INTEREST RATE PASS THROUGH IN NIGERIA: 2007-2011

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DECLARATION

I hereby declare that this thesis titled "INTEREST RATE PASS THROUGH IN NIGERIA" is original and based on my research efforts under the supervision of Dr. Aliyu Rafindadi Sanusi and Dr. Mike Duru. It has not been earlier presented for award of a degree in any university or for any publication. All sources used have been duly acknowledged by way of referencing.

…… …….

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CERTIFICATION

This is to certify that this thesis is an original work written by IBRAHIM, Usman(M SC/SOC-SCIEN/02352/2008-09) and has been examined and approved as meeting the requirement of the Department of Economics, Faculty of Social Sciences, Ahmadu Bello University, Zaria, for the award of Master of Science M S.c (Hons) Degree in Economics and was carried out under our supervision.

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DEDICATION

This thesis is dedicated to my Daughter, Maimunat Usman Ibrahim.

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Abstract

The study sets out to determine the magnitude and speed of interest rate pass through in Nigeria using a monthly data for the period 2007:1 to 2011:1. The aim was to uncover the extent to which changes in policy rate pass through to market and retail rates and also from market rate to retail rate. Auto Distributed Lag (ARDL) approach otherwise known as the Bounds testing approach was employed because of its inherent advantage (allowing for testing both I(0) and I(1) at the same time. The major findings are: First, interest rate pass through is incomplete in Nigeria both in the long and short run, which is consistent with the generality of the empirical literature. Secondly, the pass through is more substantial in the long run than in the short run in all stages of the pass through. Thirdly, the pass through is greater from MPR to market rate than from money market to retail rate. Finally, a substantial long run pass through is found between MPR and prime lending rate, there was none between MPR and deposit rate. We concluded that interest rate is a potential monetary policy tool in Nigeria especially from policy rate to market rate, which is eventually transmitted to real sector. We recommend that efforts should be made towards improving the pass through of policy rate to retail rate.

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CHAPTER ONE

Introduction

1.0 Background

Generally, the objective of monetary policy is to achieve certain macroeconomic objectives, which may include attaining price stability, economic growth, equilibrium balance of payments and attainment of full employment. Over the years in Nigeria, monetary policy has been used to achieve these targets and more importantly to reduce inflation. Inflation has been one of the major problems facing the Nigerian economy and the combinations of instruments of monetary policy have proven inadequate in combating this problem. Despite the various monetary policy regimes that have operated in Nigeria, there is little or no result (see for instance Uchendu, 2009; CBN, 2008 and Adam, 2008).

The apparent historical ineffectiveness of monetary policy has led to, of recent, the consideration for the adoption of the much talked about inflation targeting. Inflation targeting, if implemented, is thought to have the potential of keeping inflation at single digit. This belief is based on the observation that inflation targeting has improved the performance of monetary policy in all the countries that have adopted it (see for instance Adam, 2008:20; Nello, 2008:56).

The use of interest rate as the sole instrument of monetary policy in undertaking inflation targeting framework is continuously getting so much attention. Interest rate plays a significant role in inflation targeting, hence the need for understanding the magnitude and speed of the pass through of policy interest rate to other money market rates of different maturities (see Aydin, 2007).

Routinely, the Central Bank of Nigeria (CBN) changes the official interest rate (currently called the monetary policy rate- MPR) to stimulate other banking rates in order to bring inflation back to the target. This means for monetary policy to be effective in inflation targeting, the change in policy interest rates should be transmitted to the market interest rates quickly with a magnitude large enough to influence price stability – complete or substantial interest rate pass through. It is therefore very important to determine the stickiness or otherwise of the market rates (commercial bank rates, capital market rates and other market rates). Thus a quicker and substantial pass through of changes in the official rate to market interest rates strengthens monetary policy transmission and thereby influencing price stability. Previous policy action on interest rate in Nigeria did not translate to a significant impact in the economy. The country has passed through different interest rate regimes with less impact on the economy in terms of reducing inflation to a desirable single digit.

1.1 Statement of problem

There has been a growing concern over the effectiveness of monetary policy in achieving macroeconomic targets especially in a developing economy like Nigeria. This discontentment with the ineffectiveness of monetary policy is evident in the plan by the CBN to change its monetary policy framework from monetary targeting to the inflation targeting framework (see Okafor, 2009 and CBN, 2008). This framework however requires a more developed and liberalized financial sector with different institutions and legal framework that is now in place (see for instance Adam, 2008:20; Nello, 2008:56). Various reforms have therefore been in place to provide the regulatory environment for inflation targeting. These include the recent deregulation of the financial sector and granting of autonomy to CBN (see for instance CBN, 2008). The deregulation of the interest rates allow banks to determine their deposit and lending

rates according to market conditions through negotiation with customers and depending on the cost of funds. The Minimum Rediscount Rate (MRR), which was used from 1984 to 2006, was abolished and replaced by Monetary Policy Rate (MPR). The shift to MPR was based on two conclusions. First, the MRR was no longer relevant as it only influenced the setting of commercial bank loan rates and did not seem to have any linkage with other money market interest rates. This independence or unclear relationship constrained the ability of the Central Bank to influence economic variables through the conduct of monetary policy. Second, the application of MRR for many years could also not eliminate the macroeconomic imbalances typified by the co-movements of interest rates and inflation rates. This co-movement has led to several bouts of policy inconsistencies and reversals (Alade, 2007: Martins, 2010). Under the inflation targeting framework, the CBN relies on this interest rate (MPR) as the major policy instrument of monetary policy (see CBN, 2008). It is expected therefore that a change in the MPR by the CBN be passed through to change in the deposit and lending rate of the commercial banks as well as to other Money Market Rates. This forms the first stage in the transmission of monetary policy actions in the economy, that is, the effectiveness of monetary policy depends crucially on whether changes in the MPR are transmitted to other longer term interest rates in the economy. This transmission of impulse from the MPR to other interest rate is called the interest rate pass through (IRPT). This study sets out to examine the extent to which changes in the policy rate are transmitted to other rates in the financial market. In order words, would monetary policy under inflation targeting be effective given its apparent reliance on the monetary policy rate as the major instrument?

1.2 Research Questions

From the research problems this research seeks to answer the following questions

a) What has been the magnitude and speed of interest rate pass through in Nigeria since the introduction of MPR?
b) What is the implication of the pass through on the conduct and effectiveness of monetary policy in Nigeria?
c) Would monetary policy be more effective under inflation targeting framework?

1.3 Objectives of the Study

The main objective of this research is to investigate whether interest rate pass through is complete or not in Nigeria. The specific objectives of this work include:

a) to estimate the magnitude and speed of the pass through of MPR to :
    i. Market Interest Rate (MMR)
    ii. Retail Rates (Lending and Deposit Rates)
b) to estimate the magnitude and speed of the pass through of MMR to:
    i. Lending rate
    ii. Deposit rate
c) analyse the implications of these pass through effects on the effectiveness of monetary policy.

1.4 Justification of the Study

The outcome of this research will have a far reaching policy implication with regards to the use of interest rate as a vital tool for the implementation of monetary policy. Since the most important tool of monetary policy is the interest rate, it will be of greater interest to the policy makers to know the extent to which MPR changes translate to changes in MMR and any other retail sector rate. The magnitude and the speed of the pass through determine, to a larger extent,

the effectiveness of the monetary policy. The empirical knowledge of the magnitude will help the Monetary Policy Committee (MPC), which meet every two months, in deciding the magnitude of the required change in MPR, while the empirical knowledge of the speed of the pass through helps in the timing of policy changes. In addition, the empirical knowledge of the magnitude of the various interest rate pass through can serve as a valuable input to macro model for calibration.

1.5 Scope of the Study

The scope of the study covers the period between 2007 and 2011, because the monetary policy rate (MPR) was introduced in December 2006 to replace the minimum rediscount rate (MMR) as the short term policy interest rate of CBN. Monthly data was sourced from the CBN website (www.cenbank.org). This research shows the impact of changes in policy rate on the market rates and retail rates, not the transmission of the mechanism of the monetary policy. Hence further studies will be needed to determine the effectiveness of monetary policy transmission mechanism.

1.6 Limitation of the Study

The study is limited by the data which is secondary in nature. Also the period covered is short because monetary policy rate was introduced in 2006.Therefore the research is in no way perfect, but the best has been put to produce a qualitative and reliable findings.

CHAPTER TWO

Literature Review

2.0 Introduction

There has been a growing interest by both scholars and policy makers on the level of interest rate pass through, which signifies the overall efficiency of policy rate changes on the economy. This is as a result of the frequency at which policy rate changes in order to be in tune with the overall performance of the economy. There have been a number of changes in policy rate especially after the introduction of the monetary policy rate as the in-corridor system. Various studies have been carried out especially in developed countries where the financial sector of the economy seemed to have developed. Theoretical as well as empirical evidence abound as to the role of interest rate in the pursuance of monetary policy.

2.1 Channels of Monetary Policy Transmission

The transmission mechanism describes the various routes through which a central bank's monetary policy action affects the entire economy (CBN, 2009). For example, changes in the CBN monetary policy rate (MPR) may impact on other short term interest rates. This in turn may affect lending rates in the medium-to long-run and may ultimately affect domestic demand.

The Interest Rate Channel

The transmission of monetary policy through interest rate mechanisms has been a standard feature in the economics literature for many years. It is the key monetary transmission mechanism in the basic Keynesian model, which has been a mainstay of teaching in

macroeconomics. The traditional Keynesian view of how a monetary tightening policy is transmitted to the real economy can be characterized by a schematic diagram,

M↓→ i↑→ I↓→Y↓.

Where M ↓indicates a contractionary monetary policy leading to a rise in real interest rates (i↑), which in turn raises the cost of capital, thereby causing a decline in aggregate demand and a fall in output (Y↓).

The interest rate channel of transmission of monetary policy was clearly defined in Keynes' General Theory. The present value of capital and durable consumption goods is negatively related to the real interest rate (the marginal efficiency of capital function). A lower real rate of interest implies a higher present value of existing durable (capital and consumption) goods and an increase in the ratio between the prices of existing stocks and the prices of newly produced goods. Although Keynes originally emphasized this channel as operating through businesses' decisions about investment spending, later research recognized that consumers' decisions about housing and consumer durable expenditure are also investment decisions. Thus the interest rate channel of monetary transmission outlined in the schematic above applies equally to consumer spending in which (I) represents residential housing and consumer durable expenditure. The higher real interest rates lead to a decline in business fixed investment, residential housing investment, consumer durable expenditure and inventory investment, which produces the decline in aggregate output. Taylor takes the position that there are strong interest rate effects on consumer and investment spending and, hence, a strong interest channel of monetary transmission

The Credit Channel

Two basic channels of monetary transmission arise as a result of agency problems in credit markets: the bank lending channel and the balance sheet channel.

The Bank Lending Channel

The bank lending channel is based on the view that banks play a special role in the financial system because they are especially well suited to deal with certain types of borrowers, especially small firms where the problems of asymmetric information can be particularly pronounced. After all, large firms can directly access the credit market through stock and bond markets without going through the banks. Thus, a tight monetary policy that decreases bank reserves and bank deposits will have an impact through its effects on these borrowers. Schematically, the monetary policy effect is

M↓→ bank deposits↓→bank loans↓→I↓→Y↓.

Because of banks role, certain borrowers will not have access to the credit markets unless they borrow from banks. For the bank-lending channel to exist, a reduction in reserves engineered by the monetary authority must cause the volume of bank lending to decline. That is, banks must not insulate their loan supply after a shock to reserves by simply rearranging their portfolio of other assets and liabilities. The central bank can affect the supply of bank loans in two ways. The first is by raising reserve requirements. This has the ultimate effect of reducing not only the total volume of commercial bank assets but also the proportion of commercial bank earning assets to their total assets. The second way is by conducting open market sales. An open market sale of treasury bills, for instance, will reduce commercial bank reserves as purchasers issue checks against their accounts in commercial banks. In a closed economy, where banks cannot easily

substitute deposits with other sources of credit, open market sales drain liquidity from the economy; a distinctive feature of the bank-lending channel.

The degree of pass through of central bank policy rate or money market rates on the lending of banks is very important in monetary policy. When the degree of pass through is high, monetary policy can have a significant impact on cost of credit. Conversely, with a low degree of pass through bank lending rates are relatively sticky downward arising from: risk aversion by banks, high proportion of term deposits with high cost of funds and uncertainty about macroeconomic developments, among other (CBN, 2008-09).

2.1.1 Definition of key terms

Interest Rate Pass through: this is the responsiveness of market interest rate to policy rate changes. When the CBN changes the policy rate it is expected that the impact be translated in to the market and retail rates.

Market Interest rate: this is the rates at which commercial banks trade, the rate they lend and borrow among them. This rate should be related to the monetary policy rate because any signal should be propagated in this rate. The most important market rate as relates to MPR is the call rate.

Retail rate: these are the rates at which people borrow and lend from the banks. They include the prime lending and 3 months deposit rates.

Oligopoly: this is market a structure in which there are few sellers of commodity selling homogenous or differentiated products so that the action of each seller will affect the other seller.

Collusive Oligopoly: is an agreement between firms to cooperate in order to avoid mutually damaging rivalry. The two types of oligopoly are cartel and price leadership.

Non-collusive oligopoly: this explains the price and output determination in a market structure, in which oligopolies recognize their independence.

2.2 Interest Rate Adjustment-conceptual definition

Market interest rate adjustment otherwise known as stickiness is used to describe the responsiveness of market interest rates to changes in another interest rate, such as the policy interest rate. The level of stickiness is measured by how small the change in the official interest rate elicits a change in the market interest rates. There is a difference between adjustment in the short-run and in the long-run. While there may be a considerable degree of response of market interest rates (complete; incomplete) to changes in the official interest rate in the long-run, the short-run may be different. Because of costs of adjustment, banks may respond sluggishly to changes in the official rate in the short-run. The short-run sluggishness may be intensified by poor or limited alternative financing or investment sources to bank loans or deposits. As a result banks may not feel pressured to adjust their rates in the short-run when the official rate changes. Lastly, due to long-term relationships with their customers, banks may want to smooth interest rates changes thereby creating a gap between the long-run and short-run adjustment (Egert, *et al.* 2007). A wide gap between the short-run and the long-run adjustments can also be viewed as evidence of interest rate rigidity.

Much of the theoretical literature about interest rate adjustment tends to focus on short term money market interest rates, especially the various deposit and lending rates of banks (Aydin,

2007). Usually the aim of central banks' operations is to influence the overall lending policies of banks and the demand for money and credit in the economy through changes in bank liquidity and interest rates in the money market (Mboweni, 2000). Changes in interest rates in the money markets should then be translated into long-term capital market interest rates as suggested by the expectations theory of the yield curve. But as indicated by the liquidity preference theory of the yield curve, due to risks in long-term debts, the long-term interest rates will not reflect perfectly the changes in the short-term rates. Hence, one will expect adjustments in the long-term interest rates to be lower than in the short-term money market interest rates in response to changes in the official interest rate (Aziakpono and Wilson, 2010). This means the situation may be different where the capital market is not developed with the banking system dominating the financial system.

2.3 Factors Affecting the Adjustment of Interest Rate

A number of factors influence the behavior of interest rates in an economy. Prominent among these are: savings, investment, inflation, government spending, taxation and monetary policy orientation- liberal or control regime; financial structure – its development level, banking sector concentration, bank size, the degree of openness of the financial market; asymmetric information; and menu costs amongst other things.

Monetary policies under controlled interest rates and credit allocation are inherently rigid, since changes in interest rates are not as a result of markets' spontaneous adjustments. In contrast, a deregulated environment allows the market to determine interest rates and credit allocation. In such an environment, markets rates are more flexible and do readily adjust to changes in monetary policy stance (Gidlow, 1998).

The structure of the financial system also affects how interest rates adjust. It is part of financial structure the degree of competition within the banking system, competition between banks and other non–bank intermediaries. What sets the level of competition in financial system is the regulatory environment, the number and size of intermediaries, the ownership structure as well as the openness of the financial system. Profit-maximizing behaviour in a competitive market induce banks to adjust their rates promptly to changes in the market conditions. Conversely if market forces are weak, inefficiency will not be penalised and bank interest rates may be more rigid (Cottarelli andKourelis, 1994).

Also, in a highly oligopolistic (concentrated) banking market, banks may cause interest rates to adjust asymmetrically to an increase or a decrease in the official rate. The asymmetric adjustment of interest rates can be explained using two competing hypotheses. Firstly the collusive behaviour hypothesis which suggests that deposit rates will be rigid upward when the official rate is increased, while the lending rates will be rigid downward in the case of a decrease in the official rate. Secondly, the adverse customer reaction hypothesis which suggests that deposit rates will be rigid downward when the official rate is decreased, while the lending rates will be rigid upward in the case of an increase in the official rate (Hannan and Berger, 1991; Neumark and Sharpe, 1992; Scholnick, 1996; Lim, 2001; De Bondt, 2005).

The ownership structure of banks (that is whether state-owned or private sector owned) is another factor that could influence the speed of adjustment of interest rates. State domination of banking system results in banking concentration or some form of monopoly, which may cause inefficiency hence rigidity in the interest rates.

The response of domestic banks to changes in the official rate also depend on the extent to which banks rely on the accommodation facilities provided by the central bank for their liquidity needs. If the financial system is sufficiently open and banks can easily access external source of finance, this may reduce banks reliance on the accommodation facilities from the central bank (Fourie, *et al.* 1999). Consequently, in an open financial system the response of bank interest rates to changes in the official rate may be slower than when the market is not open.

Stiglitz and Weiss (1981) provide another explanation for interest rate rigidity based on asymmetric information. If banks perceive the risk of default to be very high, they will maintain a large spread between lending and deposit rates. If this cushion is very large, then market lending rate may be relatively insensitive to small changes in official rate.

Lastly, the level of development of the financial system affects the degree of interest rate adjustment. A well developed financial system will offer alternative financial instruments and intermediaries for investors and savers thereby providing alternative investment or financing sources to bank loans and deposits. In addition to the availability of other financial intermediaries, alternative financing or investment sources include active and broad markets for Treasury bills, long-term bonds (both government and private), and an active stock market. In such a developed financial system, no single financial intermediary enjoys absolute market power and interest rates are more flexible in responding to changes in market conditions.

The foregoing discussion shows that several factors - which vary from country to country - could cause the stickiness of market interest rates. Moreover, stickiness will vary within a country as the financial environment changes over time. These variations are critical to the calibration and

execution of monetary policy. Little wonder, therefore, that, the relationship between official interest rates and market interest rates has given rise to growing empirical literature.

2.4 Empirical Literature Review

The area of IRPT has received attention of scholars and researchers of recent; especially as inflation targeting becomes favorite to policy makers. So many studies have been conducted in this field, especially in developed countries and the outcome was encouraging. The study was also extended to some developing countries including African countries (see Aziakpono and Wilson , 2010). Interest in the area is no longer limited to interest rate spread, but is extended to investigating the general degree of adjustment of bank interest rates in response to changes in the monetary policy rate. Virtually all the studies conducted in this field found out that the pass through are more complete in the long run than in the short run. Also most of the studies discovered cross country differentials in the level of PT irrespective of the data used and the period covered. Some studies also found evidence of asymmetric adjustment, the nature of which varies from country to country subject to the type of the interest rates used.

In their studies Aziakpono and Wilson (2010) found that the speed of adjustment of market interest rates varies across the rates, with the highest speed occurring for lending rate, followed by Treasury bill rate and money market rate, and closely followed by commercial bank deposit rate, while the government bond yield has the least speed of adjustment. The test of asymmetric adjustment of commercial bank interest rates confirms asymmetric adjustment. While the evidence shows that the commercial banks are becoming increasingly more rigid in adjusting their lending rates upward in response to a positive shock in the official rate, thus supporting the

negative customer reaction hypothesis, the converse is true for the deposit rate adjustment, where the evidence seems to support collusive behaviour of banks.

Kwapil and Scharler (2009) carried out a comparative analysis of the PT from policy rate to retail interest rates in the euro area and the US. They analysed monthly data from January 1995 to September 2003 for various deposit and lending rates. They found the average long-run PT to be lower in the euro area than the US. Whereas the PT from policy rate to most categories of deposit rates was nearly complete in the US, it was only 0.32 in the euro area. The long-run PT to lending rates was also lower in the euro area at 48 per cent compared to 57 per cent in the US.

Aydin (2007) examined the speed and rate of adjustment of lending rates to monetary policy rate for corporate, housing, cash and automobile loans using bank-level micro data in Turkey. The empirical results on unit root, co-integration tests and the estimation of co-integrating vector improve when cross-sectional dependence is allowed. He found evidence in favor of central bank control over credit market via short-term interest rates, which is more apparent in the post-credit boom period. Estimation results reveal that while corporate loans are not sensitive to changes in the policy rate, cash and automobile loan rates are responsive to the policy rate. Housing loans, on the other hand, display excessive sensitivity to the policy rate.

Using an error correction model derived from a partial adjustment model, Mamingi*et al* (2008), empirically investigates the effectiveness of central bank's interest rate policy (minimum deposit rate) on commercial banks' lending rate behaviour in Barbados for the period 1980 to 2007. Their study finds that the reaction of commercial banks' lending rate to changes in the central bank's policy rate is sticky in the short-run, but fully complete or effective in the long-run.

A growing number of studies have also been conducted in emerging market economies. These include Scholnick (1996) for Singapore and Malaysia; Iregui, *et al*. (2002) for Colombia and

Mexico; Espinosa-Vega and Rebucci (2002) and Berstein and Fuentes (2003) for Chile; and Aziakpono and Wilson (2010) for South Africa.

Overall, the results of these studies remain inconclusive as to the extent of PT with wide differentials in PT across interest rates and market segments- for instance between corporate and consumer loans (see Lowe and Rohling (1992) and Aydin (2007)). Furthermore, the differences in the degree of PT across interest rates relates to the maturity of interest rates used, that is the shorter the maturity of lending or deposit rate, the faster and larger the PT (see for instance, Egert, *et al*. 2007; De Bondt, 2005; Espinosa-Vega and Rebucci, 2002). Finally, very central to current study, results from studies on the possibility of asymmetric adjustment have also been mixed. Investigations that found evidence of significant asymmetry in adjustments includes Hannan and Berger(1991) and Neumark and Sharpe (1992) for USA; and Scholnick (1996) for Singapore and Malaysia. Also, the nature of the asymmetric adjustments depends on whether it is in the long-run or short-run and the type of interest rates. While there are commendable efforts in studies that explored interest rate adjustment around the world, studies from Africa remain scant. Junglee's (2004) examination of the rigidity of commercial bank interest rates in Mauritius, is the only known study from the rest of Africa outside South Africa (De Angelis, *et al.,* 2005, Aziakpono, *et al*., 2007 and Aziakpono and Wilson, 2010). Junglee's (2004) methodology was based on the Johansen Cointegration, TAR, and M-TAR models and used quarterly data from September 1988 to September 2003. The work concluded that IRPT is higher in the deposit rates (0.413) than in the lending rates (0.242), but asymmetry only exists in the lending rates. Moreover the lending rate tends to adjust slower when there is an increase than when there is a decrease in policy rate.

With regards to South Africa, the three (3) attempts focused on the PT using different rates and methodologies. De Angelis, *et al.* (2005) found that the PT to the whole rates was higher (almost one-for-one PT) during the first repo system than the second repo system. Aziakpono, *et al*. (2007) concentrated in exploring the differentials between the six (6) periods corresponding to different monetary policy regimes. In addition to estimating the degree of PT of the official rate, the authors as in Aziakpono and Wilson (2010) also explore the possibility of asymmetric adjustment in the interest rates. Their results show that the wholesale interest rates record a weak evidence of asymmetry with high speed of adjustment throughout the period especially during more market-oriented policy regimes, which suggests effective monetary transmission to wholesale rates.

Aziakpono and Wilson (2010) extend the study scope by focusing on more interest rates and the coverage period. This is very relevant because with constant changes in the financial and monetary environment, there is need for further studies that will not only cover more interest rates, but extend the analysis to more recent period as much as possible. Therefore this study is extended to cover more recent development in the monetary sector as well as involve more relevant interest rates.

2.5 Overview of Monetary Policy and Financial Reforms in Nigeria

Monetary policy refers to the actions taken by the central bank to regulate the value, supply and cost of money with a view to achieving the overall macroeconomic objectives of the economy. It can also refer to a blend of measures and or set of instruments design by the central bank to regulate the value, supply and cost of money consistent with absorptive capacity of the economy or the expected level of economic activity without necessarily generating undue pressure on

domestic prices and the exchange rate. All over the world, the primary function of central banks is the formulation and implementation of monetary policy (CBN briefs, 2009).

In designing of monetary policy the CBN reviews developments in the economy over a period, articulates the measure pressure for a risk to price stability and formulates a framework which will guide its monetary policy implementation (Uchendu, 2009).. The framework which is essentially an approach to monetary management is based on a programme which sets out future trends in macroeconomic aggregates. The monetary programme defines the quantitative targets to be obtained (Uchendu, 2009).

The conduct of monetary policy can be broadly divided in to two major eras, namely: the pre-liberalization era (before 1986) which was characterized by the direct monetary control and the liberalization era (after 1986) till date which relies on market mechanisms.

2.5.1 Pre-Financial Liberalization Era: 1970-1985

Interest rate impacts almost all macroeconomic aggregates and consequently the economy at large. As claimed by Fakiyesi (1996:11) "interest rate is a subject of analysis and as an instrument of policy has remained an enigma to both researchers and policy makers alike." It is therefore important to understand the various issues that lead to effective management of interest rate in Nigeria and also study her experience in interest rate policy. We want to see how this experience influenced the future trend of interest in Nigeria.

The pre-SAP banking development in Nigeria can be captured in three phases: namely; the era of laissez faire banking (1892 - 1952), the era of limited banking regulations (1952-1958), the period of prudential Regulations and Control (1959-1985). The most significant development as far as this study is concern is the development from the enactment of the banking act of 1969.

The period 1958-1986 can be referred to as the era of consolidation because it improved and consolidated on the gains of the banking ordinance period. The period began with the enactment of the Central Bank of Nigeria Act of 1958 to establish the Central Bank of Nigeria (CBN). This act empowered the CBN to promote and integrate the Nigerian financial system through outlining regulatory measures to effectively stem the tide of bank failures.

The Banking Act of 1969 was to provide for the regulation and control of the monetary and financial system. Its provisions were specifically made to restrict granting of licenses to banks. The Act empowered the CBN to exercise its power in maintaining monetary and financial stability in the economy through measures such as enforcement of liquidity and capital adequacy requirements, and capping of both interest rates and bank lending to the private sector.

As then expected, the banking regulations had some salutary effects on the banks and their customers. Banking distress was greatly reduced with improved viability of banks in Nigeria. However, despite the benefits associated with this development a number of problems arose from the banking regulations, especially in the early 1980s, and questioned the entire mode of banking regulation.

Having outlined the regulations, it will be necessary to examine their various forms and their application before the commencement of the Structural Adjustment Program. Three categories of banking regulations are considered - statutory regulations, Central bank's guidelines and other regulations incidental to performing the functions of the CBN.

2.5.2 Monetary Policy before SAP

Interest rate commenced as a policy instrument only after the establishment of the Central Bank of Nigeria (CBN). In fact while referring to Okigbo (1981); CBN (1979); Helleiner (1966) and Newlyn&Rawan (1953), Fakiyesi (1996) concludes that there was no macroeconomic environment for the country prior to establishment of CBN. Interest policy developed in a rudimentary form in the sense that the rates offered were nominal rates as a mere compensation for willing depositors in the few colonial banks. "These rates were invariant for most of the times and were therefore not responsive to economic forces. Rather they depend on the whims of the caprices of the colonial government." (Fakiyesi, 1996:14).

However since the establishment of CBN, the main channel of policy on interest rate is the rediscount rate. The initial anchor rate was the Bank of England rediscount rate. Inevitably the rate was artificial since it was unreflective of its operating environment. Strictly funds movements were tailored to meet export trade requirements of commercial houses with parent companies in Britain, or to meet cash movements in London. The major event that marked the first domestic regulatory action on interest rate in Nigeria was the amendment of banking act in 1962 that gave the CBN the power to regulate interest rate of commercial banks through linkage to minimum rediscount rate (MRR). This brought to the fore the use of monetary policy as a tool of economic management.

The banking decree of 1969 (section 14) consolidated this achievement by extending the power to cover all rates. Thus the CBN was empowered to prescribe minimum and maximum rates chargeable by each bank. The prescription commenced in March 1970 with a prescribed composite spread of 4-9% by movements around the MRR: lending rates to generate 2.5-7.5%

above MRR while deposit rates to generate 1.5% below or above the MRR. This period coincided with the global trend of credit rationing and rates control. However given the experiences of mid 70s and early 80s, scholars in general are of the opinion that rates control had influence on the poor growth and development of the Nigerian financial system.

Importantly, the success of interest rate management is contingent upon the type of the regulatory environment. There is no doubt that banking regulations were necessary given the tide of massive bank failures witnessed in the formative years of banking in Nigeria. Nonetheless, a number of problems arose from the banking regulations, especially in the early 1980s, and questioned the entire mode and implementation of banking regulation. To put this in clear perspectives, it is necessary to examine the regulations applied prior to SAP. Three categories of banking regulations are considered - statutory regulations, Central bank's guidelines and other regulations incidental to performing the functions of the CBN.

There is no doubt, that regulations positively influenced the viability of banks in Nigeria. The mass bank failures as witnessed during the laissez-faire banking practices when between 1951 and 1952, about 17 new indigenous banks were established with only one that survived beyond two years. The simple causal factor was absence of regulations, especially before the Banking Ordinance of 1952. Since the 1952 Ordinance and subsequent banking laws - the Central bank Act and the 1969 Banking Act, bank failures gradually diminished. This confirms that banking regulations have been effective

Despite this positive side of controls, a number of problems arose from the banking regulations, especially the application of direct controls in the period immediately before SAP. The performance of banks with regard to these measures was mixed especially on the degree of

compliance. Examples of these controls were direct deposits with CBN, ceilings on credit expansion and sectoral allocation of credit.

Importantly, the rapid increase in the number of banks since the 1970s increased the burden of monitoring individual banks and thereby making enforcement of regulations more difficult. The banks were circumventing the controls by creating products that are off-balance sheet items to hide relevant information about their operations. In an attempt to get the growing number of banks to comply with the rules, the regulatory authorities diverted more of its resources to the enforcement compliance with credit ceilings and related direct controls.

Lastly, the direct control affected competition negatively in that it created opportunities for all banks in all sectors with discrimination; tacitly guaranteeing each a good market share across the broad spectrum of industries. These and other related problems associated with intensive banking regulations led to the introduction of Financial Deregulation in Nigeria.

2.5.3 Financial Liberalization Era: 1986 - 2006

As a result of the long-term disequilibrium in balance of payment, an adjustment package was initiated and adopted in 1986 with deregulation of the financial sector as one of the key elements of the adjustment process. Structural Adjustment Program (SAP) was meant to assign the role of determination and allocation of resources to market mechanisms.

2.5.3.1 Changes in Structure

Before the financial deregulation began in 1986, the banking sector in Nigeria has been described by Lewis and Stein, (1997) as static for almost 10 years with 29 commercial banks

owning 60% of total banking assets and the rest represented by 12 merchant institutions. At the commencement of the Structural Adjustment Program (SAP) in 1986 (which comprised currency devaluation, trade liberalization and privatization of state enterprises among others), some of the direct control measures from the 1970s like entry restrictions and interest rate controls were loosened.

The financial liberalization saw the entry of many new banking institutions, largely and unfortunately, to leverage on the parallel exchange rate regime meant to eliminate the perceived overvaluation of the domestic currency. This the banks found to be a quick means of making profits from various arbitrage opportunities. Thus banks with connections with political class often had preferred access to exchange rate auctions and could sell the foreign exchange for a high premium.

Although the contribution of the financial sector to GDP increased after the financial deregulation and even surpassed the manufacturing share in GDP by 1990 (Lewis and Stein, 1997), the Nigerian financial sector actually saw a financial disintermediation. Many of the new banks were not interested in sourcing funds from depositors for onward lending, but rather to make quick profits from the arbitrage and other rent-seeking activities (often not legal). As a consequence of the high fragmentation and low financial intermediation, the Nigerian authorities established some prudential guidelines in 1990-91 and a moratorium on new bank licenses in 1991. The financial bubble burst inevitably occurred in early 1990s as stock market prices fell sharply, and the extent of non-performing loans became evident. For instance the Nigeria Deposit Insurance Corporation within 1992-93, announced that 50 banks that had two-thirds of total banking assets and three-quarters of deposits in Nigeria's financial system were exhibiting

distress signals (Lewis and Stein, 1997). Also, according to Caprio and Klingebiel (2003), Nigeria faced a systemic banking crisis throughout the 1990s. Nigeria's financial indicators such as liquid liabilities, bank assets, private credit or financial system deposits remained relatively low throughout the 1990s by both historical standards and the 1985 figures and only started to significantly increase after 2000.

In 1998, 26 bank licenses were revoked, reducing the total number of banks from 115 to 89. In spite of improvement of the macroeconomic environment as a consequence of a new civilian administration after 1999, the Nigerian financial system remained highly fragmented with low financial intermediation (Hesse, 2007). In this context, the CBN decreed on July, 6, 2004 that banks had to increase their minimum capital requirements from NN2 billion to NN25 billion ($ US 190 million) by the end of 2005. The intention was to increase the average size of banks via merger and acquisitions to increase economies of scales, create new product development and overall generate a more stable banking system with a higher contribution to financial intermediation. By the beginning of 2006, 75 banks out of the existing 89 banks reduced to 25 banks; while the remaining 14 banks failed to increase their capital or secure merger partners.

2.5.3.2 Summary Indicators

According to Fakiyesi (1996) and Busari (1996), in spite of all the institutional and structural changes interest rate policy was inconsistent; hence from on-set the key element of monetary policy is lost. Notwithstanding, a market based interest rate policy was introduced in August 1987. Banks were given a band within which to fix their deposit and lending rates. Within the period MRR continued to be fixed by the CBN in line with perception of overall economic conditions.

For instance, MRR in December 1987 was reduced by 2.25% to 12.75% with the sole aim of stimulating investment and growth in the economy. During the same period, there was 3.5% cost differential between commercial and merchant banks at 11.5% and 15%; while maximum lending rates were 19.2% and 22.0% respectively. The market thus gave a wider spread to the commercial banks.

Disparity of interest rates offered on deposits was observed favour of banks existing pre-SAP known as the "Old Generation Banks (OGBs)" when compared with banks that came into existence in response to the structural adjustment process tagged "New Generation Banks (NGBs)". However the lending rates of the two (2) categories of banks were much closer, indicating squeezed spread to the NGBs. This lack of congruity indicates other factors' influencing the system, other than the market mechanism. Overall, a stable feature of the market was that of widening spread because the banks were only willing to increase lending rates while holding the deposit rates low (Fakiyesi 1996).

In a bid to remove distortions in the interest rate structure, CBN reached an accord with the banks towards end of 1989 by fixing the spread at 7%. To moderate monetary expansion, the MRR was raised to 13.35% in the same period. The lack of responsiveness of the structure of deposit and lending rates to market fundamentals, particularly the fall in inflation rate in 1990, forced the CBN to fix the spread at 4%. While interest rates reported by the banks were within limits, there was sufficient evidence that actual rates were higher. Examples are compulsory deposits received from borrowers at much lower rates to run concurrently with the amount borrowed. By this action, the effective rate- hence the spread, blows out. As indication of failure, this ceiling was removed in 1992 through to 1993. Within 1993 interest rates were not

only distorted and volatile, but also rose to unprecedented levels that undermined the efficiency and general stability of the financial system. It was at this time that most merchant banks began to crumble.

Necessarily some measures of regulations were reintroduced in 1994 due to continued wide variations and unnecessary high rates following the 1992/3 deregulations. Deposit rates were set at 12-15% while 21% was the ceiling for loans. This situation was maintained up to 1996.

Thus the Nigerian financial system has undergone some remarkable changes in recent times. The question now is how banks have fared since the commencement of the deregulation exercise.

Before era of SAP, financial policies were characterized by financial repression. The seeming ineffectiveness of interest rate in allocation of assets portfolio may be due to the incongruence of regulated rates and the actual cost of funds to the banks. Consequently a lot of "under the counter" dealings became the norm. The adherence to the repression policy and oversight of their consequences impacted the development of the financial system which reflects the inability of the sector to perform its allocative role in the economy. The relative fixity of rates (1970-1979; 1980-1985) does not present interest rate policy as a major tool for influencing macroeconomic stability. In fact the rising negative real interest rate within this period explains the great disintermediation experienced up to 1986 (Fakiyesi, 1996; Hesse, 2007). Thus instead of enhancing financial deepening, the policies led to narrowing of the sector.

Whichever policy a country adopts, the crucial issue is how the policy actions and or decision are transmitted to the economy (the so-called transmission mechanism of monetary policy) to achieve the ultimate objectives.

2.6 Interest rate management in Nigeria

The management of interest rate in Nigeria can be viewed on two different broad perspectives, namely, administrative fixing and free market determination of the rate.

2.6.1 Management prior to 1986

Prior to the Structural Adjustment Programme (SAP) in 1986, the level and structure of interest rate were administratively determined by the CBN. Both deposit and lending rates were fixed by the bank based on policy decision. At that time the major reasons of administering interest rates were the desire to obtain the social optimum in resource allocation, promote growth of the financial market, combat inflation and lessen the burden of internal debt servicing on the government.

The major event that marked the first domestic regulatory action on interest rate in Nigeria was the amendment of banking act in 1962 that gave the CBN the power to regulate interest rate of commercial banks through linkage to minimum rediscount rate (MRR). This brought to the fore the use of monetary policy as a tool of economic management.

The Banking Decree of 1969 (section 14) consolidated this achievement by extending the power to cover all rates. Thus the CBN was empowered to prescribe minimum and maximum rates chargeable by each bank. The prescription commenced in March 1970 with a prescribed composite spread of 4-9% by movements around the MRR: lending rates to generate 2.5-7.5% above MRR while deposit rates to generate 1.5% below or above the MRR. This period coincided with the global trend of credit rationing and rates control. The prevailing rates were unable to keep pace with inflation resulting in negative interest rate. Moreover the demand for

credit soon exceeds the rate of savings and a large proportion of government borrowing had to be financed by the CBN. However given these experiences, scholars in general are of the opinion that rates control had influence on the poor growth and development of the Nigerian financial system. These and other related problems associated with intensive banking regulations led to the introduction of Financial Deregulation in Nigeria.

2.6.2 Management since 1986

Within the general framework of deregulating the economy in 1986 to enhance competition and efficient allocation of resources, the CBN introduced a market based interest rate policy in August 1987. Before the financial deregulation began, the banking sector in Nigeria has been described by Lewis and Stein, (1997) as static for almost 10 years with 29 commercial banks owning 60% of total banking assets and the rest represented by 12 merchant institutions. The deregulation of interest rates allowed banks to determine their deposit and lending rates according to market conditions through negotiations with customers. However, the minimum rediscount rate (MMR) which influences other rates continued to be determined by the CBN in line with changes in overall economic conditions (CBN Briefs 2008-09).Although the contribution of the financial sector to GDP increased after the financial deregulation and even surpassed the manufacturing share in GDP by 1990 (Lewis and Stein, 1997), the Nigerian financial sector actually saw a financial disintermediation. Many of the new banks were not interested in sourcing funds from depositors for onward lending, but rather to make quick profits from the arbitrage and other rent-seeking activities (often not legal). As a consequence of the high fragmentation and low financial intermediation, the Nigerian authorities established some prudential guidelines in 1990-91 and a moratorium on new bank licenses in 1991. The financial

bubble burst inevitably occurred in early 1990s as stock market prices fell sharply, and the extent of non-performing loans became evident. For instance the Nigeria Deposit Insurance Corporation within 1992-93, announced that 50 banks that had two-thirds of total banking assets and three-quarters of deposits in Nigeria's financial system were exhibiting distress signals (Lewis and Stein, 1997). Also, according to Caprio and Klingebiel (2003), Nigeria faced a systemic banking crisis throughout the 1990s. Nigeria's financial indicators such as liquid liabilities, bank assets, private credit or financial system deposits remained relatively low throughout the 1990s by both historical standards and the 1985 figures and only started to significantly increase after 2000.

In 1998, 26 bank licenses were revoked, reducing the total number of banks from 115 to 89. In spite of improvement of the macroeconomic environment as a consequence of a new civilian administration after 1999, the Nigerian financial system remained highly fragmented with low financial intermediation (Hesse, 2007). In this context, the CBN decreed on July, 6, 2004 that banks had to increase their minimum capital requirements from NN2 billion to NN25 billion ($ US 190 million) by the end of 2005. The intention was to increase the average size of banks via merger and acquisitions to increase economies of scales, create new product development and overall generate a more stable banking system with a higher contribution to financial intermediation. By the beginning of 2006, 75 banks out of the existing 89 banks reduced to 25 banks; while the remaining 14 banks failed to increase their capital or secure merger partners.

2.7 Behavior of Some Key Interest Rates in Nigeria

It should be noted that CBN's intermediate objective is to curtail large volatilities in the interbank rate. From 1987, interest rates assumed an upward trend, and with a low inflation rate

of 10%, lending rates and deposit rates were positive. However, inflation rose dramatically to 38.3% and 40.9% in 1988 and 1989, lending rates and deposits rose as well triggered largely by the transfer of government deposits from banks to the Central Bank. Distressed banks engaged in distressed borrowing in order to finance their foreign exchange operations which did not push up short term rates, but led to the distortions in interest rate structure. Interbank call money rates rose to unprecedented levels. In 1990 both deposits did not own finance companies sought to close affiliations in order to circumvent CBN guide lines (Oke, 1995). In 1990s, the exchange rate persistently depreciated, since the introduction of the 1986 reforms. This resulted among others, persistent higher inflation rates, supply shortages, speculative demand and capital flight, all these culminated into macroeconomic instability.

In 1991, lending rates turned positive with a fall in inflation from 7.5% to 13% respectively. The rise was in line with the minimum rediscount rate (MRR) of 18.5%. In 1992, the reverse was quick as ceilings failed to achieve intended purpose. Interest rate did not apply to finance companies and banks. The interbank rates have been very volatile between 1996 and 2005. This volatility could be attributed to the increased efforts by banks to mobilize funds and increase their yearly balance sheet and also as result of liquidity injected into the banking sector through the sharing of the federation's revenue among the three tiers of the government, which is done monthly (Mbutor, 2010). In 2006, the MRR was replaced with a monetary policy rate (MPR) intended to subdue the volatility of the interbank rates. The MPR was reviewed downward in 2007, due to the stability in the exchange rate, external reserve as well a significant moderate inflation rate (CBN Annual Report, 2007). But from 2008 upwards the interbank rates have been volatile.

CHAPTER THREE

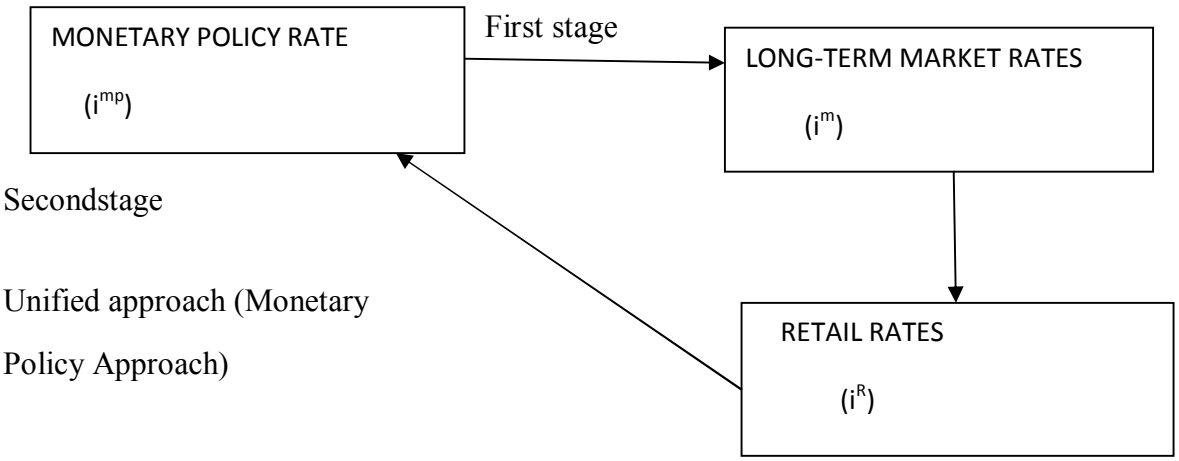
Methodology

3.0 Theoretical Framework

According to Ewerthart et al (2004) cited by Sanusi (2010), the theoretical link between the official rate and money market rates is provided by the principle that the central bank standing facilities represent an actual source of liquidity to the banking sector. So long as banks can get liquidity from the central bank at a certain rate, they would not pay a significantly different rate in the interbank market for same liquidity. Therefore the interbank rates must be closely linked with the official policy rate. The theoretical link between short-term and long-term (market) interest rate is provided by the Term Structure of interest rates, whose slope and dynamics are explained by several theories (Sanusi, 2010).

From the literature, three main routes can be identified in tracing the pass through effect of the interest rate. The first route shows how money market interest rates are transmitted into retail bank interest rates at maturity. This approach is termed the cost of funds approach (deBondt, 2002). The second route investigates the impact of variations in the interest rate controlled by monetary policy on retail rates. According to Sander and Kleimeier (2004), this is known as the monetary policy approach. And lastly, the third used by Egert (2006) known as unifying approach which includes two stages: a.) the pass-through from monetary policy rate to market rates (i MP→i M) and b.) the transmission from market rates to retail rates (i M→i B).

Figure 3. 1: The Transmission between Interest Rates, (Source Egert, 2006)



Against this background, we adopted the approach depicted by (Egert, 2006) in the Fig 3.1 above. Although the monetary policy approach estimates the elasticities that are more relevant to the monetary authorities, one advantage of the two-stage approach is that it highlights the areas of potential rigidities, hence in need of policy action. For this reason, this study adopts both approaches, since its focus is to identify the sources of money market distortions that have implications for monetary policy (see for instance Sanusi, 2010).

To examine the relationship among the variables, that is monetary policy rate, money market rates and the retail rates, we made use of the Error Correction Modeling and Cointegration analysis. In applying any cointegration technique, the first exercise is to determine the degree of integration of each variable in the model. We have made use of the Autoregressive Distributed Lag (ARDL) approach as such there is no need to test for the order of the integration of the variables (see for instance Pesaran et al, 1996 and 2001). Pesaran and Shin (1995) and Pesaran et al 1996 and 2001) introduced the ARDL approach with the following advantages, which provide us with the justification for applying this approach

- The existence of a long run relationship (between variables) is tested without any *a priori* knowledge of the order of time series, that is, I(0) or I(1) of the possibility of cointegration.
- It does not matter whether the explanatory variables are exogenous or not (Pasaran and Shin, 1997).
- The short run and long run parameters with appropriate asymptotic inferences can be obtained by applying OLS to ARDL with an appropriate lag length.

3.1 Model Specification

We constructed the models based on the linkages shown on fig 3.1 above. We traced the pass through effect from monetary policy rate (which is the nominal anchor to which other rates adjust) to money market rate specifically the call rate and to retail rates which include lending rate (prime lending rate) and deposit rate (3 months deposit rate). We further traced the pass through effect from monetary policy rate to money market rate (call rate). And finally the pass through effects from money market rate (call rate) to retail rate (prime lending rate and 3 months deposit rate. The different models were specified in their Autoregressive Distributed Lag(ARDL) form since past and current values of monetary policy variables tend to be highly correlated.The theoretical model can be specified in mathematical form as follows:

$\mathbf{MMR_t=\gamma_0+\gamma_1MPR_t+ \mu_{1t}}$ **……………………………….………3.1.1**

$\mathbf{RETAIL_t=\delta_0+\delta_1MMR_t+ \mu_{2t}}$ **…………………………………..3.1.2**

$\mathbf{RETAIL_t+\theta_0+ \theta_1MPR_t+\mu_{3t}}$ **…………………………………….3.1.3**

Where equation 3.1.1 represents the Unified Approach in Fig 3.1, and equations 3.1.2 and 3.1.3 represent the first-stage and second-stage pass-through effects respectively. MMR would include the call rate (CRATE); and RETAIL would include all retail rates such as the deposit rate (DRATE) and the prime lending rate (PLRATE), MPR is the monetary policy rate.

3.2 ESTIMATION STRATEGY

Estimation of the relationships between interest rates captured in equations 3.1.1 – 3.1.3 above requires the following steps. First, the default choice of estimation technique is the OLS, because of its BLUE properties. However, to avoid spurious results, the variables have to be either stationary or co-integrated. This suggests that we start by determining the order of integration of each of the variables in our model. Given the well-known problems of the available unit root tests (DF, ADF, PP, KPSS), especially in small samples (i.e., power, size and the so-called pre-testing) the Pesaran's*et al.,* (2001) Bound Testing Approach becomes more suitable and appropriate. In addition, the approach allows us to skip the unit root tests because the approach does not require all the variables to be I(1) as required in the Engle Granger's two-steps approach or the Johansen's Multivariate approach. This is especially so because there is doubts on whether interest rates can be I(0). The test for cointegration is necessary in order to avoid "throwing the baby with the bath water" should we simply difference the variables and apply OLS. That would detect and estimate only the short-run relationship between the rates, leaving out any potentially important long-run relationships.

The so-called Bounds Testing approach is proposed in Pesaran*et al.* (2001), who pointed out that as long as the variables are not integrated of order I(1), a conventional cointegration tests on the long run equilibrium (Engle-Granger, and Johansen's approach) will produce biased results. In

order to eliminate such bias (due to the co-existence between I(1) and I(0)) we adopt the autoregressive distributed lag (ARDL) model, also known as Bound Testing approach suggested by Pesaran et al. (2001). In undertaking this (ARDL) test, the order of the integration of the data does not matter hence there is no need to undertake a unit root test as both I(0) and I(1) can be estimated together. This framework is useful because we can examine the short run adjustment and long run relationships between official rate, market rate and the retail interest rates and the magnitude of their adjustments. Thus, in the first step, we estimate the following autoregressive distributed (ARDL) equation:

$$\Delta MMR_t = c + \omega_0 MMR_{t-1} + \omega_1 MPR_{t-1} + \sum_{i=1}^{p} \emptyset_i \Delta MMR_{t-i} + \sum_{j=1}^{q} \theta_j \Delta MPR_{t-j} + \varepsilon_{1t} \text{..3.2.1}$$

$$\Delta RTAIL_t = c + \sigma_0 RTAIL_{t-1} + \sigma_1 MMR_t + \sum_{i=1}^{k} (\rho_i \Delta RTAIL_{t-i} + \sigma_i \Delta MMR_{t-i}) + \varepsilon_{2t} \dots\dots 3.2.2$$

$$\Delta RTAIL_t = c + \pi_0 RTAIL_{t-1} + \pi_1 MPR_t + \sum_{i=1}^{k} (\emptyset_i \Delta RTAIL_{t-i} + \mu_i \Delta MPR_{t-i}) + \varepsilon_{3t} \dots .3.2.3$$

From the equations above,Δ is the difference operator, MMR is the money market rate (call rate), MPR is the monetary policy rate and RTAIL is the retail rate (prime lending rate and 3 months deposit rate).$\varepsilon_t$is the stochastic error term, which is independent and identically distributed (*iid)*.

The *long run elasticities* obtained from estimating the equations (3.2.1to 3.2.3) are the coefficients of the one lagged explanatory variable (multiplied by a negative sign) divided by the coefficient of one lagged dependent variable (Mohan et al., 2007). For instance, the long run MPR elasticity with respect to MMR (equation 3.2.1) isω_1/ω_0.

The coefficients of the differenced (Δ) variables are the short-run adjustment of the model's convergence to equilibrium of changes in the monetary policy rate on money market rates,

money market rates on retail rates, monetary policy rate on retail rates respectively. A value less than one of the coefficients display stickiness, for example if ω_0<1and $\sigma_0 < 1 and\ \pi_0 < 1$ it implies a sluggish adjustment of money market rates (MMR) to monetary policy rate (MPR) , sluggish adjustment of retail rates (RTAIL) to money market rates and that of retail rates (RTAIL) to monetary policy rate (MPR).

Testing the existence of a long run relationships in the case of 3.2.1 can be conducted by examining the joint null hypothesis that $\omega_0 = \omega_1 = 0$ against the alternative that $\omega_0 \neq \omega_1 \neq 0$,$\sigma_0 = \sigma_1 = 0$ against the alternative that $\sigma_0 \neq \sigma_1 \neq 0$ in the case of 3.2.2 and $\pi_0 = \pi_1 = 0$ against the alternative that $\pi_0 \neq \pi_1 \neq 0$ in the case of 3.2.3. This test resembles testing the existence of ECM after estimating the short run dynamic specification. Existence of a long run relationship can be confirmed once this null is successfully rejected. However, the conventional distribution cannot be applied in this context. Pesaran*et al*. (2001) provide critical values based on their stochastic simulation. The fact that their test considers two extreme cases; I(0) and I(1), leads to calculation of the two extreme values, which creates the critical value band. Therefore, the null hypothesis can be rejected when calculated F-values are greater than the upper boundary and cannot be rejected when they are less than the lower ceiling. When the F-values are within the band, the result is inconclusive, and the knowledge of the integration status of the variables would be required to reach conclusion.

Furthermore, once cointegration is established the conditional ARDL (p_1, q_i) long-run model for the equations (3.2.1 to 3.2.3) can be stated as:

$$MMR_t = c + \sum_{i=1}^{k}(\alpha_i \Delta MPR_{t-i} + \varphi_i \Delta MMR_{t-i}) + \varepsilon_{it} \quad \text{.....3.3.4}$$

$$\text{RTAIL}_t = c + \sum_{i=1}^{k}(\rho_i \Delta RTAIL_{t-i} + \sigma_i \Delta MMR_{t-i}) + \varepsilon_{it} \quad \text{....3.3.5}$$

$$\text{RTAIL}_t = c + \sum_{i=1}^{k}(\emptyset_i \Delta RTAIL_{t-i} + \mu_i \Delta MMR_{t-i}) + \varepsilon_{it} \quad \text{... ... ...3.3.6}$$

Where, all the variables are as previously defined. This involves selecting the orders of the ARDL (p, q_i) model in the variables on the equations using Akaike information criterion (AIC). Consequently, we obtained the short-run dynamic parameters by estimating an Error Correction Model associated with the long-run estimates. The equations can be specified as:

$\Delta MMR_t = \mu + \sum_{i=1}^{k}(\alpha_i \Delta MPR_{t-i} + \varphi_i \Delta MMR_{t-i}) + \pi ecm + \varepsilon_{it}$ 3.3.7

$\Delta RTAIL_t = \mu + \sum_{i=1}^{k}(\rho_i \Delta RTAIL_{t-i} + \sigma_i \Delta MMR_{t-i}) + \alpha ecm + \varepsilon_{it}$ 3.3.8

$\Delta RTAIL_t = \mu + \sum_{i=1}^{k}(\emptyset_i \Delta RTAIL_{t-i} + \mu_i \Delta MMR_{t-i}) + \eta ecm + \varepsilon_{it}$ 3.3.9

Where, all variables are as previously defined. In addition, $\alpha_i, \varphi_i, \rho_i, \sigma_i, \emptyset_i \; and \; \mu_i$ are the short run dynamic coefficients of the models' convergence to equilibrium. $\pi, \alpha,$ and η are the speed of adjustments for the equations. This implies that the coefficients determine the magnitude and the *ecm* determine the speed of interest rate pass through.

3.3 DATA AND SOURCE

We used monthly data of the various interest rates which was sourced from the Central Bank of Nigeria (CBN) web site www.cenbank.org. The period covered was from 2007:1 to 2011:12. This was because monetary policy rate (MPR) was introduced in December, 2006 to replace the minimum rediscount rate (MMR), which is the key short-term interest rate, used by the CBN to signal its monetary policy stance.

CHAPTER FOUR

Data Analysis

4.1 Introduction

This Chapter presents the results of the Cointegration test using the Bounds Testing approach, then the estimated equations of the interest rate pass-through equations based on the ARDL approach and finally the ECM estimate which captured the speed of adjustment of the rates in the respective equations.

4.2 Empirical Results

In estimating equations 3.2.1 to 3.2.3, we followed the following steps in each case. First, we estimated the equation as it appeared in section 3.2 above, using the Akaike information criterion (AIC) and Schwarz criterion (SC) to determine the optimal lag length. In addition, R^2 was also used to determine the overall fitness of the model, while the DW is used to test for the presence of serial correlation. Secondly, the Bounds Testing approach to cointegration is applied by the use of F-statistic to either reject or accept the null hypothesis of the existence of long run relationship. The F-statistic tests the joint null hypothesis that the coefficients of the lagged variables are zero (i.e no long run relationship exists between them). In the following sections, the results for each of the equations are presented.

4.2.1 Bounds Test for Cointegration

In the first step of the ARDL analysis, we tested for the presence of the long run relationships in equations 3.2.1 to 3.2.3. We used the general to specific modeling approach guided by the AIC to select the maximum lag order for the ARDL equations. We estimated an OLS regression for

the first differenced part of equations 3.2.1 to 3.23 and then tested for the joint significance of the parameters of the lagged level variables by use of F statistic. The F statistic tests the joint null hypothesis that the coefficients of the lagged level variables are zero (i.e no long run relationship exists between them). Table 4.2.1 reports the results of the calculated F-statistics in the ARDL-OLS regressions.

The calculated F- statistics of 3.97, 3.39 and 2.98 are higher than the upper bound critical values of 3.10, 3.10 and 2.93 at the 10% level. Thus the null hypothesis of no cointegration is rejected, implying long run relationships amongst the variables.

The calculated F-statistics of 2.81, 2.89 fall between the upper and lower critical values of 3.19, 2.17 and 3.10, 2.01 respectively. Thus, the result is inconclusive hence the need to determine the order of integration of the variables before going ahead to estimate the OLS for the equations. The order of integration and the OLS estimate for the inconclusive results were explained in 4.2.4.

Table 4.2. 1: Results from bounds tests on equations 3.2.1 to 3.2.3

Model	***AIC lags***	***F-statistic***	***Probability***	***Outcome***
Crate=f(mpr)	3	3.97	0.0012	Cointegration
Drate=f(crate)	3	3.39	0.0038	Cointegration
Plrate=f(crate)	5	2.98	0.0048	Cointegration
Drate=(mpr)	2	2.81	0.0197	No Cointegration
Plrate=(mpr)	3	2.89	0.0105	No Cointegration

Notes: Asymptotic critical value bounds for F-statistic. Testing for the existence of a level relationships. Table CI(i) Pasaran and Pasaran, 1997

Once we established that a long run cointegration relationship existed, we estimated equations 3.3.4 and 3.3.5 using the ARDL specification.

Estimated Coefficient of the ARDL equations between call rate and MPR

The estimated coefficient of the ARDL relationship (Table 4.2.2 below) shows that previous values of Call rate helps in explaining its present value. The coefficient of 0.55 and 0.30 are positive and statistically significant. They indicate that between 55% and 30% changes in call rate are explained by their previous values lagged one and three times respectively. The result also suggests that a 100 basis point increase in MPR will lead to 1.26% basis point rise in call rate in the long run. Having established that there exist a long run relationship between call rate and MPR, we report below the estimate of the parameter which describes the long run relationship between them.

Table 4.2. 2: Estimated Coefficient of the ARDL equations between call rate and MPR

variables	***coefficients***	***t-statistics***	***p-values***
Constant	-3.62	-1.9582	0.0558
$Crate_{t-1}$	0.55	4.1334	0.0001
$Crate_{t-2}$	-0.17	-1.1281	0.2647
$Crate_{t-3}$	0.30	2.3605	0.0222
MPR_{t-1}	1.26	2.1568	0.0359
MPR_{t-2}	-0.68	-0.8032	0.2647
MPR_{t-3}	0.25	0.3854	0.7016

R^2 = 0.70 R^{-2}=0.66 DW = 1.98 F-stat = 19.17 p-value = (0.0000)

This is obtained by dividing the coefficient of the one lagged explanatory variable (multiplied by a negative sign) by the coefficient of one lagged dependent variable (Mohan, Ramesh and

Nandwa, 2007). The value of -2.29 (obtained by -1.26/0.55) shows that in the long run 1% increase in MPR leads to 2.29% decrease in call rate. This is not consistent with theory and expectation of this research.

The DW value of 1.98 suggest the absence of serial correlation, while the value of the R^2 indicates that 70% of past values of call rate and changes in MPR account for the variation in call rate.

Estimated Coefficient of the ARDL equation between Deposit rate and Call rate

The estimated coefficient of the ARDL equation between deposit and call rate is reported in (Table 4.2.3). The coefficients of the deposit rate lagged once and twice are positive and highly significant implying that immediate pass values of the deposit rate bring about a 75% and 45% change in call rate. Also a 100% increase in call rate increases deposit rate by 12% lagged four times. The relationship is positive and significant. This implies that a change in call rate leads to a sluggish change in deposit rate.

Having established the long run relationship between the variables, we estimated the long run elasticities as explained in 3.2 above. The value obtained is -0.07 which implies that a 1% increase in call rate will lead to a 0.07% decrease in the deposit rate in the long run. It shows that over the long term a negative relationhip exist between call rate and deposit rate.

The value of DW shows absence of serial correlation and the value of the R^2 shows the goodness of fit of the regression equation.

Table 4.2. 3: Estimated Coefficient of ARDL equation between Deposit rate and Call rate

variables	***coefficients***	***t-statistics***	***p-values***
Constant	0.06	0.1670	0.8681
$Drate_{t-1}$	0.75	5.3608	0.0000
$Drate_{t-2}$	0.41	2.3747	0.0217
$Drate_{t-3}$	-0.23	-1.3315	0.1894
$Drate_{t-4}$	-0.05	-0.3568	0.1228
$Crate_{t-1}$	0.05	1.2762	0.2082
$Crate_{t-2}$	-0.02	-0.4283	0.6704
$Crate_{t-3}$	-0.04	-0.3568	0.7228
$Crate_{t-4}$	0.12	2.9414	0.0051

R^2 = 0.96 R^{-2}=0.95 DW = 1.97 F-stat = 129.71 p-value = (0.0000)

Estimated Coefficient of the ARDL equation between Prime Lending rate and Call rate

The estimated coefficient of the ARDL equation between prime lending rate and call rate is reported in (Table 4.2.4) below. The optimal lag length was chosen by the AIC and SC. The coefficient of the call rate lagged once is negative and significant. This implies that immediate pass value of call rate reduces current call rate by about 7%. The coefficients of prime lending rate lagged once and twice are positive and significant implying that 100% increase in call rate increases the prime lending rate by 82% and 37% lagged once and twice respectively. Having established the existence of a long run relationship between call rate and prime lending rate, we estimated the parameter which describes the long run relationship between call rate and prime lending rate. We find a positive relationship (a value of 11.71), which implies that a 1% increase

in call rate increases prime lending rate by 11.71%. This is consistent with theory and expectation of the study.

The R^2 of 0.93 indicates a goodness of fit of the regression equation while the DW value of 1.99 implies the absence of serial correlation.

Table 4.2. 4: Estimated Coefficient of the ARDL equation between Prime Lending rate and Call rate

variables	***coefficients***	***t-statistics***	***p-values***
Constant	2.32	1.9780	0.0542
$Crate_{t-1}$	-0.07	-3.1464	0.0030
$Crate_{t-2}$	0.03	1.0546	0.2974
$Crate_{t-3}$	0.02	0.8060	0.2974
$Crate_{t-4}$	0.01	0.4111	06830
$Crate_{t-5}$	0.04	1.9702	0.0551
$Plrate_{t-1}$	0.82	5.8409	0.0000
$Plrate_{t-2}$	0.37	2.1870	0.0341
$Plrate_{t-3}$	-0.12	-0.6767	0.5021
$Plrate_{t-4}$	-0.39	-2.2653	0.0551
$Plrate_{t-5}$	0.16	1.0915	0.2810

R^2 = 0.93 R^{-2}=0.92 DW = 1.99 F-stat = 62.26 p-value = (0.0000)

4.2.2 Pass through changes of Monetary Policy Rate to Money Market Rate

The result below shows the estimates of the short run effect of the monetary policy rate (MPR) on call rate. The coefficients reveal that there is a positive and insignificant relationship between call rate and MPR. That is a 100% basis point rise in the MPR, will lead to a 31% basis point rise

in money market rate. This suggests that the call rate is inelastic with respect to change in MPR in the short run. This indicates that the pass through between MPR and Call rate is not complete in the short run.

D(CRATE) = -1.642 - 0.2535*D(CRATE(-2)) + 0.30936*D(MPR) - 0.36964*ECM(-1)…….4.2.2s

R^2 = 0.32 R^{-2}=0.28 DW = 2.02 F-stat = 8.39 p-value = (0.0001)

However, there is a negative and significant effect between the call rate lagged twice and the current call rate. That is a 100 basis point increase in the call rate leads to a 25% decrease in the current years call rate. The expected ECM sign is negative and significant indicating that when call rate exceed their long-run relationship with monetary policy rate, a downward adjustment at a rate of 36% towards the equilibrium take place in a month. This indicates that the speed of adjustment is low in the short run.

4.2.3 Pass through from Money Market Rate to retail rates

The results below shows the estimates of the deposit rates (DRATE) and the call rates (CRATE) given by their respective coefficients.

D(DRATE) = -0.0405 - 0.0096*D(DRATE(-1)) + 0.3981*D(DRATE(-2)) +0.0006*D(CRATE(-1)) -0.0437*D(CRATE(-2)) -0.0950*D(CRATE(-3)) - 0.0836*ECM(-1)……4.2.3

R^2 = 0.27 R^{-2}=0.18 DW = 1.98 F-stat = 3.05 p-value = (0.0129)

The results report that there exists an insignificant relationship between previous month's deposit rate and current month's deposit rate as well between deposit rate and call rate considering their first and second lag. There exists a positive and significant effect between deposit rate lagged twice on current deposit rate, i.e. an increase of deposit rate lagged twice by 100 basis point

causes current deposit rate to rise by 39.8% basis point. This suggests that as the lag in deposit rate increases, deposit rate will increase as well. However a significant and negative relationship exists between deposit rate and call rate lagged thrice. A 100 basis point increase in the call rate lagged thrice cause deposit rate to rise by 9.5% basis point. This result contradicts the a priori expectations of this study and suggests that deposit rate reduces as the number of previous months increase. The result further reveals that the pass through from call rates to deposit rate is very slow. The ECM sign is negative and significant but low. This suggests that when deposit rate exceed their long-run relationship with call rates, a downward adjustment at a rate of only 8.4% towards equilibrium takes place in a month. This implies that the speed of adjustment is slow in the short run which is consistent with literature.

Prime Lending rate and call rate

The relationship established between Prime lending rate and the call rate is negative. At the first lag, the significance occurs at 5% while at the second lag the significance occurs at 10%. That is a 100 basis point increase in the call rate lagged once decreases prime lending rate by 6.2% basis point and 3.8% basis point when call rate is lagged twice. The pass through is very slow as indicated by the ECM coefficient which has expected negative and significant sign. This shows equilibrium will be restore downward at a rate of 1.1% when lending rate exceed its long-run relationship with call rates.

D(PLRATE) = -0.370 - 0.0.0109*D(PLRATE(-1)) +0.3633*D(PLRATE(-2)) - 0.0622*D(CRATE(-1)) -0.0391*D(CRATE(-2))- 0.1087*ECM(-1)

R^2 = 0.28 R^{-2}=0.21 DW = 2.09 F-stat = 3.98 p-value = (0.0040)

The conclusion drawn on the basis of the two results above generally indicate that the pass-through from whole sale rate to retail rate is slow and incomplete.

4.2.4 Pass through From Monetary policy rate to retail rate

The calculated F-statistics of 2.81, 2.89 fall between the upper and lower critical values of 3.19, 2.17 and 3.10, 2.01 respectively. Thus, the result is inconclusive hence the need to determine the order of integration of the variables before going ahead to estimate the OLS for the equations. The order of integration of the series was determined by both ADF and the PP tests. The optimum lag length was determined using Akaike information criterion (AIC). The results obtained shows the order of integration of the variables based on both ADF and PP tests in level and at first difference. Hence, we reject the null hypothesis of non stationarityat first difference of all the variables as reported in table 4.1 below.

Table 4.2. 5: ADF-PP test on MPR, DRATE and PLRATE

Variable	**Augmented Dickey Fuller Test (ADF)**		**Philip Peron Test (PP)**		**Oder of Integration**
	Level	**First Difference**	**Level**	**First Difference**	
MPR	-0.8132 (0.42)	-4.6174 (0.00)	-0.9933 (0.49)	-7.1345 (0.00)	**I(1)**
DRATE	-0.7531 (0.45)	-3.9346 (0.00)	-0.9849 (0.40)	-8.0480 (0.00)	**I(1)**
PLRATE	-1.4799 (0.14)	-3.8327 (0.00)	-1.7197 (0.15)	-7.4543 (0.00)	**I(1)**

Having established the order of the integration of the variables, we further estimate whether the variables are cointegrated or not. If they are cointegrated then a long run relationship exists between them. We used the Johansen cointegration test as reported below.

Cointegration result between prime lending rate and MPR

The test of cointegration between prime lending rate and MPR using the Johansen maximum likelihood approach suggest that there is evidence of cointegration as reported in table 4.2.7 below. This is true from both the trace and maximum-eigen value statistics. The trace and maximum-eigen value suggest cointegration at 5% level. This implies that there is a long run

relationship between deposit rate and MPR. Having established that a long run relationship exist a between prime lending rate and MPR, we estimate the long run equation as in 4.2.6

Table 4.2. 6: Johansen cointegrationtest result between prime lending rate and MPR

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.235833	17.75206	15.49471	0.0225
At most 1	0.036421	2.151830	3.841466	0.1424

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.235833	15.60023	14.26460	0.0306
At most 1	0.036421	2.151830	3.841466	0.1424

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Long run Equation between prime lending rate and MPR

$$PLRATE_t = 0.62MPR_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.2.6$$

t-stat (0.16921)

The result above implies that a one percent change in the MPR will lead to a 0.62% long run adjustment in the Prime lending rate. The long run pass through is therefore incomplete as in the case between the previous rates above. To find how long it would take the Prime lending rate to attain this 0.62 % change whenever a change in the MPR disequilibriates it, we need to estimate the associated Error Correction Model. This gives us the short run adjustment.

4.2.5 Pass through From Monetary policy rate to Prime Lending rate

The following general error correction model is estimated, and will be simplified using the general-to-specific approach of Hendry to arrive at the parsimonious model.

$$D(PLRATE) = 0.78 - 0.02*D(PLRATE(-1)) + 0.43*D(PLRATE(-2)) + 0.13*D(PLRATE(-3)) + 0.27*D(MPR)$$
$$(2.0509) \quad (-0.1295) \quad (3.0965) \quad (0.7811) \quad (2.3272)$$

$$- 0.11*D(MPR(-1)) - 0.05*D(MPR(-2)) - 0.32*D(MPR(-3)) - 0.07*ECM_PLRATE(-1) \ldots\ldots 4.2.5$$
$$(-0.9115) \quad (-0.4787) \quad (-2.4982) \quad (-2.1688)$$

$R^2 = 0.30$ $R^{-2}=0.18$ DW = 1.78 F-stat = 2.48 p-value = (0.0246)

After sequentially eliminating the least significant variables for the general specification above, and checking the behavior of the other diagnostic indicators, we arrived at the following parsimonious short-run model.

$$D(PLRATE) = 0.58 + 0.38*D(PLRATE(-2)) + 0.24*D(MPR) - 0.34*D(MPR(-3)) - 0.05*ECM_PLRATE(-1)$$
$$(1.6924) \quad (2.9086) \quad (2.1869) \quad (-2.6018) \quad (-1.8314)$$

$R^2 = 0.26$ $R^{-2}=0.20$ DW = 1.79 F-stat = 4.42 p-value = (0.0038)

The model suggests that in the short-run, prime lending rate is persistent with up to two months memory, and is influenced by the MPR and with a lag. The speed of adjustment is indicated in the coefficient of the error correction term, which appears to be small. This suggests that when disequilibrium occurs in the current period, only 0.05 (or 5%) of such disequilibrium is corrected in the next period. It would therefore take quite long for the rate to adjust back to its long run sustainable level once disequilibrium occurs. The pass-through of the MPR to Prime lending rate is therefore sluggish.

Cointegration result between Deposit rate and MPR

The test of cointegration between deposit rate and MPR using the Johansen maximum likelihood approach suggest that there is no evidence of cointegration as reported in table 4.2.6 below. This

is true from both the trace and maximum-eigen value statistics. The trace and maximum-eigen value suggest no cointegration at both 5% and 1% levels. This implies that there is no long run relationship between deposit rate and MPR. Therefore, we estimated the OLS for the equations in 4.2.4.1.

Table 4.2. 7: Johansen cointegrationtest result between Deposi rate and MPR

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.116768	13.31171	15.41	20.04
At most 1 *	0.099986	6.109983	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates no cointegration at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.116768	7.201731	14.07	18.63
At most 1 *	0.099986	6.109983	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

4.2.4.1 Monetary Policy Rate and Deposit Rate

The result obtained below indicates that both monetary policy rate (MPR) lagged once and deposit rate lagged twice exert a positive and significant effect on current deposit rate. A 100 basis point increase in MPR lagged once leads to an increase in current deposit rate by 34.8%. This suggests that banks can create new money in form of deposits if monetary policy rate increases. If deposit rate lagged twice increased by 100%, current deposit rate will rise by 31% basis point. This suggests that previous years' deposit rate determine current year's deposit rate.

$$D(Drate_t) = -0.06 + 0.31D(Drate_t) + 0.34\ D(DMPR_t)$$

S.E (0.11) (0.12) (0.17)

t stat (-0.55) (2.45) (2.07)

$$R^2 = 0.16\ R^2_{adj}=0.13\ DW=2.07\ F\ stat=5.10\ Prob=0.0094$$

CHAPTER FIVE

Summary, conclusion and recommendation

5.1 Summary

The prime objective of monetary policy is to maintain price stability and sustain economic growth. The concern of monetary authorities is how shocks of the policy-controlled interest rate are propagated in the deposit and lending rates. This propagation/transmission is a part of the transmission mechanism of monetary policy. In this light, this study analysed the interest rate pass through of monetary policy rate to money market rate and retail rates in Nigeria for the period 2007 to 2011. The objective of the study was to identify whether interest rate pass through is complete or not in Nigeria. That is identifying the magnitude and speed of pass through from monetary policy rate to the money market rate and from the money market rate to retail rates.

Due to the fact that past and current values of monetary variables tend to be highly correlated, the study used the Auto Regressive Distributed Lagged models stated in chapter three to realize the above objectives. The first model investigated the long run relationships based on Bounds testing approach, while the second set of models made use of the Error Correction Models due to the presence of con-integrating equations among the variables. The OLS technique was used to estimate the non-cointegrating equation.

The major findings established by the study are that there exists a long run relationship between MPR and call rate, and the overall results indicate slow and incomplete pass through. The short run relationship was also confirmed by the coefficient of the ECM but indicating a sluggish and incomplete pass through, lower than what was obtained in the long run. This indicated that there exist a substantial pass through in the long run. These findings are consistent with the literature where in some cases a complete pass through was reported in the long run (see for instance

Egert, *et al*. 2007; De Bondt, 2005; Espinosa-Vega and Rebucci, 2002).A long run relationship was found between call rate and retail rates (Lending and Deposit rates). The pass through effect was sluggish and incomplete but significant as indicated by the coefficient of the ECM.

However, no long run relationship was established between call rate and retail rates as indicated by the results of Bounds testing. The results were inconclusive because they fell within the upper and lower critical values of the F-statistic. Consequently, Johansen cointegration test revealed the presence of cointegration between MPR and prime lending rate, while no cointegration was revealed between MPR and deposit rate. The pass through is also incomplete and sluggish both in the short and long run for prime lending rate.

5.2 Conclusion

The findings revealed that there is a long run relationship between the CBN's nominal anchor which is the monetary policy rate and the money market interest as well as the prime lending rates. There is also a short run relationship among all the rates. But the pass through is sluggish and incomplete. This shows that changes in policy interest rate do not completely pass through to the market and retail rates. The low pass though implies that the MPC requires a larger change in the MPR for a given change in market interest rate. In addition, the sluggish pass-through implies that policy lag in Nigeria is long; hence monetary policy action will have to be taken much earlier, and that inflation has to be forecasted with a long horizon. This is possible because change in MPR is a short term policy which is reviewed bi-monthly. Overall the entire pass through is not complete but significant. This exposes possible distortions especially between MPR and deposit rate rate. These distortions can be attributed to the lack of competition among banks due to their collusive tendencies.

The conclusion derived here is that interest rate is a strong tool for monetary policy conduct in Nigeria, but proper reforms need to be carried out in seeing that it is pass through improves which ultimately leads to a strong monetary policy transmission mechanism.

5.3 Recommendations

The following recommendations were offered based on the outcome of the estimated results:

- Since adjustment is low, it means the policy lag will be long, which means the monetary policy committee (MPC) needs longer inflation forecast horizon.
- The low and incomplete pass through means that large changes in MPR are required to effect a small change in money market rates which may be injurious to output in case of high inflation threat. This means the CBN should make efforts to raise the sensitivity of spending/lending to interest rate.
- The operation in the money market should be harnessed in order to make it more competitive and reduce the cost of doing business so that the rates go in the same direction. The ownership structure and other tendencies for sharp practices should also be addressed by the regulatory authority.
- CBN should also try to improve the efficiency of the retail market in order to improve the performance of monetary policy. More specifically CBN should address the transmission gap between MPR and retail rates so that any policy rate change can, within the required period, pass through to retail market. Other options include addressing the risk factors involved in commercial banks' lending and proper regulations to make the banks more competitive

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Appendix

ARDL and Long Run Results between the variables

CALL RATE AND MPR

Dependent Variable: D(CRATE)
Method: Least Squares
Date: 03/29/12 Time: 09:53
Sample(adjusted): 2007:05 2011:12
Included observations: 56 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.733741	1.945766	-1.918906	0.0611
CRATE(-1)	-0.315147	0.134435	-2.344240	0.0233
MPR(-1)	0.843989	0.313684	2.690572	0.0098
D(CRATE(-1))	-0.133548	0.158879	-0.840563	0.4048
D(MPR(-1))	0.301360	0.670976	0.449136	0.6554
D(CRATE(-2))	-0.362595	0.147367	-2.460492	0.0176
D(MPR(-2))	-0.237546	0.658329	-0.360832	0.7198
D(CRATE(-3))	-0.016981	0.137793	-0.123233	0.9024
D(MPR(-3))	0.679710	0.793073	0.857059	0.3958

R-squared	0.403375	Mean dependent var	0.148393
Adjusted R-squared	0.301822	S.D. dependent var	3.165046
S.E. of regression	2.644620	Akaike info criterion	4.929156
Sum squared resid	328.7187	Schwarz criterion	5.254659
Log likelihood	-129.0164	F-statistic	3.972055
Durbin-Watson stat	2.072267	Prob(F-statistic)	0.001168

CALL RATE AND MPR (lagged)

Dependent Variable: CRATE
Method: Least Squares
Date: 03/29/12 Time: 09:59
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.616116	1.846605	-1.958251	0.0558
CRATE(-1)	0.549266	0.132886	4.133362	0.0001
MPR(-1)	1.256985	0.582799	2.156808	0.0359
CRATE(-2)	-0.174556	0.154741	-1.128052	0.2647
MPR(-2)	-0.676603	0.842355	-0.803228	0.4256
CRATE(-3)	0.300921	0.127484	2.360465	0.0222
MPR(-3)	0.249911	0.648471	0.385385	0.7016

R-squared	0.697022	Mean dependent var	9.333684
Adjusted R-squared	0.660665	S.D. dependent var	4.514494
S.E. of regression	2.629804	Akaike info criterion	4.886281
Sum squared resid	345.7934	Schwarz criterion	5.137182
Log likelihood	-132.2590	F-statistic	19.17145
Durbin-Watson stat	1.978118	Prob(F-statistic)	0.000000

DEPOSIT RATE AND CALL RATE

Dependent Variable: D(DRATE)
Method: Least Squares
Date: 03/29/12 Time: 10:25
Sample(adjusted): 2007:05 2011:12
Included observations: 56 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.061205	0.366469	0.167014	0.8681
DRATE(-1)	-0.118129	0.039742	-2.972421	0.0046
CRATE(-1)	0.110279	0.037733	2.922615	0.0053
D(DRATE(-1))	-0.131827	0.134124	-0.982875	0.3307
D(CRATE(-1))	-0.062362	0.047922	-1.301342	0.1995
D(DRATE(-2))	0.281315	0.133937	2.100348	0.0411
D(CRATE(-2))	-0.081401	0.040409	-2.014437	0.0497
D(DRATE(-3))	0.048793	0.136751	0.356804	0.7228
D(CRATE(-3))	-0.116918	0.039749	-2.941405	0.0051

R-squared	0.365919	Mean dependent var	-0.068036
Adjusted R-squared	0.257990	S.D. dependent var	0.862616
S.E. of regression	0.743058	Akaike info criterion	2.390138
Sum squared resid	25.95033	Schwarz criterion	2.715641
Log likelihood	-57.92387	F-statistic	3.390377
Durbin-Watson stat	1.966303	Prob(F-statistic)	0.003765

DEPOSIT RATE AND CALL RATE(lagged)

Dependent Variable: DRATE
Method: Least Squares
Date: 03/29/12 Time: 10:53
Sample(adjusted): 2007:05 2011:12
Included observations: 56 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.061205	0.366469	0.167014	0.8681
DRATE(-1)	0.750044	0.139914	5.360753	0.0000
CRATE(-1)	0.047917	0.037546	1.276213	0.2082
DRATE(-2)	0.413142	0.173976	2.374706	0.0217
CRATE(-2)	-0.019038	0.044446	-0.428347	0.6704
DRATE(-3)	-0.232522	0.174628	-1.331527	0.1894
CRATE(-3)	-0.035517	0.044316	-0.801445	0.4269
DRATE(-4)	-0.048793	0.136751	-0.356804	0.7228
CRATE(-4)	0.116918	0.039749	2.941405	0.0051

R-squared	0.956669	Mean dependent var	9.404643
Adjusted R-squared	0.949294	S.D. dependent var	3.299832
S.E. of regression	0.743058	Akaike info criterion	2.390138
Sum squared resid	25.95033	Schwarz criterion	2.715641
Log likelihood	-57.92387	F-statistic	129.7099
Durbin-Watson stat	1.966303	Prob(F-statistic)	0.000000

PRIME LENDING RATE AND CALL RATE

Dependent Variable: D(PLRATE)
Method: Least Squares
Date: 03/29/12 Time: 11:00
Sample(adjusted): 2007:07 2011:12
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.172980	1.449879	1.498732	0.1416
CRATE(-1)	0.027483	0.024479	1.122705	0.2681
PLRATE(-1)	-0.143708	0.078263	-1.836223	0.0736
D(PLRATE(-1))	-0.053496	0.153009	-0.349626	0.7284
D(CRATE(-1))	-0.101152	0.025100	-4.029889	0.0002
D(PLRATE(-2))	0.377951	0.135227	2.794935	0.0079
D(CRATE(-2))	-0.072298	0.028736	-2.515970	0.0159
D(PLRATE(-3))	0.233153	0.159449	1.462239	0.1513
D(CRATE(-3))	-0.046629	0.030441	-1.531787	0.1333
D(PLRATE(-4))	-0.172695	0.164670	-1.048731	0.3004
D(CRATE(-4))	-0.040479	0.026705	-1.515781	0.1372
D(PLRATE(-5))	-0.018273	0.164577	-0.111027	0.9121
D(CRATE(-5))	0.009254	0.023683	0.390742	0.6980

R-squared	0.466128	Mean dependent var	-0.013148
Adjusted R-squared	0.309873	S.D. dependent var	0.493195
S.E. of regression	0.409716	Akaike info criterion	1.259364
Sum squared resid	6.882555	Schwarz criterion	1.738194
Log likelihood	-21.00284	F-statistic	2.983117
Durbin-Watson stat	1.981328	Prob(F-statistic)	0.004475

Dependent Variable: PLRATE
Method: Least Squares
Date: 03/29/12 Time: 11:05
Sample(adjusted): 2007:06 2011:12
Included observations: 55 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.326879	1.176354	1.978043	0.0542
CRATE(-1)	-0.072985	0.023197	-3.146359	0.0030
PLRATE(-1)	0.820279	0.140435	5.840979	0.0000
CRATE(-2)	0.028851	0.027356	1.054633	0.2974
PLRATE(-2)	0.373987	0.171002	2.187033	0.0341
CRATE(-3)	0.019238	0.023868	0.806023	0.4246
PLRATE(-3)	-0.120844	0.178552	-0.676797	0.5021
CRATE(-4)	0.010151	0.024692	0.411095	0.6830
PLRATE(-4)	-0.391290	0.172841	-2.263870	0.0286
CRATE(-5)	0.043174	0.021913	1.970209	0.0551
PLRATE(-5)	0.164132	0.150379	1.091452	0.2810

R-squared	0.933994	Mean dependent var	16.73600
Adjusted R-squared	0.918993	S.D. dependent var	1.402283
S.E. of regression	0.399114	Akaike info criterion	1.177718
Sum squared resid	7.008853	Schwarz criterion	1.579185
Log likelihood	-21.38724	F-statistic	62.26087
Durbin-Watson stat	1.985260	Prob(F-statistic)	0.000000

DEPOSIT RATE AND MPR

Dependent Variable: D(DRATE)
Method: Least Squares
Date: 03/29/12 Time: 11:12
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.841814	0.607280	-1.386204	0.1718
DRATE(-1)	-0.071608	0.041461	-1.727100	0.0903
MPR(-1)	0.180834	0.081769	2.211511	0.0316
D(DRATE(-1))	-0.086160	0.136043	-0.633332	0.5294
D(MPR(-1))	0.118763	0.195837	0.606437	0.5470
D(DRATE(-2))	0.229352	0.132653	1.728955	0.0900
D(MPR(-2))	-0.319543	0.194288	-1.644683	0.1063

R-squared	0.251849	Mean dependent var	-0.064211
Adjusted R-squared	0.162071	S.D. dependent var	0.855367
S.E. of regression	0.782990	Akaike info criterion	2.463193
Sum squared resid	30.65369	Schwarz criterion	2.714094
Log likelihood	-63.20099	F-statistic	2.805238
Durbin-Watson stat	2.088701	Prob(F-statistic)	0.019747

DEPOSIT RATE AND MPR(lagged)

Dependent Variable: DRATE
Method: Least Squares
Date: 03/29/12 Time: 11:16
Sample(adjusted): 2007:02 2011:12
Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.898200	0.529768	-1.695457	0.0955
DRATE(-1)	0.942766	0.034509	27.31923	0.0000
MPR(-1)	0.168298	0.062437	2.695498	0.0093

R-squared	0.939952	Mean dependent var	9.453220
Adjusted R-squared	0.937808	S.D. dependent var	3.220845
S.E. of regression	0.803226	Akaike info criterion	2.449149
Sum squared resid	36.12968	Schwarz criterion	2.554787
Log likelihood	-69.24990	F-statistic	438.2959
Durbin-Watson stat	2.261503	Prob(F-statistic)	0.000000

PRIME LENDING RATE AND MPR

Dependent Variable: D(PLRATE)
Method: Least Squares
Date: 03/29/12 Time: 11:20
Sample(adjusted): 2007:05 2011:12
Included observations: 56 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.828019	1.485444	3.250220	0.0021
PLRATE(-1)	-0.240400	0.068641	-3.502252	0.0010

MPR(-1)	-0.100006	0.053721	-1.861577	0.0689
D(PLRATE(-1))	0.222809	0.142373	1.564967	0.1243
D(MPR(-1))	-0.076275	0.114451	-0.666437	0.5084
D(PLRATE(-2))	0.496326	0.142274	3.488520	0.0011
D(MPR(-2))	-0.012720	0.105738	-0.120295	0.9048
D(PLRATE(-3))	0.190643	0.161423	1.181012	0.2435
D(MPR(-3))	-0.270660	0.122826	-2.203608	0.0325

R-squared	0.329804	Mean dependent var	-0.032857
Adjusted R-squared	0.215728	S.D. dependent var	0.505841
S.E. of regression	0.447969	Akaike info criterion	1.378037
Sum squared resid	9.431762	Schwarz criterion	1.703540
Log likelihood	-29.58503	F-statistic	2.891094
Durbin-Watson stat	1.865376	Prob(F-statistic)	0.010530

PRIME LENDING RATE AND MPR(lagged)

Dependent Variable: PLRATE
Method: Least Squares
Date: 03/29/12 Time: 11:25
Sample(adjusted): 2007:05 2011:12
Included observations: 56 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.828019	1.485444	3.250220	0.0021
PLRATE(-1)	0.982409	0.137312	7.154578	0.0000
MPR(-1)	-0.176281	0.119211	-1.478724	0.1459
PLRATE(-2)	0.273517	0.181649	1.505747	0.1388
MPR(-2)	0.063555	0.165174	0.384774	0.7021
PLRATE(-3)	-0.305683	0.204775	-1.492776	0.1422
MPR(-3)	-0.257940	0.165621	-1.557410	0.1261
PLRATE(-4)	-0.190643	0.161423	-1.181012	0.2435
MPR(-4)	0.270660	0.122826	2.203608	0.0325

R-squared	0.911211	Mean dependent var	16.73964
Adjusted R-squared	0.896098	S.D. dependent var	1.389744
S.E. of regression	0.447969	Akaike info criterion	1.378037
Sum squared resid	9.431762	Schwarz criterion	1.703540
Log likelihood	-29.58503	F-statistic	60.29292
Durbin-Watson stat	1.865376	Prob(F-statistic)	0.000000

ECM test results on MPR and MMR

Dependent Variable: D(CRATE)
Method: Least Squares
Date: 05/01/12 Time: 18:50
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.642433	0.609565	-2.694432	0.0094
D(CRATE(-2))	-0.253592	0.117333	-2.161312	0.0352

D(MPR)	0.309361	0.588458	0.525715	0.6013
ECM(-1)	-0.369642	0.103710	-3.564181	0.0008

R-squared	0.321861	Mean dependent var	0.143333
Adjusted R-squared	0.283476	S.D. dependent var	3.136892
S.E. of regression	2.655309	Akaike info criterion	4.858591
Sum squared resid	373.6854	Schwarz criterion	5.001963
Log likelihood	-134.4698	F-statistic	8.385013
Durbin-Watson stat	2.023474	Prob(F-statistic)	0.000117

DEPOSIT RATE

Dependent Variable: DEP
Method: Least Squares
Date: 05/01/12 Time: 19:53
Sample: 2007:01 2011:12
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.022088	0.909463	7.721138	0.0000
CRATE	0.263314	0.088547	2.973725	0.0043

R-squared	0.132296	Mean dependent var	9.468667
Adjusted R-squared	0.117335	S.D. dependent var	3.195674
S.E. of regression	3.002343	Akaike info criterion	5.069428
Sum squared resid	522.8157	Schwarz criterion	5.139240
Log likelihood	-150.0828	F-statistic	8.843041
Durbin-Watson stat	0.148030	Prob(F-statistic)	0.004281

Dependent Variable: D(DEP)
Method: Least Squares
Date: 05/01/12 Time: 19:35
Sample(adjusted): 2007:05 2011:12
Included observations: 56 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.040474	0.105347	-0.384200	0.7025
D(DEP(-1))	-0.009575	0.128781	-0.074349	0.9410
D(DEP(-2))	0.398097	0.129206	3.081104	0.0034
D(CRATE(-1))	0.000566	0.041260	0.013717	0.9891
D(CRATE(-2))	-0.043710	0.038348	-1.139838	0.2599
D(CRATE(-3))	-0.095033	0.040569	-2.342485	0.0233
ECMB(-1)	-0.083550	0.039358	-2.122833	0.0388

R-squared	0.272032	Mean dependent var	-0.068036
Adjusted R-squared	0.182893	S.D. dependent var	0.862616
S.E. of regression	0.779753	Akaike info criterion	2.456790
Sum squared resid	29.79274	Schwarz criterion	2.709959
Log likelihood	-61.79012	F-statistic	3.051774
Durbin-Watson stat	1.979816	Prob(F-statistic)	0.012884

PRIME LENDING RATE

Dependent Variable: D(PLRATE)
Method: Least Squares
Date: 05/01/12 Time: 20:31
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.370003	0.141524	-2.614421	0.0117
D(PLRATE(-1))	-0.010947	0.121261	-0.090277	0.9284
D(PLRATE(-2))	0.363335	0.121755	2.984146	0.0044
D(CRATE(-1))	-0.062192	0.020878	-2.978836	0.0044
D(CRATE(-2))	-0.039088	0.020839	-1.875764	0.0664
ECM(-1)	-0.108697	0.037831	-2.873249	0.0059

R-squared	0.280522	Mean dependent var	-0.017018
Adjusted R-squared	0.209985	S.D. dependent var	0.515371
S.E. of regression	0.458076	Akaike info criterion	1.375737
Sum squared resid	10.70151	Schwarz criterion	1.590795
Log likelihood	-33.20851	F-statistic	3.976941
Durbin-Watson stat	2.091653	Prob(F-statistic)	0.004023

ADF test results on MPR, MMR

ADF Test Statistic	-0.813238	1% Critical Value*	-3.5457
		5% Critical Value	-2.9118
		10% Critical Value	-2.5932

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPR)
Method: Least Squares
Date: 04/19/12 Time: 09:14
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR(-1)	-0.040130	0.049346	-0.813238	0.4196
D(MPR(-1))	0.088059	0.138855	0.634179	0.5286
C	0.359752	0.411010	0.875288	0.3852

R-squared	0.015195	Mean dependent var	0.034483
Adjusted R-squared	-0.020617	S.D. dependent var	0.629063
S.E. of regression	0.635514	Akaike info criterion	1.981574
Sum squared resid	22.21331	Schwarz criterion	2.088148
Log likelihood	-54.46564	F-statistic	0.424297

Durbin-Watson stat	2.020630	Prob(F-statistic)	0.656352
ADF Test Statistic	-4.617449	1% Critical Value*	-3.5478
		5% Critical Value	-2.9127
		10% Critical Value	-2.5937

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPR,2)
Method: Least Squares
Date: 04/19/12 Time: 09:16
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MPR(-1))	-0.859191	0.186075	-4.617449	0.0000
D(MPR(-1),2)	-0.088051	0.135554	-0.649566	0.5187
C	0.030147	0.085377	0.353105	0.7254

R-squared	0.475175	Mean dependent var	0.000000
Adjusted R-squared	0.455737	S.D. dependent var	0.871165
S.E. of regression	0.642695	Akaike info criterion	2.004902
Sum squared resid	22.30506	Schwarz criterion	2.112431
Log likelihood	-54.13972	F-statistic	24.44574
Durbin-Watson stat	2.038478	Prob(F-statistic)	0.000000

Pp test

PP Test Statistic	-0.993250	1% Critical Value*	-3.5437
		5% Critical Value	-2.9109
		10% Critical Value	-2.5928

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	(Newey-West suggests: 3)	
Residual variance with no correction		0.379259
Residual variance with correction		0.513493

Phillips-Perron Test Equation
Dependent Variable: D(MPR)
Method: Least Squares
Date: 04/19/12 Time: 09:24
Sample(adjusted): 2007:02 2011:12
Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR(-1)	-0.031543	0.046462	-0.678909	0.4999
C	0.292929	0.390162	0.750789	0.4559

R-squared	0.008021	Mean dependent var	0.033898
Adjusted R-squared	-0.009382	S.D. dependent var	0.623632
S.E. of regression	0.626551	Akaike info criterion	1.936137
Sum squared resid	22.37626	Schwarz criterion	2.006562
Log likelihood	-55.11604	F-statistic	0.460917
Durbin-Watson stat	1.840429	Prob(F-statistic)	0.499943
PP Test Statistic	-7.134550	1% Critical Value*	-3.5457

	5% Critical Value	-2.9118
	10% Critical Value	-2.5932

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	(Newey-West suggests: 3)	
Residual variance with no correction		0.387593
Residual variance with correction		0.460303

Phillips-Perron Test Equation
Dependent Variable: D(MPR,2)
Method: Least Squares
Date: 04/19/12 Time: 09:25
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MPR(-1))	-0.942098	0.133406	-7.061865	0.0000
C	0.032486	0.083321	0.389889	0.6981

R-squared	0.471049	Mean dependent var	0.000000
Adjusted R-squared	0.461604	S.D. dependent var	0.863489
S.E. of regression	0.633590	Akaike info criterion	1.959044
Sum squared resid	22.48041	Schwarz criterion	2.030094
Log likelihood	-54.81227	F-statistic	49.86994
Durbin-Watson stat	2.010202	Prob(F-statistic)	0.000000

ADF Test Statistic	-0.753106	1% Critical Value*	-3.5457
		5% Critical Value	-2.9118
		10% Critical Value	-2.5932

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DRATE)
Method: Least Squares
Date: 04/19/12 Time: 09:27
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DRATE(-1)	-0.026817	0.035609	-0.753106	0.4546
D(DRATE(-1))	-0.055851	0.135559	-0.412007	0.6819
C	0.196531	0.357578	0.549616	0.5848

R-squared	0.015099	Mean dependent var	-0.055345
Adjusted R-squared	-0.020716	S.D. dependent var	0.850515
S.E. of regression	0.859280	Akaike info criterion	2.584894
Sum squared resid	40.60988	Schwarz criterion	2.691468
Log likelihood	-71.96192	F-statistic	0.421586
Durbin-Watson stat	1.942815	Prob(F-statistic)	0.658107

ADF Test Statistic	-3.934608	1% Critical Value*	-3.5478
		5% Critical Value	-2.9127
		10% Critical Value	-2.5937

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DRATE,2)
Method: Least Squares
Date: 04/19/12 Time: 09:27
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DRATE(-1))	-0.746041	0.189610	-3.934608	0.0002
D(DRATE(-1),2)	-0.301009	0.129956	-2.316238	0.0244
C	-0.048824	0.110240	-0.442889	0.6596

R-squared	0.575206	Mean dependent var	-0.018596
Adjusted R-squared	0.559473	S.D. dependent var	1.248906
S.E. of regression	0.828926	Akaike info criterion	2.513825
Sum squared resid	37.10443	Schwarz criterion	2.621354
Log likelihood	-68.64402	F-statistic	36.56023
Durbin-Watson stat	2.025974	Prob(F-statistic)	0.000000

Pptest

PP Test Statistic	-0.984914	1% Critical Value*	-3.5437
		5% Critical Value	-2.9109
		10% Critical Value	-2.5928

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	(Newey-West suggests: 3)	
Residual variance with no correction		0.691819
Residual variance with correction		0.869419

Phillips-Perron Test Equation
Dependent Variable: D(DRATE)
Method: Least Squares
Date: 04/19/12 Time: 09:28
Sample(adjusted): 2007:02 2011:12
Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DRATE(-1)	-0.029340	0.034683	-0.845950	0.4011
C	0.218464	0.347880	0.627987	0.5325

R-squared	0.012399	Mean dependent var	-0.060678
Adjusted R-squared	-0.004927	S.D. dependent var	0.844146
S.E. of regression	0.846223	Akaike info criterion	2.537243
Sum squared resid	40.81731	Schwarz criterion	2.607668
Log likelihood	-72.84866	F-statistic	0.715632
Durbin-Watson stat	2.094656	Prob(F-statistic)	0.401118

PP Test Statistic	-8.047978	1% Critical Value*	-3.5457
		5% Critical Value	-2.9118
		10% Critical Value	-2.5932

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	(Newey-West suggests: 3)	
Residual variance with no correction		0.707391
Residual variance with correction		0.970484

Phillips-Perron Test Equation
Dependent Variable: D(DRATE,2)
Method: Least Squares
Date: 04/19/12 Time: 09:29
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DRATE(-1))	-1.070482	0.133640	-8.010185	0.0000
C	-0.058954	0.112600	-0.523569	0.6026

R-squared	0.533967	Mean dependent var	-0.004138
Adjusted R-squared	0.525645	S.D. dependent var	1.242790
S.E. of regression	0.855952	Akaike info criterion	2.560670
Sum squared resid	41.02865	Schwarz criterion	2.631720
Log likelihood	-72.25944	F-statistic	64.16306
Durbin-Watson stat	1.938104	Prob(F-statistic)	0.000000

Plrate

ADF Test Statistic	-1.479980	1% Critical Value*	-3.5457
		5% Critical Value	-2.9118
		10% Critical Value	-2.5932

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PLRATE)
Method: Least Squares
Date: 04/19/12 Time: 09:29
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PLRATE(-1)	-0.074059	0.050040	-1.479980	0.1446
D(PLRATE(-1))	0.044072	0.135891	0.324320	0.7469
C	1.219908	0.843429	1.446367	0.1537

R-squared	0.038372	Mean dependent var	-0.024483
Adjusted R-squared	0.003404	S.D. dependent var	0.513984
S.E. of regression	0.513109	Akaike info criterion	1.553680
Sum squared resid	14.48042	Schwarz criterion	1.660254
Log likelihood	-42.05671	F-statistic	1.097340
Durbin-Watson stat	1.991622	Prob(F-statistic)	0.340953
ADF Test Statistic	-3.832679	1% Critical Value*	-3.5478
		5% Critical Value	-2.9127
		10% Critical Value	-2.5937

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PLRATE,2)
Method: Least Squares
Date: 04/19/12 Time: 09:30
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PLRATE(-1))	-0.702834	0.183379	-3.832679	0.0003
D(PLRATE(-1),2)	-0.294942	0.131445	-2.243844	0.0290
C	-0.011035	0.066559	-0.165797	0.8689

R-squared	0.536012	Mean dependent var	-0.002807
Adjusted R-squared	0.518827	S.D. dependent var	0.723589
S.E. of regression	0.501929	Akaike info criterion	1.510481
Sum squared resid	13.60438	Schwarz criterion	1.618010
Log likelihood	-40.04870	F-statistic	31.19119
Durbin-Watson stat	1.891656	Prob(F-statistic)	0.000000

Pptest

PP Test Statistic	-1.719743	1% Critical Value*	-3.5437
		5% Critical Value	-2.9109
		10% Critical Value	-2.5928

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	(Newey-West suggests: 3)	
Residual variance with no correction		0.245993
Residual variance with correction		0.348709

Phillips-Perron Test Equation
Dependent Variable: D(PLRATE)
Method: Least Squares
Date: 04/19/12 Time: 09:31
Sample(adjusted): 2007:02 2011:12
Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PLRATE(-1)	-0.070645	0.048292	-1.462851	0.1490
C	1.163204	0.814385	1.428323	0.1587

R-squared	0.036184	Mean dependent var	-0.024237
Adjusted R-squared	0.019275	S.D. dependent var	0.509537
S.E. of regression	0.504603	Akaike info criterion	1.503220
Sum squared resid	14.51356	Schwarz criterion	1.573645
Log likelihood	-42.34498	F-statistic	2.139934
Durbin-Watson stat	1.896798	Prob(F-statistic)	0.149001
PP Test Statistic	-7.454337	1% Critical Value*	-3.5457
		5% Critical Value	-2.9118
		10% Critical Value	-2.5932

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3	(Newey-West suggests: 3)	
Residual variance with no correction		0.259605
Residual variance with correction		0.342811

Phillips-Perron Test Equation
Dependent Variable: D(PLRATE,2)
Method: Least Squares
Date: 04/19/12 Time: 09:31
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PLRATE(-1))	-0.991188	0.135201	-7.331231	0.0000
C	-0.024358	0.068114	-0.357611	0.7220

R-squared	0.489735	Mean dependent var	-0.010345
Adjusted R-squared	0.480623	S.D. dependent var	0.719508
S.E. of regression	0.518533	Akaike info criterion	1.558249
Sum squared resid	15.05709	Schwarz criterion	1.629298
Log likelihood	-43.18921	F-statistic	53.74695
Durbin-Watson stat	1.969180	Prob(F-statistic)	0.000000

OLS estimate on MPR and DEP

Dependent Variable: D(DRATE)
Method: Least Squares
Date: 05/01/12 Time: 21:27
Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.058571	0.106223	-0.551399	0.5836
D(MPR(-1))	0.348089	0.168218	2.069271	0.0433
D(DRATE(-2))	0.306514	0.124982	2.452462	0.0175

R-squared	0.158901	Mean dependent var	-0.064211
Adjusted R-squared	0.127749	S.D. dependent var	0.855367
S.E. of regression	0.798865	Akaike info criterion	2.439946
Sum squared resid	34.46200	Schwarz criterion	2.547475
Log likelihood	-66.53846	F-statistic	5.100867
Durbin-Watson stat	2.067143	Prob(F-statistic)	0.009351

OLS RESULT BETWEEN MPR AND PRIME LENDING

Dependent Variable: D(PLRATE)
Method: Least Squares
Date: 05/15/12 Time: 14:46

Sample(adjusted): 2007:04 2011:12
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007604	0.066988	-0.113517	0.9100
D(PLRATE(-1))	0.008515	0.131709	0.064649	0.9487
D(MPR(-1))	-0.081843	0.109274	-0.748968	0.4572
D(PLRATE(-2))	0.318236	0.135597	2.346913	0.0227

R-squared	0.094937	Mean dependent var	-0.017018
Adjusted R-squared	0.043707	S.D. dependent var	0.515371
S.E. of regression	0.503982	Akaike info criterion	1.535040
Sum squared resid	13.46190	Schwarz criterion	1.678412
Log likelihood	-39.74864	F-statistic	1.853159
Durbin-Watson stat	1.848775	Prob(F-statistic)	0.148791

PRIME LENDING RATE AND MPR

Date: 06/19/12 Time: 11:43
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: PLRATE MPR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.235833	17.75206	15.41	20.04
At most 1	0.036421	2.151830	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at the 5% level
Trace test indicates no cointegration at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.235833	15.60023	14.07	18.63
At most 1	0.036421	2.151830	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

PLRATE	MPR
0.873126	0.542063
0.254160	-0.470369

Unrestricted Adjustment Coefficients (alpha):

D(PLRATE)	-0.052189	-0.095012
D(MPR)	-0.291495	0.016590

1 Cointegrating Equation(s): Log likelihood -88.52636

Normalized cointegrating coefficients (std.err. in parentheses)

PLRATE	MPR
1.000000	0.620830
	(0.16921)

Adjustment coefficients (std.err. in parentheses)

D(PLRATE)	-0.045567
	(0.06020)
D(MPR)	-0.254512
	(0.06319)

COINTEGRATION RESULT BETWEEN DEPOSIT RATE AND MPR

Date: 06/19/12 Time: 16:34
Sample(adjusted): 2007:03 2011:12
Included observations: 58 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: DRATE MPR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.116768	13.31171	15.41	20.04
At most 1 *	0.099986	6.109983	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates no cointegration at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.116768	7.201731	14.07	18.63
At most 1 *	0.099986	6.109983	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

DRATE	MPR
0.351556	-0.413137
0.090165	0.541639

Unrestricted Adjustment Coefficients (alpha):

D(DRATE)	-0.171740	0.201833
D(MPR)	-0.172233	-0.115527

1 Cointegrating Equation(s): Log likelihood -121.4097

Normalized cointegrating coefficients (std.err. in parentheses)

DRATE	MPR
1.000000	-1.175166
	(0.66781)

Adjustment coefficients (std.err. in parentheses)

D(DRATE)	-0.060376
	(0.03799)
D(MPR)	-0.060549
	(0.02862)