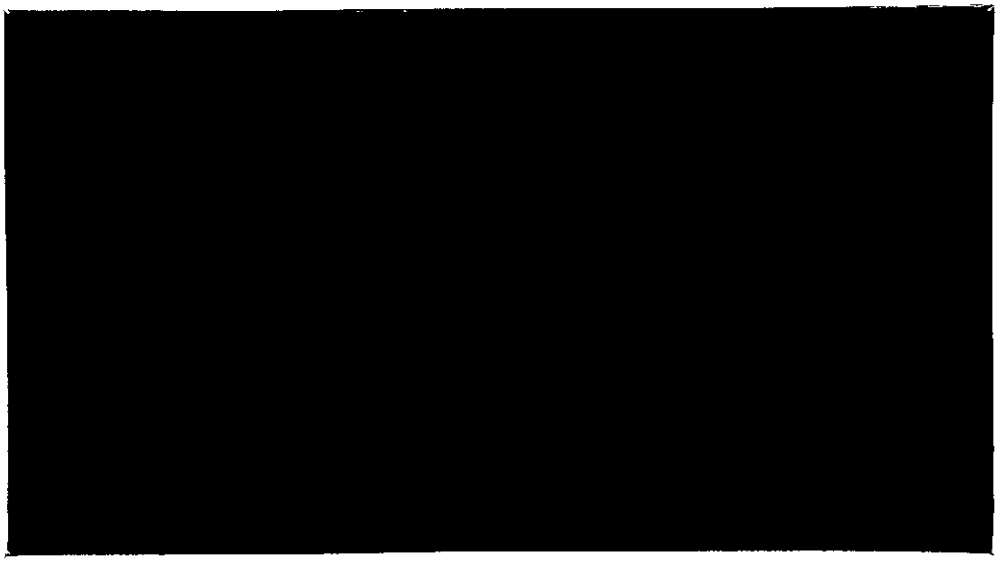
XXXII ANNUAL MONETARY STUDIES CONFERENCE



KINGSTON, JAMAICA

30 OCTOBER - 02 NOVEMBER 2000

INTEREST RATE DETERMINATION IN THE CARIBBEAN

Patrick Kendall
Economics and Programming Department
Caribbean Development Bank

ACKNOWLEDGEMENTS

In the undertaking of this study, I gratefully acknowledge the useful contributions made by Mr. Roland Craigwell of the Central Bank of Barbados, Mr. Carlos Holder, Mr. Elliott Murphy, Mr. Elmer Harris and Mr. Carl Howell of the Caribbean Development Bank. However, all errors and omissions are those of the author.

ABSTRACT

Assuming profit maximising behaviour on the part of commercial banks, the paper seeks to identify the major determinants of lending rates within the region. Using panel data for six Caribbean countries (Bahamas, Barbados, Belize, Guyana, Jamaica, Trinidad), and fixed effects estimation, the study concludes that the level of deposit rates is the largest single determinant of lending rates. Very importantly, however, the study also concludes that national financial markets despite efforts at liberalisation, continue to be isolated from regional and international financial markets, thus leading to the continuation of high interest rates.

INTRODUCTION

Domestic lending rates are an important determinant of the rate of capital formation and hence of income growth. By contributing to the determination of the relative price of capital and labour, lending rates influence the level of labour absorption and hence unemployment rates. The cost of capital is an important determinant of international competitiveness and of the dynamism of the external sector. Lending rates through their effect on capital flows can also impact on the size and sustainability of the balance of payments and the rate of foreign reserve accumulation. Under the circumstances, an understanding of the process of determination of lending rates is critical.

In many Caribbean territories, lending rates are high. Several explanations have been advanced for the high rates including the small size of national markets, the oligopolistic structure of the commercial banking industry, the uncompetitiveness of non-bank financial intermediaries, poor fiscal management and the lack of integration of the Caribbean money and capital markets. The study attempts to provide an understanding of the process of interest rate determination in the Caribbean, focusing on the larger territories.

Section A provides an overview of the theoretical and empirical literature on interest rate determination. The empirical model is presented in section B followed by discussion of the results in section C.

A. LITERATURE REVIEW

Models of interest rate determination in the empirical literature can be placed into four categories: (i) market models in which interest rates are the outcome of the interaction of supply and demand in the money, securities or loanable funds market; (ii) variations on the Fisher equation of interest rate determination; (iii) models that address the specific circumstances of open economies through their inclusion of external factors in the process of interest rate determination; and (iv) the portfolio adjustment models of financial intermediaries.

Examples of the first category are articles by Hoelscher (1986) and by Correia-Nunes and Stemitsiotis (1995) who use the loanable funds variant of the market model. Correia-Nunes and Stemitsiotis (1995), for example, hypothesise that the supply of loanable funds is dependent on both the short-term and long-term interest rates, inflationary expectations and the budget deficit. The demand for loanable funds is also hypothesised to be a function of the foregoing variables together with the real growth rate of GDP.

Assuming market clearing, the reduced form model of interest rate determination is generated from the foregoing functions. Friedman (1980) used a similar reduced form approach with respect to the US bond market, based on the demand and supply functions of the major participants. Another common approach within this type of model has been the derivation of the reduced form on the basis of the IS-LM model [Bomberger and Frazer (1981); Evans (1985); Peek and Wilcox (1987)].

A substantial portion of the empirical literature in this category has focused on the relationship between budgetary deficits and interest rates. The empirical results on this issue are inconclusive with some finding empirical support for the hypothesis that budgetary deficits do impact on interest rates [Friedman (1980); Hoelscher (1986); Bovenberg (1988)); Correia-Nunes and Stemsiotis (1995) and others not [Plosser (1982); Evans (1985); Spiro (1987) Findlay (1990)]. The latter group claim that their results substantiate the validity of the Ricardian equivalence theory or that there is some other compensating adjustment in the money market (international capital inflows, domestic asset adjustment) that vitiates the impact of budgetary deficits.

Articles by Fama (1975); Nelson and Schwert (1977); Garbade and Wachtel (1978); Makin (1982); Blejer (1982); and Tanzi (1980,1985) typify the second approach to interest rate determination which is based on the Fisher equation. The latter approach views nominal interest rates as the sum of a constant real rate and the expected rate of inflation. Much of the empirical literature has focused on the question of the constancy of the real rate and the size of the coefficient of the inflationary expectations variable which within the Fisher model is unity. In recognition of the problem of mis-specification bias posed by the Fisher equation, most of the empirical literature tested these hypotheses within an expanded theoretical framework. For example, Tanzi (1980,1985) expanded the Fisher equation to include the impact of the business cycle [Tanzi (1980, 1985)] and of fiscal variables - budgetary deficits and the public debt [Tanzi (1985)]. Levi and Makin (1979) and Bomberger and Fraser (1981) introduced measures of inflation uncertainty. Makin (1982) introduced monetary shocks and budgetary deficits. The majority of empirical research has concluded that the real interest rate is not constant [Nelson and Schwert (1977); Garbade and Wachtel (1978); Makin (1982); Tanzi (1980,1985)]. There is, however, less agreement with respect to the size of the coefficient of the inflationary expectations variable [Garbade and Wachtel (1978); Levi and Makin (1979); Friedman (1980 (a)); Tanzi (1980); Makin (1982)].

Unlike the two previous approaches which assume a closed economy, Tanzi and Blejer (1982) and Edwards and Khan (1985) modeled domestic interest rates as the outcome of domestic and international factors. In the latter category are expectations with respect to exchange rate movements and world interest rates. One of the more interesting expositions of this approach was that of Edwards and Khan (1985) who hypothesised that domestic interest rates in an open economy are a weighted combination of domestic and international factors. The domestic and international factors were represented by the Fisher and interest rate parity equations respectively.

Given the openness of Caribbean economies, many of the models of interest rate determination variation have tended to use some variant of this approach. Some of the more noteworthy analyses in this vein include that by Thomas (1974); Zephirin (1984); Walker and Craigwell (1994);Worrell (1994; 1995 (a); 1995(b)); Greenidge and McClean (1996) and Doyle (1997).Thomas (1974) emphasised the relationship between domestic and foreign interest rates. Relating the Guyanese experience during 1945-62, he pointed out that in the context of expatriate ownership of commercial banks, the non-existence of a domestic capital market, limited domestic lending opportunities and the presence of the British Caribbean Currency Board (BCCB) that essentially facilitated capital movements, domestic rates were wholly determined by foreign rates. Reflecting a new environment with the replacement of the BCCB by Central Banks, Zephirin (1984) in her analysis of the Caribbean financial sector shared Thomas' view. She, however, modified Thomas' analysis, claiming that external rates essentially influenced deposit rates but collusive pricing behaviour by commercial bank oligopolies determined lending rates.

Subsequent Caribbean literature continued to struggle with assessing the impact of foreign interest rates on domestic rates. On this issue, there is a dichotomy of views depending on the particular emphasis of the analyst. There are those such as Walker and Craigwell (1994); Greenidge and McClean (1996) and McClean (1997) who have emphasised the endogeneity of monetary policy in small open economies. Others such as Worrell (1994); 1995(a); 1995 (b)) and Doyle (1997) are more emphatic about the barriers to capital flows (transactions and information costs; policy uncertainties and imperfect substitutability of financial assets) and see foreign interest rates as exerting a somewhat more limited influence on domestic interest rates. Doyle (1997), adopting the Edwards and Khan(1985) model for Barbados for the period 1965-95, was able to determine that, despite various barriers, there is still moderate capital mobility as regards Barbados.

However, she found no statistically significant impact of US Treasury Bill rates (three months) on Barbadian Treasury Bill rates.

One of the more interesting treatments of the issue of foreign interest rates and their impact on domestic rates was that of Worrell (1995(a)) who synthesised these two views. He pointed out, quite unlike Khan and Edwards (1985) who hypothesised that domestic interest rates are the result of domestic policy and foreign interest rates, that imperfections in the capital market afford domestic policy makers a corridor of monetary policy autonomy. The greater the imperfections, the wider the corridor. The width of the corridor is also impacted by the type of exchange rate regime. Flexible exchange rate regimes permit greater policy autonomy as compared with fixed exchange rate regimes because of the addition of the foreign exchange risk premium. Worrell (1995 (a)) hypothesised that within the corridor of autonomy, only domestic factors are operative. Outside of that corridor, foreign interest rates are the sole determinant of domestic interest rates. He defined the corridor in terms of the differential between domestic and foreign interest rates. Using monthly data for the period 1968 to 1994, he found that differential to be four percentage points for Trinidad and the Bahamas, eight percentage points for Barbados and eighteen and nineteen percentage points for Guyana and Jamaica respectively.

The final group of studies hypothesises that interest rates are determined through the portfolio adjustment behaviour of utility maximising financial intermediaries facing a range of income generating opportunities with varying expected returns and risks. This portfolio choice theoretic model pioneered by Markowitz (1952) and Tobin (1958), generally assumes risk aversive behaviour on the part of financial intermediaries as they seek to maximise expected returns for any given level of risk. That is, they seek to operate on a particular point on the efficiency frontier (Tobin's "opportunity locus"), given their individual risk-return preference as defined by their indifference curves. Notable empirical tests of the Markowitz-Tobin model include Parkin (1970); Courakis (1975,1980); Berndt, McCurdy and Rose (1980); Thistle and McCleod (1989).

In the Caribbean, while not as popular as the interest rate parity theory, the portfolio adjustment model has nevertheless been accepted as a possible explanation of interest rate determination. According to McClean (1975),

" The analysis of commercial bank interest rates is a part of portfolio allocation theory as it applies to commercial banks in the East Caribbean Currency area, and involves much more than an analysis of the supply of loanable funds and the demand for commercial bank credit"[1]

Later, however, Greenidge and McClean (1997) rejected this view in relation to the Barbadian financial sector because of the existence of imperfect competition.[2]

B. EMPIRICAL MODEL

The study investigates the determination of lending rates in six Caribbean countries (Bahamas, Barbados, Belize, Guyana, Jamaica and Trinidad). It is assumed that commercial banks, which generally account for the major portion of assets in the financial sector, seek to maximise expected profits the function for which is specified below.

$$\text{Maximise } \Pi_t^{\,e} = \{TL_t * r_{lt} + RR_t * DR_t + (TA_t - TL_t - RR_t) * r_{2t} - [TD_t * DEPR_t + TD_t * T + RR_t * r_t (r_{1t}, r_{2t}) + AOC_t]\} \quad (1)$$

s.t. (i) $y_{t+s} \geq \bar{y}$

(ii) $RR_t \geq \overline{RR}_t$

where

$\Pi_t^{\,e}$	=	Expected Profits
TL_t	=	Total loans
DR_t	=	Discount rate
TA_t	=	Total assets
TD_t	=	Total deposits
$DEPR_t$	=	Deposit rate

---

1 Wendell A McClean, Money and Banking in the Eastern Caribbean Currency Area, Institute of Social and Economic Research, University of the West Indies, Jamaica, 1975, p.57.

2 Several theorists have questioned the applicability of the portfolio adjustment model in the context of imperfect competition. These include Klein (1970); Sealey and Lindley (1977) and Sealey (1980).However, as argued below, the Caribbean commercial banking sector in the countries being studied is perhaps better approximated by the perfect competition model rather than by the imperfect competition/oligopoly models, all appearances to the contrary. As argued by Henderson and Quandt (1980), the existence of a small number of firms is consistent with various types of behaviour including perfect competition. Consequently, to arrive at the conclusion of oligopolistic behaviour merely on the basis of a small number of firms is at best superficial.

RR_t	=	Actual reserves
AOC_t	=	Administrative and operations costs
r_t	=	Weighted interest foregone
r_{1t}	=	Weighted lending rate
r_{2t}	=	Weighted rate of return on other assets
T_t	=	Taxes on deposits
t	=	time period
	=	Probability attached to a given profit outcome
y_{t+s}	=	Real income growth in time period t+s (s= 0.....n)

However, profit maximisation is subject to two constraints as identified in (i) and (ii) above. The first constraint is that posed by the macroeconomic environment, current and future. The latter would influence the creditworthiness of potential borrowers. Alternatively stated, the profitability of banks is conditioned by the absorptive capacity of the domestic economy. The first constraint indicates that there is some minimum level of growth in economic activity, represented by $\bar{y}$ in (i), required for bank lending. The second constraint is the statutory reserves constraint.

The term $RR_t * DR_t$ in equation (1) represents notional revenues while the term $RR_t * r_t(r_{1t}, r_{2t})$ represents the opportunity costs of holding reserves. The component $(TA_t - TL_t - RR_t)$ of the third term in the profit equation represents the various non-loan assets such as domestic and overseas securities. The value of lies between zero and one, and represents the probability attached to each profit outcome. It is assumed that commercial banks have available various profit strategies. Each strategy, however, has a given level of risk attached to it. There are country and sector specific risks and risks related to lending to specific institutions and individuals. In combination, these risks aggregate to a specific probability of attaining a given level of expected profits.

Commercial banks are assumed to be operating in a perfectly competitive environment. In the Caribbean, there has been a dichotomy of views on the level of competition within the financial sector [Haynes (1995);Peart (1995); Shaw (1995); Seepersaud (1995);Worrell 1995(a); (1997)] with no empirical justification for either view. Those who support the imperfect competition hypothesis generally argue on

the basis of market concentration. However, there is neither theoretical nor empirical consensus with respect to the impact of market concentration on profitability in the commercial banking sector. In fact, some theorists see market share, which is the basis for market concentration, as the reward to efficiency in the competition among banks rather than an exogenous determinant of market behaviour [Berger (1995)].

In the model, in both the loans and the deposit markets, commercial banks are seen more as quantity rather than price adjusters.[3] With respect to costs, it is assumed that the major cost components are interest payments on deposits and reserve costs. Administrative and other costs (AOC_t) are assumed much smaller cost components and thus not a major influence on profitability. In any case, in the markets for these cost components, which would include substantially the labour market and the market for goods and supplies, commercial banks are assumed also to be price takers. In the circumstances, the choice variables in equation (1) are TL_t and TD_t. Maximising the expected profit function with respect to TL_t yields:[4]

$$t^e / TL_t = (r_{1t} - r_{2t} - 1/TA_t*RR_t*r_{1t} + 1/TA_t*RR_t*r_{2t}) = 0 \quad (2)$$

$$\Rightarrow \quad r_{1t} - 1/TA_t*RR_t*r_{1t} = r_{2t} - 1/TA_t*RR_t*r_{2t} \quad (3)$$

$$\Rightarrow \quad r_{1t}(1-1/TA_t*RR_t) = r_{2t}(1- 1/TA_t*RR_t) \quad (4)$$

$$\Rightarrow \quad r_{1t} = r_{2t} \quad (5)[5]$$

---

[3] As pointed out by Hart and Jaffee(1974), in the case of quantity setters, prices are stochastic. This hypothesis was tested in the study using the Jarque Bera test of normality. It was found that the weighted lending rates using quarterly data for 1991 to 1998 in all countries except Barbados and Guyana were normally distributed. In the case of Barbados, the result was not unexpected, given the imposition of an interest rate floor. The Guyanese case is somewhat more intriguing since there is no similar intervention in the market for deposits which has been fully liberalised since the early nineties. One possible explanation may be some form of market rigidity. Reportedly, deposit rates tend to adjust fairly rapidly downwards but are sticky upwards. Weighted lending rates for all countries except Barbados and Guyana were normally distributed. In the case of Barbados, there has been a loan rate ceiling for almost half of the period. In the case of Guyana, reportedly loan rates adjust rapidly upwards but are sticky downwards.

[4] In the calculation of the first order condition, r_t is assumed to be a weighted average of r_{1t} and r_{2t}:

$$r_t = a_1 r_{1t} + a_2 r_{2t} = TL_t/TA*r_{1t} + (TA_t - TL_t - RR_t)/TA*r_{2t}$$

[5] This conclusion is not very different from that of Sealey and Lindley (1977) for whom the equilibrium condition was that the marginal revenue from each category of loans and securities is equal to the marginal cost of

Equation (3) indicates that reserves operate as a tax on the revenues and profits of commercial banks. The greater the level of reserves, the higher the level of taxation and, arguably, the higher the required lending rates of commercial banks.

Equation (5) implies that for profit maximisation, the weighted returns on loans and on other assets at the margin must be the same. The argument is that commercial banks adjust their portfolios so that, at the margin, the weighted returns per dollar invested in loans must be equal to the weighted returns on non-loan assets. This is consistent with the fact that loans generally within the Caribbean account for the major portion of the investment portfolio of commercial banks. At the local level, non-loan assets are assumed to include deposits in other financial institutions (other domestic banks and financial institutions), Treasury Bills and other government securities. At the regional level, domestic banks can invest to some extent in Treasury Bills and other government securities or lend to banks and governments in other Caribbean territories. At the international level, it is assumed that the investment opportunities available are mainly in the form of foreign short and medium-term financial assets represented in the model by US three-month Treasury Bills and three-year bonds.

Equation (5) has important policy implications. Firstly, it implies that monetary policy, which has traditionally focused on the commercial banking sector, can perhaps develop a wider focus. It suggests that governments can influence commercial bank lending rates by influencing, where possible, a range of alternative earning opportunities of commercial banks. It suggests greater policy flexibility than that provided by traditional monetary theory. The objective is to identify the policy options with the greatest leverage. Additionally, equation (5) suggests that contrary to the closed economy model according to which interest rates are driven essentially by domestic monetary policy, the model can explicitly incorporate the influence of external monetary policy in recognition of the openness of Caribbean economies.

Based on equation (5) and the preceding discussion, the function to be estimated is presented below:

---

producing each of these categories. However, in the case of both loans and securities, Sealey and Lindley (1977) have two marginal cost components: (i) the marginal deposit cost; and (ii) the marginal cost of engaging in loans or securities (p.1259). The marginal deposit cost for both loans and securities is the same. Hence, if one abstracts from the differences in marginal costs of engaging in loans or securities for purposes of simplification (in the absence of industry data), Sealey and Lindley's(1977) equilibrium condition reduces to equation (5).

$$WTDLR_t = a_0 + a_1 TB_t + a_2 WTDDEPR_t + a_3 DR_t + a_4 TBUS_t + a_5 USBOND_t + a_6 ARWTDEPR_t + a_7 ARWTDLR_t + a_8 ARTB_t + e_{it} \quad (6)$$

$$e_{it} = u_i + v_{it} \quad (7)$$

$$E(u_i) = 0$$

$$E(u_i u_j) = 0 \quad i \neq j$$

$$= \sigma_i^2 \quad i = j$$

$$E(v_{it}) = 0$$

$$E(v_{it} v_{jt}) = 0 \quad i \neq j$$

$$= \sigma^2 \quad i = j$$

$$E(u_i v_{it}) = 0$$

where

$WTDLR_t$	=	Weighted nominal lending rate
TB_t	=	Treasury Bill rate
$WTDEPR_t$	=	Weighted deposit rate
DR_t	=	Discount rate
$TBUS_t$	=	US Treasury Bill rate
$USBOND_t$	=	US three-year bond rate
$ARWTDLR_t$	=	Average regional weighted lending rate
$ARTB_t$	=	Average regional Treasury Bill Rate
t	=	time period

$WTDLR_t$ in equation (6) is the same as r_{1t} in equation (5) and the right hand side variables constitute the vector of non-loan asset returns referred to in r_{2t}. The u_i are the variation in the error term e_{it} due to time-invariant individual characteristics such as differences in financial market size and structure, in monetary and fiscal policy (macroeconomic management) and in exchange rate regimes. The u_i are assumed correlated with the independent variables and hence the use of the fixed effects estimation below.

The returns on domestic non-loan assets are represented by TB_t, $DEPR_t$ and DR_t. Banks hold Treasury Bills as part of their required reserves but also as part of their investment portfolio. When held as required reserves, Treasury Bill holdings impact on commercial banks' operating costs through the differential between the Treasury Bill rate and the weighted average returns on loan and non-loan assets [(r_t in equation 1(a)]. To the extent that the interest rate on Treasury Bills rises, all other things being equal, the cost to banks of holding Treasury Bills is reduced, and they can lower lending rates. Similarly, a lowering of the interest rate on Treasury Bills would increase bank costs and push lending rates upwards as banks attempt to recoup costs. It is therefore arguable that the expected sign of the Treasury Bills coefficient would be negative.

However, apart from being used to satisfy reserve requirements, Treasury Bills are also part of banks' general investment portfolio, and as the interest rate on Treasury Bills rises, one can expect, all other things being equal, that an increasing portion of banks' investible funds would be allocated to the purchase of Treasury Bills, resulting in a squeeze on loanable funds for productive sector activity and for consumption (the crowding out effect). The fact that loans to the general public for investment and consumption are generally seen as riskier relative to government securities also tends to influence the acquisition of the latter and hence the availability of loanable funds. Borrowers would have to compete for a reduced supply of funds, thus putting upward pressure on the lending rate.[6] As a result of the twin influences discussed above, one positive, the other negative, the sign of the coefficient on domestic Treasury Bills is indeterminate.

In the case of interest rates on other government securities such as debentures and bonds, since they are not generally part of required reserves, one would expect that their impact on lending rates would be positive. However, in the interest of parsimony, the rates of other government securities are not included. The second reason for their exclusion is the fact that such securities generally form only a small portion of banks' holdings of public sector securities. Treasury Bills are the most prevalent form of government securities held in the region.

---

[6]Worrell (1995(a)), however, notes that an important consideration by banks in response to monetary policy is the issue of switching costs. These are referred to as the "cost of alienating good customers" through higher interest rates. He argues that if switching costs are greater than the costs of borrowing externally, banks would borrow externally in order to satisfy customer demand, hence frustrating monetary policy.

The domestic deposit rate is included since banks, as another domestic investment option, can earn interest by depositing excess funds with other domestic banks. In an era when banks have tended to diversify in order to reap economies of scope as in the case notably of Trinidad and Jamaica, banks can also pass on deposits to subsidiaries such as trust companies and merchant banks for onlending. Very importantly as well,
the deposit rate clearly represents a substantial portion of bank lending costs. The expected sign for the coefficient of $DEPR_t$ is positive.

he inclusion of the discount rate is in recognition of the fact that it represents a notional return on excess liquidity. The excess liquidity earns a return in the form of costs avoided as represented by the discount rate. The more stringent (the higher the discount rate) and more variable is monetary policy, the greater the potential costs involved. The expected sign of the coefficient is positive in accordance with traditional monetary theory.

In light of the increased potential for intraregional mobility of capital in the nineties both as a result of the financial liberalisation that has characterised the period and the presence of stock exchanges in Barbados, Trinidad and Jamaica, the model has also attempted to incorporate the possible influences of variations in returns on financial assets in other regional economies. While there is clearly some intraregional movement of capital, data on the type, quantum and source is not easily accessible or scarce. This state of affairs has possibly been worsened by the reduced surveillance of capital flows that has characterised the liberalisation process. However, if these intraregional flows are substantial enough, they would impact on the domestic rates in regional economies.

The model assumes that banks can purchase Treasury Bills from governments other than that of the host country and that banks can lend directly to governments and/or to the private sector in the rest of the region. These regional investment opportunities are represented by $ARTB_t$ and $ARWTDLR_t$ respectively. These variables are simply the arithmetic means of TB_t and $WTDLR_t$, for countries other than the host country so that they truly represent the non-domestic regional investment opportunities. For example, in the case of the Bahamas, $ARTB_t$ and $ARWTDLR_t$ are the arithmetic mean of TB_t and $WTDLR_t$ respectively of Barbados, Belize, Guyana, Jamaica and Trinidad. The coefficients for the two regional variables are assumed to be positive.

It is also assumed that returns on foreign assets impact on domestic lending rates. An increase in the returns on external assets, all other things being equal, would encourage the accumulation of external assets, and would limit the availability of loanable funds domestically, thus driving lending rates upwards. A lowering of returns on external assets would tend to have the reverse effect. For example, Greenidge and Warner (1999) using data for Barbados on three month Treasury Bills for 1974 to 1998 found that US rates Granger cause domestic rates. The expected sign of the coefficient on external assets is positive. To represent the returns on foreign securities, the interest rates on the US Treasury Bill (three months) and on the US three year bond rate are used.

The foregoing hypothesis can be considered a proxy for the interest rate parity theory which though not strictly applicable because of the dissimilarity between the assets being compared (interest rates on Treasury Bills/bonds with lending rates) can nevertheless provide useful insights into the model under consideration. In the absence of a forward foreign exchange market with the exception perhaps of Jamaica, it is the uncovered interest parity (UIP) theory that would be applicable to the majority of countries in the sample. Under UIP,

$$1 + i_d = (1 + i_f)\, E\, S_{t+1} / S_t \qquad (8)$$

where i_d and i_f are the domestic and foreign rates, E is the expectations operator and S is the spot exchange rate for the domestic currency. In the case of those countries with stable exchange rates (Barbados, Bahamas, Belize), (8) reduces to an equality between the domestic and foreign rates barring transactions cost and perceptions of non-exchange risk. Alternatively stated, specifically for this case (8), approaches some minimum differential between the two rates reflective of the dissimilarity in the nature of the assets. It is assumed that under these conditions, the coefficients of $TBUS_t$ and $USBOND_t$ would tend towards one. Other countries in the sample, however, which have experienced substantial fluctuations in exchange rates during the period, notably Guyana, Jamaica and Trinidad, would tend to push the coefficients of the two variables towards zero because of the substantial wedge driven between domestic and foreign rates by exchange rate instability. Thus the expected size of the coefficients of $TBUS_t$ and $USBOND_t$ would be between zero and one.

The study uses panel data from six Caribbean countries (Bahamas, Barbados, Belize, Guyana, Jamaica and Trinidad and Tobago) to test the model. Quarterly data for the period 1991:1 to 1998:4 is used. The period of study was restricted to the nineties since it is the period of financial liberalisation in the region [Marston (1995); El Hadj (1997)]. [7] The data was obtained from the IMF International Financial Statistics; Central Bank of Belize Quarterly Review; Quarterly Economic Bulletin, Central Bank of Trinidad and Tobago; Statistical Bulletin, Central Bank of Guyana; Statistical Digest, Bank of Jamaica; Economic and Financial Statistics, Central Bank of Barbados; and Quarterly Statistical Digest, Central Bank of the Bahamas.

C. EMPIRICAL RESULTS

Using first differences, the model was estimated by pooled least squares, generalised least squares (GLS) and seemingly unrelated regression (SUR), all of which produce best linear unbiased estimates (BLU) estimates. [8] SUR is used, given the possibility that the error terms across units may be correlated. This is possible, given the heavy export dependence that characterises all of these countries and in some cases the similarity in the structure of the export sector such as the substantial dependence of the Bahamas, Barbados, Jamaica and Belize on the tourism sector and also the dependence on primary export products (Belize, Guyana, Trinidad, Jamaica). The expectation is that the financial sector would tend to face similar external shocks both from the export sector and, of course, international currency and financial markets. The empirical results are presented in Table 1 below.

In the case of the Treasury Bills, the coefficients are all insignificant. One reason may be the netting out effect of the cost of holding Treasury Bills as part of required reserves and the revenue effects of holding Treasury Bills as an investment asset referred to earlier. An alternative explanation for the performance of domestic Treasury Bills in the model is the small size of the domestic Treasury Bill market. In many cases (the size of the market is generally limited by statute), market volume does not permit the effective use of open market operations to target interest rates. Also, activity in the domestic Treasury Bill market is often

---

[7] While there has been a trend towards greater liberalisation of the financial sector in the nineties particularly under the prodding of the international financial institutions, the pace of liberalisation has differed across countries. For example, Doyle (1997) noted in the case of Barbados that there were implicit and explicit barriers to capital movements. Seerattan (1997) noted also that Bahamas and Belize had in place exchange controls and required approval for the purchase and sale of securities across borders.

[8] See Greene(1997) for the use of first differences in fixed effects estimation.

more the result of budgetary financing needs rather than the requirements of monetary policy. Other possible explanations for the ineffectiveness of open market operations include the issue of switching costs referred to earlier, the opportunities for accessing resources from the non-bank financial sector and also through external borrowing (See footnote 6).

Table 1: Empirical Results			
Variables	**Pooled Least Squares**	**GLS**	**SUR**
TB_t	0.05(1.2)*	0.02(0.4)	0.03(0.6)
$WTDEPR_t$	0.41(7.0)	0.48(6.5)	0.49(6.7)
DR_t	0.10(2.6)	0.16(3.3)	0.13(2.6)
$TBUS_t$	-0.55(1.6)	-0.09(0.6)	-0.16(0.9)
$USBOND_t$	0.49(2.3)	0.12(1.3)	0.14(1.4)
$ARWTDLR_t$	-0.04(0.3)	-0.002(0.1)	-0.02(0.8)
$ARTB_t$	0.02(0.3)	0.01(0.3)	0.01(0.4)
R^2	0.57	0.50	0.55
DW	2.1	2.1	2.0

* t scores are in parentheses

In the case of the discount rate, the results are remarkably similar. In all cases, the coefficient is significant but small. A one percentage point increase in the discount rate results in a 0.1 to 0.16 percentage point rise in the lending rate. This result suggests that the discount rate can be used more as a tool for fine tuning monetary policy than as a dominant policy instrument. The small impact of the discount rate is possibly due to the fact that banks rarely use Central Bank resources because of access to the interbank market and also, particularly in the case of expatriate banks, the possibility of borrowing abroad. This would not be true, for example, of the Trinidadian banking sector which is largely domestically owned. However, the coefficient can be said to capture only the cost relationship between the discount rate and the lending rate, and reflects the direct effect of discount rate changes on the lending rate as compared with the indirect effects through changes in commercial banks' demand for deposits and hence on the deposit rate.

The robustness of the results in the case of the deposit rate $WTDEPR_t$ also is striking. In all three cases the coefficient is positive, lying between 0.4 and 0.5, implying that a one percentage point change in

the deposit rate has a substantial effect on lending rates. It is the most important result of the study. Pyle (1971) observed that the greater the correlation between deposit and lending rates, the lower the risk and the variation in commercial bank profit and hence the greater the likelihood of financial intermediation. His second major conclusion was that intermediation was more likely the greater the variance of deposits and the smaller the variance of loan rates. The latter was true only in the case of the Jamaica and Guyana data. However, the coefficient of variation of weighted lending rates in five of the countries was greater than that of weighted loan rates. The sole exception was Belize in which the coefficient of variation of both rates was quite close.

The regression results underline the importance of deposit rates as a policy focus in the battle to moderate interest rates, and suggests the need to look more comprehensively at deposit rates and the way in which both monetary and fiscal policy impact therein. For example, the findings automatically bring into question the attempts to prop up deposit rates through the use of an interest floor. While this may lead to an increase in deposits (note, however, that savings may be interest inelastic), it can also lead to a slowing in the rate of economic growth through its impact on lending rates. It also forces one to question the use of a tax on deposits or on deposit rates as revenue generating measures by Central Government, both of which can push lending rates upwards. In the first case, this is achieved by restricting the demand for monetary balances through reduced marginal returns. In the second case, commercial bank demand for deposits can be reduced, restricting the supply of loanable funds.

Several other important policy issues emerge. For example, the results point to the importance of public sector savings and its indirect impact on the level of economic activity through the level of public sector deposits. While it is common to speak of the crowding out effect of public sector borrowing, little is heard generally of the possible crowding in effect of public sector savings. This does not imply, however, that the outcome would be neutral to the fiscal policy used to generate those savings. For example, increased taxation may simply change the structure of savings (public/private) rather than impact on the quantum of savings. The responsiveness of domestic savings to tax policy is therefore a critical issue. For this reason, it may be more effective, where such possibilities exist, to generate those savings through the curtailment of recurrent expenditure rather than through increased taxation. The latter policy is likely to be more stimulative of growth by effecting a change in the structure of aggregate demand in favour of investment expenditure, initiating the virtuous circle of increased real income growth, higher deposit levels, reduced

deposit and lending rates etc. A related issue and one perhaps to which not enough attention is paid is the distribution of public sector deposits in the financial system. As a major depositor, the public sector through the distribution of its deposits in the banking system, can influence the level of demand for and thereby the interest rate on deposits offered by individual banks, thus either moderating or ratcheting up loan rates.

More generally, however, the finding points to the need to create an institutional and policy environment that is more conducive to the generation of savings. For example, is the institutional environment adequate? Are there enough financial institutions to ensure access to all who wish to save? Is the range of financial instruments such as to maximise the level of savings? Do government policies stimulate domestic savings? One notable example of successful policy in this regard is the establishment of national insurance schemes throughout the Caribbean which have made a substantial contribution to the level of domestic savings. The encouragement of membership in private pension schemes through tax breaks can perhaps achieve a similar goal. It can help to increase the level of private domestic savings and at the same time reduce the burden of pension payments on Central Government.

In the case of regional rates ($ARWTDLR_t$, $ARTB_t$), the coefficients are both insignificant. The results for interest rates on foreign instruments are not very different. The coefficients for US Treasury Bills are negative and insignificant. In the case of $USBOND_t$, the results are insignificant in two out of three cases. While the OLS estimate suggests a substantial impact on domestic lending rates, the GLS and SUR estimates suggest otherwise. Thus the preponderance of empirical evidence indicates that domestic markets are insulated from regional and international financial markets. Boyle (1997) reported similar results for Barbados with respect to the relationship between US three month Treasury Bill rates and domestic Treasury Bill rates. These results would explain, for example, the continuing effectiveness of domestic monetary policy and the continuation of high lending rates in the Caribbean while rates are relatively low abroad, the corridor of policy autonomy to which Worrell (1995 (a)) made reference.

D. CONCLUSION

An important conclusion of the study is the substantial impact of deposit rates or cost of funds on commercial bank lending rates, emphasising the need for policy to focus somewhat more on this nexus. A surprising result was the negligible impact of domestic Treasury Bill rates on domestic lending rates despite regional efforts at marketisation, underscoring perhaps the need for development of the money and capital

market in the region. Finally, the findings suggest that integration into the global financial market remains elusive after a decade or more of efforts by policy makers and the international financial institutions.

BIBLIOGRAPHY

Barro, Robert J., "The Ricardian Approach to Budget Deficits," Journal of Economic Perspectives, Vol. 3, No.2 (Spring 1989), p.37-54.

Bennett, Karl, "International Capital Mobility and the CARICOM Economies," Paper presented at the Twenty-Seventh Annual Conference of Monetary Studies, St. Kitts, 1995.

_____. "An Analysis of the Performance of the Financial Sector in Barbados, Jamaica and Trinidad and Tobago," Social and Economic Studies, Vol. 44, 1995, p.69-86.

Berger, Alan, "The Profit-Structure Relationship in Banking - Tests of Market Power and Efficient Structure Hypothesis," Journal of Money, Credit and Banking, Vol. 27, No. 2 (May 1995), p. 404-31.

Berndt, Ernst R., McCurdy, Thomas H. and Rose, David E., "On Testing Theories of Financial Intermediary Portfolio Selection," Review of Economic Studies, Vol. 47 (1980), p.861-73.

Blejer, Mario, "Interest Rate Differentials and Exchange Risk: Recent Argentine Experience," IMF Staff Papers, Vol.29, No.2 (June 1982), p. 270-79.

Bomberger, William A. and Frazer, William J., "Interest Rates Uncertainty and the Livingston Data," Journal of Finance, Vol. 36 (June 1981), p. 661-75.

Bourne, Compton, " A Reconsideration of Interest Rate Policy in the Caribbean,"Paper presented at the Thirteenth Annual Regional Monetary Studies Conference, Trinidad, November, 1981.

_____. "Structure and Performance of Commercial Banking in Trinidad and Tobago," Paper presented at the Sixteenth Annual Regional Monetary Studies Conference, Jamaica, October, 1984.

_____. "Some Fundamentals of Monetary Policy in the Caribbean," Social and Economic Studies, Vol. 38, No.2 (June 1989), p.265-90.

Bovenberg, Lans A., "Long Term Interest Rates in the United States," IMF Staff Papers, Vol. 35, No.2 (June 1988), p. 382-90.

Correia-Nunes, Jose and Stemitsiotis, Loukas, "Budget Deficit and Interest Rates: Is There a Link? International Evidence," Oxford Bulletin of Economics and Statistics, Vol.57, No. 4 (November 1995), p.425-50.

Courakis, Anthony S., "Testing Theories of Discount House Portfolio Selection," Review of Economic Studies, Vol. 42, (October 1975), p. 643-48.

_____. " Modeling Portfolio Selection," Economic Journal, Vol. 98 (September 1988), p. 619-42.

Doyle, Michelle , "Capital Mobility: Estimate and Implications, the Case of Barbados, Central bank of Barbados Working Papers, 1997, Vol. 2, p.55-74.

Edwards, Sebastian and Khan, Moshin, "Interest Rate Determination in Developing Countries: A Conceptual Framework,"IMF Staff Papers, Vol. 32, No. 3, (September, 1985), p.377- 403.

El Hadj, Sidya Ould,"Financial Liberalisation: Its Relavance and Experience in the Caribbean," Social and Economic Studies, Vol. 46, Nos. 2 and 3 (1997), p.1-30.

Evans, Paul, "Do Large Deficits Produce High Interest Rates?" American Economic Review, Vol.75, No. 1 (March, 1985), p.68-86.

Fama, Eugene F., "Short-Term Interest Rates as Predictors of Inflation," American Economic Review, Vol.65, No.3 (June 1975), p.269 -282.

Findlay, David W., " Expectations and Long-Term Interest Rates," IMF Staff Papers, Vol.37, No.2 (June 1990), p.433-39.

Fried, Joel and Howitt, Peter, "The effects of Inflation on Real Interest Rates," American Economic Review, Vol. 73, No. 5 (December 1983), p.968-80.

Friedman, Benjamin M., "Price Inflation, Portfolio Choice and Nominal Interest Rates," American Economic Review, Vol. 70, No.1(March 1980), p.32- 48.

_____. "The Determination of Long-Term Interest Rates: Implications for Fiscal and Monetary Policies," Vol. 12, No. 2 (May 1980), p.331- 352.

Garbade, Kenneth and Wachtel, Paul, "Time Variation in the Relationship between Inflation and Interest Rates," Journal of Monetary Economics, Vol. 4 (1978), p.755-65.

Greene, William H. Econometric Analysis, Prentice Hall, New Jersey, Third Edition, 1997

Greenidge, K. and Warner, A. , " A VAR Analysis of Cross Country Monetary Spillover Effects: The Case of Barbados and the US," Central Bank of Barbados Working Papers, July 1999, p. 1-11.

Greenidge, K and McClean, W. , " The Impact of Regulatory Measures on Commercial Bank Interest Rates : A Micro Analysis of the Barbados Case," Central Bank of Barbados Working Papers, 1997, Vol. 1, p.207-216.

Hoelscher, Gregory, "New Evidence on Deficits and Interest Rates," Journal of Money, Credit and Banking, Vol. 18, No. 1, (February 1986), p.1-17.

Klein, John J. , "The State of Finance Field Methodology: A Discussion," Journal Finance 25 (May 1970), p. 322-25.

Levi, Maurice D. and Makin, John H., "Fisher, Phillips, Friedman and the Measured Impact of Inflation on Interest," Journal of Finance, Vol. 34, No.1 (March 1979),p.35- 52.

Makin, John H., "Effects of Inflation Control Programs on Expected Real Interest Rates," IMF Staff Papers, Vol. 29, No. 2 (June 1982), p. 204-33.

Markowitz, H.. M.., "Portfolio Selection," Journal of Finance, Vol. 7 (March1952), p. 77-91.

Marston, David, "Jamaica's Experience with Indirect Instruments: Lessons for the Caribbean," Social and Economic Studies, Vol.44, 1995, p.111-138.

McClean, Wendell A. Money and Banking in the East Caribbean Currency Area, Institute of Social and Economic Research, Jamaica, 1975.

Nelson, Charles R. and Schwert, William G., " Short-Term Interest Rates as Predictors of Inflation : On Testing the Hypothesis that the Real Rate of Interest is Constant," American Economic Review, Vol. 67, No. 3 (June 1977), p.478- 485.

Parkin, M., "Discount House Portfolio and Debt Selection," Review of Economic Studies, Vol. 37, (1970), p. 469-97.

Peart, Kenloy, "Financial Reform and Financial Sector Development in Jamaica," Social and Economic Studies, Vol. 44, 1995, p.1-22.

Peek, Joe and Wilcox, James A., " Monetary Policy regimes and the Reduced Form for Interest Rates," Journal of Money, Credit and Banking, Vol. 19, No.3 (August 1987), p.273 - 291.

Sealey, C.W. ,"Deposit Rate Setting, Risk Aversion, and the Theory of Depository Financial Intermediaries," Journal of Finance, Vol.35, No.5(December 1980), p.1139-54.

Sealey, C.W. and Lindley, James T. , "Inputs, Outputs and a Theory of Production and Cost at Depository Financial Institutions," Journal of Finance, Vol.32 (September 1977), p.1251-66.

Seepersaud, Suzanne, "The Commercial Banking Industry in Trinidad and Tobago, 1968-1992," Social and Economic Studies, Vol. 44, 1995, p. 41- 68.

Seerattan, Dave, "Caribbean Capital Market Development Strategies Revisited," Caribbean Centre for Monetary Studies, Staff Working Papers, Vol.1 (April 1997), p.95-130.

Shaw, E.A., "Operational Results of Commercial Banks in Jamaica (1991-1993)," Social and Economic Studies, Vol. 44, 1995, p. 23 - 40.

Spiro, Peter S., "The Elusive Effect of Fiscal Deficits on Interest Rates," International Monetary Fund Staff Papers, Vol. 34, No. 2 (June 1987), p.400 - 03.

Tanzi, Vito, "Inflationary Expectations, Economic Activity, Taxes and Interest Rates," American Economic Review, Vol. 70 (March 1980), p.12-21.

_____ ."Deficits and Interest Rates in the United States: An Empirical Analysis, 1960-84," International Monetary Fund Staff Papers, Vol.32 (December 1985), p.551-76.

Tanzi, Vito and Blejer, Mario I. , "Inflation, Interest Rate Policy, and Currency Substitutions in Developing Economies: A Discussion of Some Major Issues,"World Development, Vol. 10, No.9 (September, 1982), p. 781-90.

Thistle, Paul D. and McCleod Robert W., "Interest Rates and Bank Portfolio Adjustments," Journal of Banking and Finance, Vol. 13 (1989), p.151-61.

Thomas, C.Y. , Monetary and Financial Arrangements in a Dependent Monetary Economy, Institute of Social and Economic Research, Jamaica, 1974.

Tobin, J., "Liquidity Preference as Behaviour towards Risk," Review of Economic Studies, (1958), p. 65-86.

Walker, A. and Craigwell, R., "An Economic Model of the Monetary sector of the Barbadian Economy," Central Bank of Barbados, July 1994, p.111-26.

Worrell, Delisle. "Open Market Operations in Small Developing Economies: The Barbados and Jamaican Experiences," Central Bank of Barbados Working Papers, November 1994, p.249-61.

(a)_____ . "Domestic Interest Rates and Monetary Policy in Small Open Economies with Fixed and Flexible Exchange Rates," Central Bank of Barbados Working Papers, November 1995, p. 307-18.

(b)_____."Monetary Policy in Small Open Economies," Central Bank of Barbados Working Papers, December 1995, p.319-33.

_____ . " Bank Behaviour and Monetary Policy in Small Open Economies with Reference to the Caribbean," Social and Economic Studies, Vol. 46, Nos 2 and 3, (1997), p. 59-74.

Zephirin, Mary, "Interest Rate Determination," Central Bank of Barbados Research Department, May 1984.