

An Econometric Analysis of the Monetary Policy Reaction Function in Nigeria

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Abstract

In the past decade, models have been developed to explain the monetary policy formulation behaviour of central banks. As expected, propositions for rules abound, among which the Taylor rule has almost come to be accepted as a benchmark, because of its simplicity, efficiency and insight into tracking historical monetary policy in many countries. However, it is accepted in the literature that some of the peculiarities of developing countries make a rigid application of the rule improper. For developing countries, therefore, the specific policy reaction function in each economy needs to be tracked. This paper specifies two simple models of monetary policy reaction functions for Nigeria: The first, a tracking model based on the revealed processes at the Central Bank of Nigeria (CBN), and an alternate model which closely follows the Taylor rule. The results confirm the primacy of inflation and credit to the private sector in the CBN's monetary policy reaction function, which is consistent with the literature. Apart from these, however, none of the key macroeconomic variables that CBN indicates in its policy documents actually seem to have been considered in setting the interest rate policy. Empirical estimates could also not confirm interest rate smoothing, or the relevance of fiscal dominance in the reaction function. However, inflation and credit to the private sector do matter to the bank – although the first only retroactively. It is therefore apt to infer that the CBN acts consistent with its price stability and private sector-led growth objectives, but accommodates discrepancies in its goals and outcomes and, possibly without intending to do so, follows the Taylor rule.

Acknowledgements

1. Introduction

Monetary policy outcomes vary greatly depending on both the target and instrument in use. Conventional wisdom indicates that constraints are imposed on results depending on the number of targets and available instruments. In a typical economy, the effectiveness of monetary policy as a nominal anchor depends on what is targeted and how it is done, as well as what support parameters are available to aid the conduct of such policy. Taylor (2000) showed that there is broadly a choice between exchange rate targeting and inflation targeting (explicitly targeting the domestic price level).

One of the major policy instruments for monetary policy in Nigeria is CBN's minimum rediscount rate (MRR). While both interest and inflation rates are high, a worrying problem observed in response to these macroeconomic imbalances is lack of policy consistency and coherence. This could be due to inadequate information on the nature and size of the impact of the MRR on key macroeconomic aggregates. Specifically, CBN, with massive support from the presidency, made a series of efforts to reduce this "high" rate. Thus, between 2000 and 2004, the MRR was reduced by more than 400 basis points to less than 16%, ostensibly in response to public pressure. However, a substantial portion of this reduction is not based on any known formulae or systematic understanding of the relationship between MRR (the key policy instrument) and other monetary or macroeconomic aggregates. In addition, different segments of the organized private sector have different proposals for how low interest rates should be. Similarly, these are not based on any known estimates of the size of the reaction of targets for macroeconomic variables to changes in the MRR. The long-term effect has been large variations in monetary targets and outcomes, as shown in Table A1. As the table shows, for a number of years there were large deviations between the targets and the actual performance of major macroeconomic aggregates.

However, monetary policy should not only be conducted on the basis of opinion polls. Rather, policy makers are expected to have clear and quantifiable reaction functions for inter-temporal instrument variation. Such reaction functions identify a set of variables that, combined with a monetary policy rule, offer a good approximation for the process by which interest rates are determined (Torres, 2002). Indeed, the debate in policy making is not only about the broad instrument choice, but even more about inter-temporal instrument variation. Having chosen the interest rate as a key instrument of monetary policy in a liberalized regime, what determines how policy makers vary the instrument over time? For example, the monetary policy reaction function could adjust the MRR to close to any observed disequilibrium relationship between the target and actual inflation rate, exchange rate, or rate of output/employment. Surprisingly, the nature of

the monetary policy reaction function with regard to the MRR is not known; nor are the precise parameters of such a reaction function. Therefore, when a central bank adjusts the MRR, by how much does it expect the major macroeconomic aggregates to move?

While there are numerous studies about the policy reaction function in many developed and emerging market economies, there is not as much literature on developing countries. Nigeria has had robust debates on monetary economics for years. In the history of intellectualism in the country, estimating money demand functions almost became an industry, giving rise to the TATOO¹ phenomenon. It does seem as if the policy reaction function has not enjoyed the same level of interest by intellectuals, leaving a gap in monetary policy action which leaves it somewhat disconnected from the theory. A few authors, such as Asogu (1996) and Doguwa (2002), have attempted to estimate the monetary policy reaction function. While explanatory variables in the Asogu model yield counter-theoretical, counter-intuitive coefficients, Doguwa finds differing policy perspectives in the regimes that he studied. Both agree on the impact of distortions, discontinuities and instability in the policy reaction function, and Doguwa ultimately recommends including a reaction function equation in the list of factors on which monetary policy decisions are based.

The goal of this paper is to model CBN's monetary policy reaction function with respect to the policy interest rate. In particular, the paper estimates alternative reaction functions in order to inform the size of the parameters and effectiveness of such functions. It also illustrates the methodological issues which are considered in the specification and estimation of monetary policy reaction functions, especially in light of recent developments in monetary policy reaction function formulation and estimation.

Specifically, the paper:

- Specifies and estimates a model of monetary policy reaction in Nigeria; and,
- Highlights theoretical and methodological developments in the literature regarding monetary policy reaction function formulation and estimation, and uses the benchmark in the literature to assess the performance of the Nigerian reaction function.

The paper consists of six sections. Section 2 reviews the literature on monetary policy reaction functions while Section 3 evaluates the trend in monetary policy in Nigeria. Equations of the monetary policy reaction model are specified and discussed in Section 4, while Sections 5 and 6 discuss the estimation results and preliminary policy implications, respectively.

2. Literature review

It seems axiomatic that central banks should focus on the control of price levels in an economy, but that only extends to theoretical conclusions. Despite the expansive literature on what central banks should target, there are no clear-cut conclusions about the focus of policy. This is for two reasons. First, the literature is inconclusive about the trade-off between inflation and output (the standard Phillips curve). Even the most dogmatic inflation-targeting framework still provides for output growth. Despite the recommendations and the “near agreement” that central banks should focus explicitly on maintaining price stability, the inclusion of the output gap still indicates (somewhat more than just implicitly) a mandate for output growth. Second, practice could be quite different from theory. Often, even the most “independent” central banks get mired in the broad policy environment and thereby become involved in growth policy design. The central bank provides technical assistance to other institutions and collaborates with such institutions to achieve improved growth. Central bank reports often indicate support to real sector development programmes. The scope of such programmes depends on the configuration of power and politics, as well as the collaboration of other institutions that ought to spearhead such policies.

The basic framework for the perceived trade-off between inflation and output growth started with the Phillips (1958) curve which established an empirical negative relationship between the inflation rate and level of employment. At the time of publication, Phillips did not intend his curve to be a policy tool, but Samuelson and Solow (1960) later serialized the policy implications of the relationship establishing it as a policy tool. The reasoning behind the trade-off seemed to complement the classical Keynesian structure that was widely accepted at the time. Seven years later, Friedman and Phelps (1967) attempted to prove that the Phillips curve showed a short-term relationship and that, in the long term, there is a natural rate of unemployment which can be combined with any rate of inflation. They claimed that stagflation illustrates this stance. This view very quickly became widely accepted. In 1979, Taylor incorporated rational expectations in a simple general equilibrium model of the US economy. Taylor concluded that “there is no long-run trade-off between the level of output and the level of inflation in the model – the Phillips curve is vertical in the long run. However, there is a long-run trade-off between fluctuations in output and fluctuations in inflation. In other words, there is a ‘second order’ Phillips curve which is not vertical in the long run” (Taylor, 1979). His conclusion introduced a new perspective on the relationship between inflation and output. He followed this with his work on inflation targeting in 1993, which forms the core of inflation and output analysis. The central conclusion of this work is that a central bank seeks to minimize a loss function that is a weighted average of two terms: One based on deviations from the inflation target and the other on deviations from the output

target. According to Friedman, the trade-off in the Taylor curve is not an inference from experience, but rather the implication of a policy choice. A zero weight on the output term reduces the bank's objective to inflation alone, while a zero weight in the inflation term reduces the bank's objective to output alone. As the weight varies between these two extremes, the bank's objective shifts and each weight is allocated a policy rule that is optimal for the Taylor economic model. This policy rule, in turn, will imply a variable inflation and a variable output for that model.

For many years, and influenced by the monetarist perspectives and macroeconomic management, led by Friedman (1959)², the thrust of monetary policy in many countries has been the control of inflation. Indeed, the success of monetary policies in different economies is often measured in terms of the ability of such policies to curtail inflation. The traditional literature on monetary policy reaction functions has therefore been defined in terms of the inflation and output gap³. Therefore, the systematic aspect of monetary policy, with inflation as the major policy goal and the rediscount rate as the instrument, is the essence of the specification of a reaction function (Zha, 1997: 30).

However, it is not clear that there is a simple (direct) link between the rediscount rate and broad money, or between broad money and the domestic price level in the very short run. Price level, for example, is affected by a number of variables such as broad money, output, and even its own past values, and many of these variables change simultaneously. Over time, a largely consistent form of the relationship between the rediscount rate of central banks and other macroeconomic variables has been used. This is expressed as follows:

$$R = \beta_1 M + \beta_2 R + \beta_3 X + \epsilon_t \quad (1)$$

Where R is the funds (rediscount rate), M is a monetary indicator, R is the Treasury Bill rate (a summary representation of other interest rates in the economy), X is a set of other variables that are used to predict fluctuations in the general price level, and ϵ_t is money supply shock. The dynamic relationship reflected in the systematic component of Equation 1 is complicated and the trade-off between output and inflation, for example, could be substantial and uncertain, especially in the short run. As a consequence, policies could fail in the short run if they exactly reflect this relationship.

Is a rule to conduct monetary policy really necessary, or should policy makers use their own discretion? This has been the subject of intense debate over the decades. The possibility of erring in policy making and organizing monetary policy according to rigid rules is the major focal point for arguments in favour of the use of discretion. It might not be entirely wrong to see the rules versus discretion debate as one between practitioners, on the one hand, and academics on the other hand. Central bankers seem to be perpetually afraid of leaving monetary policy to some predetermined formula. In the words of McCallum and Nelson (2000: 274):

When central bankers object to the use of a policy rule, they typically refer to alleged constraints on policy flexibility. Evidently, the conception that they have in mind – at least in many cases – is a regime in which the central bank "has turned policy decisions over to a clerk armed with a simple formula and a hand calculator" or possibly "to a team of PhD economists armed with computers

and Matlab programs".

On the other hand, advocates of rules cite arbitrariness and the time-inconsistency of political processes, among other things, for favouring rule-based monetary policy regimes. In the words of Christ (1953), quoted in Hutzler (2004):

Debates about which of the alternative regimes is to be preferred must take place. But, prior to this discussion, we should try to attain consensus on the need for some alternative regimes that will embody greater predictability than the unconstrained monetary authority that exists. The familiar analogy is with traffic chaos that would exist if there were no rules. The first requirement is that there be rules of the road. Whether or not these rules require driving on the left or the right is of secondary importance to the requirement that there be a rule.

Since 1993, the literature on monetary policy reaction has been influenced largely by the work of John Taylor. Taylor's (1993) monetary policy rule specifies the Federal Reserve as aiming to close a specified output gap and a (predetermined) inflation target. It is a monetary policy rule that views the central bank as particularly concerned with the rate of domestic inflation. In his rule, he showed that the federal funds rate is determined as a function of the economy's real rate of interest at a zero rate of inflation plus target inflation, deviation of inflation from its target rate, and deviations of output from its desired level (termed the output gap). The rule is summarized as:

$$i_t = \bar{r} + \Pi_{t-1} + \beta_1(\Pi_{t-1} - \Pi^T) + \beta_2(y_{t-1} - \tilde{y}_{t-1}) \quad (2)$$

where i_t is the federal funds rate at time t , \bar{r} is the real rate of interest at a zero rate of inflation, Π_{t-1} is the average inflation rate over the last four quarters, Π^T is target inflation, Y_{t-1} is the real output in the previous period, and \tilde{y}_{t-1} is potential output. Taylor specifically defined his rule for the US economy as a weighted average of the inflation and output gap in a simple relationship, given as:

$$R_t = (r^* + p^*) + 1.5(p4pt - p^*) + 0.5 y \sim t \quad (3)$$

where R_t is the nominal interest rate, $p4pt$ is the annual inflation rate (the fourth difference of the log price level pt), and $y \sim t$ is the output gap (defined as $y \sim t = y_t - y_t^p$, where y_t is log real GDP and y_t^p its potential level). p^* is the target for annual inflation, and r^* is the steady-state value of the real interest rate (Nelson, 2000). In implementation, the rule involves comparing the real rate with its long-run equilibrium value and adjusting the rate to reflect deviations from its equilibrium value. In reality, the coefficients 1.5 and 0.5 are simply economy-specific approximations of the United States federal funds rate and are not a generalization of a strict relationship between the central bank discount

rate and its determinants (indeed, empirical studies have consistently supported higher values for one or both feedback coefficients). From a policy viewpoint, however, it is desirable to have a (long-run) coefficient on inflation in the rule that exceeds one. This ensures that the Taylor rule, on average, delivers an inflation equal to its target value (p^*) (Nelson, 2000; Taylor, 1999). Taylor's rule is characteristic of the processes of systematic policy making, which are both descriptive and prescriptive, based on what has worked elsewhere, and not just an ideal based on an abstract model (Hetzel, 2000).

Some research has been conducted to ascertain the timing of actions by monetary authorities that would help maintain effective controls on inflation. Taylor believes the superior inflation performance of the 1980s in the US is attributable to the effective reactionary response from the Federal Open Market Committee (FOMC). Conversely, Orphanides (2001) posits that it is not principally what the monetary policy committee actually does with observed inflation but rather its preemptory action on expected inflation that makes the difference. Orphanides's model is part of a larger family of models involving a forward-looking specification of policy reaction by the FOMC. According to his model, it is not weak policy response that leads to the observed inflation of the past but activist policies which may have proved overambitious. Mehra (1999) argues that what is partly lacking in conventional Taylor rule models is the part played by activist policies that "anticipate" a reaction and incorporate feedback from agents to the FOMC. His model, therefore, incorporates movements in long-term inflationary expectations as evidenced by the behaviour of bond rates, which he uses to represent reactionary expectations, following Goodfriend (1993).

Most reaction models, whether they are backward-looking, for example that by Ball (1999), Svensson (1997), and Rudebusch and Svensson (1997), or forward-looking models such as the one by Clarida et al. (2000), simply extend the Taylor rule and predict movements in the policy rate of interest as a function of macroeconomic variables without incorporating feedback from the latter. Hetzel (2000) argues that this is only based on the observed correlations between the funds rate and economic activity and has very little information on what really defines the behaviour of the funds rate itself or on the reaction function of the FOMC. In view of the joint behaviour of the public and the feedback to the monetary policy committee (Bernanke and Blinder, 1992), Hetzel (2000) proposes a rule that allows for a specification of the structural form of the relationship between the FOMC and the public which distils the behaviour of the public from the reaction of the FOMC. Moreover, the modelling of inflation as exogenous to monetary policy actions raises questions about the real-life application and coverage of the models. For example, inflation is mostly a function of monetary policy. Therefore, portraying the central bank as primarily concerned with fighting inflation and not responsible for inflation itself, though gratifying to monetary authorities, may be a skewed representation of actual monetary policy behaviour.

An interesting finding about forward and backward-looking specifications of the Taylor rule is the high significance of the coefficient of the lag of the dependent variable. This has been interpreted as an interest rate "smoothing" reaction by monetary authorities. Indeed, investigating the interest rate smoothing behaviour of central banks now forms the bulk of a growing literature and, as expected, arguments about the nature of such smoothing behaviour, and whether it even exists, are deepening. Ellis and Lowe (1997)

examined the effects of interest rate smoothing on the Taylor rule in Australia. In order to do so, they introduced a cost for interest rate changes to the central bank's loss function. When the cost varied, it was found that moderate degrees of smoothing often do not increase the variability of inflation and output to any appreciable extent. They explain this as a result of monetary policy transmission lags that increase the impact of previous interest rates on current output. Smoothing in this sense leads to longer cycles in output and inflation. While the Ellis and Lowe (1997) model is backward-looking, Clarida et al. (1998) present a forward-looking model to assess the smoothing behaviour of the German, American and Japanese central banks. The results show that the central banks apparently raised the anchor rates in reaction to a rise in expected inflation and lowered the rates when output was below a target range.

Closely related to discussions about reaction functions and their specification are assumptions about the money demand function of a country. The literature on money demand in Nigeria is vast. All the research, however, shows that money demand in Nigeria has been fairly stable over time. Ajayi (1977), for example, examined the period 1960 to 1970 and found that real income and interest rates have a significant impact on M2 money supply. In his view, this was an indication that the money demand function is stable for the period studied. His work relied on the ordinary least squares (OLS) methodology. On the other hand, Darrat (1986) explored the demand for money in three OPEC member countries, namely Libya, Nigeria and Saudi Arabia. Applying the Chow, Gupta, and Farley and Hinich stability tests, he concludes that the money demand function is stable in the three countries. Anoruo (2002) examined the stability of the money demand function in the Structural Adjustment Programme (SAP) period. Using the Johansen and Juselius cointegration test, as well as other stability test procedures (the CUSUM and CUSUMQ tests), he finds that the M2 demand function in Nigeria was stable in the period. In his view, this implies that M2 is a viable monetary policy tool which can be used to stimulate economic activity in Nigeria. Arize and Lott (1985) also examined money demand in Nigeria. They find that real income and expected inflation are important determinants of money demand, explaining over 80% of the variation in the real cash balance in Nigeria. They show that, given the low per capita income of the country, permanent income and measured income are largely the same. In addition, given the near-exogenous determination of major prices (particularly oil prices), monetary authorities in the country should be more prone to following the constant growth rate rule, as international inflation can be easily transmitted to domestic prices. Using data from 1960 to 1995, Nwaobi (2002) examined the stability of the demand for money in Nigeria. With a model specifying a vector-valued autoregressive process (VAR) and the Johansen co-integration framework, he finds that money supply, real GDP, inflation and the interest rate are co-integrated. This suggests that the money demand function is stable. In addition, evidence gathered from his non-nested tests suggests that income is the more appropriate scale variable in the estimation of the money demand function in Nigeria. Fielding (1994) employs quarterly data from four African countries (Nigeria, Cameroon, Kenya and Côte d'Ivoire) to construct money demand functions. He finds that money demand not only depends on income, inflation and interest rates but also, inversely, on the variability of inflation and interest rates. The central policy implication of this finding is that calculations of the seigniorage-maximizing rate of inflation,

which ignore the variability effect of inflation and interest rates, will overestimate the optimal rate of inflation given that high inflation tends to be associated with highly variable inflation. The estimated functions were quite heterogeneous and, therefore, he recommends membership of monetary unions for higher stability, but warns against the four countries belonging to the same monetary union.

Some studies have tried to estimate a policy reaction function for Nigeria. Prominent among these are the studies by Asogu (1996) and Doguwa (2002). As one of the earliest authors, Asogu (1996) premised his study on the fact that research was scarce on estimating and testing the stability or otherwise of policy reaction functions. The study therefore proceeded to specify reaction functions of the central bank, with a monetary base and a discount rate as dependent variables. The work established the significance and stability of the coefficients of the reaction function, but noted that in a number of cases the signs of such coefficients ran counter to theoretical postulations. This was attributed to policy distortions, discontinuities and instability in the sample period (1960 to 1993).

Doguwa (2002) followed the Taylor specification in capturing the monetary policy reaction function in Nigeria based on actual policy performance of a real MRR and the monetary base. His work divided the sample period according to three distinct regimes (the Babangida, Abacha-Abdulsalam and Obasanjo administrations). The study finds that the implied paths of the reaction functions fit the actual paths of the policy variables (MRR and base money) rather closely. The estimated reaction functions revealed that while the Babangida and Obasanjo regimes defended the official exchange rate, they also leaned with the wind in managing inflation and output. By contrast, the Abacha-Abdulsalam regime did not appear to defend the official exchange rate. Overall, the informal policy of leaning against the wind adopted by the Abacha-Abdulsalam regime appeared to have generated a positive response by the real interest rate to changes in real output. While noting that members of the Monetary Policy Committee (MPC) base their decisions on leading indicators and forecasts, the study recommends including a reaction function equation to the list of factors on which policy decisions are based, even if only on an experimental basis.

A key message emanating from the works reviewed, particularly those on the monetary policy reaction function in Nigeria, is the need for more work on the nature of the monetary policy reaction function at CBN. Without exception, the findings from each of the works seem to point to the increasing need for more in-depth analysis of the process, particularly in light of the frequent changes in processes at the central bank. This study, therefore, is an attempt to fill the gap in available knowledge about the reaction function at CBN, particularly taking into account updated data and improved methodologies.

3. Monetary policy in Nigeria

The responsibility for monetary policy formulation in Nigeria rests with CBN. The monetary policy objective is based on maintaining price stability and promoting non-inflationary growth. The primary means to achieve this objective is to set aggregate money supply targets and to rely on open market operations (OMO) and other policy instruments to achieve the target.

Monetary policy in Nigeria has relied more on indirect transmission mechanisms. Over time, it has become the practice to target the monetary base. However, the practice of targeting the money base rests on the assumption that there is a stable money demand function in the economy. The MRR is central to monetary policy making and analysis. This reliance on indirect transmission processes, which are anchored in instruments of which the exact impact are not known, makes monetary policy making in Nigeria a very challenging responsibility. A result of this has been large observed discrepancies between policy targets and outcomes over time (as shown in Table A1). At times, it is difficult to relate targets to outcomes in meaningful ways, especially as the magnitude and persistence of the variations are quite high. For example, target growth rates for M1 and M2 were exceeded by 121% and 554%, respectively, in 2001 while target reserves were exceeded by 792% in 2000. CBN regularly blames this on fiscal dominance, but it needs to be empirically proven that the nature of monetary policy itself is not a factor in this anomaly.

The fiscal stance of the central government is particularly important in understanding and analyzing monetary policy in the country. As the financing of one-eighth of all central government fiscal deficits is provided by the monetary authorities, concerns about fiscal dominance often dominate discussions about monetary policy making. Indeed, fiscal dominance is often blamed for a large share of the poor performance of monetary aggregates. In addition, the provision of deficit financing, and the fiscal stance of government also affect monetary policy through unbridled borrowing from the commercial banking system. CBN can be seen as a perpetual fire-fighting agency in charge of mopping up excess liquidity created by fiscal authorities. It also possibly contributes to the short-term nature of the monetary policy focus⁴.

Following liberalization of the financial sector, interest rates became market-determined and soon soared above repression-regime values. Despite high inflation rates, the real interest rate as at 2000 was more than 20%. The spread of lending and deposit rates also constitute a disincentive to effective financial intermediation. One of the factors identified by CBN as a cause for this is the oligopolistic nature of the banking industry in Nigeria⁵. Of more concern, however, is the high premium placed on foreign exchange transactions which, in turn, is a function of the distorted incentive system and breakdown of the traditional control mechanism in the financial industry. The persistent high interest rate reduces returns on investment in the real sector and encourages trading

in financial instruments.

Policy direction at CBN has continued to present a mix between inflation management and maximization of output growth. As part of its programme to shore up output growth, CBN manages a number of programmes aimed at facilitating credit and resource flows to areas of the real sector that it considers critical. The rationale given by CBN is that part of its mandate is not only the design and management of monetary policy but also involvement in development programmes that ultimately yield growth in output. Importantly, it instituted the Agricultural Credit Guarantee Scheme Fund (ACGSF) with an authorized call-up share capital standing of Naira(N)3 billion (about US\$24 million). From the inception of the programme in 1978 to June 2005, a total of 403,886 loans valued at N7.9 billion (about US\$63.2 million) have been guaranteed, while a total of 293,141 loans, valued at N5.3 billion (about US\$42.4 million) had been fully repaid, representing a repayment rate of 72.6%. CBN also has an interest drawback programme for banks lending to the real sector. It also maintains the small and medium-enterprise equity investment scheme (SMEEIS). The new SMEEIS guideline, developed in March 2005, expanded the scope of the scheme to include non-industrial enterprises. As at the end of June 2005, 83 banks set aside a total of N31.0 billion under SMEEIS. The cumulative investment in 192 projects by 83 banks at the end of June 2005 was N10.3 billion. CBN also started a scheme to encourage the establishment of microfinance institutions.

Also in 2005, CBN launched a new monetary policy framework. The policy kicked off from a position of strength as the bank exceeded its targets for the first time in the 2004 fiscal year. The objectives of the policy include a continued drive to achieve a lower (single-digit) inflation rate, a gradual reduction in the cost of borrowing, particularly for private-sector investors, by reducing interest rates; the maintenance of monetary stability; and sustaining exchange rate stability. The thrusts of the policy include exchange rate stability through commitment not to allow the rate of exchange to fluctuate beyond 3% above or below the official rate of the naira to the US dollar at any time; maintenance of positive real interest rates while minimizing the spreads in the term structure of rates; and ensuring lower cost of capital for investors and consolidating the banking system. Other policy measures are continued institutional reform where CBN will play a more challenging role in the economy; quarterly review of the MRR; reform of the payments system; setting ways and means advances to government strictly to zero; and a gradual withdrawal from and reinjection of public sector deposits with commercial banks for liquidity management (CBN, 2005).

On 28 November 2006, the MPC of CBN adopted a new monetary policy framework that took effect on 11 December 2006. The framework introduced a new Monetary Policy Rate (MPR) to replace the MRR. The MPR determines the lower and upper band of the CBN standing facility and is expected to have the capability to act as the nominal anchor for other rates. It is also expected to discontinue outright rediscounting of bills in the CBN to encourage trading among market operators; and ensure the full deployment of an information technology infrastructure for the effective implementation of the new framework as a follow-up to banking consolidation. The MPC now meets every two months to review developments in the economy. The new framework became necessary as the MRR had not been sufficiently responsive to CBN's policy initiatives, especially in tackling the problem of excess liquidity in the system. The new monetary policy

framework, which hinges on an interest rate corridor, provides for a CBN lending facility as well as the acceptance of overnight deposits from operators at specified rates. Under the new initiative, the CBN discount window can be accessed by market operators (discount houses and deposit money banks) who are in need of funds to meet liquidity shortages, while those with excess liquidity can deposit the funds overnight. The utilization of the standing facility is expected to bring about orderly market operations in the banking system by ensuring that interest rate volatility is reduced to a bare minimum and stability in market rates can be guaranteed. Potential challenges to the new system are expected to emanate from defining the policy setting rules (the response function); the frequency of changes to the policy rate; the significance of the inflation rate in determining the policy rate; and the challenges of price, credit and operational risks. There is also the continual challenge of poor sensitization of operators and other stakeholders, as well as the need to regularly train implementers.

4. Methodological framework

Monetary policy management in Nigeria has historically followed a base-money targeting framework (see CBN, 2002; Nnanna, 2002b). Such monetary policy making relies on targeting one or two definitions of money and then adjusting the key monetary instruments to meet the target broad money. The framework assumes a stable money demand function, with a simplified specification given as:

$$M_t = P_t + k Y_t - \eta i_t + v_t \quad (4)$$

where M_t is the money supply (as defined at any particular time t), Y_t is t -period aggregate income, i_t is the interest rate at time t , and v_t is a white noise error term. If, however, this equation is rewritten to endogenize the interest rate and normalize the base money impact on interest rate to unity, the above function becomes:

$$i_t = \frac{P_t}{\eta} - \frac{M_t}{\eta} + \frac{k}{\eta} (Y_t) + v_t \quad (5)$$

Equation 5 is similar to Equation 4, except that the interest rate is endogenized and becomes the target variable, with money supply and income as key determinants. The coefficient k/n could be considered the feedback indicator of the upward pressure on the interest rate given output expansion.

The history of monetary policy in Nigeria spans two major regimes – pre- and post-liberalization – and any policy tracking exercise should be delineated according to these two periods. Pre-liberalization, the interest rate was mainly suppressed (at low and near-constant values for long periods) by executive fiat. It is common practice in existing studies on reaction function estimation to capture such regimes by using dummy variables after testing for structural shifts⁶. As in most other dummy representations, the information content of such estimates is rather weak. Therefore, in this study, we omit the pre-liberalization regression period entirely and concentrate on the period when interest rates were market-determined. Following Flores et al. (2000) and the revealed goals of monetary policy in Nigeria, we model interest rates to adjust to defend the exchange rate. According to Nnanna (2002a), the interest rate was high for most of the sample period immediately following financial liberalization. The MRR was used to defend a number of other macroeconomic variables. The overvalued exchange rate was sustained by high interest rates. Thus, “ensuring exchange rate stability” mostly implied manipulating

monetary instruments to keep the exchange rate from moving too far away from target values. Consequently, the deviation of the exchange rate from the target ($e - e^*$) has been an important concern for monetary policy. However, the idea of a quantified exchange rate target is not explicit in monetary policy documents in Nigeria. As a particularly pervasive indicator of distortion for many years, the parallel exchange rate premium has drawn greater policy attention in the country. The only drawback is that while the size of the premium has been large over the years, the theoretical implication of including it in a model is not very clear, except to assume that policy makers are interested in reducing its size as an indicator of distortion. Arguably, the parallel market premium has at least drawn as much policy attention as the deviation of the exchange rate from the target (where such targets existed) and it is easier to capture with available data than the target deviation.

Post-liberalization, reserves serve two purposes: They are indicators of movements in the balance of payments (BOP), and they are used to stabilize the exchange rate. Given its mono-product status and high import propensity, Nigeria continues to battle with BOP challenges. CBN is at the forefront of the BOP management team and considers it a major responsibility to optimize the country's insurance through consistently improved reserves management. Thus, the inclusion of reserves partly captures adjustments made to ensure favourable balance of payments through alterations in the policy interest rate and other capital account transactions. Equation 5 is therefore extended as follows:

$$i_t = \frac{P_t}{n} - \frac{M_t}{n} + \frac{k}{n}(Y_t) + \alpha PREM + \beta \log\left(\frac{RES_t}{RES^*_t}\right) \quad (6)$$

$$\text{where } PREM_t = \left[\left\{ \frac{(off_e - par_e)}{par_e} \right\} * 100 \right]_t$$

where i_t is the policy interest rate (in this case MRR), P_t is the price level, M_t is broad money supply, $PREM_t$ is the premium of the parallel market exchange rate, and RES_t is foreign exchange reserves.

$$i_t = \frac{P_t}{n} - \frac{M_t}{n} + \frac{k}{n}(Y_t) + \alpha PREM + \beta \log\left(\frac{RES_t}{RES^*_t}\right) + \mu_t \quad (7)$$

Irrespective of the targeting framework, monetary policy is more concerned with the rate of growth of (or changes in) the price level and not really the level itself. Effectively, the price level is replaced by the inflation rate. In addition, while output growth is one of the broad objectives of the central bank's monetary policy, instrument variation with respect to output is not properly defined and, as such, it often remains no more than an implicit target. Apart from that, output data exist only in annual series

while this study utilizes monthly data. It is feared that interpolation may introduce some form of systematization of the data, which may affect the results. Bleaney and Lisenda (2001) recommend the use of private sector credit growth or the share of credit to the private sector in total credit under such circumstances to capture trends in productivity. This need not be the only reason for the use of credit to the private sector. As part of its developmental role, CBN supports the growth of the private sector and engages in a number of activities aimed at enhancing growth and development. These go beyond the setting of monetary policy rates and extend to providing credit (through specialized banks, special interest rates and interest drawback programmes) to targeted sectors of the economy. CBN continuously works to increase the private sector's share of total credit and minimizing constraints to access to such credit. For example, under the current reforms and as part of its developmental responsibilities, CBN's efforts to reposition the private sector as the engine of growth partly implies paying attention to the volume and share of private sector credit. Neither these responsibilities nor their impact can be fully captured through the use of quantitative indicators. However, outcomes in the form of access to credit by the private sector could be informative indicators of their success. This will be complemented using the real exchange rate, widely acknowledged to reflect major macroeconomic fundamentals, as expounded by Hinkle and Nsengiyumva (1999), Elbadawi and Raimundo (1994) and Baffes et al. (1997). Complementing each other, access to credit by the private sector and the real exchange rate replace output.

Flores et al. (2000) and some other authors recommend the inclusion of the differential between "desired" and "actual" rates of interest in developing countries' monetary policy reaction functions. Although such recommendations generally refer to the difference between target and actual interest rates, the definitions of desired and actual have to be contextualized. In Nigeria, for example, a central issue has been the determination options for reducing the persistently high difference between lending and deposit rates, and promoting real sector growth⁷. There is a broad understanding that the high differential is used by banks as a hedge against the abnormally high cost of doing business (particularly occasioned by infrastructure deficiencies) and is therefore less amenable to changes arising from the MRR. However, the increased relevance of the money market has meant greater reliance on interaction among banks as a lever for the rest of the economy to transmit signals from the policy rate to other segments of the private sector. In this context, it seems meaningful to incorporate not a desired rate (as the reality is very far from that), nor a lending-deposit rate differential (seemingly less under the control of monetary policy), but a leverage rate such as the inter-bank market rate which is also controllable, at least in principle.

Fiscal dominance continues to feature prominently among reasons why CBN has consistently been missing major macroeconomic targets for many years. This shows the very active role of government in setting the monetary policy direction and outcome. Two such channels of fiscal dominance are the share of the public sector in overall credit from the banking sector, and CBN credit to government. Government borrowing from the banking sector is often considered very distortionary as it tends to crowd out private borrowing, particularly as there are very limited resources in the entire economy. Given the above, the tracking equation is summarized as follows:

$$i_t = \alpha + \eta CPG_t + \alpha PREM_t + \beta \log\left(\frac{RES_t}{RES^*}\right) + \delta(CGG)_t + GREER_t + \chi Intbank + \varphi_{t-1} + \mu_t \quad (8)$$

where π is the inflation rate, CPG is the share of private credit in total credit, CGG is the share of the public sector in total credit, REER is the real exchange rate, and Intbank is the inter-bank lending rate. Other variables are as defined earlier. Regarding target reserves, we note that CBN does not explicitly target reserves in its monetary policy. However, the country is a signatory to both the West African Monetary Zone (WAMZ) and International Monetary Fund (IMF) target protocols. This entails a minimum of six months import cover by the former, and three months import cover by the latter. Operationally, the WAMZ protocol resembles reserves targeting in Nigeria more than the IMF specification⁸. This study adopts the WAMZ target and Equation 8 will be estimated as the tracking model.

The specification of prescriptive monetary policy reaction functions goes beyond merely tracking history and using the outcomes to judge history. This is often achieved by, among other things, incorporating optimality rules, implications of commitments in monetary policy reaction, and non-linear responses to macroeconomic variables (Evans and Honkapohja, 2003; Moessner and Gravelle, 2001; Cook et al., 1997). However, this study shall be limited to specifying an *alternate* model that follows theory – of the type outlined in the Taylor rule. The estimates from such an equation will be compared with those from the historical *tracking* model shown in the previous section. It begins with a central bank loss function that minimizes the difference between desired and actual inflation, as well as between desired and actual output. The specification consists of a standard IS curve (relating the output gap to the real interest rate), a Phillips curve (relating inflation to the output gap) and an interest rate response function. The output gap, x_t , is the percentage deviation of real GDP from a trend line measuring potential output, as shown in the relationships below.

$$x_t = -(i_t - \pi_t - r) + u_t \quad (9)$$

$$\pi_t = \pi_{t,1} + \lambda x_{t,1} + e_t \quad (10)$$

$$i_t = g_0 + g_\pi \pi_t + g_x x_t \quad (11)$$

All variables are as defined earlier, except inflation, which is defined in the current period, and r , which is the long-run average rate of interest (Orphanides, 2001; Hetzel, 2000). The above three conditions are captured by an optimal rule that minimizes the variance of output and inflation as in Equation 12:

$$i_t = \bar{r} + \Pi_{t-1} + \beta_1(\Pi_{t-1} - \Pi^T) + \beta_2(y_{t-1} - \tilde{y}_{t-1}) \quad (12)$$

where i_t is policy interest rate at time t , \bar{r} is real rate of interest at a zero rate of inflation, Π_{t-1} is average inflation rate over the past four quarters, Π^T is target inflation, Y_{t-1} is actual output in the previous period, \tilde{Y}_{t-1} and is potential output.

While it is the intention to estimate a function as close as possible to the Taylor rule, the reality of data constraints and policy relevance of the rule in Nigeria require some modifications. First, given the data constraints on output outlined earlier, even in this “optimal” model output will be de-emphasized. In addition, it is clearly more difficult to track potential output at high frequencies in an environment where data on actual output at such frequencies are not readily available. As there are a number of conceptual difficulties associated with measuring potential output, the last indicator in Equation 12 will be completely omitted. It will be replaced by the growth of credit to the private sector (CPG), as in the tracking model. CBN does not explicitly set monthly inflation targets in its monetary policy framework. Available data are annual but it is assumed that these annual targets do not necessarily change at shorter intervals. In the previous equation, actual inflation is used instead of a target, but the model in this section will use the deviation between actual and target inflation. To bridge the consistency gap between annual targets and monthly actuals, the annual targets shall be assumed constant for each year, leaving the size of the deviations for all months in any particular year dependent on the rate of the actual inflation for each month. Finally, the first term in Equation 12 is often regarded in the literature as a measure of interest rate smoothing. The present analysis shall retain both the concept and the measurement which will be investigated using the lag of the dependent variable. Thus, the alternate model presented in Equation 12 becomes:

$$i_t = \lambda(\pi - \pi^*) + \eta CPG_t + \theta REER_t + i_{t-1} + \mu_t \quad (13)$$

All variables are as defined earlier. Relative weights of both output and inflation (as espoused in the Taylor rule) shall be implicitly determined in the estimations and not assigned a priori. The alternative model (Equation 13) captures the developmental role of CBN through the incorporation of private credit and the real exchange rate (REER). Equation 13 will be estimated as the alternate model.

This study uses monthly data from between 1999 and 2005 (covering mainly the period of the current democracy in Nigeria). Given the nature of the estimation, it is often recommended in the literature that the highest possible data frequency available is used. For most of the variables of interest in the model, data exist at monthly rates. Presently, the MPC of the CBN meets once every two months and, in most of these meetings, monetary policy position decisions are made that either retain existing policies

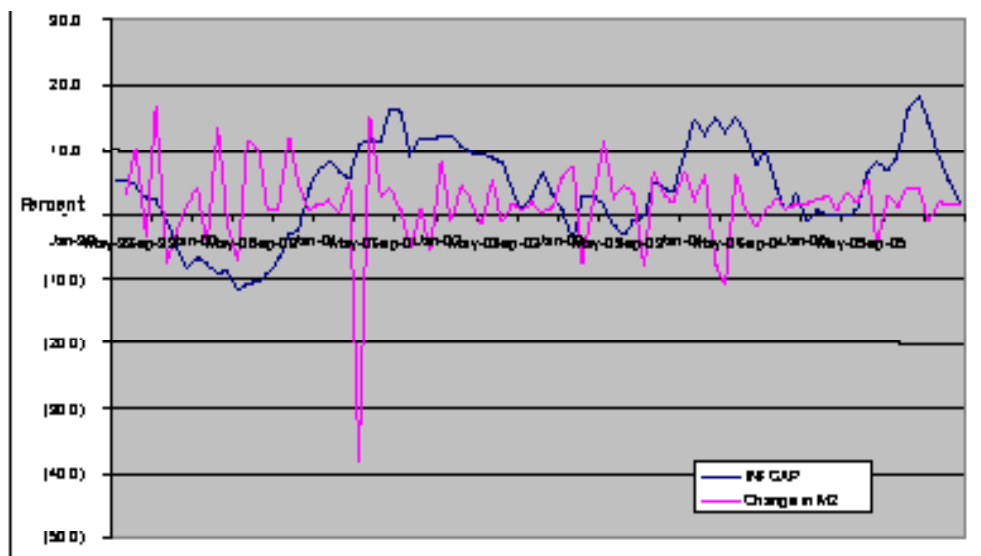
or make changes in one direction or another. Monetary policy actions, however, have impacts that can be more regularly observed than every two months. The error correction estimation approach will be used for the equations, with tests for stationarity and co-integration conducted to assess the individual mean-reverting and co-trending properties of the variables. The equations shall be estimated using the error correction modelling approach. Interest rate, exchange rate, credit and reserves data are sourced from CBN publications. Additional inflation data are from the Federal Office of Statistics. The estimation was done with PCGive econometric software.

5. Empirical findings

This section presents a summary of the outcome of the estimations of the different representations made in the previous section, and outlines their implications for policy making and further studies.

Figures 1 and 2 show the trends in the inflation gap, relating these changes to base money (in Figure 1) and the inter-bank rate (in Figure 2)⁹, respectively.

Figure 1: Relating change in base money to inflation gap



As seen in Figure 1, the relationship of the difference between desired and actual inflation, on the one hand, and changes in the monetary base on the other, is very weak. The changes in the monetary base are much more profound than those of the inflation gap throughout the sample period. Given that base money is an intermediate target of CBN, with the ultimate intention of having an impact on the overall size and movement of inflation, this raises a problem for the channel of transmission of changes in M2 on inflation. Admittedly, given the process for generating the inflation gap, there has been some smoothing of the data; nonetheless, such smoothing is not enough to explain the big difference in trends between the inflation gap and base money as captured in Figure 1. This is corroborated by the fact that the relationship between actual inflation and changes in base money is similar to Figure 1 (see Figure A1). In fact, all figures in the appendix seem to corroborate the fact that it is difficult to relate instrument variables (base money and MRR) to inflation.

Plotting the inter-bank rate and the inflation gap gives a slightly different picture (Figure 2). The inter-bank rate seems to track the inflation gap more effectively than base money, indicating a closer trending between inflation and the private sector interest rate determination process. In effect, market instruments approximated inflation better than policy instruments – possibly an indication of greater flexibility in the market than in the policy process. In Table A2, we show the correlation among selected interest rates,

exchange rates and the consumer price index, the MRR, average savings rate (ASR), minimum lending rate (MLR), prime lending rate (PLR), external reserves (EXTR), nominal exchange rate (NER), the 12-month consumer price index (CPI12), the inter-bank rate (Inter-Bank), and the 7-day, 30-day and 90-day deposit rates. The correlation among these interest rates is not very strong: Ranging from .4 for the average savings rate to .53 for the prime lending rate between the minimum lending rate and others. It is even more weakly related to the nominal exchange rate, consumer price index and external reserves with coefficients of .012, .21 and -.07, respectively. By contrast, the relationship among deposit rates is much higher with that between the inter-bank rate and 7-day, 30-day and 90-day rates between .97, .84 and .53, respectively. The nominal exchange rate also has a high correlation with the consumer price index. Again, this shows the relative weakness in the relationship between the policy interest rate and other interest rates, and macroeconomic variables.

Figure 2: Relating inflation gap to overnight inter-bank rate

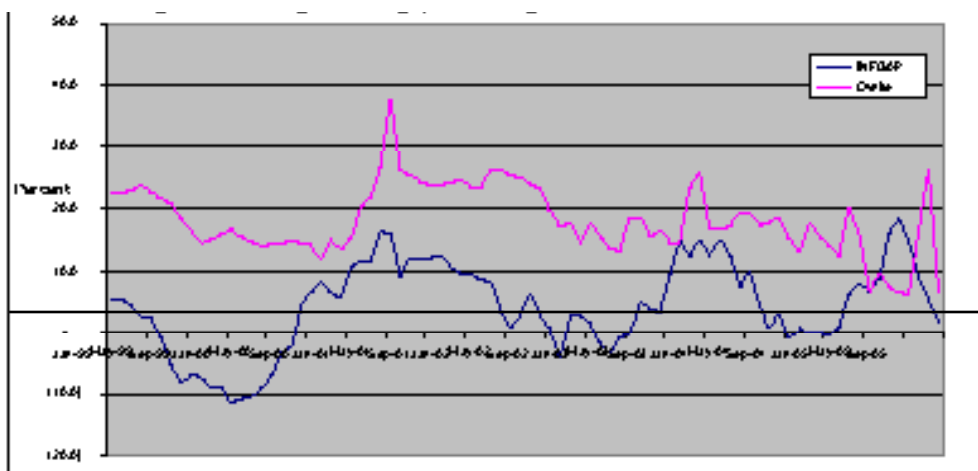


Table A3 summarizes the time series characteristics of most of the data used in the estimations in the models. Most of the variables are integrated of order 1 (i.e., I (1) series). Five of the variables, mainly constituting the growth rates (of M2, private credit, reserves and total credit), and average savings rate are stationary at level values. Most of the others (including exchange rate, inflation, and inflation gap¹⁰, broad money, MRR, nominal and real effective exchange rates, prime lending rates, parallel market exchange rate and its premium, and reserves and target inflation) are not stationary at level forms. Given the differences in the time series properties of the different variables in the models, attempts were not successful in establishing cointegration in order to introduce the error correction factor. As required by theory, the equations therefore had to be estimated at level forms with the individual coefficients interpreted only from a short-run perspective.

Bleaney and Lisenda (2001) note that “few developing countries satisfy the criteria necessary for estimating a central bank reaction function in the way that has been done

for industrial countries because of a combination of lack of monetary independence, instability of the policy regime, speculative exchange rate pressures, and paucity of data". It is therefore not surprising that there were some challenges with the data. For example, while the data for this study were monthly series, it was observed that CBN has limited data on target inflation, which are available mainly as annual series. The assumption was therefore made that the monthly targets did not differ greatly from annual target rates. This might not be wholly representative of the processes at CBN, but no evidence to the contrary could be found. The annual targets therefore had to be assumed constant for each year and the difference between the targets and the actual for each month is taken as the inflation gap. In addition, while the idea of the reaction of the policy rate to private sector credit as a measure of its reaction to overall economic growth seems inadequate, estimations using high frequency data such as those used in this study seem to preclude the use of GDP growth rates as these are not available in higher frequencies. It is feared that interpolations might increase overall interdependence of errors in the estimations. Indeed, the approach here follows largely the recommendation by Orphanides (2001) and Batini (2003) that in situations where the values of the output gap are uncertain, either due to data paucity or poor quality of the data, it is better to de-emphasize the output gap and proceed with only inflation and other more certain (identified) variables. The challenges emanating from the balance of the problems (monetary independence and instability of the policy regime) have significantly decreased within the sample period, relative to the country's history. The estimated log linear equations are summarized in Table 1. Following the data properties as reported earlier, particularly with respect to the absence of co-integration among the key variables of the model, relationships expressed by the equations are mainly short-run.

Against a priori expectations, a number of variables in the tracking model were not significant in determining the setting of the MRR. Based on the revealed preferences of CBN, some variables, such as the foreign exchange rate premium, foreign reserves, share of credit to the public sector and the inter-bank lending rate appearing in Equation 8, ostensibly went beyond the prescriptions of theory¹¹. Empirical estimates, however, could not establish that these variables matter for the policy instrument, the MRR. Earlier estimations, including these variables, showed that they are not significant in explaining changes in the MRR. Some of these variables were either wrongly signed or were very insignificant where they were included, indicating either that they really did not matter in the setting of the monetary policy rate or that they introduced distortions in cases where they appeared as important variables.

Table 1: Summary of estimation outputs

Modelform REER*	Const	Inflation*		Inflation		Private credit		
	Public credit	Inter-bank		D.W.	gap	growth**		
growth**	interest rate							
Coef	Lag/ Diff	Lag/ Coef Diff	Coef Lag/ Diff	Lag/ Coef Diff	Coef	Lag/ Diff	Coef	Lag/ Diff
Tracking	-0.0280	1, 1	-0.0032	-	-	0, 0	0.0246	-
-	0, 0	-1.36e-05			1.89			

	(-3.58)	(-2.07)	(3.72)	(-1.46)				
..	-0.0286 (-3.54)	1, 1 -0.0044 (-2.27)	0, 0	0.0224 (3.34)	1, 1	0.2529 (1.22)	0, 0	-1.14e-05 (-1.20)
Alternate	-0.0276 (-3.49)	-	1, 1	-0.0032 (-2.04)	0, 0	0.0243 (3.64)	-	-
..	-0.0300 (-3.78)	-	1, 1	-0.0049 (-2.60)	0, 0	0.0230 (3.46)	1, 1	0.3197 (1.59)

* Log forms of variables used in estimation ** Variables not in log forms
 Figures in parentheses are calculated t-values

While the above is slightly surprising, it is not altogether inexplicable. For example, the results indicate the premium in the foreign exchange market does not matter in the setting of the MRR. In Nigeria, with a monetary base-targeting framework and price stability as an overriding policy objective, the control of foreign exchange premia could be difficult without the use of additional policy instruments. While CBN tries to control the premium, it is doubtful that the array of instruments at its disposal could do this successfully while contending with its other responsibilities. It therefore might have to rely on a number of other indirect instruments and even, in extreme cases, collaboration with other institutions to bring down the foreign exchange premium.

The same case can be made for the estimates of the coefficient of foreign reserves, which had to be dropped because they were insignificant. Developments in the global financing system seem to continually place a strain on the capacity of nations (particularly developing ones) to continuously raise foreign reserves, almost in a spirit of a unilateral insurance mechanism. While reserves are raised from the surplus of CBN operations, such operations depend on the gamut of policies that the bank adopts, including its position on the policy interest rate. It was not possible to establish any significant relationship between reserves and the MRR, indicating that the size of reserves does not matter in the setting of the policy interest rate.

In both the tracking and the alternate model, we investigate interest rate smoothing using the lag of the dependent variable. Given the time series properties of the variable, it could enter the model only in first difference form. However, there were not significant differences in running the equations. A possible explanation for this may be the short-run nature of the equations estimated, in which case efforts at smoothing the interest rate may neither be necessary nor significant in the short run. The inability of this study to confirm interest rate smoothing partly implies that the central bank does not seem to attach great weight to costs arising from interest rate variability. Such costs could be macroeconomic or agency-specific, and could, to a large extent (and depending on the nature of structure of the economy), determine the persistence with which a monetary authority follows the inflation-output variability rule (see, for example, Ellis and Lowe, 1997, on Australia).

Given the growing importance of the money market, the inter-bank interest rate was introduced into the equation¹². However, the rate was not significant, signifying a bottleneck in the functioning of the inter-bank market, a phenomenon that is largely under-researched but which holds a potential challenge to the post-consolidation banking sector. Figure A2 sketches the actual trends in the MRR and overnight inter-bank rate.

The estimations incorporate the lagged and current values of changes in the price level. The results showed that only the one-year lagged value of the inflation rate affects the MRR. This result remained consistent and significant in most of the estimations, indicating that CBN's policy objective of price stability actually influences the setting of the policy interest rate. The one-period lag in the estimation results seems to indicate that CBN raises the anchor rates in reaction to the previous year's inflation rates – a form of reactionary policy making. This is in contrast to both recommendations in the literature and the practice of more advanced central banks, which is to take a proactive stance towards future inflation rates and set policy interest rates to achieve these rates.

Two measures of the impact of the fundamentals of economic activity on monetary policy were used (outlined in Equation 8). Interestingly, the results show that the growth of credit to the private sector significantly influences the setting of the policy interest rate, the MRR. This result remained consistent even in the estimation of the alternate model. In effect, whether as a reflection of the desire of monetary policy makers to have an impact on the growth of the real sector or merely for its own sake, there is evidence that it remained a major factor in monetary policy formulation. By contrast, the real exchange rate was only marginally significant in its impact on monetary policy for the sample period. Table 1 contains two equations for each of the model forms – the essence of the second equation is mainly to highlight the impact of the real exchange rate as a

complement to private-sector credit growth, as well as that of the inter-bank lending rate, in influencing the setting of the MRR.

In representing historical monetary policy (using the tracking model), the analysis was extended to macroeconomic factors that could have an impact on the setting of monetary policy targets. Specifically, given Nigeria's history of government's high share in total output and the oil-driven nature of its income and expenditure patterns, three indicators were incorporated: Public income, expenditure, and the oil price. However, data could not be obtained for government income and expenditure beyond published and annual data. Attempts to obtain these data from the Federal Ministry of Finance and the Office of the Accountant General of the Federation, which hold such unpublished data, were unsuccessful. As such, the growth of credit to the public sector and the oil price (data for both obtained from CBN) were used to reflect trends in government finances and the impact of oil, respectively. However, estimations show that the oil price does not have a significant impact on monetary policy target setting and that the impact of changes in public sector credit is only marginal.

6. Conclusion and policy implications

One of the major differences between the Taylor rule and the observed reaction function in Nigeria, as captured in the proposed equations, is the targeting of inflation. While CBN's expressed intention is to target inflation, the Taylor rule recommends the targeting of the inflation gap. This was captured in the specification of the alternate model where the inflation gap was used instead of the target and/or actual inflation. Output estimates show that the impact of the inflation gap on the MRR could

relevance of output in a monetary policy reaction function, given both the trends in the literature as well as mandates of central banks – especially not in developing countries where growth is a critical variable. Indeed, it is no big surprise that the real exchange rate and oil prices did not have an appreciable impact on the dependent variable as they are less precise in capturing either the explicit targets of monetary policy or providing a tangible handle on practical economic activities that affect day-to-day living in Nigeria.

It is interesting to note that inflation rates and inflation gaps (between target and actual rates) seem to “coincide” with the estimates so closely that one equation could easily be replaced with another. This means that it is possible for CBN to use the same set of instruments it uses for reducing inflation to also reduce the gap between desired and actual inflation. However, evidence shows that inflation targets have not been very closely met in the past (as can be seen in Table A1). It may be that explicit targeting of the inflation gap may point to some other (probably more effective) combination of policy instruments to reduce both inflation rates and gaps between desired and actual inflation.

Both the co-integration tests and the estimation results point to a lack of long-run relationships, even among monetary variables, and even less so between monetary and real sector variables. This may not be unrelated to the pronounced short-run stance of monetary policy for a large part of the sample period. CBN did not have a medium-term policy framework until 2002. For an economy with long-term trends in many important macroeconomic variables, this is a major setback to building strong linkages in the economy.

While the results are fairly consistent with the pronounced policy of CBN to tackle inflation as a priority, there are other questions regarding the optimality or otherwise of CBN’s targeting framework. In particular, it will be interesting and worth investigating to find out whether the targeting framework is optimal and whether the values set by, and consequently obtained from, the monetary policy stance are most suited to rapid economic growth. In other words, while the evaluation in this study was concerned with the question of *what* monetary authorities in Nigeria target there are other (equally fundamental) questions such as determining the optimal targets that are consistent with rapid growth, and comparing these with the targets set by monetary authorities in Nigeria.

Notes

1. TATOO is an acronym for Tomori (1972), Ajayi (1976), Teriba (1974), Ojo (1974) and Odama (1974), the five authors famous for the heated debate on money demand in Nigeria in the 1970s.
2. Friedman (1959) showed that changes in money supply can cause changes not only in nominal variables, but also sometimes in real ones, such as output and unemployment. The

be quite important. However, it has to be noted that although this has not been explicit in CBN's policy making, it may have been implicit. Attempts were made to incorporate broader macroeconomic fundamentals of the Nigerian economy (particularly the pervasive government and oil sector) in the tracking equation. The aim was to provide deviations from the traditional and strict Taylor rule specification and to provide a Nigeria-specific flair to the model for tracking monetary policy history.

One major observation of the outcome of our model efforts is that, ex-post, the outcomes of the targeting framework for monetary policy in Nigeria do not seem to differ significantly from expected results in a Taylor rule. Indeed, there are quite important similarities between the outcomes of the tracking and alternate equations. Interestingly, this suggests that a number of variables, which CBN ex-ante notifies as targeted variables, do not really seem to have an impact on the ex-post setting of the monetary policy instrument, the MRR. However, this could be more of a coincidence than design. On the one hand, it is possible that the bank uses instruments other than the MRR to achieve these other targets, in which case the MRR is not able to capture the outcomes of the targets set in those areas. On the other hand, it is not very clear that CBN explicitly quantifies the impact of these other variables and takes all of them into account either in the setting of the MRR ex-ante, or restructuring the outcomes ex-post. If this is the case, the close tracking of the observed relationship with the Taylor rule is no more than a coincidence.

In some sense, the "coincidence" viewpoint seems to be more credible. While there is enough evidence to show that CBN uses other instruments, its publications are explicit about the primacy of the MRR (now replaced with the monetary policy rate, or MPR) as a policy instrument. However, the huge discrepancies between targets and outcomes of monetary policy and other macroeconomic aggregates (as shown in Table A1) indicate that the ex-ante quantification of target variables and the impact of instruments on such targets are, mildly speaking, very weak. In addition, a number of the variables that seem to be important in the tracking model are not explicitly targeted in CBN statements. Put simply, the variables that are targeted are missed (with large variations), while those that are not targeted turn out to have a significant impact. As such, there is reason to believe that these outcomes may be no more than coincidence, notwithstanding the persistent reference to fiscal dominance as a cause. Although it may not be correct to draw firm conclusions about the impact of the public sector owing to the inability to explicitly incorporate all indicators of government's fiscal stance, evidence points to a weak ex-post influence on monetary policy.

The Taylor rule, however, specifies the reaction function in terms of deviations in output and inflation. Presently, data on output do not exist except as annual series. This implies that, in our models, output deviations could not be effectively captured, whether in the tracking or the alternate models. This raises the immediate challenge of improving the data collection process. The National Bureau of Statistics is presently working with other agencies to generate higher frequency output growth series. This has intrinsic value both for policy making and research. Given that most of the targets of CBN have short intervals, it is important that a significant variable such as output growth, which CBN also targets, could be obtained from short interval series. The use of growth in private and public sector credit, the real exchange rate and oil prices can in no way substitute for the

7. Indeed, a number of policy programmes were designed to reduce the spread between lending and deposit rates. One major reason for this extraordinarily high differential is the risk associated with real-sector banking in the economy. Evidence abounds that the central bank uses a number of other “instruments”, such as moral suasion, to influence banks to lower the lending rates. In some cases, as in the well-known bankers’ committee case of 2002, this worked, but in many other cases the central bank has to increase the incentive towards this optimal behaviour by using the policy rate of interest.
8. Indeed, the central bank signals a red alert whenever reserves reach as low as seven months import cover.
9. As can be expected, the different inter-bank rates are highly correlated, permitting the use of any one of them to reflect the overall situation in the inter-bank market. Of these, the most significant in the equations is the overnight lending rate. Therefore, both the graphs and the estimations make use of overnight lending rates.
10. This was obtained as the difference between actual and target inflation, although the latter was found in annual series only.
11. Noting policy changes to position it for greater effectiveness, the 2003 Central Bank of Nigeria Annual Report and Statement of Accounts, states as follows: “Specifically, the policy measures were designed to achieve a non-inflationary growth of 5% through the mobilization and prudent use of resources; achieve a single digit inflation; sustain stability in the exchange rate; promote financial sector soundness and achieve external reserve stock that could support at least six months of current import cover.”
12. Of all the inter-bank market rates, the overnight interest rate is the most significant. Given that the correlation level among the inter-bank rates is quite high, we did not consider it useful using other rates in the market.

References

- Ajayi, S.I. 1977. “Some empirical evidence on the demand for Money in Nigeria”. *American Economist*, 21(1): 51–4.
- Anoruo, E. 2002. “Stability of the Nigerian M2 money demand function in the SAP period”. *Economics Bulletin*, 14(3): 1–9.
- Arize, A.C. and E.J. Lott. 1985. “A re-examination of the demand for money in Nigeria”. *Atlantic Economic Journal*, 13(1): 27–35.
- Asogu, J.O. 1996. “An econometric analysis of the effectiveness of monetary policy in Nigeria”.

main instrument of Friedman's exposition is the quantity theory of money which views real balances as an asset with money stock, bonds and physical assets alternative forms of holding wealth, thereby making its demand a function of the yield on other assets.

3. This leaning was influenced by two factors. First, the experiences of many developed countries, especially in the late 1980s and 1990s, raised serious questions about the authenticity of the trade-off between inflation and output as contained in the Phillips curve proposition. Secondly, there seems to be some measure of consensus in the literature that where monetary policy matters, it does so in the short run. This has left the control of employment principally within the purview of fiscal policy.
4. The CBN outlook for monetary policy became medium-term for the first time in 2002. Before that, the policy time horizon hardly (if ever) exceeded one year (Nnanna, 2002).
5. At the end of 2001, the financial sector in Nigeria consisted of 90 deposit money banks, 747 community banks, six development finance institutions, one stock exchange, one commodity exchange, five discount houses, 74 primary mortgage institutions, 98 finance companies, 118 insurance companies, and 80 bureaux de change. However, only 10 banks control about 53% of total deposits, 46.5% of total credit and 50.8% of total assets in the industry.
6. In the Nigerian case, a structural shift in 1986 is taken as a given in the literature as the introduction of a structural adjustment policy and the consequent liberalization of the monetary sector provided a major departure from the structure of monetary policy pre-1986.

- Misalignment: Concepts and Measurement for Developing Countries*. New York: Oxford University Press for the World Bank.
- McCallum, B.T. and E. Nelson. 2000. "Timeless perspective vs. discretionary monetary policy in forward-looking models." Working Paper No. 7915; National Bureau of Economic Research: New York
- Mehra, Y. P. 1999. "A Forward-Looking Monetary Policy Reaction Function". *Economic Quarterly*, 85(2): 33–53. Federal Reserve Bank of Richmond, .
- Moessner, R. and T. Gravelle. 2001. *Sterling Yield Curve Reactions to Macroeconomic News and Monetary Policy Decisions: International Influences and Implications for Monetary Policy Transparency*. Bank of England, Centre for Central Banking Studies, London.
- Nelson, E. 2000. "UK monetary policy 1972 to 1997: A guide using Taylor rules". Working Paper No. 120. Bank of England, London.
- Nnanna, O.J. 2002a. "Monetary and financial sector policy measures in the 2002 Budget". National Centre for Economic Management and Administration (NCEMA). *Policy Analysis Series*, 8(1). Ibadan, Nigeria
- Nnanna, O. J., 2002b. "Monetary Policy and Exchange Rate Stability in Nigeria". Proceedings of a one-day seminar organized by Nigerian Economics Society held on 23 May 2002.
- Nwaobi, G. 2002. "A vector error correction and nonnested modeling of money demand function in Nigeria." *Economics Bulletin*, 3(4): 1–8.
- Odama, J.S. 1974. "The Demand for Money in the Nigerian Economy: A Comment." *The Nigerian Journal of Economics and Social Studies*, 16(1):175-78
- Ojo, O.1974. "The Demand for Money in the Nigerian Economy: Some comments." *The Nigerian Journal of Economics and Social Studies*, 16(1):149-52
- Orphanides, A. 2001. "Monetary policy rules, macroeconomic stability and inflation: A view from the trenches". European Central Bank Working Paper Series No. 115, December, 2001
- Phillips, A.W.H. 1958. "The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957". *Economica*, NS 25(2): 283–99.
- Rudebusch, G.D. and L.E.O. Svensson. 1997. "Policy rules for inflation targeting". In J. Taylor, ed., *Monetary Policy Rules*, *Business Cycle Series*, 31: 203–262. National Bureau of Economic Research, Cambridge, MA, September.
- Samuelson, P.A. and R.M. Solow. 1960. "Analytical aspects of anti-inflation policy". *American Economic Review*, 50(2): 177–94.
- Svensson L.E.O. 1997. "Inflation targeting: Some extensions". Working Paper No. 5962. National Bureau of Economic Research, New York.
- Taylor, J.B. 1979. "Estimation and control of a macroeconomic model with rational expectations." *Econometrica*, 47(5): 1267–86.
- Taylor, J.B. 1993. "Discretion versus policy rules in practice". *Carnegie Rochester Series on Public Policy*, 39: 195–214, North Holland.
- Taylor, J.B. 1999. "A historical analysis of monetary policy rules". In J. Taylor, ed., *Monetary Policy Rules*, *Business Cycle Series*, 31: 319–348. University of Chicago Press, Chicago.
- Taylor, J.B. 2000. "Summary Remarks at Bank Indonesia". Summary paper presented at the Inflation Targeting and Monetary Policies in Emerging Economies Conference at the Central Bank of the Republic of Indonesia. Jakarta, Indonesia, 13–14 July.

- PhD Thesis, University of Lagos, Nigeria.
- Baffes, J., I. Elbadawi and S. O'Connell. 1997. "Single equation estimation of the equilibrium real exchange rate". In L.E. Hinkle and P.J. Montiel, eds., *Exchange Rate Misalignment: Concepts and Measurement for Developing Countries*. New York: Oxford University Press for the World Bank.
- Ball, L. 1999. "Policy rules for open economies". In J. Taylor, ed., NBER Business Cycle Series, *Monetary Policy Rules*, 31: 127–56. Chicago: University of Chicago Press.
- Batini, N. 2003, "Achieving and maintaining price stability in Nigeria". Paper presented at the 2nd Annual Conference of the Money Market Association of Nigeria on Financial Stability. Abuja, 15–17 May.
- Bernanke, B.S. and A.S. Blinder. 1992. "The Federal Funds Rate and the Channels of Monetary Transmission". *American Economic Review*, 82: 901–21.
- Bleaney, M. and L. Lisenda. 2001. *Monetary Policy after Financial Liberalization: A Central Bank Reaction Function for Botswana*. Centre for Research in Economic Development and International Trade Research Paper No. 17. University of Nottingham, Nottingham.
- Central Bank of Nigeria. 2002. *Annual Report and Statement of Accounts for the year ended 31 December, 2002*. Abuja: Central Bank of Nigeria.
- Central Bank of Nigeria. 2005. *Annual Report and Statement of Accounts for the year ended 31 December, 2005*. Abuja: Central Bank of Nigeria.
- Christ, C. 1953. "Rules Versus Discretion in Monetary Policy". *Cato Journal*, 3(1): Spring 1953
- Clarida, R., J. Gali and M. Gertler. 1998. "Monetary policy rules in practice: Some international evidence". *European Economic Review*, 42: 1033–67.
- Clarida, R., J. Gali and M. Gertler. 2000. "Monetary policy rules and macroeconomic stability: Evidence and some theory". *Quarterly Journal of Economics*, 115: 147–80.
- Cook, S., S. Holly and P. Turner. 1997. "Investigating the power of tests for asymmetries in macroeconomic relationships". Mimeo. University of Cambridge, Cambridge.
- Darrat, A. 1986. "The Demand for Money in Some Major OPEC Members: Regression Estimates and Stability Results". *Applied Economics*, 18: 127–42.
- Dogwu, S. I. 2002. "Estimating Taylor-Type Monetary Policy Reaction Functions for Nigeria: 1985–2001". *Journal of Monetary and Economic Integration*, 2(1): 13–36
- Elbadawi, I.A. and S. Raimundo. 1994. "Capital flows and long term equilibrium real exchange rate in Chile". Policy Research Working Paper No. 1306. The World Bank, Washington D.C., June.
- Ellis, L. and P. Lowe. 1997. "The smoothing of official interest rates". In P. Lowe, ed., *Monetary Policy and Inflation Targeting: Proceedings of a Conference*. Sydney: Reserve Bank of Australia.
- Evans, G.W. and S. Honkapohja. 2003. "Monetary policy, expectations and commitment". University of Oregon Economics Department Working Paper No. 2002–11. University of Oregon Economics Department, Oregon.
- Fielding, D. 1994. "Money Demand in Four African Countries". *Journal of Economic Studies*, 21(2): 3–37.
- Flores, M., A.W. Hoffmaister, J. Madrigal and L. Villalobos. 2000. *Policy Reaction Function in a Crawling Peg Regime: Evidence from Costa Rica*. Banco Central de Costa Rica (BCCR) Research Department, IMF Research Department, and BCCR Office of the President.
- Friedman M. 1959. *A Program for Monetary Stability*. New York: Macmillan.
- Goodfriend, M. 1993. "Interest rate policy and the inflation scare problem". *Economic Quarterly*, 79(1): 1–24. Federal Reserve Bank of Richmond, Richmond, VA.
- Hetzl, R.L. 2000. "The Taylor rule: Is it a useful guide to understanding monetary policy?" *Economic Quarterly*, 86(2). Federal Reserve Bank of Richmond, Richmond, VA
- Hinkle, L.E. and F. Nsengiyumva. 1999. "The three good internal real exchange rate for exports, Imports and domestic goods". In L.E. Hinkle and P.J. Montiel, eds., *Exchange Rate*

- Teriba, A.O. 1974. "The Demand for Money in the Nigerian Economy: Some Methodological issues and further evidence". *The Nigerian Journal of Economics and Social Studies*, 16(1):153-63.
- Tomori, S. 1972. "The Demand for Money in the Nigerian Economy" *The Nigerian Journal of Economics and Social Studies*, 16(1):153-63.
- Torres, A. 2002. "Monetary policy and interest rates: Evidence from Mexico". Paper presented at the 75th Anniversary Conference at the Banco de Mexico, Mexico City, 2002
- Zha, T. 1997. 'Identifying monetary policy: A primer'. Federal Reserve Bank of Atlanta, *Economic Review*, 2nd Quarter, pp. 26-43, Atlanta, Georgia.

Appendixes

Appendix A

Table A1: Monetary targets and performance (2000–2005)

Variable 2003	2000		2001		2002	
	2004	2005	2005	2005	2005	2005
Target	Target Actual	Actual Target	Target Actual	Actual Target	Target Actual	Actual
M2	14.6	48.1	12.2	27	15.2	21.6

	15	14	15	16.03		15.9	13.8	29.5	10.8	8.6	11.4	15.5
M1	24.1	4.3	28.1	12.4		15.9	13.8	29.5	10.8	8.6	11.4	15.5
Aggregate bank credit	9.8	4.3	28.1	12.4		15.9	13.8	29.5	10.8	8.6	11.4	15.5
Credit (net) to Fed Government	27.8	15.8	75.8	57.9	64.6	64.6	25.7	29.1	22.5	12	22.5	14.5
Credit to private sector	37.8	2.6	79.7	96.6	6320.6	-150.3		58.4	29.9	-17.9	-10.9	-37
Inflation rate (%)	21.9	22.8	43.5	34.9	11.8	32.3		27.1	22	26.6	22	30.8
GDP	9	7	18.9	9.3	12.2	9		23.8	10	10	10	11.6
	3	5	3.9	5	3.5	5		10.2	5	6.5	5	6.2

Note: All values in % growth, except where specified otherwise

Source: CBN Annual Report and Statement of Accounts, various issues

Table A2: Correlation of selected financial variables in Nigeria

	MRR	ASR	MLR	PLR	EXTR	NER	CPI12	Inter-bank	7 days	30 days	90 days
MRR	1										
ASR	.40	1									
MLR	.51	.21	1								
PLR	.53	-.02	.55	1							
EXTR	-.07	-.18	-.16	.55	1						
NER	.012	-.39	.12	.61	.57	1					
CPI12	.21	-.33	.24	.67	.50	.94	1				
Inter-bank								1			
7 days								0.97	1		
30 days								0.84	0.88	1	
90 days								0.53	0.58	0.79	1

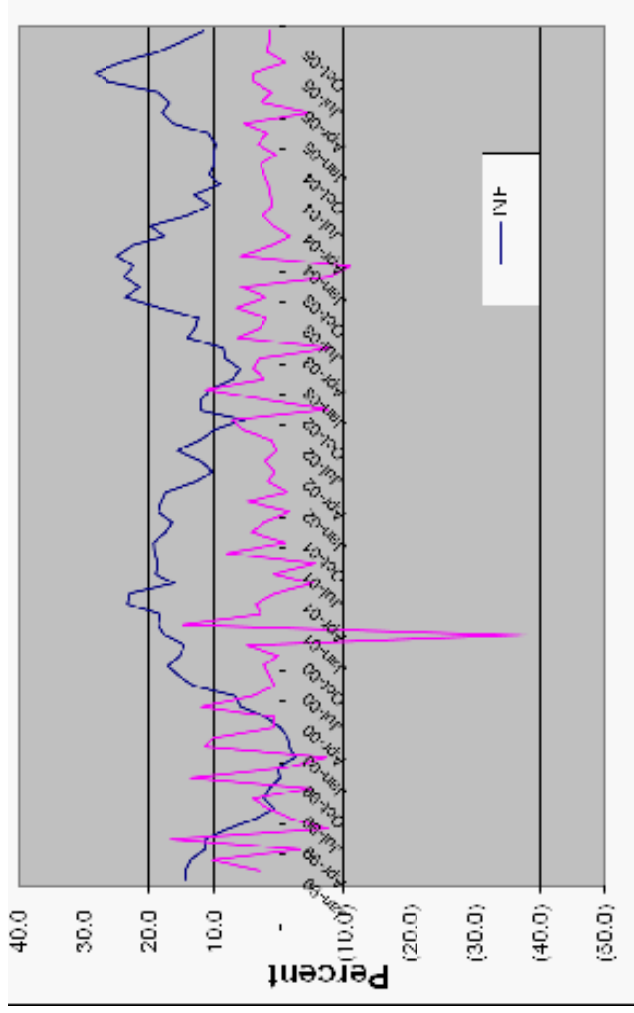


Figure A2: Minimum Rediscount and Overnight Inter-Bank Rates

Source: Author's calculations

MRR – Minimum rediscount rate

ASR – Average savings rate

MLR – Maximum lending rate

PLR – Prime lending rate

EXTR – External reserves

NER – Nominal exchange rate

CPI12 – Annual consumer price index

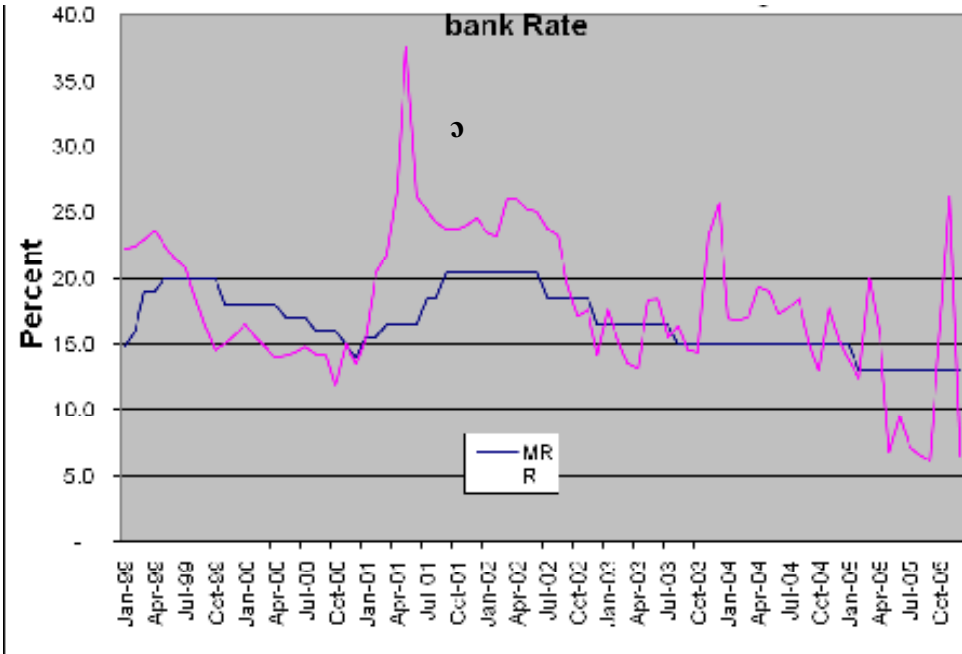
Ovnite – Overnight lending rate at the inter-bank market

7 days; 30 days and 90 days represent 7-day, 30-day and 90-day lending rates at the inter-bank market, respectively.

Table A3: Unit root tests of key variables: 1999 (6) to 2005 (12)
(Critical Values: 5% = -1.944; 1% = -2.592)

Variable	Description	T-ADF	Level of stationarity
ASR	Average savings rate	-4.8882	0
CPI	Consumer price index	-6.8538	1
EXRATE	Exchange rate	-6.5059	1
INF	Inflation rate	-7.7901	1
INFGAP	Inflation gap	-4.2899	1
M2	Broad money	-10.619	1
M2G	Growth in M2	-11.505	0
MRR	Minimum rediscount rate	-8.9651	1
NEER	Nominal effective exchange rate	-6.8404	1
PLR	Average savings rate	-7.3393	1
PMER	Parallel market exchange rate	-5.5908	1
PREM	Exchange rate premium	-5.2744	1
PRIVCREDG	Growth of private credit	-7.2649	0
REER	Real effective exchange rate	-6.692	1
RES	Reserves	-9.3044	1
RESG	Growth in reserves	-6.6242	0
TCREDG	Growth of total credit	-9.4786	0
TINF	Target inflation rate	-5.0454	1
OILPRICE	Oil prices	-5.7844	1
PUBCREDG	Growth in credit to the public sector	-6.7253	0

Figure A1: Inflation and proportional changes in M2



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