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Issues in Reserve Requirement and Monetary Management in Nigeria

Moses. F. Otu and Moses K. Tule[1]

Reserve requirement has been used over the years as a tool of monetary management. Accordingly, banks are required by law to hold a fraction of their deposit liabilities with the Central Bank as reserves. In recent times however, the use of reserve requirement has undergone modifications, from drastic reductions to outright elimination. This is attributed to the perception that under rapidly changing structure and financial system innovations, reserve requirement is a weak tool of monetary management. This paper reviews these issues and examines the effects of required reserve on the balance sheet operations of Deposit Money Banks and its impact on the monetary aggregates in Nigeria. It revealed that reserve requirement has significant cost implications on both the Central Bank and the Deposit Money Banks, and that its potency as a tool of monetary management has been weakened as the targeted reserve does not reflect the total reserve level in the system. The paper recommends a drastic reduction of reserve requirement and fine-tuning to accommodate the interest of smaller banks.

I. INTRODUCTION

The core mandate of the Central Bank of Nigeria (CBN) is ensuring price and exchange rate stability. These objectives are achieved through the formulation and implementation of appropriate monetary policies. The design of monetary policy involves the estimation of an optimum quantity of money consistent with the assumed targets for GDP growth, inflation and external reserves. A combination of market-based instruments such as Open Market Operations, (OMO)

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complemented with specification of cash reserve requirements, and discount window operations are used for monetary management.

The framework is based on the multiplier model, which exploits the direct link between deposit money banks' reserves and money supply. It assumes that money supply (M2) is a multiple of the reserves of deposit money banks (DMBs) held with the Central Bank. Thus, if the central bank wishes to increase liquidity in the system, it reduces reserves but, if its objective is to constrain liquidity, it increases reserves.

Generally, it is believed that reserve requirement play a significant role in determining the size of the money multiplier and the magnitude of bank credit expansion. The preconditions for reserve control is the ability of the monetary authorities to forecast the optimum level of reserves that is consistent with the desired money stock, such that available money supply can stimulate economic activities in the desired direction. However, recent experience in Nigeria has shown that reserve balances have increasingly been on the decline owing to a combination of several factors, including under reporting of reservable deposits, and the circumvention of reserve requirement regulations by deposit money banks.

Accordingly, it is alleged that the effectiveness of reserve requirement as an instrument of monetary management is constrained by the above-mentioned developments in the banking industry, which have reduced dependence on cash transactions. In addition, banks on their own have swapped reservable funds as a result of new financial products. The combination of these factors has tended to reduce the effectiveness of reserve requirement with obvious implications on monetary management.

The objective of this paper therefore is to investigate the impact of reserve requirements on the efficacy of monetary policy and on the behaviour of deposit money banks. We shall therefore specifically examine the effects of reserve requirement on DMBs' balance sheets, as well as the implicit cost of reserve requirement to the Central Bank and deposit money banks with a view to making appropriate policy recommendations. Consequently, the paper is organised in five sections. Following this introduction, Part II reviews the empirical literature while Part III focuses on the Implementation of reserve requirements as a tool of monetary management in Nigeria. Part IV analyses the effects of reserve requirement on the balance sheets of DMBs and its impact on monetary aggregates and the rates. Part V summarises and concludes the paper.

SECTION II

REVIEW OF LITERATURE

Reserve requirement is that fraction of the depository institution's deposit liabilities mandated to be maintained as reserve balances in the central bank or vault cash held by the bank. Reserve requirement has existed in many forms and shades over time. However, emphasis vary between economies, while its application is generally dictated by monetary conditions.

When central banks have the exclusive prerogative for monetary policy, flexibility is assured and the ratio could be adjusted from time to time. However, in some countries, reserve requirement specification is an act of parliament, in which case, the monetary authorities have limited power to adjust it (Sellon and Weiner, 1996). In the United States for instance, the structure of reserve requirement is set by the Monetary Act of 1980, which stipulates a 12 per cent maintenance level on Transactions' Account Balances. Thus, the Management of the Federal Reserve Bank cannot fiddle with the legislative provisions without clearance from Congress. In Nigeria, it is fixed by the monetary authorities, and is currently at 10% maintenance level.

The standard practice in the application of reserve requirement is that depository institutions do not have to meet daily targets but only on average basis, over a period of time. Secondly, the monetary authorities do not pay interest on reserve balances. Thirdly, depository institutions are penalized if the reserve balances are deficient over the stipulated maintenance period. Typically, reserve requirement applies to demand or transactions accounts. Savings may also be subject to reserve requirement.

Bisignano (1996), observed that reserve requirement over the years, was a useful monetary policy instrument in controlling the creation of money and credit, and the achievement of financial stability. However, in recent years, the use of reserve requirements has been diversified and modified to meet different contingencies and purposes (Weiner:1992, Kasman:1993). In the UK, reserve requirements is termed cash ratio and stipulated at 0.35 per cent. King (1994), noted in his study of *"Monetary Policy Instruments in the UK"*, that at this low level, reserve requirement serves no monetary policy purpose, but it's sole function is to provide income for the Bank of England. In Germany, reserve requirement is viewed as an essential part of monetary policy. While in some other smaller economies, reserve requirements are sometimes seen as a way to counteract adverse capital flows.

Reserve requirement has undergone series of transformations from drastic reduction (in England) to outright elimination in Belgium, Denmark and Sweden. This is attributed to its evolutionary perception as a weak tool of monetary management in the light of rapidly changing structure and innovations in financial markets. Nnanna (2002), observed that reserve requirements were supposed to provide stability to the financial system by decreasing the individual banks creation of credit. But the enthronement of self-regulation and the need for adequate transaction balances for clearing requirements by banks have gradually diminished the role of reserve requirement.

Stevens (1993) argued that reserve requirements are relatively blunt instruments for changing reserve availability as compared to the use of open market operations. He noted that changes in reserves supply could be accomplished more easily and quickly through Open Market Operations. He stressed the need to replace reserve requirement, arguing that reserve requirements are serious distortions in an increasingly competitive global financial environment; that reserve requirements are generally being applied to depository institutions, while some other lenders such as mortgage institutions are excluded, thereby giving them a competitive edge; reserve requirement are applied to a narrow range of liabilities which allows room for manipulation by banks; and, typically reserve balances attract no interest which impact on the efficiency of banks. Consequently, he concluded that reserve requirements constitute a tax, which differentially affect depository banks, depending on their capital base.

In their own contribution, Sellon and Weiner (1997) reiterated that the reduction in reserve requirement was an attempt to remove an inequitable tax on the banking system, and improve bank profitability thereby allowing banks to compete on a more even terrain with other financial institutions. The decreasing role of banks in the credit markets provide another view against the continued use of reserve requirement to control bank credit. Given the growing availability of substitutes for bank credit, Clouse (1997) has shown that controlling bank credit might no longer be sufficient to affect overall credit extension. Moreover, controlling only bank credit may place banks at a serious competitive disadvantage relative to other lenders.

Reserve requirement is fast falling into disuse in industrialized countries in recent years, through gradual reduction. Feinman (1993), observed that several industrial countries now operate monetary policy in an environment in which reserve requirements are zero or so low that they are no longer binding on the behaviour of depository institutions. The trend towards lower reserve requirement is wide-spread. The Bank of Canada reduced the marginal reserve requirements

from 10 per cent to zero in June 1992, while retaining reserve requirement on transactions accounts. The overall reserve requirements were phased out over a two year period, culminating in a zero reserve ratio in July,1994. In the USA, reserve requirements were reduced twice in December 1990 and 1992 from 12 to 10 per cent.

The other major factors underlying the diminishing role of reserve requirement as a tool of monetary management as noted by (Tait:1995, Montador:1995, and Clinton:1997), is financial market innovations. They observed that depository institutions in an attempt to evade reserve requirements have created new types of deposit-like liabilities that are not subject to reserve requirements, which have greatly reduced the volume of reserve requirements. They also noted that by shifting the composition of liabilities of reservable deposits to non-reservable liabilities, these institutions have lowered their required reserves even without a formal cut in reserve requirements. With the increasing trend of lowering reserve requirements or zero reserve requirements, Kasman (1993), asserted that the trend was an indication of the possibility of pursuing sound monetary policies without relying on reserve requirements as a policy instrument.

Bennet and Hilton (1997) have also shown that reserve requirements have a significant impact on short-term interest rates. They explained that the combined effects of institutional changes in reserve requirements and adjustments by depository institutions jointly helped in limiting interest rates volatility. However, they gave pre-conditions for the effect of reserve requirements to have impact on interest rates volatility. Thus, they contended that reserve requirements should remain binding for a number of institutions and the base broadened to include other financial instruments. Using US data, they found that continuing financial innovations may push the economy closer to a world where reserve requirements are no longer effective and interest rate volatility will assume the centre stage thereby posing new challenges for monetary management.

Batten (1990) and Laufenberg (1979) have observed that the effectiveness of reserve requirement as an instrument of monetary management is constrained by developments in the banking industry, which have reduced dependence on cash transactions. In addition, banks on their own have swapped reservable funds as a result of new financial products. The combination of these factors has tended to reduce the effectiveness of reserve requirement with obvious implications on monetary management

SECTION III

3.1 ANALYTICAL FRAMEWORK AND DATA SOURCE

A combination of basic accounting conventions, the multiplier approach to monetary management and regression analysis were used in this study. The basic accounting equation dictate that banking system assets equal liabilities. Accordingly, we apply this convention to examine bank transactions in the inter-bank market, with the view to ascertaining the stability of the system. With respect to the multiplier approach, the derivation is shown in Appendix I.

The money multiplier model underscore the importance of reserve requirement in monetary management. It shows that reserve requirement imposes an upper limit on money supply, as well as determines the size of the accelerator. These two elements are adjudged to be critical in monetary control. Relating the accelerator principle to monetary control, we have an insight into the probable outcomes of monetary policy. Doguwa (1997) found that the narrow money multiplier in Nigeria is highly volatile, while the broad money multiplier is relatively stable. Consequently, he found the money multiplier to be stable over time, suggesting a stable relationship between monetary base and money supply.

The data used in the study were generated from the Banking Analysis System (BAS), the CBN Statistical Bulletin and the CBN Annual Report and Statement of Account of various years. The data covered the period 1992 to 2001. The interest rate used was the treasury bills rate, inter-bank call rate, and the weighted average prime lending rate. The monetary aggregates (M1 and M2) were alternately used in combination with the other explanatory variables in the models. The reserve requirement used in the study was derived from the balances of the DMBs with the CBN, the same series used in monitoring liquidity in the banking system. However, the monetary aggregates used were adjusted for the component of required reserves. The data used in the study was compiled from the consolidated DMBs monthly balance sheets and CBN statistical Bulletin. The model used monthly data between 1997 and 2001.

3.2 RESERVE REQUIREMENT AND MONETARY MANAGEMENT IN NIGERIA

The Central Bank of Nigeria over the years has used reserve requirement as a tool of monetary management. This is largely because of a dearth of alternative tools of monetary management. Being a cash based economy with currency outside banks sometimes being as high as 50 per cent of total money supply, the restricted

menu of financial assets has heightened the shallowness of the financial system, while the behaviour of interest rates (short term interest rates in Nigeria are not as volatile as in the industrial countries), as well as the restricted supply of foreign exchange (being predominantly from official sources), and the absence of a real time gross settlement system, have all curtailed the efficacy of other tools of monetary management, thereby necessitating the continued use of reserve requirement as a tool of monetary policy.

The Central Bank of Nigeria issues guidelines annually, prescribing levels which all deposit money banks are expected to comply with and implement. Each depository bank is mandated to maintain with the Central Bank of Nigeria, a minimum amount of cash deposits expressed as a ratio of its total deposit liabilities. The purpose of the reserve requirement is to complement OMO in controlling liquidity in the banking system.

The prescribed ratio varies periodically with the monetary conditions. For instance, in 1992, when the selective removal of credit ceiling on banks that met specified objective criteria was introduced, the minimum reserve requirement for both commercial and merchant banks was increased from 3.0 to 6.0 per cent. Banks were obliged to keep the balance on a daily average for a two-week maintenance period. In 1996, reserve requirement was further increased by 2 percentage points to 8.0. Expectedly, the merchant banks were exempted from the reserve requirements regulations owing to the peculiarity of their operations, which preclude them from mobilizing savings deposits. (Table I).

Reserve requirements were further reviewed upwards to 12 per cent in 1998, owing to the perceived build up of liquidity in the financial system, which remained up-till year 2000. However in 2001, universal banking was adopted in Nigeria in pursuance of the policy of promoting a level playing field for the operators in the banking system. This marked the end of the dichotomy between commercial and merchant banks, and discriminatory policies affecting them, as all banks were required to engage freely in both retail and wholesale banking.

Accordingly, reserve requirement was applied across the board to all banks operating in the country and remained at 12 per cent (Table1). To grant the banks relief from the weight of reserve requirements, the proposal to pay a token of 4 per cent interest on reserves in excess of 8 per cent was introduced in 1998. The deposit money banks accounts were credited automatically with the accrued interest regularly. The mid-month and monthly returns rendered by banks were supposed to enhance the monitoring of compliance. The base on which the ratio was calculated initially included banks total deposit liabilities embracing demand, time and savings.

As a result of persistent liquidity surfeit in the system, in 1997, the reserve base was expanded to include Certificates of Deposits (CDs), Promissory Notes held by the non-bank public, and Other Deposits (any deposit related items under "other liabilities"). Recently, additions were made to the list; as all government revenue collected but not remitted to CBN within a stipulated period was also included. However, domiciliary accounts warehousing foreign currency deposits were exempted from reserve requirements computations.

SECTION IV

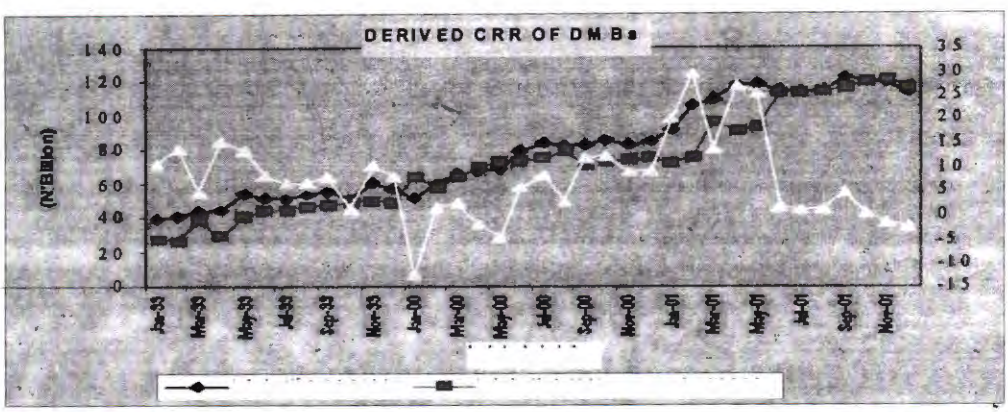
DATA ANALYSIS

4.0 Impact of Reserve Requirements in Nigeria

Reserve requirement is expected to influence the ability of banks to create credit by reducing their liquidity. The tight monetary condition forces the banks to increase their interest rates, and this could also affect funds available for transactions in the foreign exchange market. Following this, we shall examine the impact of reserve requirement on key monetary aggregates. The aggregates include, deposits money banks exposure to the private sector, exchange rate; and interest rates.

Cash reserve requirement can be calculated from statutory returns of the banks and from their balances in the CBN. Table 2 presents aggregate reserve requirements (CRR) of the banking system as derived from the banks' statutory returns and CRR* as extracted from balances of deposit money banks with the CBN. It indicates that CRR* is consistently higher than the required reserves generated internally from the banks balances with the CBN, which is usually used in monitoring liquidity in the banking system.

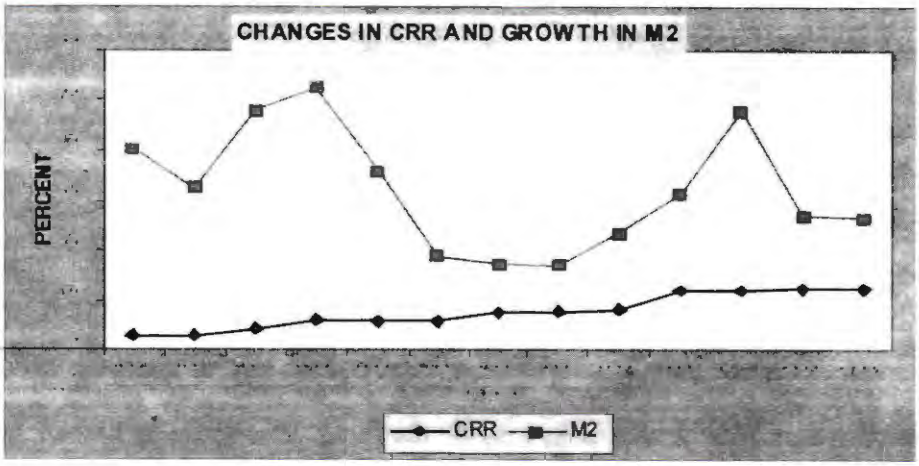
Figure I



The variances between the CRR* and the CRR ranged between ₦2 billion to ₦15billion during the period 1999 to 2001. This is attributable to the time lag in consummation of transactions owing to inadequate and poor communication facilities, as well as under-reporting. By implication, the reserve position of the banks are grossly understated which has serious implications on monetary policy.

Firstly, the cash reserve requirement may not have the desired impact on banks, and may therefore not be technically binding on them as they have more funds at their disposal than estimated by the monetary authorities. Secondly, the overall impact of the money multiplier may likely be understated; consequently, its impact on total monetary aggregates may likely be subdued.

Figure 2



The behaviour of CRR, CRR*, growth rate of money supply (M2) and the variance between CRR and CRR*, from 1999 to 2001, is illustrated graphically in Chart I. It indicates that in December 1999, 2000 and 2001, monetary aggregates grew by 33.1, 48.1 and 27.0 per cent compared with 4.1, 5.6 and -0.5 per cent, respectively, for reserve requirement. This indicates that changes in M2 far outstripped the growth rate of reserve requirement. The misalignment of the growth rate of reserve requirement points to its bluntness as an instrument of monetary control.

4.1 Effects of Reserve Requirement on Banks' Balance Sheet Operations

The habit of rendering inaccurate statutory returns to the central bank by deposit money banks, often is with a view of lowering their deposit base in order

to pay less cash reserve requirement and deposit insurance premium. Other reasons are, to cover their weak position from over exposure and claiming compliance with regulating standards.

The consolidated domestic inter-bank claims and inter bank liabilities of the deposit money banks are presented in (Table 3). Ordinarily, the claims, which are assets of one bank, should be equally reflected on the liabilities side of the corresponding banks that hold the instrument. Given peculiar circumstances, such as delays in posting of transactions arising from infrastructural deficiencies, a float allowance of 5 per cent is allowed according to international best practices. In the real time gross settlement system where transactions are instantly credited, the variance is expected to be zero. However, the analysis (Table 3) shows that the variance oscillates between 18.9 per cent in the first quarter and 42.8 per cent in the second quarter of 1999.

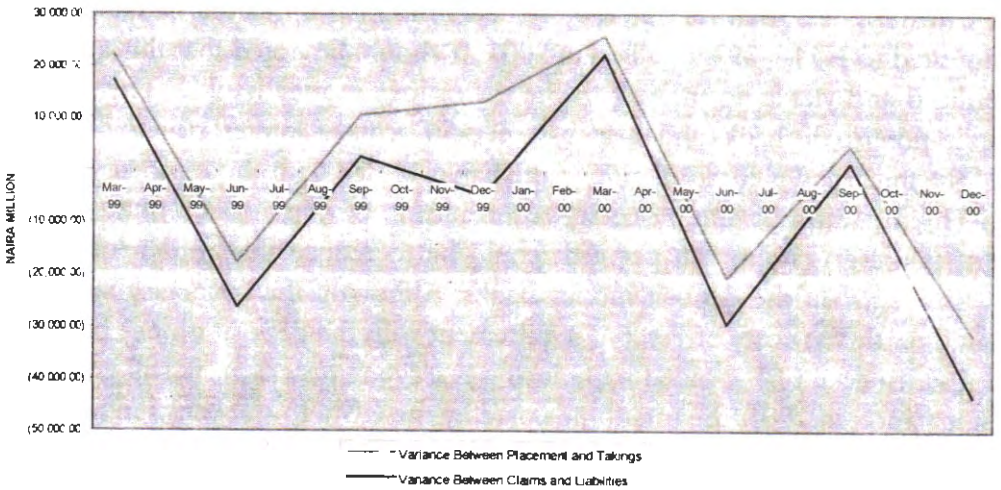
The variance between claims and liabilities maintain an acceptable level in the last two quarters of the year. To some extent, the trend in the variance was replicated in the following year. The worrisome aspect is the volatile nature of the variance which exhibits large swings between positive and negative points. This implies that often, the inter-bank mutual claims exceed inter-bank liabilities while the converse also holds. Thus, the process of generating this event cannot be said to be random, but rather a product of inherent systemic defects.

The explanation is that banks make back to back placements to bolster their liquidity positions without actually moving the funds. The accounts that are subject to abuses include: inter-bank takings from other banks, money-at-call with banks, placements with discount houses and unclear effects. This volatility could make forecasting of reserves and other monetary aggregates difficult and render monetary policy impotent.

The variance of the banks claims and liabilities are illustrated graphically in chart II below. Quarterly data for 1999 and 2000 was used for the charting. Although the plot does not follow a regular pattern in the period, it exhibited a pattern that confirms the non-randomness of the event implying that the outcome of these events are manipulated.

Figure 3

VARIANCE BETWEEN INTER-BANK CLAIMS AND LIABILITIES



4.2 The Cost Component of Reserve Requirements

In 1990, the application of reserve requirement was discriminatory where banks were debited according to the size of their deposits. Group A, were banks with deposits above ₦1 billion, and their reserve requirements was put at 9.0 per cent; Similarly, group B banks were those with deposits above ₦500 million but less than ₦1 billion (charged 8 per cent), while group C were those with deposits between ₦100 - ₦500 million and had to pay 7.0 per cent, and Group D were banks with deposits less than ₦100 million and were debited 6.0 per cent. This policy was abolished owing to the misconception that the approach was punitive to the big banks with higher deposits base. Furthermore, it was also seen as an attempt to dampen the corporate strategy of aggressive deposit mobilization and favouring the risk averse and inefficient institutions. On the other hand, the justification for the discriminatory application of reserve requirements was anchored on the skewness of the financial system, which favours few banks.

Table 4 presents the share of deposits by banks. It indicates that 10 banks control over 55.4 per cent of the total deposits, 27 banks contributed 31.3 per cent, while 53 banks jointly shared a meagre 13.3 per cent of the total deposits. The oligopolistic structure of the banking system gives few banks undue advantage over other banks. In such a situation, the activities of these big players could influence interest rates and inter bank-lending rates, and could be a major source of distortion in the financial system as well as failure of monetary management

policies to achieve intended results. Thus, the attempt at the discriminatory application of reserve requirements was indeed a better choice.

Furthermore, total reserve requirements mopped up in the banking system amounted to ₦118, 397.9 million in 2001. It should be noted that this amount is sterilized and yields no interest to the depository money banks. This has cost implications to the banks and their customers, in terms of interest paid to depositors and the unearned income, assuming the banks traded with these funds.

The intention of the monetary authorities in paying a token interest (4 per cent) on reserves above 8 per cent could be to reduce the burden of reserve requirements on the deposit money banks. Although, the monetary authorities shared partly the costs of reserve requirement with the deposit money banks, the cost which could be avoided by reducing reserve requirement is still enormous. For instance, in 2001, the total funds paid by the CBN to the banks in interest in excess of 8 per cent amounted to ₦1.705 billion (Table 4).

4.1 The Models

Cash Reserve requirement (crr) is used in model 1 as an explanatory variable for changes in the monetary aggregates, private sector credit (PSC), exchange rate (ner), treasury bill rate (tbr), call rate (call) and prime lending rate (plr). The functional specification of the model is given as:

$y_n = f(X_t)$ .....(1)

Where:

$Xt = lcrr_t$ = Cash Reserve Requirement

and $y_n = 1, 2, \ldots, 7$.

Thus,

$y_1 = lm_1$ = Money Supply (M_1)

$y_2 = lm_2$ = Broad Money Supply (M_2)

$y_3 = lpsc$ = Private Sector Credit

$y_4 = NER$ = Nominal Exchange Rate

$y_5 = PLR$ = Prime Lending Rate

$y_6 = CALL$ = Overnight Call Rate

$y_7 = TBR$ = Treasury Bills Rate

We specify the linear form of models 1 and 2 as:

$y_n = \alpha_0 + \alpha_1 X_t + \varepsilon_t$ .....(2)

With $y_n = 1, 2, \ldots, 7$ as defined above.

Small letters represent logged variables.

Equation 2 is the long-run or equilibrium reserve requirement levels as explained by the monetary aggregates, private sector credit and the rates. A priori, the variables have the following signs: $lm_1(-)$, $lm_2(-)$, lpsc(-), ner(+), plr(+), tbr(+), and call(+). A priori, increases in the crr decreases the quantum of money supply, through a reduction in credit to private sector, and increases interest rates; while nominal exchange rate appreciates. By implication, if a priori expectations are met, then achieving the objectives of monetary policy through manipulating the cash reserve ratio becomes easy. Thus, the monetary authorities would have a hold on money supply and can therefore of certainty, determine acceptable monetary targets consistent with price stability and economic growth.

The analysis was carried out within the ECM framework. This was adopted to improve the estimates of the model. The OLS procedure was applied to test for unit root using the Dickey Fuller specification for unit root test. A residual co-integration test was carried out to test the stationarity of the residuals. All variables were stationary at first differencing.

4.2 Results and Major Findings

The estimates of model 2 are presented in Table 6 and 8 as equations 1 to 7 and 8-13, respectively. The error correction models are presented in Table 9. Thus equations (8-10), by substitution, represent varying combinations of money supply M1 with prime lending rate, treasury bills rate or call rate with other explanatory variables, while equations (11-13), varies the interest rates in combination with M2 and other explanatory variables.

Whereas the Adjusted R2 for equations 1-7 ranges between 60.5 and 99.37, that of equations 8 to 13 range between 98.39 for equation 8 and 99.50 for equation 11 of Table 8. The results show that variations in cash reserve requirement sufficiently explain changes in the monetary aggregates, interest rates and the exchange rate of equations 8-13.

While cash reserve requirement and its lag as well as the lag of money supply affect present money supply as shown in equation 1, the lags of prime lending rate and cash reserve requirement explained variations in the prime lending rate, and cash reserve requirement and the lag of nominal exchange rate, movements in the exchange rate. However, cash reserve requirement could not sufficiently explain variations in M1, private sector credit, call money and treasury bills rate.

The Akaike and Schwartz Information Criteria of the dynamic specifications of equations 1 to 7 and 8-13, indicate that model 11 of Table 8 was the best fit of the various relationships and was therefore chosen for further analysis.

Whereas equation 1-7 show the effects of variations in reserve requirements on the monetary aggregates and the rates. For purposes of this study therefore, equation 3 (Table 6) is our model for analysis. The model has an adjusted R2 of 99.3. Our dynamic specification is given as:

$$lpsc = 0.22 + 0.04lcrr + 0.95lpsc(-1)$$

Table 9 indicate results of the error correction specifications for equations 1-13 of Tables 6 and 8. The results confirm the superiority of equation 3 (chosen earlier) over all other specifications. Though other variables exhibited various levels of statistical significance when regressed against crr, the Schwartz and Akaike Information Criterion became a basis for selecting the best fit model. Consequently, our error correction specification as shown by equation 3 is of the form:

$$lpsc = 0.19 + 0.04lcrr + 0.95lpsc(-1) - 0.14resid.$$

This specification which implies that changes in reserve requirement are positively related to private sector credit is contrary to a priori expectations. The results indicate that the current level of private sector credit is explained by changes in crr and its preceding level. A unit change in crr will induce a 0.4 per cent change in current private sector credit and 0.95 per cent variation in the previous level. However, the failure of a priori expectation can be attributed to the overwhelming influence of informal credit transactions in the economy, which create a large quantum of money outside banks, thus frustrating the efficacy of monetary management through crr (Otu et al: 2003). As such, the full effect of a crr policy in influencing private sector credit is undermined, implying that crr is not an efficient instrument for monetary management.

Our results reveal a weak relationship between M_2 and cash reserve. Perhaps, this accounts for the large proportion of currency outside the banking system, which forms the bulk of the monetary base that is beyond the control of the Central Bank.

Considering, the attendant risk of lending to the private sector and the quest to stay afloat, banks prefer to channel their resources to other investments such as government securities and the lucrative foreign exchange market. The upsurge in activities in these markets in the face of liquidity squeeze may give a wrong signal and could be misinterpreted. This most likely could be a response to some degree of demand/supply shocks, and not any rational behaviour based on the dictates of the market or the efficacy of the policy instrument. Rather than hold more idle cash balances either as deposits or reserves with the Central Bank; it pays the DMBs to invest in lower yielding but more secure instruments.

SECTION V

5.0 SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

The reliance of monetary policy on the control of depository institutions' reserves is gradually loosing its potency. This is because the targeted reserve position of these institutions used in monetary management is only a fraction of the actual reserve.

Secondly, since the operation of reserve requirement is not binding on the DMBs, it gives them the leverage to manipulate their balance sheets and other accounting records. Also, reserve requirement was found to constitute an unnecessary cost to both the DMBs and the monetary authorities. The deposit structure of the banking system reveals that less than 10 banks control over 55 per cent of total deposits, thus giving them oligopolistic edge in the industry. The application of reserve requirement across the board therefore gives them undue advantage over others.

Empirical analysis showed a positive relationship between private sector credit and reserve requirement, thereby contradicting a priori expectations. This was traced to the overwhelming influence of informal credit in the economy which mars the full expression of reserve requirement as a tool for monetary control.

These findings have implications on monetary management. In order to improve the efficiency of current monetary policy, the administration of reserve requirement should be fine turned and enforced to ensure that they are binding on DMBs. Specifically, a gradual reduction is advocated to enable the Bank concentrate on monitoring the settlement reserves of the banks and other discount window operations in controlling liquidity in the system.

In conjunction with these policies, the monetary authorities should ensure that the set optimal monetary targets for the purpose of estimating excess reserves are consistent with prevailing monetary conditions. These measures could be complemented by policies that discourage a high proportion of transactions in cash. This implies that the cash deposit ratio would be lower, and thus policies designed to target reserves of depository institutions would be more efficient.

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TECHNICAL APPENDIX 1

The multiplier model establishes the direct link between reserve requirements and monetary control. In its simplest form, the multiplier assumes that all money (M), is held in form of bank demand deposits (D).

Thus, $M = D$ .....(1)

Banks are required to hold a fraction of their assets as required reserves, RR., against these deposits. This relationship can be shown as:

$RR = \lambda^{*}D$ ..... (2)

Depending on monetary conditions, the Central Bank sets the required reserve ratio (λ), at a value between 0 and 100 per cent, and also supplies the reserves. The ratio currently is 12 per cent in Nigeria. Rewriting equation (1) yields

$$D = \frac{RR}{\lambda} \quad \text{..... (3)}$$

And substituting equation (1) into (3) results in equation 4:

$$M = \frac{RR}{\lambda} \quad \text{..... (4)}$$

Equation (4) implies that money supply is a multiple of reserves, and the multiplier ($1/\lambda$) provides the link between changes in money supply. Expectedly, the multiplier is determined by the level of reserve requirements, implying that the higher the required reserve ratio, the smaller the multiplier.

The current practice is to explain the determinants of money supply in terms of the monetary base or high-powered money, being the base for the expansion of bank deposits and creation of money. Money supply varies directly with changes in the monetary base, and inversely with the currency and reserve ratios. The use of high powered money consist of the demand of commercial banks for the legal limit with the central bank and excess reserves and public demand for currency notes. We define high-powered money as:

$H = C + RR + ER$ ..... (5)

where: C = Currency, RR = Required Reserves, and ER = Excess Reserves.

A bank's required reserve is a function of its total deposits. However, banks usually hold reserves in excess of its required reserves, and they do not advance loans up to the legal limit but well below it so as to enable them meet contingent cash requests or adverse clearing balances. Money supply is therefore determined

by the required reserve ratio and the excess reserve ratio of DMBs. Whereas the RR ratio (RRr) measures the ratio of required reserves to deposits, the Err measures excess reserves to deposits. Demand for currency by the public is expressed as a proportion of bank deposits where Cr = C/D, C being the currency and D, the deposits. The currency ratio is influenced by changes in income of the people, use of credit instruments and uncertainties associated with economic activities.

Thus, if we define money supply (M) as bank deposits (D) and currency outside banks (C), then the money supply identity can be written as:

$$M = D + C \quad \ldots\ldots (6)$$

Defining high powered money (H) as currency outside banks plus required reserves (RR) plus excess bank reserves (ER), results in the relationship expressed in equation 5. But the relationship between money supply and high powered money can be expressed as the ratio of M to H. Dividing equation 5 by equation 6 yields:

$$M/H = \frac{1 + (C/D)}{(C/D)+(RR/D)+(ER/D)} \quad \ldots\ldots (7)$$

Substituting Cr for (C/D), RRr for (RR/D) and Err for (ER/D), we have equation 8.

$$M/H = \frac{1 + Cr}{Cr + RRr + ERr} \quad \ldots\ldots (8)$$

High powered money is therefore given as:

$$H = \frac{Cr + RRr + ERr\,(M)}{1 + Cr} \quad \ldots\ldots (9)$$

and money supply is given as:

$$M = \frac{1 + Cr\,(H)}{Cr + RRr + ERr} \quad \ldots\ldots (10)$$

Equation 10 which defines money supply in terms of high powered money imply that the higher the supply of high powered money, the higher the money supply; and the lower the currency, reserve and excess reserve ratios, the higher

the money supply, and vice versa. The path of equation 10 given as:

$$\frac{1 + Cr}{Cr + RRr + ERr} \quad \ldots\ldots (11)$$

Is the money multiplier (λ) which relates the money supply and high powered money function by the identity:

$$M = \lambda H \quad \ldots\ldots (12)$$

Equation 12 expresses money supply as a function of λ and H. But the size of λ is influenced by the currency ratio (currency outside banks), the required reserve ratio and the excess reserve ratio. The lower these ratios, the lower the value of λ, and vice versa. A stable λ will enable the monetary authorities to manipulate M by manipulating H. However, the stability of λ depends on the stability of the currency ratio and the reserve ratios or on offsetting changes in the reserve ratios. Since the reserve ratios and the currency ratio are subject to change, the money multiplier is highly volatile in the short run. The success of monetary management through the multiplier approach largely depends on the efficient estimation of reserves.

APPENDIX II

The procedure used for the Dickey Fuller Unit Root test is of the form: $\Delta x_t = \beta_0 x_{t-1} + \sum \beta_i \Delta x_{t-i} + \varepsilon t$. The test is to verify if $X_{t-1} = 0$. Thus, $H_0 > b1 = 0$ indicating that the series X_t contains a unit root and is therefore non-stationary and the alternate hypothesis H_1: $b1 < 0$, indicates that the series is stationary. The data was corrected for both serial correlation and heteroscedasticity using the Phillip-Peron and ARIMA specifications test. The Phillip-Peron test used was conducted on four truncation lags as suggested by the Akaike and Schwartz Information Criteria and the Newey-Nest Test.

Table 1

RESERVE REQUIREMENT AND LIQUIDITY RATIO

Year	Class Of Banks	Binding Period	CRR %	LR %
1990	A - N1billion or more	End-Month	9	30
	B - N500 million but less than N1b	End-Month	8	30
	C - N100million or less than N500m	End-Month	7	30
	D - less than N100m	End-Month	6	30
	Merchant Banks	End-Month	5	22.5
1991	All Banks	End-Month	3	30
1992	All Banks	End-Month	3	30
1993	All Banks	Daily Average	6	30
1994	All Banks	Daily Average	6	30
1995	All Banks	End-Month	6	30
1996	Commercial,(Merchant exempted)	End-Month	8	30
1997	Commercial Banks	End-Month	8	30
1998	Commercial Banks	End-Month	12	40
1999	Commercial Banks	End-Month	12	40
2000	Commercial Banks	End-Month	12	40
2001	Deposit Money Banks	End-Month	12.5	40
2002	Deposit Money Banks	End-Month	12.5	40

Source: Compiled from Monetary and Credit Policy Circulars of various years.

Table 2

QUARTERLY TOTAL DEPOSITS, DERIVED CASH RESERVE REQUIREMENTS OF DEPOSIT MONEY BANKS

Month	Total Deposits	Cash Reserve Requirement (CRR)*	Cash Reserve Requirement (CRR)	(CRR*-CRR)	M2 Growth	CRR Growth
Jan-99	3237.2	38.9	28	10.9		
Feb-99	3378.9	40.6	26.6	14	12.8	6.1
Mar-99	3611.1	43.3	38.4	4.9	15.9	5.3
Apr-99	3727.5	44.7	29.1	15.6	12.1	8.9
May-99	4515.9	54.2	40.7	13.5	30.6	14.6
Jun-99	4309.3	51.7	43.7	8.1	20.8	13.7
Jul-99	4260.8	51.1	44.5	6.6	18.2	52.9
Aug-99	4424.7	53.1	46.6	6.5	19.8	14.4
Sep-99	4606.9	55.3	47.3	8	24.7	8.4
Oct-99	4219.7	50.6	49.4	1.3	18.7	10.9
Nov-99	5015.4	60.2	50	10.2	34.8	7.3
Dec-99	4763.5	57.2	49.3	7.9	33.1	4.1
Jan-00	4292.3	51.5	64	-12.5	-7.3	29.7
Feb-00	5006.5	60.1	58.4	1.7	3.3	16.9
Mar-00	5522.7	66.3	64.2	2.1	13.7	30.4
Apr-00	5640.3	67.7	69.6	-1.9	14.5	8.7
May-00	5716.5	68.6	73.5	-4.9	15.5	25.8
Jun-00	6599.6	79.2	73.5	5.7	29.2	14.4
Jul-00	6951.4	83.4	75.3	8.1	34.7	8.2
Aug-00	6840.4	82.1	79.4	2.7	35.6	8
Sep-00	6905.5	82.9	71.1	11.7	37.6	-3.2
Oct-00	7117.2	85.4	73.1	12.3	40.7	-2.9
Nov-00	6917.9	83	74.2	8.8	41	-6.5
Dec-00	7021	84.3	75.1	9.2	48.1	5.6
1-Jan	7677.1	92.1	72.2	19.9	5.5	-1.2
1-Feb	8819.2	105.8	76.2	29.6	18.3	2.8
1-Mar	9145.1	109.7	96.2	13.6	23	28.1
1-Apr	9814.2	117.8	90.7	27.1	24.4	25.5
1-May	9855.6	118.3	92.7	25.5	25.8	21.7
1-Jun	9577.1	114.9	113.2	1.7	21.9	17.7
1-Jul	9543.2	114.5	113.5	1	22.7	25.1
1-Aug	9596.3	115.2	113.9	1.3	21.1	22.8
1-Sep	10156.3	121.9	117	4.9	28.1	3.4
1-Oct	10005.9	120.1	119.7	0.4	26.4	5.5
1-Nov	9975.5	119.7	121.4	-1.7	27.9	6.6
1-Dec	9471.8	113.7	116.4	-2.7	27	-0.5

CRR* = Derived from Total deposits as reported by banks
CRR = Derived from Banks Reserves with the CBN
TOD = Total Deposits of the Domestic Money Banks

Table 3
Domestic Inter-Bank Claims and Liabilities

	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00
Domestic	90,831.00	61,404.00	80,182.00	93,468.10	96,468.10	88,628.90
Bills Discounted from Bank	6.4	115	116	14	124.2	7.9
Money at Call	3,954.80	7,030.00	6,704.00	4,600.00	5,116.00	6,227.00
Inter-Bank Placement	14,474.50	16,685.00	23,039.00	30,626.00	28,882.00	26,485.00
Balances Held with Banks	28,752.60	28,897.00	38,139.00	37,787.00	37,253.00	39,752.00
Loans and Advances to Banks	185.8	349	100	259	66.4	240.1
Checks for Collection	43,456.90	8,328.00	12,084.00	20,270.00	25,025.00	15,915.00
Inter-Bank Liabilities	73,623.00	87,744.00	77,595.00	98,362.00	74,164.00	118,019.00
Balances Held for Banks	2,438.80	6,250.60	3,944.40	4,308.90	3,942.00	7,399.00
Money at Call from other Banks	3,471.10	2,557.50	2,295.00	914.9	5,724.00	9,423.00
Inter-Bank Takings	9,502.40	8,091.10	15,113.00	12,718.30	25,445.00	17,550.00
Uncleared Effects	46,780.60	60,553.80	46,589.00	64,223.40	28,130.00	67,898.00
Loans and Advances from Banks	-	-	-	-	-	-
Bankers Payments	11,431.00	10,291.60	9,654.40	16,196.0	10,924.00	15,750.00
Variance of Claims and Liabilities	17,207.10	-26,340.00	2,586.10	-4,894.30	22,304.10	-29,390.00
Variance of Placements and Takings	4,972.10	8,593.90	7,926.00	17,907.70	3,437.10	8,935.30

Table 4A

COMPUTATION OF CASH RESERVE AND DEPOSIT LIABILITIES OF DMBs

Description	2001				2000			
CRR Computation	AGGREGATE	A	B	C	AGGREGATE	A	B	C
Number of Banks/1		10	27	53		10	27	53
Total Deposit Liabilities (N'million)	947182.91	524739.33	296468.25	125975.33	702104.5	384051.16	226077.65	91975.69
Deposit Liabilities as a percentage of Total		55.4	31.3	13.3		54.7	32.2	13.1
(1) Flat Application of CRR								
CRR at 12.5%(Million)		65592.4	37058.5	15746.9		48006.4	28259.7	11497
of which 8% is interest free		41979.1	23717.5	10078		30724.1	18086.2	7358.1
Excess of 8% attracts interest of 4.0%		23613.3	13341	5668.9		17282.3	10173.5	4138.9
4% on interest bearing component		944.5	533.6	226.8		691.3	406.9	165.6
Total CRR from A+B+C	118397.8				87763.1			
Cost of CRR to CBN	1704.9				1263.8			
Cost to DMBs*	36940.1				27382.1			
TOTAL COST OF CRR TO THE BANKING SYSTEM	38645.0				28645.9			
Money Supply (M2)(N'Million)	1315869.2				1036079.5			
TOTAL COST OF CRR AS A RATIO OF M2	2.9				2.8			
TOTAL COST OF CRR AS A RATIO OF DEPOSITS	4.1				4.1			

TABLE 4B
COMPUTATION OF CRR UNDER DIFFERENT RATIOS

REDUCING CRR	2001				2000			
	Aggregate	A	B	C	Aggregate	A	B	C
Number of Banks/1		10	27	53		10	27	53
Total Deposit Liabilities (N'million)	947182.91	524739.33	296468.25	125975.3	702104.5	384051.16	226077.7	91975.69
Deposit Liabilities as a percentage of Total		55.4	31.3	13.3		54.7	32.2	13.1
CRR at 10.5%(Million)	99454.2	55097.6	31129.2	13227.4	73721.0	40325.4	23738.2	9657.4
of which 8% is interest free	75563.4	44078.1	24903.3	10581.9	58976.8	32260.3	18990.5	7726.0
Excess of 8% which attracts interest of 4.0%	19890.8	11019.5	6225.8	2645.5	14744.2	8065.1	4747.6	1931.5
4% on interest bearing component of 2.5%	795.6	440.8	249.0	105.8	589.8	322.6	189.9	77.3
Cost of CRR to CBN	795.634	440.8	249.0	105.8	589.8	322.6	189.9	77.3
Cost to DMBs*	30234.1	16749.7	9463.3	4021.1	22411.2	12258.9	7216.4	2935.9
TOTAL COST OF CRR TO THE BANKING SYSTEM	31029.7	17190.5	9712.3	4127.0	23000.9	12581.5	7408.3	3013.1
Money Supply (M2)(N'Million)	1315869.2				1036079.5			
TOTAL COST OF CRR AS A RATIO OF M2	2.4	1.3	0.7	0.3	2.2	1.2	0.7	0.3
TOTAL COST OF CRR AS A RATIO OF DEPOSITS	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3

CRR at 8.0%(Million)	AGGREGATE	A	B	C	AGGREGATE	A	B	C
Number of Banks/1		10	27	53		10	27	53
Total Deposit Liabilities (N'million)	947182.91	524739.33	296468.25	125975.3	702104.5	384051.16	226077.7	91975.69
Deposit Liabilities as a percentage of Total		55.4	31.3	13.3		54.7	32.2	13.1
8% CRR	75774.6	41979.1	23717.5	10078.0	56168.4	30724.1	18086.2	7358.1
Excess of 8% attracts interest of 4.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4% on interest bearing component	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost of CRR to CBN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost to DMBs*	23841.7	13097.5	7399.6	3144.3	17524.5	9585.9	5642.9	2295.7
TOTAL COST OF CRR TO THE BANKING SYSTEM	23841.7	13097.5	7399.6	3144.3	17524.5	9585.9	5642.9	2295.7
Money Supply (M2)(N'Million)	1315869.2				1036079.5			
TOTAL COST OF CRR AS A RATIO OF M2	1.8	1.0	0.6	0.2	1.7	0.9	0.5	0.2
TOTAL COST OF CRR AS A RATIO OF DEPOSITS	2.50	2.50	2.50	2.50	2.5	2.5	2.5	2.5

CRR at 6.0%(Million)	AGGREGATE	A	B	C	AGGREGATE	A	B	C
Number of Banks/1		10	27	53		10	27	53
Total Deposit Liabilities (N'million)	947182.91	524739.33	296468.25	125975.3	702104.5	384051.16	226077.7	91975.69
Deposit Liabilities as a percentage of Total		55.4	31.3	13.3		54.7	32.2	13.1
6% CRR	56831.0	31484.4	17788.1	7558.5	42126.3	23043.1	13564.7	5518.5
Excess of 8% attracts interest of 4.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4% on interest bearing component	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost of CRR to CBN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost to DMBs*	17731.3	9823.1	5549.9	2358.3	13143.4	7189.4	4232.2	1721.8
TOTAL COST OF CRR TO THE BANKING SYSTEM	17731.3	9823.1	5549.9	2358.3	13143.4	7189.4	4232.2	1721.8
Money Supply (M2)(N'Million)	1315869.2				1036079.5			
TOTAL COST OF CRR AS A RATIO OF M2	1.35	0.7	0.4	0.2	1.27	0.7	0.4	0.2
TOTAL COST OF CRR AS A RATIO OF DEPOSITS	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

CRR at 4.0%(Million)	AGGREGATE	A	B	C	AGGREGATE	A	B	C
Number of Banks/1		10	27	53		10	27	53
Total Deposit Liabilities (N'million)	947182.91	524739.33	296468.25	125975.3	702104.5	384051.16	226077.7	91975.69
Deposit Liabilities as a percentage of Total		55.4	31.3	13.3		54.7	32.2	13.1
4% CRR	37887.3	20989.6	11858.7	5039.0	28084.2	15362.0	9043.1	3679.0
Excess of 8% attracts interest of 4.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4% on interest bearing component	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost of CRR to CBN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost to DMBs*	11820.8	6548.7	3699.9	1572.2	8762.3	4793.0	2821.4	1147.9
TOTAL COST OF CRR TO THE BANKING SYSTEM	11820.8	6548.7	3699.9	1572.2	8762.3	4793.0	2821.4	1147.9
Money Supply (M2)(N'Million)	1315869.2				1036079.5			
TOTAL COST OF CRR AS A RATIO OF M2	0.90	0.5	0.3	0.1	0.85	0.5	0.3	0.1
TOTAL COST OF CRR AS A RATIO OF DEPOSITS	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

1/ NOTE Category A Banks with Deposits Liabilities = > N23,000 Million
Category B Banks with Deposit Liabilities between N6,000 to -N 23,000 Million
Category C Banks with Deposits Liabilities below N6,000 Million

Table 5

ADF AND PHILLIP PERON UNIT ROOT TESTS OF THE VARIABLES
(Intercept, No Trend included)

Variable/Lag Length	ADF Test Statistic 1	Phillips Peron Test Statistic 4
Money Supply (M1)	-5.749667	-8.482266
Log Money Supply (LM1)	-6.202375	-9.176410
Broad Money Supply (M2)	-4.929027	-7.680019
Log Broad Money Supply (LM2)	-6.200549	-9.384060
Private Sector Credit (PSC)	-3.722498	-7.365234
Log Private Sector Credit (LPSC)	-5.542432	-8.509147
Cash Reserve Requirement (CRR)	-5.306307	-6.893426
Log Cash Reserve Requirement (LCRR)	-5.984315	-8.299234
Nominal Exchange Rate (ner)	-6.088062	-5.818100
Prime Lending Rate (Prime)	-10.554190	-14.993590
Treasury Bill Rate (tbr)	-5.002787	-6.292076
Overnight Call Rate (call)	-6.479048	-11.070920

Note: All variables were stationary at the first level of differencing.
The ADF and Philip Peron Test was conducted on 1 and 4 truncation lags, respectively.
The MacKinnon Critical Values for the rejection of the hypothesis of a Unit Root is given below:

ADF Critical Values
1% = - 3.5478
5% = - 2.9127
10% = - 2.5937

Philips Peron Critical Values
1% = - 3.5457
5% = - 2.9118
10% = - 2.5932

Table 6

ADF RESIDUAL COINTEGRATION TEST
(Intercept, No Trend included)

Equation	Coefficient	t-statistic	ADF Test Statistic
Equation 1	-1.0212	-5.2697	-5.2697
Equation 2	-1.0606	-5.2527	-5.2527
Equation 3	-0.9792	-5.0101	-5.0101
Equation 4	-1.0905	-5.2393	-5.2393
Equation 5	-1.1854	-6.4486	-6.4486
Equation 6	-0.9080	-4.6759	-4.6759
Equation 7	-1.1140	-5.7844	-5.7844
Equation 8	-0.9273	-4.5333	-4.5333
Equation 9	-1.0037	-4.7361	-4.7361
Equation 10	-0.9367	-4.7150	-4.7150
Equation 11	-0.8745	-4.3941	-4.3941
Equation 12	-1.1471	-5.8140	-5.8140
Equation 13	-0.9799	-4.9961	-4.9961

Note: All variables were stationary at their levels

Table 7

RESULTS OF DYNAMIC SPECIFICATION OF VARIOUS AGGREGATES ON CASH RESERVE AND LAGGED VARIABLES

Variables	Equation 1 LM2	Equation 2 LM1	Equation 3 LPSC	Equation 4 PRIME	Equation5 NER	Equation 6 CALL	Equation 7 TBR
C	0.3610	1.3329	0.2162	-10.9469	-32.6689	-2.4720	3.7730
	(1.2492)	(1.5240)	(0.9131)	(-2.8417)	(-2.6560)	(-0.3445)	(-1.0951)
LCRR	0.4051	0.0796	0.0430	-	5.3601	0.5482	0.5306
	(6.9971)	(1.8516)	(1.9947)	-	(2.7811)	(0.7618)	(1.3551)
LCRR(-1)	-0.3476	-	-	1.7673	-	-	-
	(5.5423)	-	-	(2.9677)	-	-	-
LM2(-1)	0.9273	-	-	-	-	-	-
	(20.0933)	-	-	-	-	-	-
LM1(-1)	-	0.8288	-	-	-	-	-
	-	(8.0883)	-	-	-	-	-
LPSC(-1)	-	-	0.9486	-	-	-	-
	-	-	(28.3765)	-	-	-	-
PRIME(-1)	-	-	-	0.5962	-	-	-
	-	-	-	(4.2917)	-	-	-
NER(-1)	-	-	-	-	0.7343	-	-
	-	-	-	-	(7.4338)	-	-
CALL(-1)	-	-	-	-	-	0.8772	-
	-	-	-	-	-	(10.3358)	-
TBR(-1)	-	-	-	-	-	-	0.8803
	-	-	-	-	-	-	(11.0525)
AR(1)	-0.1478	-0.0661	-0.1071	-0.2255	0.3643	-0.3256	0.2661
	(1.0276)	(-0.4013)	(-0.7848)	(-1.3988)	(2.0744)	(-2.3336)	(1.6439)
Adj. R^2	99.37	93.87	99.31	89.88	98.31	60.47	92.80
SE Reg.	0.03	0.06	0.03	0.85	1.50	3.61	0.85
DW	1.98	1.94	2.03	2.10	1.87	2.00	1.99
Akaike Inf. Cr	-3.9277	-2.6101	-4.0059	-2.5706	3.7190	5.4696	2.5745
Schwartz Cri	-3.7500	-2.4680	-3.8637	2.7126	3.8615	5.6117	2.7166

Figures in parenthesis are t-values.

Table 8

RESULTS OF DYNAMIC SPECIFICATION OF CASH RESERVE ON OTHER AGGREGATES

Variables	Equation 8	Equation 9	Equation 10	Equation 11	Equation12	Equation 13
C	-0.8469	-2.1455	4.3142	-0.5779	-1.5031	-1.0541
	(-1.0756)	(-2.3024)	(3.4256)	(-0.4501)	(-4.0122)	(-1.9192)
LM1	0.1213	0.2253	0.4200	-	-	-
	(1.0817)	(-1.8701)	(2.8986)	-	-	-
LM1(-1)	-	-	-0.3132	-	-	-
	-	-	(-2.1474)	-	-	-
LM1(-5)	-	-	-0.4066	-	-	-
	-	-	(-3.4557)	-	-	-
LM2	-	-	-	1.0911	1.2936	1.3105
	-	-	-	(8.1809)	(10.0996)	(8.8722)
LM2(-1)	-	-	-	-0.6343	-0.5758	-0.9931
	-	-	-	(-2.5273)	(-3.5134)	(-5.2910)
LPSC	0.7233	0.9058	0.9128	0.4897	-	-
	(-3.5431)	(-2.8987)	(3.3966)	(2.7402)	-	-
LPSC(-1)	-1.3265	-1.5054	-0.9202	-0.6075	-	-0.9297
	(-3.5430)	(-3.9742)	(-3.3286)	(-3.9338)	-	(-4.0512)
LPSC(-2)	-	-	-	-	-	0.8181
	-	-	-	-	-	(3.8791)
LPSC(-3)	0.5960	-	-	-	0.7920	-
	(2.6091)	-	-	-	(5.8519)	-
LPSC(-4)	-	0.6435	-	-	-	-
	-	(-2.9863)	-	-	-	-
TBR	-	-	-	-	-	0.0016
	-	-	-	-	-	(0.5196)
PRIME(-1)	-	-	-	-0.0161	-	-
	-	-	-	(-2.0306)	-	-
PRIME(-3)	-	-	0.0526	0.0338	-	-
	-	-	(4.9416)	(5.4673)	-	-
PRIME(-5)	-	-	-	0.0160	-	-
	-	-	-	(2.6777)	-	-
CALL(-1)	-	-	-	-	0.0062	-
	-	-	-	-	(5.3353)	-
CALL(-3)	-	-0.0038	-	-	-	-
	-	(-1.9437)	-	-	-	-
LCRR(-1)	0.9476	0.8923	0.8661	0.5582	0.7401	0.8361
	(17.8516)	(16.1163)	(15.1312)	(3.4688)	(16.4350)	(12.1517)
AR(1)	-0.1423	-0.1036	-0.0416	0.6646	-0.2029	0.0442
	(-0.9422)	(-0.6518)	(-0.2687)	(3.7873)	-1.4149	(0.2738)
Adj. R^2	98.39	96.43	98.75	99.50	99.49	99.26
SE Reg.	0.07	0.07	0.06	0.04	0.04	0.49
DW	1.90	1.93	1.67	1.98	2.01	2.00
Akaike Inf. Crit.	-2.3189	-2.3639	-2.6092	-3.5130	-3.4609	-3.0602
Schwartz Crit.	-2.0657	-2.0719	-2.2777	-3.1446	-3.1716	-2.7734

Figures in parenthesis are t-values.

Table 9

RESULTS OF THE ERROR CORRECTION MODELS OF VARIOUS AGGREGATES

Variables	Equation 1 LM2	Equation 2 LM1	Equation 3 LPSC	Equation 4 PRIME	Equation 5 NER	Equation 6 CALL	Equation 7 TBR	Equation 8 LCRR	Equation 9 LCRR	Equation 10 LCRR	Equation 11 LCRR	Equation 12 LCRR	Equation 13 LCRR
C	0.3885	1.3086	0.1897	-4.5605	-30.6065	-0.9074	-3.2833	-0.9048	-2.1968	4.1734	-0.3366	1.5042	-1.0609
	(1.1366)	(1.3613)	(0.7735)	(-0.6347)	(-4.4458)	(0.0916)	(-1.2913)	(-1.0290)	(-2.1991)	(3.0890)	(-0.7311)	(3.3791)	(-2.0242)
LCRR	0.4110	0.0812	0.0435	0.8019	4.8808	0.3751	0.4596						
	(7.1243)	(1.7114)	(1.8038)	(-0.9362)	(-4.6223)	(0.3718)	(1.6491)						
LCRR(-1)	-0.3461							0.9373	0.8854	0.6252	0.7301	0.7376	0.6314
	(-5.3776)							(15.0697)	(14.1984)	(12.8385)	(10.4801)	(13.4841)	(12.1033)
LM2(-1)	0.9193												
	(16.6563)												
LM1								0.1419	0.2298				
								(1.1481)	(1.7867)				
LM1(-1)		0.8294								-0.0574			
		(7.3541)								(-0.4632)			
LM1(-5)										-0.3194			
										(2.6507)			
LM2											0.9836	1.2965	1.3123
											(7.2271)	(10.3590)	(8.7287)
LM2(-1)											-0.7883	-0.5699	-0.9849
											(-4.5166)	(-3.4552)	(-5.0480)
LPSC								0.7993	0.9081	0.9123	-0.5445		
								(2.4884)	(2.9576)	(3.3172)	(-2.9013)		
LPSC(-1)			0.9503					-1.3286	-1.4961	-0.8138	-0.5445	-1.2374	-0.9457
			(25.3547)					(-3.6451)	(-3.9776)	(2.6493)	(-2.9013)	(-6.4703)	(-4.0339)
LPSC(-2)													0.6297
													(3.8455)
LPSC(-3)								0.5145				0.7906	
								(2.0529)				(5.4719)	
LPSC(-4)									0.6376				
									(2.6922)				
TBR							0.8973						0.0018
							(-18.8452)						(0.5492)
PRIME(-1)				0.8022							-0.0259		
				(-4.01616)							(-3.0540)		
PRIME(-3)										0.0307	0.0424		
										(4.5029)	(6.1226)		
PRIME(-5)											0.0056		
											(0.7233)		
CALL(-1)						0.8457						0.0082	
						(-8.5999)						(4.7558)	
CALL(-2)									-0.0041				
									(-1.9096)				
LCRR(-1)													
NER(-1)					0.7671								
					(14.3243)								
Residual (01 to 13)	-0.1397	-0.0685	-0.1377	-0.5545	0.3471	-0.3521	0.2529	-0.1227	-0.1031	0.0292	0.5284	0.2105	0.0469
	(-0.9274)	(-0.3929)	(0.9380)	(2.4460)	(-2.4759)	(-1.6796)	(1.7187)	(-0.7736)	(-0.6214)	(0.1744)	(3.0775)	(1.3573)	(0.2917)
Adj. R^2	99.41	94.82	96.26	90.46	98.46	87.17	92.63	96.32	96.34	96.56	99.64	99.67	99.22
SE Reg.	0.03	0.06	0.03	0.79	1.42	3.88	0.85	0.07	0.07	0.06	0.04	0.04	0.05
DW	2.00	1.96	2.00	1.89	2.08	1.86	1.85	1.95	1.84	2.07	2.06	2.01	2.00
Akaike Inf. Crit.	-3.93	-2.60	-4.00	2.44	3.62	6.60	2.60	-2.31	-2.35	-2.62	-3.44	-3.46	-3.04
Schwartz Crit.	-3.75	-2.48	-3.86	2.59	3.75	5.84	2.74	-2.08	-2.08	-2.22	-3.07	-3.19	-2.76

Figures in parenthesis are t-values, while Residual 1-13, apply to Equations 1-13, respectively