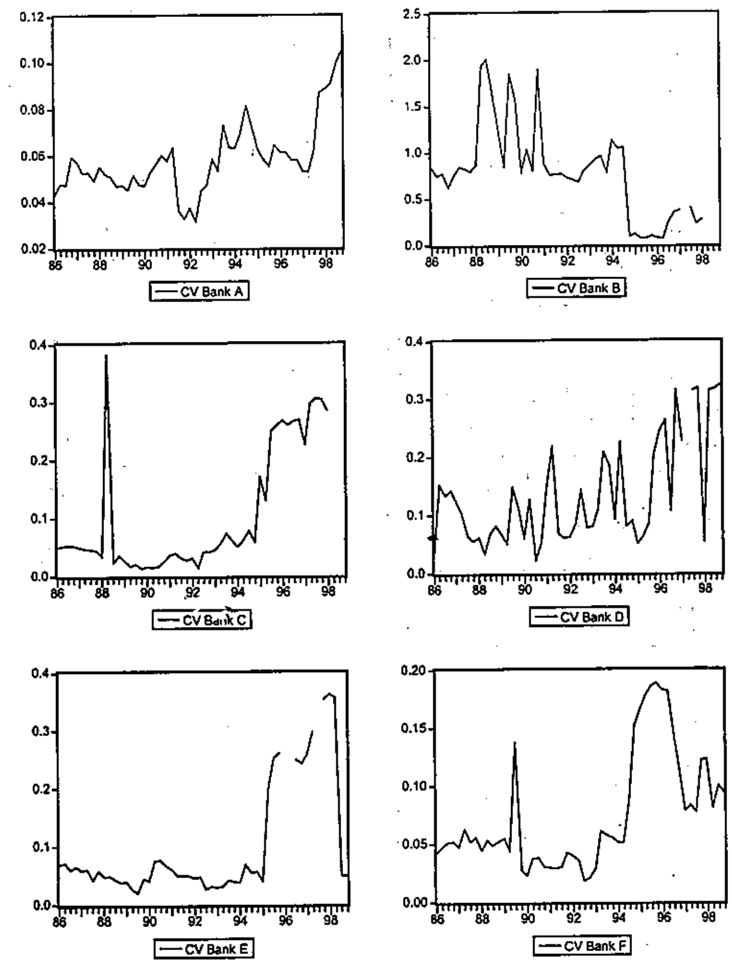

Chart 2: The Coefficient of Variation Between Banks: 1986 - 1998