



**THE IMPACT OF REGULATORY MEASURES ON
COMMERCIAL BANKS' PROFITABILITY:
THE BARBADIAN CASE**

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2. Review of Literature

2.1 *The Rationale for Regulation*

Textbooks define regulation as the public administrative policing of private activities based on a set of rules that were developed in the public interest. Thus the process consists of intentional restrictions over a subject's choice or course of operations, by an entity not directly involved in that activity.

When this definition is applied to the financial system, it is termed financial regulation, and refers to a process in which there is a monitoring of the financial institutions by a body that is directed by the government in an effort to achieve macroeconomic goals through monetary policies as well as other measures permissible by law.

Where financial regulations are in place within an economic system, they will impact greatly on the efficiency as well as the structure of financial intermediation¹. With respect to efficiency of financial institutions regulations affect competitive practices, financial and technological innovation and transaction costs. Similarly, regulatory measures influence the structure of financial institutions through their effects on local and foreign investors. As Vittas (1992) noted, regulation is perhaps the most important determinant of differences in financial structure that are exhibited by countries at a similar level of economic development and with common technologies.

Thus, where regulations are concerned, they must be extensively considered and skillfully administered, because inappropriate or ineffective regulatory measures aimed at addressing economic problems can prove to be catastrophic if wrong signals are received by the investing public or the regulated entities as a whole.²

¹ Financial intermediation is the process in which institutions ensure the transmission of funds from surplus to deficit units and select the projects and firms to be financed from a vast array of alternatives.

² A potential moral hazard associated with regulation and supervision is that they can weaken the incentive for managers to monitor and control themselves, and for clients to exercise due diligence, with these institutions. (Goodhart (1998)).

Though this is true, commercial banks in their role as intermediaries, ensure the transmission of funds from surplus to deficit units and select the projects and firms to be financed from various alternatives. They issue liquid liabilities and acquire assets that are mainly illiquid, and have longer maturity periods than their liabilities. The very nature of this role suggests risky business. The financial market forces do not impose the necessary discipline on financial institutions through pricing nor rationing of funds. Hence there is a need for some discipline to be interposed on the financial institutions through some form of regulation.

The impact of the prevailing economic climate (macroeconomic conditions) on the banking system, if left unattended could pose a threat to macroeconomic stability. Hence, there is a need for prevention of stress in a banking system; which requires a well-balanced institutional and regulatory structure, as well as a macroeconomic policy mix that is 'sensitive' to bank's financial soundness. By soundness we mean that banks are solvent (having a positive networth which is the difference between assets and liabilities in the balance sheet), and are likely to remain so³.

Craigwell et al (1997) agreed that a sound banking sector is crucial to economic growth in the Caribbean, and that any effective monitoring of the banking system must include gauging the factors that contribute to bank fragility (insolvency). This suggests that regulations should guard against extensive market and credit risk, poor quality of management, unprofitability, and excessive interbank borrowings, among other factors.

2.2 *Types of Financial Regulation*

Financial regulation can be classified into groups according to their aims and functions. The three most common classifications are structural, prudential, and monetary. These are outlined in Williams, 1996 and are therefore only briefly discussed here.

³ See Lindgren (1996) for more details on bank soundness.

Structural regulations are boundaries placed on commercial banks determining the activities in which they can participate from those from which they are debarred. Licensing of commercial banks and prohibitions from engaging in commercial activities, are examples of structural regulations used.

Monetary regulation is the process of setting monetary policy directives designed to bring about predetermined macroeconomic outcomes by focusing on interest rates, credit controls and primary and secondary reserve requirements. It impacts on the deposit-taking and lending activities of commercial banks through adjustments in price, volume, portfolio change and risk-taking.

Prudential regulation emphasizes the control of systemic risk through principally balance sheet constraint such as capital adequacy and permissible bank concentration (share of bank's assets held by a particular body or individual) ratios; and it establishes guidelines to banks with the intention of maintaining safety and soundness of the banking system and protecting the users of financial services. An example of prudential placing limits on loan to a single borrower or group.

Thus, the major functions of financial regulation, along with ensuring institutional soundness are:

- 1) the protection of depositors,
- 2) ensuring financial and monetary stability⁴,
- 3) maintaining an efficient and competitive system, and
- 4) channeling activities that would promote monetary and Credit policies

⁴ Banking supervision/regulation is only part of wider arrangements that are needed to promote stability in financial markets. Others such as sound and sustainable macro-economic policies, developed public infrastructure, market discipline, procedures for efficient resolution of problems in banks and mechanism for providing systemic protection. See Basle Committee on Banking Supervision 1997.

2.3. Regulation Versus Rules

An issue that must be addressed, and is critical to any discussion on regulation is why the allows for on going regulation, instead of just prescribing the rules to be followed and the penalties for evasion and avoidance? Goodhart (1998) presented a case for regulation of financial institutions as opposed to prescription rules. Prescriptive regime tends to focus upon firm's processes rather than outcomes, while regulation may create a confrontational relationship between the regulator and regulated firms, forcing firms' to comply with the challenges of the regulator. During regulation, more is learned about consumer preferences and how behavior affects objectives and properties of different rules. The rationale presented for imposing regulatory measures includes: the position of banks in the financial system, the nature of bank contracts (risk involved as well as asymmetric information), potential and systemic dangers, and adverse selection and moral hazard associated with lender of last resort role and other safety net arrangements that apply to banks.

A view on the issue of central banking by the Federal Reserve Bank of Australia is that: "By supervising banks, central bank gains first hand knowledge and 'feel' for financial market conditions and for the behavior of those institutions which are a key element in the transmission of monetary policy changes to the general economy."⁵

The literature reviewed so far, has shown some degree of necessity for regulatory measures to be imposed on the banking system, and that much consideration be done before any one actually comes to fore. Regulations have their place in promoting a safe banking environment, but whether they impact positively or negatively on individual banks' profitability will be dealt with in the ensuing section.

⁵ Goodhart et al 1998, *Financial Regulation*, Bank of England, page 170.

2.4. The Impact of Regulatory Measures

Regulations impact on the very structure of the banking system since they present the stipulations and restrictions that must be considered in the banks' entire series of operations. But in terms of optimality, it remains to be answered whether all the restrictions in place are necessary. Bhattacharya (1998) had some notable conclusions when he set out to survey modern literature on bank regulation, exploring the implications for optimal regulation. Among the conclusions were:

- (1) Imposing restrictions on bank's investment may limit the liability of the deposit insurance fund, affecting the optimal configuration of banking and may reduce charter values as a result.
- (2) Risk-sensitive capital requirements and risk-calibrated deposit insurance premia are potentially useful regulatory tools in coping with moral hazard
- (3) If bank closure policy is improved and discipline brought to bear, it could attenuate the moral hazard problems related to deposit insurance.
- (4) Increasing (and preserving) bank's charter values can also help to dampen the risk-taking propensities of the insured banks.
- (5) Government deposit insurance distorts the behavior of insured institutions and engenders forms of moral hazard that elevate bank risk and taxpayer liability.
- (6) If universal banking is permitted it facilitates reusability of information (cross-sectional as well as intertemporal), and stimulates investments.

Further Bhattacharya et al suggests that restricting banks to financing themselves does not sacrifice efficiency; bank sizes should not be restricted and financing with non-traded demand deposit contracts without constraints on the associated interest rate patterns should be permitted. Therefore, it can be concluded that although restrictions have their place in the financial system, they are not all beneficial to the public nor the banking system and sometimes the economy as a whole.

Measures such as interest rate ceilings and floors, exchange and credit controls, and reserve requirement are typical tools for the Central Banks to use in their effort to

regulate the banks. One school of thought is that where there is no deposit rate ceilings, banks will bid up deposit interest rates which in turn will cause them to seek out higher yielding riskier assets to justify the high deposit rates. Therefore, where ceilings are imposed on deposit rates they should lead to safer and sounder banking institutions. Mingo (1978) in testing the relationship between interest rate competition and bank risk, noted possibly counter arguments to the preceding statement. These include the fact that rate ceilings cause banks to substitute non-price for interest payments (which may be a less efficient means of competing deposits), that rate-ceilings hinder attempts to purchase profitable deposits in cases where there are opportunities for purchasing high-yielding assets and that use of non-price means will be detrimental for banks in cases of failing assets returns, due to the associated inflexibility of this means. Thus causing rate ceilings to lead to greater bank risk. However, the results showed that rate ceilings are associated with lesser, not greater bank risk.

The extent to which banks become involved in risky projects or investments influences the probability of bank failures on the one hand, and the viability and structure of the banking system on the other. Mitchell (1986) sought to examine the effect of three policy variables; the binding ceiling on the deposit interest rate, the required reserve ratio, and the interest rate paid by the Federal Reserve, on bank risk. The main finding was that any policy decision concerning these exogenous variables must be made with the knowledge of (a) the nature of the deposit market, (b) the type of relative risk aversion possessed by banks and, (c) the appropriate definition of bank risk. Barro and Santomero (1972) also found that bank risk regardless of how it is measured, is affected by the interest rate-on bank loans, and separately by reserve requirement. Therefore a chain of influences results; regulatory measures affecting bank risk which in turn affects the banking system and its efficiency.

In his paper on "Concentration and Other Determinants of Bank Profitability", Bourke (1989) divided the determinants (regulation, bank size and economies of scale, competition, concentration, growth in market, interest rates and government ownership, management of funds source and use) into external and internal determinants, and

tested them across ten countries. He noted that concentration, competitive behavior and regulation issues are related. Although there was not a focus on bank profitability in relation to regulation, the results of his regression show that capital ratios, liquidity ratios as well as interest rates are positively related to bank profitability. The results of capital ratio were to be expected as, in accounting terms, capital represents a 'free' resource, but liquidity holdings (particularly if imposed by government) represent an expense to banks, thus the related result was unexpected. Studies have shown that conditions under which changes affect net worth of a financial institution occur if the average length of time in which banks hold assets is greater than the average time period in which it has liabilities outstanding, and vice versa. Here, an increase in interest rates will decrease the net worth (make it less solvent), and a decrease in interest rates will increase the net worth (Grove 1974).

According to Williams (1996), an overview of bank performance in the Caribbean disclosed that bank profitability appears to expand during periods of increasing liberalization. In Trinidad and Tobago, bank profits increased up to 1980 and declined during the period 1980-1986, a period described by Farrel (1990) as one of stabilization and adjustment. In Barbados, a period of declining bank profitability also coincided with a period of tight monetary control, which primarily included higher reserve requirements. Likewise, in Jamaica, in the post 1995 period - a period in which there was a shift to increasingly liberalized system there was increased bank profitability.

3. Regulations in Barbados

The Central Bank of Barbados was established by the Barbadian Government, in 1972. Since its inception, there have been a variety of regulatory measures imposed upon the commercial banks, in an effort to achieve macroeconomic goals such as stability. In fact, the Central Bank functions with the following objectives in view:

- 1) Promoting monetary stability
- 2) Promoting a sound financial structure

- 3) Regulation of the issue, supply, availability and international exchange of money
- 4) Fostering the development of money and capital markets, and
- 5) Fostering credit and exchange conditions conducive to the orderly and sustained economic development in Barbados.

These functions suggest that the Central Bank takes a national view, and does not operate at the expense of consumers or to the detriment of the viability of the banking system. The regulatory measures used in pursuit of these goals include cash reserves and security requirements, credit controls, and interest rate ceilings and floor and moral suasion, (the latter being the first resort) (Worrell, 1997).

A legal cash reserve requirement for commercial banks was introduced by the Central Bank in 1973 at two percent of the commercial bank deposit liabilities, (taking the form of non-interest bearing cash deposits with the Central Bank). In September 1974, the rate was increased to 4% and the banks could now include till cash as an eligible reserve asset. The rate was increased to 6%, and 8% in 1977; in 1993, it was again reduced to 6%.

Another requirement of the commercial banks made by the Central Bank was that they maintain a percentage of their total deposit liabilities in government securities such as treasury bills and debentures. This ratio was introduced at 1% in 1973 and kept increasing periodically until it reached 25% in October 1991. In September 1992, it was reduced to 23% and has since remained at this level. Government securities are priced in line with market conditions in an effort to ensure an effect on the money supply that is consistent with economic circumstances and policy. The price of Government securities can act as a basis for tighter (or more liquid) credit conditions.

The use of credit controls by the Central Bank has been extensive. In 1974, foreign borrowing by all (except government) entities, to finance domestic credit operations was restricted. (All such borrowing had to be referred to the Central Bank - a restriction

which is in force to date). The personal and distributive sectors have also had ceilings imposed on them, often as a percentage of some previous outstanding level of credit to the particular sector. The Hire-Purchase Credit Sales and the Hire-Control Act came into force in 1975. Through these, the Central Bank had power to, under ministerial supervision, control credit by issuing statutory orders. These orders issued by the Central Bank included stipulations on the minimum percentage down payment and maximum repayment period for items sold under hire-purchase contracts. It should be noted that some of these credit limits were not binding and often they were exceeded. Consumers found ways around the stipulated credit limits by borrowing from non-banking institutions (which are not thus controlled), and by lease arrangements.

The re-discounting of the Commercial Bank paper with the Central Bank was introduced in 1973. This changing of the discount rate was often used in pursuit of the Central Bank's monetary objectives. However writers such as (Worrell, 1997) argue that this does not actually tighten credit since banks do not practice to borrow from the Central Bank with an aim of lending to customers.

Prior to 1978, the Government of Barbados under the provisions of the Interest Rate Act 1970-47, was responsible for fixing the maximum rates to be paid on deposits with commercial banks. In 1978, the Central Bank placed floors on the savings deposit rates and ceiling on term deposit rates and the weighted average loan rate. The ceiling on the term deposit rate was removed in 1982, the floor on the prime lending rate in 1986, and the ceiling on the average lending rate in 1991. The floor on the savings deposit rate remained in effect until March 1995, when it was replaced by a floor on all interest-bearing deposits. The direct interventions in the interest ratio could be used as an indication of the prevailing market conditions. That is, the interest rates rose when credit conditions were tight there was and fell when easy access to credit. The trend in interest

rates guided by the Central Bank did not distort market signals, instead, they ensured an orderly transition when interest rates needed to be changed.⁶

Notwithstanding, Worrel (1997), argued that although there was none so great as to result in universal malfunction within the banking system or economic chaos within the country, the Central Bank has made some "impractical" and also some "irrelevant" regulatory measures. For example, in 1981, it stipulated the maximum interest rates that might be offered on deposits of different sizes, a measure that proved to be impractical. There was a very large interest rates spread between deposits and loan interest rates, which is typical of the Caribbean banking systems. Market theory will show that where there are low volumes there will be comparatively high mark-ups. The Central Bank sought to narrow the spread⁷, but it widened instead, during the Bank's regulation period. Ceilings set for bank credit to households and firms in the distribution sector, introduced in 1977, were also ineffective, since actual credit remained below the set maximum.

In 1977, the Central Bank directed commercial banks not to expand consumer installment credit, (incorporating home improvement, real estate and the consolidation of debt), and also a ceiling was placed on credit for the distribution and personal sectors. However, the limits on loans to households became invalid in 1978, when some of these loans⁸ became exempted. Households found ways around the remaining restrictions, by making use of the limit available to them in the regulated institutions and utilizing those available from unregulated entities for whatever was not covered by these banks. Commercial banks also sought to circumvent the rules and the limits were finally removed in 1987.⁹ The fact that the regulations led households to diversify their funds

⁶ "Central Bank's initiative increased visibility of market signals as excess liquidity ratio, government financing needs and long term interest rate trends in international markets, closely monitored by the Central Bank", Worrell (1997)

⁷ This narrowing of the spread would be done by law or decree or after rigorous interest rate competition, which was introduced by incoming American banks, failed to make any impact in the 1970's.

⁸ These loans refer to loans for house repair and home improvement with a maturity of five years.

⁹ The credit restrictions made on commercial banks gave rise to consumers aim at circumventing them and so a great divergence was made to the unregulated institutions, thus credit unions began to boom during the period of massive restrictions and limits made on personal credit.

and seek credit elsewhere suggests that it could not have been a measure that proved to be profitable for the commercial banks involved.

The Central Bank of Barbados has always been involved in a close scrutiny of the performance of commercial banks through the use of on-site and off-site examinations. The Bank Supervision Division of the Central Bank is responsible for these examinations. The division functions to administer laws related to institutions to determine whether there are any violations, determine whether banks are operating within the ambits stipulated by the Central Bank and advise them on supervisory issues. With the use of certain ratios (see Table 1 for these ratios) assessments are made and quarterly and annual reports are prepared.¹⁰ Off-site examinations are done on asset quality, capital adequacy, funding, and profitability. On-site examinations on the other hand, are made on the aforementioned categories as well as on management, provisioning, records, systems, and internal controls. It should be noted that the aim of the bank supervision is not to ensure individual banks' profitability (although its efficiency may be determined through some of the ratios used), but to ensure institutional soundness and compliance with the stipulated requirement, promoting stability of the nation's financial system.

4. The Model

The tool that is most widely used in the analysis of the behavior of financial institutions has been the portfolio theory. Writers such as Hyman (1972), Kane and Malkiel (1965), Parkin (1970), Pyle (1971), and Hart and Jaffee (1974), have used the Markowitz-Tobin portfolio theory in conducting their analysis.

Although this approach treats uncertainty explicitly, it ignores the resource cost incurred in intermediary operation. It also assumes that markets are perfectly competitive. However, Seally (1980) noted that this assumption is not applicable in the deposit

¹⁰ These reports are prepared with the guidelines pertaining to average assets, loans, after tax profits, recoveries, dividends, liquidity, net inter-bank funds, Central Bank short-term borrowings, among others.

market since they are virtually always highly concentrated where intermediaries set rates and face random deposit levels. The assumption of perfect competition suggests that the appropriate behavioral mode is quantity-setting, but Hart and Jaffee (1974) have conceded that rate-setting behavior cannot be treated adequately within a portfolio theory.

The portfolio approach was criticized by Klein (1970) and (1971), on the basis that some basic premises of the theory are not applicable under imperfect market structure. While Seally and Lindley (1977) relate the inadequacy of the approach to the total omission of production and cost constraints under which firms operate, and thus the role of these constraints in determining the equilibrium output mix and the scale size of the financial firm. We therefore submit in this paper that the portfolio theory is not applicable to the Barbadian case with its rate-setting practices and oligopolistic (imperfectly competitive) banking system.

As an alternative, a number of writers have focused on commercial banks as regulated financial service firms - "allowing for the inclusion of more realistic market and cost conditions along with the more appropriate behavioral mode of deposit rate setting". This approach has been seen in studies such as: Pesek (1970), Klein (1970), Korakan (1970), Benston (1973), Seally and Lindley (1977) and King (1986). In the context of the Barbadian regulatory environment, a basic representation of the profit function of a banking firm is:

$$\pi_i = r_L L_i + r_S S_i - r_{Di} D_i \quad (1)$$

π_i is the profit of bank i

D_i is deposits with bank i

L_i is loans with bank i

r_L is the average rate of interest on loans at bank i

r_{Di} is the average rate of interest on deposits at bank i

r_S is the rate of interest on government securities

S_i is the amount of the government securities held by bank i

In a regulated environment characterized by a ceiling on the loan rate of interest and a floor on the deposit rate of interest, any of the four possible scenarios may be obtained.

Case 1: A binding ceiling and a non-binding floor.

Case 2: A binding floor and a non-binding ceiling.

Case 3: A binding ceiling and a binding floor.

Case 4: A non-binding ceiling and a non-binding floor.

Case 4 is tantamount to the absence of interest rate regulation. In Case 1, the loan rate of interest would predominantly be determined by regulatory measures and other exogenous variables. In such circumstances, commercial banks would determine the interest rate on loans prior to the interest rate on deposits. The banks would also choose the level of loans that is consistent with constrained profit maximization. Prior to March 1994, Cases 2 and 3 could not have been generally applicable in that interest rate regulation has had an effect on commercial banking behavior in Barbados, Case 1 would have characterized the Barbadian experience. However, in this regard, note must be taken of an official view of the content of interest rate regulation. DeLisle Worrell (1997) has noted that:

"The Central Bank of Barbados' direct interventions with respect to interest rates reflected the underlying market conditions: the interest rate rose when credit conditions tightened and fell when credit eased... ..spreads between deposit and loan rates were adjusted in line with the banks' requirements. The loan rate was controlled in name only; exemptions were pervasive and the actual was frequently above the controlled maximum."

Examining a related issue, Marion Williams (1996) concluded that:

"The hypothesis of cost-axiomatic pricing is supported by the results for the banking system of setting of interest rate ceilings and floors and contradicts the conventional

literature which posits that interest rate regulation impacts adversely on bank profitability."

The foregoing observations suggest that the Central Bank interest rate policy has been implemented in a manner that has afforded commercial banks a high degree of discretion in regard to the fixing of the loan rate of interest. Hence, it is possible that Case 4 closely approximates the Barbadian experience.

Given case 1, as qualified by Williams (1996) and Worrell (1997), the interest rate on a commercial bank's loans may be represented in a functional terms as,

$$r_{Li} = f(\Phi, r_{Li}); \quad f'_{r_{Li}} > 0 \quad (2)$$

where Φ is a vector of policy and other exogenous variables, including foreign interest rates, and i is all banks other than bank i .

In Barbados, commercial banks normally fix the interest rates on deposits and accept all deposits. For an individual bank, the supply function for deposits may be represented as:

$$D_i = D(r_{Di}, r_{Ai}, \overline{TD}); \quad D_{r_{Di}}, D_{\overline{TD}} > 0, D_{r_{Ai}} < 0 \quad (3)$$

where r_{Ai} is a vector of interest rates on alternative financial assets that may be held by the public, including deposits at other banks. \overline{TD} is total deposits within the banking system, and (-) indicates exogeneity.

Profit maximization, abstracting from non-deposit source of funding, may be represented as subject to the constraint:

$$L_i = (1 - \bar{\rho}_c - \bar{\rho}_s) \quad (4)$$

where $\bar{\rho}_c$ is the required cash reserve ratio

$\bar{\rho}_s$ is the stipulated government security ratio.

Assuming that the main determinant in the level of securities held by a commercial bank are the required ratios and level of total deposits in the system then the profit equation may be expressed in the general functional form as:

$$\pi_i = \pi(r_{Li}, \Phi, \bar{\rho}_c, \bar{\rho}_s, r_s, r_{di}, r_{di}, \overline{TD}) \quad (5)$$

Security holdings comprise of actual open market securities less non-deposit liabilities with immediate maturity (eg. repurchase agreements). If net securities held by the bank are positive, then we expect that the returns on these securities should represent income to the banks, (on negative net securities, returns represent a cost of borrowing).

Deposits represent a liability to the banks, so returns paid to depositors should have a negative impact on banks' profit. Total deposits in the banking system are expected to have a positive relationship with an individual bank's profitability, since more deposits suggest a level of confidence in the banking system and more loanable funds at the individual banks' disposal. A stipulation that the banks should hold a fraction of its deposits in reserve, (that is, they cannot lend beyond a certain fraction of their deposits), should have an adverse relationship with profitability since it represents stored possibility for increased earnings and leaves less 'loanable' funds.

Banks are required to hold a percentage of their deposits in government securities. These securities accrue interest. The impact of the reserve requirement on securities depends on the liquidity situation and the rates that are being offered on loans. If the rate of returns on securities is higher than that on loans, then holding more securities should be more profitable for the banks; and the converse is also true.

The vector of policy and other exogenous variables also includes the regulatory measures that have been imposed by the Central Bank from time to time. One such measure is the floor on the savings rate of return. An increase in the floor of deposit interest rate (without a corresponding increase in the interest rate on loans) would mean a narrowing of the interest rate differentials and thus a decrease in the profits for banks. A ceiling on loan interest would have a similar effect on profitability, as it reduces the possibility of increasing this rate above a certain measure and the higher the loan rate, the greater the profits for banks (*ceteris paribus*).

5. Data Definition and Properties

The data used in this study are quarterly data from January 1986 to December 1999. The software package used was Econometric Views (EViews 3.1). There are six endogenous variables comprising of the profit measure for six of the seven commercial banks operating in Barbados. This measure is defined as the returns on assets (ROA), which is the net profit before tax as a percentage of total assets.

The exogenous variables are the foreign interest rates represented by the London Interbank Overnight Rates, on three months deposits (LIBOR_3m), total deposit (AB.DTO1), and five policy variables. The policy variables are the Average Lending Rate Ceiling (ALRC), Cash Reserve Ratio (RHO), the Stipulated Government Security Ratio (SGSR), the Savings Deposit Rate Floor (SDRF) as well as the Bankrate (BR). It should be noted that the ALRC is the only measure that was discontinued in the in the second quarter of 1990, and all the others were in effect for the duration of the period.

Before embarking on the econometric analysis, it is necessary to ascertain the order of integration of the variables. Using the Augmented Dickey-Fuller test for non-stationarity, (the results of which are presented in table 1) the following results were obtained: Two of the policy variables (RHO, and SGSR), were integrated of order zero ($I(0)$), with SDRF, bankrate and ALRC being $I(1)$. It should be noted that the variables ALRC, and SGSR, when graphed are constant for long periods and when changes do

occur, they are sharp increases and decreases that also remain constant for some time. Similarly, the graphical representation of the variable bankrate has a relatively sharp slump which takes the observed values from a period of high values to a period of much lower values (See Chart 1). Since the variables are definitely not growing over time, the researcher has treated all policy variables as $I(0)$. The profit measures for all banks except bank 1 and bank 5 were also recognized to be stationary. Bank 5 reported a significant loss in the third quarter of 1989, which is actually an outlier which when included, changes the stationarity property of the bank's returns on asset from $I(0)$ to $I(1)$. Bank 1 had non-stationary profit measure over the period. (See Chart 2). Thus, with five mean reverting variables, tests for cointegration would prove futile so the researcher focused on the method of Seemingly Unrelated Regression (SUR) and cointegration test was only carried out for Bank 1.

Although the interest rates on savings and loans are stated as a part of the profit function in equation 5, they were not included in the econometric tests for two main reasons. First, the focus of the study is on the impact of regulatory measures on bank's profitability. Thus, with the limited number of related data points available, and accounting for the all the policy measures plus foreign rates, including all the interest rates on loans and deposits would lead to decreased degrees of freedom and hamper the accuracy of the results. Second, and more importantly, regulations have a direct impact on banks profits, and also have significant indirect influences through the various interest rates. Because of the direct effects that interest rates have on banks' profits, if included in the tests, the coefficient on the regulatory measure will only be capturing the impact of commercial banks' profitability above and beyond their influences on interest rates.

6. Econometric Analysis

6.1. Methodology

The Iterative Seemingly Unrelated Regression is applied to a system in which each equation has an endogenous variable on the left side and only exogenous variables on

the right. Here, although the disturbances are assumed to be uncorrelated with the exogenous variables, if they are in fact correlated, the SUR estimator is more efficient because it takes into account the entire matrix of correlations of all of the equations. Each iteration of SUR re-estimates the parameters of the model after transforming the equations to get rid of the correlation across the residuals.

Since Bank 1 has an I(1) profit variable, for consistency, there is a need to carry out cointegration analysis. One of the main features of cointegrated variables is that time paths are influenced by the extent of any deviation from long run equilibrium. Thus the short run dynamics must be influenced by the deviation from the long run relationship. The error correction model incorporates this relationship. In fact, the error correction model for I(1) variables implies cointegration and vice versa.

The Johansen test for cointegration was used instead of the Engle-Granger two-step method in order to avoid the limitations of the latter method. These limitations include requiring that one variable be placed on the left hand side and the others used as regressors. Subsequently, if this is reversed then the results may be completely opposite; that is, one result shows cointegration and the other suggests that there is no cointegrating relationship. Also, in test for three or more variables there may be more than one cointegrating vector, and the methodology may compound errors since one step depends on the other. On the other hand, the Johansen methodology determines how many characteristic roots of the error-correcting vector are less than one. It determines the no. of cointegrating equations and is better for testing more than three variables. Hence this methodology was used in this paper.

6.2. *Econometric Results*

The results of the SUR method revealed a significant positive relationship between the total deposits within the banking system and profits for three of the six banks such that a unit increase in the total deposits within the system would subsequently raise the profit measure by between .80 and 1.66 for banks 1, 2, and 5 (the larger banks); but had no

effect on returns on assets of banks 3, 4 and 6 (the smaller banks). This is probably because large banks receive a much larger share of deposits, such that the impact of the total deposits in the system has a more significant effect on these banks' profits, compared to that of the smaller banks. More deposits provide cash for investments on which interest can be earned. In only one bank (bank_1), was any significant relationship seen between foreign rates and profits. Any increase in the London Interbank Overnight Rate would correspond with a significant increase in bank 1's return on assets.

One policy variable, the average lending rate ceiling (ALRC), while it was in place had no significant impact on any of the bank's profit. This result is consistent with the hypothesis of Worrel (1997) and Williams(1996), who noted that this ceiling was non-binding. Interestingly, the cash reserve ratio, one of the most manipulated tools of the Central Bank of Barbados, only had significant impact on the profits of one bank (bank 5). This impact, consistent with theoretical expectations, is negative. A one-point increase in the cash reserve ratio leads to a corresponding 1.64 points decrease in the bank's return on asset. One explanation of this result could be that increases in the ratio were associated with increases in the lending rates for the same period, which were probably not enough so as to counter the effects of the ratio. For the banks in which there were no significant effects the results show that increases in the ratio were also associated with periods of increased lending rates; but this increase was probably just sufficient to cushion the effects of the ratio.

The savings deposit rate floor only had significant impacts on two banks' (banks 1 and 2), returns on assets. This impact is negative, and thus in line with the theoretical expectations. Any 1% increase in the SDRF leads to a corresponding .47% and 1.02% decrease in the ROA's for banks 1 and 2 respectively. However, the other four banks were not affected. As theory indicated, the government security ratio had mixed effects on the banks' profit measure (negative for banks 1, 3, and 6; and positive for banks 2 and 4, and none on bank 5). The positive relationships were significantly greater than the negative ones. However, contrary to a priori information, the bankrate had positive

effects on income of the three banks (banks 1, 2, and 3). This could probably be attributed to banks borrowing at the discount window in order to onlend to customers, which would suggest that the Central Bank is not really a lender of last resort.

The results of the cointegration test revealed a long run relationship existing between total deposits within the banking system and the bank's return on assets. None of the policy variables had any impacts on the bank's profitability in the long run. The short run results were on par with theoretical speculations, since all the policy variables except bankrate had adverse effects on the bank's profit measure, although not significant (see Table 4).

7. Policy Implications

The aim of the Central Bank is to foster economic stability at the lowest possible cost, thus extensive considerations must be taken in policy settings and instigations. If the cash reserve ratio which is manipulated to regulate the liquidity situations in the country only affects one bank's profitability, then monetary authorities must consider the liquidity position of this bank before changing the cash reserve ratio. Adverse results on a large bank such as Bank 5 could lead to financial instability. There should probably be more rigid stipulations for borrowing at the discount window, such that it is not used as a profit-making avenue for the banks. The savings deposit rate floor may be a good manipulative tool, but since it affects two (large) banks adversely, it could force them into financial instability if used too frequently; which would be contrary to the ultimate aim of economic stability by the Central Bank. Bearing in mind that the average lending rate ceiling had no significant effects on the profitability of the banks, it can be seen as achieving policy objective at minimum cost to the system. Thus, it could be used from time to time by the Central Bank, to the extent that it curtails credit expansion. But in light of the current moves towards liberalization, this study does not recommend a return to adapting this policy measure. Movements in the stipulated government securities ratio may have positive as well as negative implications for the banks' profits

and so maneuvering this measure must include studies as to which banks impact on the entire market more forcefully and the expected results of this movement on such banks.

Table 1

The following are the ratios used by the Central Bank of Barbados in assessing whether the Commercial Banks are in line with the required regulations.

1. Net Income/Average Assets
2. Net Income/Capital
3. Ave. Earning Assets/Ave. Assets
4. Interest Earned on Loans/Ave. Loans
5. Interest Paid on Deposits/Ave. Deposits
6. Loans/Deposits
7. Net Interest Income/Ave Assets
8. Non Interest Income/Ave. Assets

9. Non Interest Expenses/Ave. Assets
10. Non Interest Expense/Ave. Revenue
11. Non Interest Expense/Net Interest Income
12. Personnel Costs/Operating Expenses
13. Current Provisions/Revenue

14. Gross Classified Debt/Total Loans
15. Loans Classified Substandard/Gross Classified Debt
16. Loans Classified Doubtful/Gross Classified Debt
17. Reserve for Loans Loss/Gross Classified Debt
18. Loans written Off/Total Loans

19. Liquid Assets/Short Term Liabilities
20. Volatile Deposits/Total Deposits

21. Net Classified Debt/Capital
22. Retained Earnings/Capital
23. Capital/ Assets
24. Tier 1 capital / Risk Weighted Assets
25. Tier 1 & Tier 11 Capital/ Risk Weighted Assets

Table 2

The following are the results of the Augmented Dickey-Fuller Test for unit roots

Variables	Test Statistic		Critical Values	
	No trend	Trend	1% level	5% level
AB_DTO	4.649276		-3.4946	-2.8895
DAB_DTO		-12.26887	-4.0494	-3.4535
ALRC	-1.459893		-3.5239	-2.9023
DALRC	-8.368585		-3.5253	-2.9029
BANKRATE	-2.419885		-3.5039	-2.8936
DBANKRATE	-7.562682		-3.5039	-2.8936
TBR	-3.984845		-3.4946	-2.8895
SGSR	-3.778068		-3.4940	-2.8892
SDRF	-2.174427		-3.4940	-2.8892
DSDRF	-10.2087		3.4946	-2.8895
RHO	-3.594740		-4.0485	-3.4531
B1_ROA	-2.901676		-4.0890	-3.4721
DB1_ROA	-8.302959		-3.5239	-2.9023
B2_ROA	-5.384392		-3.5213	-2.9012
B3_ROA	-5.832117		-3.5457	-2.9118
B4_ROA	-6.934713		-3.5200	-2.9006
B5_ROA	-2.871837		-3.5239	-2.9023
DB5_ROA	-15.57033		-3.5239	-2.9023
B6_ROA	-8.552039		-3.5200	-2.9006

Source: Banking Supervision Department Central bank of Barbados

The short run model:

	D(B1 ROA)	
		t statistic
ALRC	-0.007349	(.026899)
RHO	-0.046237	(-0.68899)
SGSR	-.054409	(-0.49986)
SDRF	-0.025242	(-0.49986)
BANKRATE	0.038739	(1.19481)
C	1.504037	(1.69790)
ECM(-1)	-0.626755	(-3.11349)

Table 4: Cointegration Test Results for Bank 1

Table 3: Estimation By the Seemingly Unrelated Regression (SUR) Method

	Log(B1_ROA)	Log(B2_ROA)	Log(B3_ROA)	Log(B4_ROA)	Log(B5_ROA)	Log(B6_ROA)
Log(AB_DT01)	.820236 (7.706490)	1.612843 (5.778084)			1.226614 (3.482084)	
Log(LIBOR_3m)	6.79416 (4.694818)					
Log(SDRF)	-.473322 (-2.289533)	-1.020089 (-2.681888)				
Log(ALRC)						
Log(SGSR)	-.612843 (-5.253021)	9.590887 (6.163559)	-1.909197 (-5.810518)	4.217221 (2.964441)		-2.611718 (-2.274017)
Log(Bankrate)	.334531 (2.715949)	1.629146 (5.170643)	2.297946 (4.283388)			
Log(RRIO)						
Constant		-32.80847 (-6.654470)			-14.23337 (-3.231260)	7.221751 (1.992828)
R-Squared	.559308	.442763	.294412		.129481	.104238
Adj. R-Squared	.524053	.396327	.274252		.110136	.084765
S.E. of Regression	2.63409	.603525	.792417		.679275	.549543
D-W Statistic	1.797722	1.482515	1.614206		2.589819	2.319647
SSR	3.469218	17.48365	21.97734		20.76362	10.83754

Chart 1: The Five Policy Variables

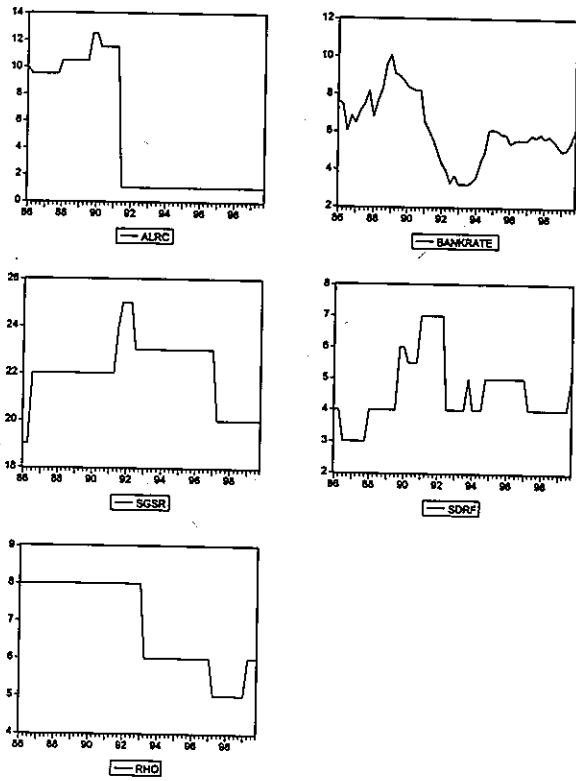
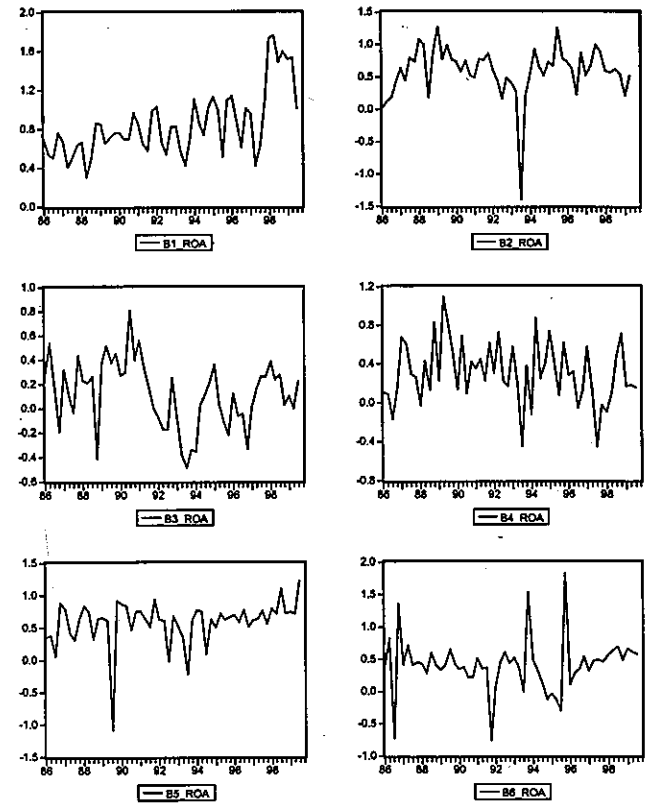


Chart 2: The Returns On Assets For Each Of The Six Banks



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