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Determination of the Floor and Optimal Threshold of Lending Rates in Nigeria

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CENTRAL BANK OF NIGERIA

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By

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Abstract

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This paper investigated factors responsible for high lending rates. It also identifies the floor and threshold for lending rate beyond which it becomes detrimental to growth and investment in the Nigerian economy. The study employed quarterly data set covering the period 2000-2013 using the Ordinary Least Square (OLS) method to investigate the key determinants of maximum lending rate. The quadratic function and the iterative model were employed for determining the threshold lending rate in Nigeria. The paper followed the works of McKinnon (1973) and Shaw (1973) for the threshold model which suggested the likelihood of positive effect of interest rate on private investment particularly in developing economies. The study found more credible support for these Authors' work. The Results of the "quadratic model" estimated to determine the threshold found the threshold lending rate of 21.46% while the "iterative threshold method" identified 21% as the threshold lending rate. The study therefore, suggests a threshold lending rate band of between 21% - 21.5%. It can be deduced from the study that a relatively high interest rate beyond the threshold band can be detrimental to investment.

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Key words: Weighted Average Cost, Lending Rates, Deposit Money Banks, Nigeria, Panel Estimation

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1.0 Introduction

The Nigerian economy has been growing at an average rate of 6-7 per cent in the last several years, and this growth rate is considered to be below potential given the enormous human, material, and natural resource endowments of the economy. The recent rebasing of the economy has further revealed the potentials of many sectors, and provided a clearer picture of the growth potentials of the economy. In particular, the services sector is seen as a major driver of growth contributing about 50 per cent of GDP. In the context of stimulating the economy, it is imperative that the availability, accessibility and affordability of financing under a favorable interest rate regime would play a catalytic role in unleashing the growth potentials of the economy.

Interest rate developments in the economy in the last 5 years indicate that the problem of high lending rates, against the background of declining deposit rates poses a key challenge to financial intermediation. The persistence of this problem had been observed by the Monetary Policy Committee in several communiques, particularly following the onset of the global financial crises of 2007/08, and the ensuing measures taken to address liquidity challenges in the Banking system. Over, the last 5 years, lending rates have remained positive in real terms. The average maximum lending rate has hovered around 23 -26 percent. Similarly, the prime lending rate ranged between 16 -19 percent, given an average year-on-year inflation rate of 9.0 per cent during the period.

Savings rates have largely remained negative in real terms. The average savings deposit rate between 2009 and 2014, was 2.13, per cent while the 3-months deposit rate was 8.4 per cent, indicating negative real rates. Deposit rates, however, marginally increased into the positive territory following the increase in CRR on public sector deposits in the third quarter of 2013. The tight monetary policy forced banks to offer remunerative rates to mobilize private sector deposits. Notwithstanding, the emerging picture shows persisting high lending rates, declining deposit rates, and the widening of the interest rate spread. This clearly

indicates inefficiencies in the intermediation process, attributable to: infrastructure issues reflected in the high cost of mobilizing deposits, perverse incentives offered by the availability of cheap public sector deposits, rising credit risks reflected in high Non-Performing Loan (NPL) ratios, paucity of investment outlets and high demand for treasury securities for liquidity management, and the under developed capital markets.

The interest rate dynamics is also affected by the maturity structure of DMB deposit liabilities. Over the period, 2007- 2012, about 75 per cent of DMB deposits are those maturing within 30 days, and a further 20 per cent would mature in less than 360 days. Overall about 96 per cent of DMB deposit liabilities in the Nigerian banking system would mature in less than one year, thereby constraining the ability of banks to make longer tenured loans (Appendix 1). Given the underdeveloped corporate bonds market, the credit needs of the economy are met through a banking system characterized by short-term deposits. Accordingly, the pressure on credit particularly from the large corporate sector is likely to put upward pressure on bank's lending rates, and widen interest rate spreads.

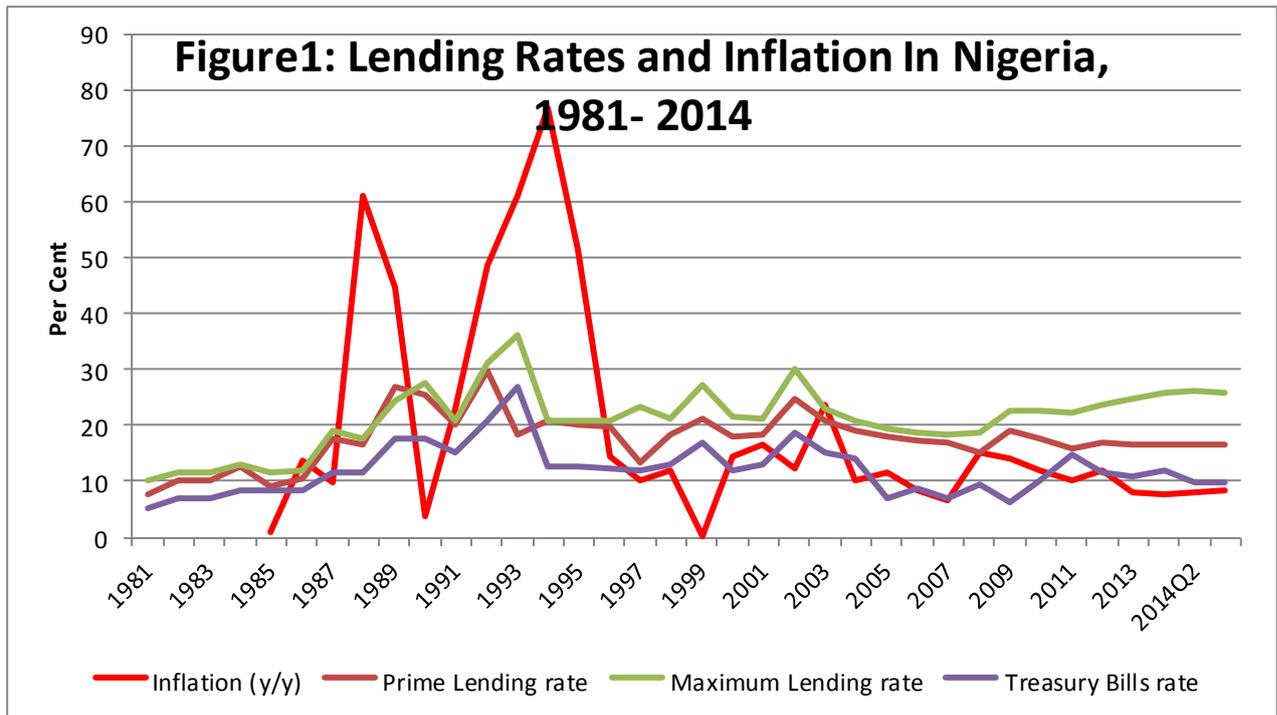
In the past, several steps were taken to address the problem of high lending rates, and access to credit in Nigeria. These measures included the introduction of various development finance schemes, and interventions by the Central Bank of Nigeria, including the Agricultural credit guarantee Scheme fund (ACGS) in 1978, Interest rate drawback programme in 2002, the Commercial Agricultural Credit Scheme (CACCS), Small and Medium enterprises Equity Investment Scheme (SMEIS) in 2001, and the Microfinance policy in 2004. In 2010, the Bank, injected N500 billion as a special intervention fund under a quantitative easing program to ensure the flow of liquidity to the real economy at reasonable interest rates.

These measures were complemented by interventions to manage interbank liquidity and the use of treasury securities. Despite these measures, the phenomenon of high lending rates still persists as reflected in the complaints of

manufacturers, industrialists, and SME operators who consistently identify high lending rates as a key contributor to unfavorable business and investment climate in Nigeria. There is, therefore, clearly the need to revisit this problem to account for the persisting high lending rates, and to determine the interest rate thresholds beyond which growth and employment could be hampered.

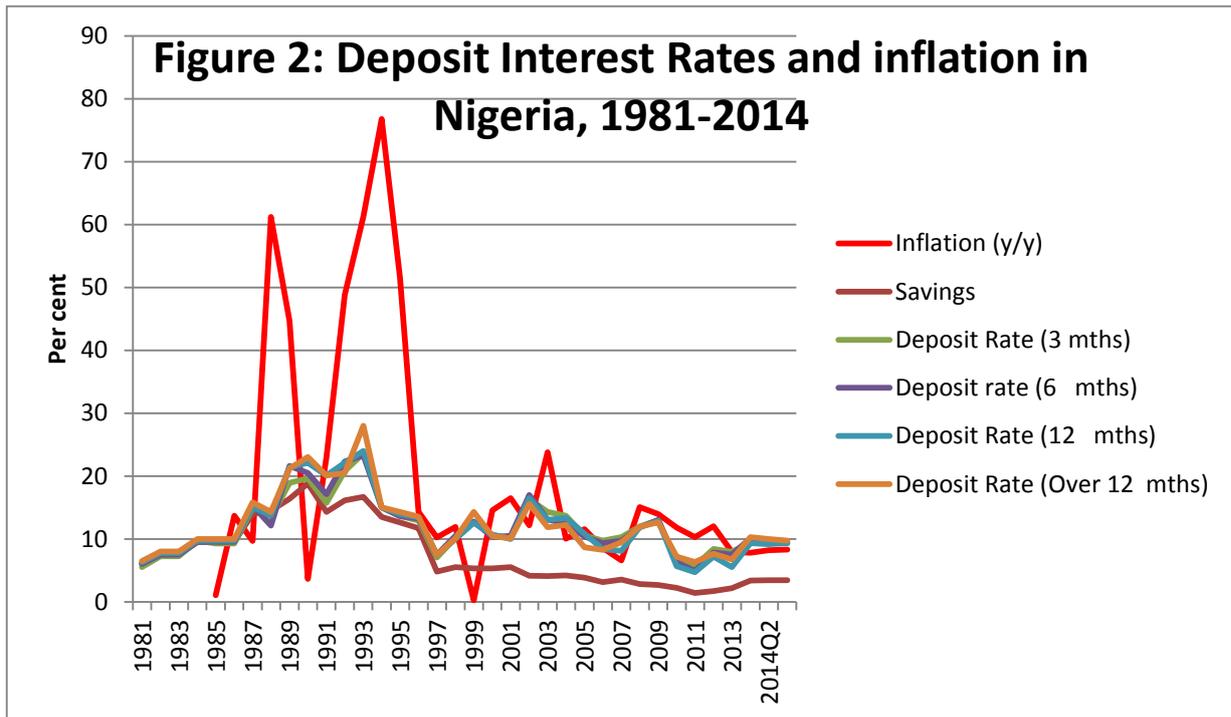
1.1 Stylized facts on Interest Rates Developments in Nigeria

Interest rates developments in Nigeria can be sub-divided into two periods: i) the regime of controlled interest rates prior to 1986; and ii) the era of interest rates liberalization. Before the introduction of the Structural Adjustment Programme (SAP) in 1986, interest rate in Nigeria was administratively determined by the Central Bank of Nigeria ostensibly to achieve overriding policy objectives including: promoting the flow of credit to the preferred sectors of the economy- agriculture, manufacturing, etc.; facilitating the orderly growth of the financial market; and achieving a socially desirable pattern of resource allocation. Ikhide and Alawode (2001) indicated that the control of interest rates took different forms such as putting ceilings on interest rates and credit expansion, use of selective credit policies, and reserve requirements. During this period, nominal interest rates were generally low, leading to excessive borrowing and consumption resulting in rising inflation rates. Annualized headline Inflation rate rose to as high as 61.2 and 44.7 per cent in 1988 and 1989 (Figure 1). The regime of high inflation rates created an environment of negative real interest rates from financial repression resulting in disintermediation which discouraged savings and investment, leading to lack of private sector competition and slow economic growth.



Interest rates were liberalized following the introduction of SAP in 1986, whose cardinal objective was to restructure and alter the production and consumption patterns of the economy to address structural and macroeconomic imbalances. Accordingly, interest rates were market-determined following the establishment of interbank markets and money market instruments for trading in securities. Consequently interest rates rose remarkably relative to the era of financial repression as inflation rates moderated significantly, particularly from 1995 onwards. For instance the average prime and maximum lending rates rose gradually from about 10.00 and 11.50 per cent, respectively, in 1982/83 to 24.8 and 30.0 per cent in 2002/03. During the same period, treasury bills rate also rose from about 7.0 per cent to 18.0 per cent due to expansionary fiscal policy of government.

In the post-SAP era as the economy was gradually recovering from the repression of interest rates, deposit rates were generally sluggish and negative in real terms due to poor investment climate, limited domestic savings, high marginal propensity to consume, and inadequate institutional framework for saving mobilization (Figure 2).



Clearly it can be inferred that following financial liberalization, market determined interest rates rose relative to rate of inflation. However, due to the paucity of domestic savings, deposit rates have largely been sluggish and negative in real terms. This study, therefore, seeks to determine the persistence of high lending rates in Nigeria and to establish the upper threshold beyond which lending rates becomes detrimental to investment and growth.

2.0 Literature Review

2.1 Conceptual and Theoretical Framework

Conceptually, lending rate is the interest charged by banks when they advance loans to their customers. This rate varies according to perceived risks, the duration of loans (short, medium or long term), the cost of loanable funds and lending margins. Lending rate could either be prime or maximum. Prime lending rate are interest rate charged by banks to their largest, most secure, and most creditworthy customers on short-term loans (This rate is used as a guide for computing interest rates for other borrowers) while the maximum lending rate refers to interest charged by banks for lending to customers with a low credit rating.

The term "lending rate" is synonymous with the term "interest rate." Interest rates are defined as the rental payment for the use of credit by borrowers and returns for parting with liquidity by lenders, (Ibimodo, 2005.) Interest rates differ mainly in term and maturity (that is the length of time for repayment and liquidity that is quick conversion of assets to funds). When maturity and liquidity together with other factors are considered, many different financial instruments as well as many different interest rates will emerge (Anyanwu *et al*, 1997). Interest rates can either be nominal or real. Nominal interest rate can be measured in naira terms, not in terms of goods. The nominal interest rate measures the yield in naira per year, per naira invested while the real interest rate is corrected for inflation and is calculated as the nominal interest minus the rate of inflation (Pandy, 1999).

At the theoretical level, interest rate determination has been extensively debated among economists. While these theories are difficult to categorize, the chronological stages of their development can be traced. These stages and theoretical viewpoints include the classical and Neo-classical (loanable funds) theories, as well as the Keynesian version through the middle (or compromise) approach of interest rate theory of Hicks general equilibrium approach and finally the post Keynesians views.

The Classical Theory of Interest Rate is originally associated with renowned economists like Ricardo (1923), Marshal (1923), Pigou (1917) etc. Its proponents maintained that rate of interest is determined by the interaction of investment and saving schedule. In other words, interest rate can be determined by the equality of savings and investment under the condition of perfect competition. In this case, interest rate is considered a balance element that links the volume of savings with volume of investment in a given economy. The existence of inverse relationship between interest rate and the demand for capital explains why the demand curve for capital slopes downward from left to the right. The supply of capital on the other hand, at any particular time depends on a number of factors. One of the key factors according to the classical economists is the rate of interest. The public saves more at a higher rate than at a lower rate. This is why the supply curves of capital

slopes downwards. The classical economists believed that the rate of interest must be high enough to induce the saver to forego consumption. If the public saves less, the total supply of capital will fall short of the total demand and ultimately the rate of interest will have to rise high enough to compensate the saver.

The Neoclassical or Loanable Funds Theory of Interest is a flow theory that determines the interest rate by the interaction of demand for and supply of loanable funds or credit. First initiated by the Swedish economist Wicksell (1936) and later developed and supported by several leading American and Swedish economists including Roberson (1934), this theory remains one of the two general approaches that have been followed in developing the modern monetary theory of rate of interest. The theory attempts to ascertain the estimated interest rate variations by analyzing the supply of and demand for credit. Often referred to as the most appropriate theory for interest rate determination for explaining long-term interest rates, the theory is predicated on the belief that savers make a decision between consumption now and consumption in the future dates. According to Hansen (1951), the loanable funds theory like the classical and the Keynesian theories of interest is indeterminate unless the income level is already known.

The Keynesian Liquidity Preference Theory of Interest emerged out of Keynes' criticisms of the classical theory. Keynes (1936) theory of interest is essentially a monetary phenomenon since the rate of interest is calculated in terms of money and determined by the demand for and the supply of money. This liquidity preference theory postulates that the rate of interest can be controlled through variations in the supply of money and as such the theory is normally called the monetary theory of interest rate determination. Keynesian liquidity preference theory is often referred to as a stock theory since its analysis regards the supply of money as given during short run and determines the interest rate by liquidity preference or demand for money.

Furthermore, liquidity preference theory could be defined as a theory of the demand for money that depends, amongst other things, on the interest rate. Keynes argued specifically that the demand for money is indirectly related to the interest rate: as interest rate goes up, smaller quantity of money is demanded (Ackley 1978). The theory of interest rate determination provides an alternative approach to the loanable funds theory. Keynes (1936) recognized the theoretical validity of the loanable fund theory but pointed out that the extension of the theory to saving-investment equality was a fallacy. He argued that it is not necessarily true that all saving will be directly invested or place on the bond market, so that the equilibrium in the bond market ($B^s = B^d$) does not necessarily imply saving-investment equilibrium. Liquidity preference theory involved a combination of monetary theory and interest rate theory.

In the Modern Theory of Interest/ The General Equilibrium Approach, Hicks (1982) adopted Keynes liquidity preference theory of interest rate determination by extending Walrus's general equilibrium framework into a mathematical piece of analysis which, he claimed, could embody Keynes's method. Hicks' analysis was called the IS-LM system which assumed away the important implication of uncertainty and inter-dependence among variables in the good and money market. The Hicks' general equilibrium is the middle or compromise approach of interest rate theories. This approach, views the rate of interest as a price which like other prices, is determined with them as part of mutually interdependent system. In other words, the rate of interest cannot be treated in isolation but is a general equilibrium, which depends on both real and monetary factors. This implies that the rate of interest can be conceptualized within the framework of general equilibrium. The theory of the rate of interest that is determined within such a system is both a real and monetary theory. It is determined by the interaction of the real and monetary factor. Thus, in this approach, saving, investment, liquidity preference and the quantity of money are integrated at various levels of income for synthesis of the loanable fund theory with liquidity preference theory. The four variables of the two formulation have been combined, to contrast two new curves, the *IS* curve

representing flow variable of the loanable funds formulation (or the real factors of the classical theory) and the *LM* curve representing the stock variable of liquidity preferences formulation. The equilibrium between the *IS* and *LM* curves provides a determinate solution. Recall that $M^d = L(r, Y)$, thus money demand is also a function of output. When output rises, the money demand curve will thus rise and therefore the equilibrium level of interests r^* , will rise

It is evident that no single theory of interest rate is adequate and determinate. An adequate theory of interest, must take into consideration both real and monetary factors that influence the interest rate. Most economists, while noting the contribution of the classical economist and Keynes, would agree that neither theory adequately explains interest rate determination.

The Post Keynesian economics is principally associated with an eclectic group of economists located in Cambridge, England and the United State. This group included Nicholas Kaldor, Joan Robinson, Paul Davidson, Sidney Weintraub and Hyman Minsky. Their approach to interest rate determination suggests that the rate of interest rate is determined by central banks as a main policy variable in pursuit of monetary policy objective(s). This line of thinking came up in disagreement to neoclassical economics in general, monetarism, rational expectation and new classical thinking. In fact, most central bankers shared this view today, given acceptance to the widespread acknowledgment that short-term interest rate are determined as a key policy variable and not by impersonal market forces.

Post Keynesians believe that Keynes provided a new way of analysing monetary economies and other fundamental insights that were not captured in the neoclassical synthesis, and that these have important consequences for economic theory and analysis. Post Keynesians support the dominant ideas and intuitions put forward by Keynes (1936) in the *General Theory* but differ from him as far as the exogeneity of the money supply is concerned. They also build on the work of the Polish economist, Michal Kalecki, particularly in respect of the mark-up theory of interest rate determination.

2.2 Empirical Literature

Rama (1990) examined both the theoretical and empirical determinants of private investment in less developed countries (LDCs). He employed dynamic model of two equations using instrumental variable technique of estimation. The study recognized that macroeconomic and institutional factors such as financial repression, foreign exchange shortage, lack of infrastructure, economic instability are essential variables that explain private investment. The finding revealed that changes in interest rate played a negative and highly significant role in investment decision in the economy and demand for credit also had negative and significant influence on interest rate variations in both the short run and long run. Although, the study deduced that investment has an indirect relationship with interest rate variation, other variables such as debt burden, economic stability, foreign exchange, shortage and lack of infrastructure affect gross domestic investment. Improvement in these key macro-economic variables is a necessary condition towards facilitating investment in Nigeria.

Gochoco (1991) studied financial liberalization and interest rate determination in Philippines from 1981 to 1985. He underscored the relative importance of domestic and external factors in determining domestic nominal interest rate which depends on the degree of openness of the capital account. He observed that when capital flows are totally unrestricted, the domestic interest rate would be determined by the external factors via the uncovered interest parity relationship. If, however, the capital account were completely closed, the domestic interest rate would be determined predominantly by domestic conditions via the Fisher effect.

Edwards and Khan (1995) studied the behaviour of nominal interest rates in Columbia: small open economy. They established that the differentials between domestic nominal interest rates and world interest rates plus expected devaluation, would lead to higher domestic rate of interest. They also reported that excess supply of real money exerted significant negative pressure on nominal interest rates.

Sarel (1996) employed panel data comprising 87 countries to explore the relationship of non-linear effects of inflation on economic growth using annual data on Gross Domestic Product (GDP), Population real exchange rate, government expenditure, investment rate and term of trade during the period 1970 – 1990. The 20 year sample period was divided into four equal periods of five years each, obtaining a total of 248 observations for the study. Identifier dummy variables were stimulated through a dynamic and stable baseline growth model estimated by the Auto Regressive Distributive Lag (ARDL) bound testing and estimation approach. He found a significant structural break (inflation threshold) in the function that relates economic growth to inflation. The threshold was estimated at 8 per cent, below which inflation did not have any effect on economic growth or it may have a slight positive effect. When it rose above the 8.0 per cent threshold, however, the estimated effect of inflation was significant, robust and extremely powerful. He demonstrated that when the existence of the structural break is ignored, the estimated effect of inflation on economic growth for higher inflation rates decreased by a factor of three.

Vasudevan *et al* (1998) estimated an error correction model by employing Engle-Granger methodology to study the determinants of interest rate in India using monthly data for the period 1993 to 1997. The model capture both the long run and short-run dynamics of domestic interest rate behavior and assumed interest rates to be a combination of an autarkic rate as in a closed economy and the uncovered interest parity rate as in a completely open economy. The econometric analysis suggest that as the Indian financial sector integrates more and more with global markets, returns on foreign assets play a significant and increasing role in the determination of domestic interest rates.

Demirgüç-Kunt and Huizinga (1999) employed panel data to investigate the determinants of bank interest margins using data for 80 countries during 1988-1995. They found positive influence on bank interest margin of the ratio of equity to lagged total assets, ratio of loans to total assets, foreign ownership dummy, bank

size as measured by total bank assets, ratio of overhead costs to total assets, inflation rate, and short-term market interest rate.

Khan and Senhadji (2001) estimated a panel regression with data from 140 countries comprising both developing and developed countries during the period 1960–98. The study re-examined the non-linear correlation between inflation and economic growth using new economic technique that provide appropriate procedures for estimation and inference. Estimates were obtained for panels with five-year averaged data as well as yearly data. Due to the uneven coverage, the analysis was conducted using unbalanced panels. The data come primarily from the World Economic Outlook (WEO) database for the following variables: the growth rate of GDP in local currency in constant 1987 prices, inflation computed as the growth rate of the CPI index, the initial income level measured as the five year average of GDP per capita in 1987 PPP prices, gross domestic investment as a share of GDP, population growth, the growth rate of terms of trade, and the five year standard deviation of terms of trade. The results strongly suggest the existence of a threshold beyond which inflation exerts a negative effect on growth.

Caner and Hansen (2001) considered Threshold Autoregressive (TAR) models as alternative to linear near unit root models. These linear models assume a stationary threshold variable, which in practice is typically the lagged difference of the series. The paper used the threshold cointegration technique to examine the relationship between long-term and short-term rates for eight yields. They employed a non-linear threshold autoregressive model that allows for heteroscedasticity in the error process. The results significantly reject the null of linear cointegration for all interest rates, paving the way to test for threshold cointegration. The alternative hypothesis - threshold cointegration means the existence of a non-linear long-run dynamic relationship between long-term and short-term rates. For the most part, error-correction effects indicate that short-term rates adjust more than long-term rates

Afanasieff *et al* (2001) applies the two-step approach of Ho and Saunders (1981) to study the interest rate spread in Brazil by estimating an unbalanced panel data

model of 142 commercial banks using monthly data from February 1997 to November 2000. In the first step, it estimated a panel model with time dummy coefficients which are then used in the second step as the dependent variable on which a measure of interest rate risk and selected macroeconomic variables are used as regressors. Unlike most studies that define the interest rate margin based on interest income and interest expense, Afanasieff et al (2002) defines the spread on the basis of lending and deposit rates as posted by banks. They find that the spread is higher the larger a bank is, the larger the operating costs, bank leverage, ratio of service revenues to operational revenues and ratio of non-interest bearing deposits to total operating assets. However, the spread is found to be negatively related to the ratio of interest-bearing funds to earning assets and foreign-ownership of banks

Gambacorta (2004) studied the factors explaining cross-sectional variances in bank interest rates of Italian banks by considering both micro and macroeconomic factors. The variables considered include: (i) loan and deposit demand (ii) operating cost, credit risk and interest rate volatility (iii) impact of monetary policy through changes in policy rates and reserve requirements and (iv) the structure of the industry. Results showed that interest rates on short term lending of liquid and well capitalized banks respond less to monetary policy shocks.

Fabayo and Ajilore (2006) used Nigeria annual data from 1970 – 2003 in their study titled “How Much is too Much for Economic Growth in Nigeria”. Their study adopted the basic framework of Sarel (1996) as they simulate growth models for potential values of thresholds inflation using OLS and NLLS respectively. They advocated the existence of inflation threshold level of 6.0 for Nigeria. They expounded that above this threshold, inflation retards growth performance of the economy while below it, the inflation-growth relationship is significantly positive. They suggested that the goal of macroeconomic management in Nigeria should be to bring down inflation to a moderate single digit of 6 per cent. The duo adopted a framework developed by Sarel (1996) in determining inflation threshold in Nigeria. All the models

introduced dummy variables to capture the threshold of inflation to economic growth.

Folawewo (2008) employed a dynamic panel data analysis to study determinants of interest rates spread in sub-Saharan African countries. The findings shows that different macroeconomic policy variables play significant role in explaining variations in interest rate spread in the region. Among others, the study showed that the extent of government crowding out in the banking sector, public sector deficits, discount rate, inflationary level, level of money supply, reserve requirement, level of economic development, and population size are important determinants of interest rate spreads in Sub-Saharan African countries.

Alao (2010) re-examined the Nigeria financial sector which assumes that interest rate is determined by a combination of a domestic rate in close economy and the uncovered interest rate parity in a wholly open economy. The study captured both the long run and the short run dynamics of domestic interest rate behavior by employing error correction approach using the Engle-Granger methodology. The equation was estimated using output as proxied by the real gross domestic product (RGDP), real money supply was measured by M2 deflated by the consumer price index (CPI), domestic equivalent of foreign returns was measured by the foreign real income (FRI), and domestic interest rate is measured by the interest rate spread (IRS). Econometric analysis indicates that as the Nigerian financial sector integrates more with global markets, returns on foreign assets will play a significant role in the determination of interest rates.

Onanuga et al (2010) investigated the determinants of interest rate in Nigeria within the framework of a Vector Error Correction Model (VECM), using quarterly data between first quarter of 2000 and last quarter of 2008. The study found that the Treasury Bill Rates (TBR) in Nigeria and its hypothesized determinants are generally I (1) series, with two cointegrating equations existing among their linear combinations. Results based on normalisation of the restricted VAR system in respect of the TBR and real GDP revealed that Real money supply (RMS) and

Expected Foreign Returns (EFR) exerts significant ($p < 0.01$) long-run influence on both the TBR and domestic output. The equilibrium relationship was found to be stable, with exogenous shocks due to TBR being corrected within 92 days, while those due to real output are corrected within 4-days. In general, rising domestic outputs and past quarters' TBR leads to significant increases in current TBR in Nigeria, while increase in past quarters' RMS cause current TBR in Nigeria to decline. Overall, real GDP accounts for as much as 37.4% of the variation in TBR after 5 quarters (15 months), while RMS and EFR accounted for 8.41 and 4.48% of variation in TBR in the same period.

Hayat (2013) employed Sarel (1996) estimation techniques in particular identification of structural breaks to estimate optimal desirable and threshold inflation rates through a baseline growth model. The baseline growth model was estimated through the ARDL bounds testing and estimation approach of Pesaran et al. (2001) to avoid spurious regression and endogeneity problems. The study employed annual time series data for the period 1961 – 2010 obtained from the World Bank Development Indicators (WDI) and State Bank of Pakistan (SBP). The empirical investigation proposed a new discretion-assessment approach instead of its relative-assessment with commitment in conduct of monetary policy. The results suggest that the actual performance of the discretionary monetary policy maker of Pakistan when assessed against the estimated benchmarks has brought in welfare losses compared with expected welfare gains for most of the time. When assessed against the estimated benchmarks of 1%, 3% and 5%, the observed inflation remained in the non-performance range 92%, 82% and 62% of the 50 years" time respectively. Allowing discretion in conduct of monetary policy has produced overall negative effects on the economy in terms of lost real growth for 31 years out of 50 years owing to inflation bias.

Georgievska *etal* (2011) employed panel estimation technique of a sample of 17 commercial banks over the period 2001 to the first half of 2009 to estimate the key driving factors that influence lending rate and interest spread in Macedonia. Their results indicate that lending rates are mostly influenced by bank size and market

share and to a lesser extent by deposit rates and non-performing loans. In addition, policy variables such as the domestic policy rate and the foreign interest rate also appear to be quite important. Furthermore, the bank size and the market share, as well as the differential between domestic and foreign rates, are the most important factors affecting interest rate spreads, while the effect of other factors is less.

Uzeru (2012) employed correlative causal design and multiple regression models called the *best subset* method to study the factors that impact on lending rate comprising 28 Ghana commercial banks using the average lending period 2005 – 2010. The findings indicated that for bank specific factors, lending rates in Ghana increases with increasing interest expense. While for industry specific factors, lending rates decreased with increasing T-bill rates. Again, for macroeconomic factors, inflation and gross domestic product were found to impact lending rates in Ghana. Lending rate was found to increase with increasing inflation and gross domestic product

Maureen and Wambua (2013) employed both descriptive and regression analysis to study the determinants of interest rate spreads in Kenya's banking sector. The former is used to show trends and comparative analysis of interest rate spreads and other variables of interest while the Regression analysis is undertaken to investigate the determinants of interest rate spreads by employing panel data estimation methodology on a panel of commercial banks using annual data for the period 2002 to 2011. The econometrics analysis show that bank-specific factors play a significant role in the determination of interest rate spreads. These include bank size based on bank assets, credit risk as measured by non-performing loans to total loans ratio, liquidity risk, return on average assets and operating costs. The impact of macroeconomic factors such as real economic growth and inflation is not significant. Similarly, the impact of policy rate as an indicator of monetary policy is found to be positive but weak. On average, big banks have higher spreads compared with small banks.

Nampewo (2013) employed time series data in the Uganda banking sector to study the determinants of interest rate spread for the period 1995 – 2010. The study applied the Engle and Granger two-step procedure to test for cointegration between the bank rate, treasury bill rate, exchange rate volatilities, the ratio of money supply to gross domestic product (M2/ GDP) and the proportion of non-performing loans to total private sector credit. Results show that the interest rate spread in Uganda is positively affected by the bank rate, the Treasury bill rate and non-performing loans. On the other hand, M2/GDP ratio and real GDP have a negative influence on the spread. However the analysis is undertaken at macro level hence concealing micro and bank-specific characteristics

Dube and Zhou (2013) employed a two-regime vector error-correction model (VECM) with a single cointegrating vector and a threshold effect in the error-correction term. They adopt a Hansen-Seo (2002) algorithm to extract maximum likelihood estimates in eight threshold cointegration models that relate short-term to long-term interest rates in South Africa for the period 1990M1-2010M7. They also used a *SupLM* test to test for the presence of threshold. The Hansen-Seo algorithm yields both linear and non-linear estimates plus critical values used to test threshold effects. The method is applied by relating the South Africa Reserve Bank policy rate, the repo (short-term) to intermediate (TB rate, money market rate) and long-term rates (the 10-year government bond, the loan and deposit rates). In all cases, linear cointegration is rejected in favor of a threshold effect.

Okoye and Richard (2013) examined and analyzed how bank lending rate policy affects the performance of Nigerian deposit money banks during the period between 2000 and 2010. The used secondary data econometrics in a regression, where time-series and quantitative data were combined and estimated. Their findings show that the lending rate and monetary policy rate has significant and positive effects on the performance of Nigerian banks. The implication of these is that lending rate and monetary policy rate (MPR) are true parameter of measuring bank performance.

3.0 Methodology of the Data

In achieving the first objective of the study which examined the determinants of lending rates in Nigeria, we adopted the ordinary least square method. For the second objective which was meant at identifying the floor and threshold for lending rate, we used both the quadratic approach and the non-linear model adopted by Khan and Senhadji (2001).

3.1 Specification of models

3.1.1 Macroeconomic Determinants of Lending Rate in Nigeria

Maximum lending rate is expressed as a function of some key macroeconomic variables such as GDP, exchange rate, inflation, deposit rate and treasury bill rate. The equation is expressed as follows:

$$MLR = \beta_0 + \beta_1 LOGGDP + \beta_2 INF + \beta_3 EXCHR + \beta_4 TBR + \beta_5 SDR + U$$

Where

LOGGDP = log of GDP. Increase in economic activity is expected to result in high lending rates due to increased demand for loans.

INF = Inflation rate. Increase in inflation is likely to increase lending rate.

EXCHR = Exchange rate. Relationship between lending rate and exchange rate is expected to be positive.

TBR = Treasury Bill Rate. Rise in TBR is expected to lead to an increase in lending rate.

SDR = Savings Deposit rate. Savings deposit rate is expected to have positive relationship with lending rate.

U = error term.

3.1.2 Determination of Threshold Lending Rate

Some methodological clarifications on the non-linear relationship between private investment and real interest rate

The contributions of real interest rate to investment decision making and growth is well documented in the literature (Ajide and Lawanson, 2012; Fry, 1998; Khatib et al,

2013; Okorie, 2013; Akpokodjie, (1998)). Traditional economic theory postulates that low interest rate is a necessary condition for stimulating private sector investment. This justifies why some countries keep their interest rates low even at negative levels to attract borrowings for productive activities. However the seminal works of McKinnon (1973) and Shaw (1973) introduced a twist in the traditional relationship between interest rate and private investment. Their arguments in support of a liberalized financial market (and by implication higher interest rates) raised the possibility of the existence of a non-linear relationship between private investment and the rate of interest. This argument was premised on the assumption that the net impact of real interest rate on private investment could be positive, a contradiction to the traditional economic theory of a negative relationship between real interest rate and private investment (Lugo, 2001). In other words, a non-linear relationship could exist between private investment and real interest rate.

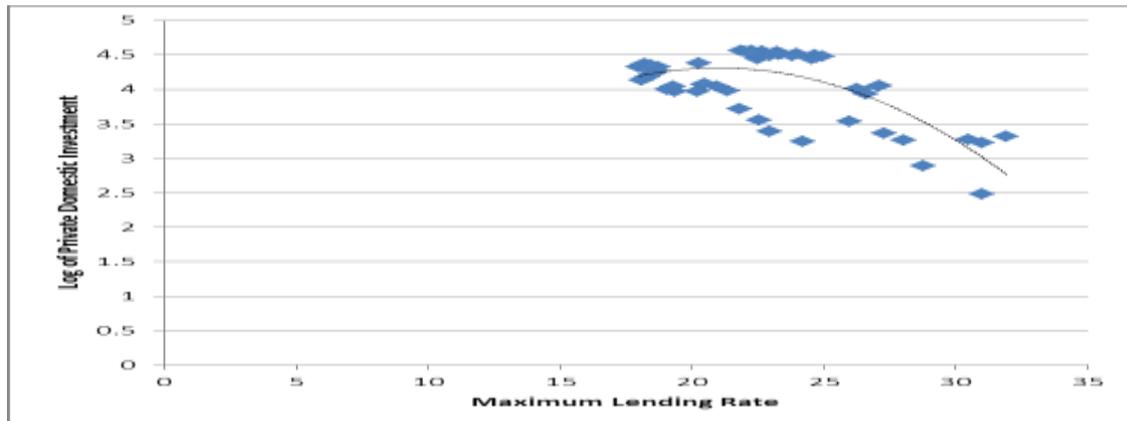
According to McKinnon (1973), high interest rate induces savings and conversion of personal assets to bank deposits which in-turn increases the mobilization of funds to finance private investment. However, investment returns would be low at extremely high levels of interest rate in accordance with the traditional negative relationship that exists between investment and interest rate.

Our methodological approach is based on McKinnon's (1973) thesis of a non-linear relationship between private investment and real interest rate. This implies the existence of a certain threshold level within which an increase in real interest rate will mobilise more savings and ultimately impact positively on private investment. However, beyond the threshold level, and in line with conventional theory, increasing the real interest rate would affect private investment adversely.

The literature has established a possibility that interest rate has a non-linear impact on private investment. This implies that interest rate could rise to a certain threshold level with corresponding positive effects on private investment and after the threshold; it begins to retard private investment.

For a detailed understanding of the Nigerian context, Figure1 showed a nonlinear relationship between private investment and lending rate.

Figure 1: Non-linear relationship between Private Domestic Investment and Maximum Lending Rate in Nigeria (2000-2013)



Source: Authors' calculation

Figure 1 suggests the existence of a positive relationship between lending rate and private investment up to about 20-23 percent which increases private investment and after that level of lending rate, the volume of private investment tends to decrease.

To further confirm the existence of non-linearity between lending rate and private investment, we conducted the Brock, Dechert, and Scheinkman (BDS) test. The BDS test is usually employed to ascertain whether the series is independent and identically distributed.

Table 2: Brock, Dechert, and Scheinkman (BDS) test statistic for maximum lending rate

Dimension	BDS statistic	Std Error	z-stastic	Normal Prob	Bootstrap prob
2	0.169846	0.009297	18.26894	0.0000	0.0000
3	0.279430	0.014967	18.66945	0.0000	0.0000
4	0.347646	0.018053	19.25669	0.0000	0.0000
5	0.392048	0.019061	20.56846	0.0000	0.0000
6	0.410321	0.018622	22.03433	0.0000	0.0000

The null hypothesis states that the time series data follows an independent and identical distribution (I.I.D.) pattern. For both the normal and bootstrap probabilities, all the p-values of the BDS were significant both at the normal and bootstrap probabilities at 1%, thus validating the rejection of the linearity assumption. This clearly indicates that the time series is non-linearly dependent thus showing evidence of a chaotic behavior. The confirmation of a non-linear relationship between lending rate and private investment using the Nigerian data therefore raises the key question of what constitutes the inflexion point beyond which the lending rate becomes harmful to investment.

3.1.3 Threshold Analysis

Having established the non-linear relationship between lending rate and private investment, we proceeded with two methodologies. The first is the quadratic function employed by Younus and Akhteruzzaman (2012) to determine inflation threshold for Bangladesh while the second was proposed by Khan and Senhadji (2001) as applied by (Mehrrara and Karsalari, 2011) in the investigation of a threshold interest rate for private investment in developing economies.

(i) The quadratic function:

Based on the nonlinear graphical relationship between inflation and growth, Younus and Akhteruzzaman (2012) adopted a bivariate quadratic function to determine the inflation threshold for Bangladesh.

In the same manner, we estimated a bivariate model to determine the lending rate threshold for private investment. While it may be reasonable to argue for the inclusion of other plausible determinants of private domestic investment, this model included lending rate as its only determinant in line with the key objective of determining the threshold interest rate for private investment.

The quadratic equation is stated as:

$$\text{LGPD I} = C + \beta_1 \text{MLR} + \beta_2 \text{D(MLR)}^2 + U$$

Where

LGPD I = log of private domestic investment

MLR = Maximum lending rate

C = constant

U = error term

Based on the simple optimization rule, the first order differentiation is set to zero and the equation is solved to get the threshold lending rate.

(ii) The nonlinear approach by Khan and Senhadji

The second methodology followed an approach similar to the framework developed by Khan and Senhadji (2001) and applied by Fabayo and Ajilore (2006), Adeleke (2012) and Hayat (2011) in determining inflation threshold. All the models introduced dummy variables to capture the threshold of inflation rate on economic growth.

In particular, our study relied on the works of Mehrara and Karsalari, (2011) who also adopted the same framework in their cross-country determination of a nonlinear relationship between private investment and lending rate.

In our analysis, the dummy variable was included to capture the threshold of lending rate on domestic private investment, the basis for which the optimal lending threshold was deduced.

Other plausible determinants of private domestic investment were included in the model. These include exchange rate, inflation, GDP and public investment. The choice of these variables was based on empirical literature, investment theory and diagnostic analysis.

The threshold lending rate was estimated using the following equation:

$$LGPD|_{it} = \beta_1 + \beta_2 MLR (-1)_{it} + \beta_3 (MLR[-1]_{it}) D^*(MLR_{it} > \pi\alpha) + \beta_4 X_{it} + U_t$$

$$D(MLR_{it} > \pi\alpha) = \begin{cases} 1 & \text{if } MLR_{it} > \pi\alpha \\ 0 & \text{if } MLR_{it} < \pi\alpha \end{cases}$$

Where

$LGDP_{it}$ is the logarithm of Private domestic investment proxied by Gross Fixed Capital Formation;

B_1 is the fixed effect;

$MLR(-1)_{it}$ is the lagged value of maximum lending rate;

$\pi\alpha$ is the lending rate threshold;

$D^*(MLR_{it} > \pi\alpha)$ is a dummy variable that assumes a value of one for observed lending rate greater than $\pi\alpha$ and zero otherwise;

X_{it} is a vector of control variables which includes lagged values of interbank exchange rate ($EXCHR(-1)$) and inflation ($INF(-1)$) as well as log values of private domestic investment ($PUBINV(-1)$) and Gross Domestic Product ($LGDP$) while U_t is the error term.

The parameter “ $\pi\alpha$ ” represents the threshold lending rate whose relationship between lending rate and private investment is expressed as:

(i) B_2 measures the low lending rate;

(ii) B_3 measures the incremental effect of lending rate on investment when it is greater than the arbitrary lending rate, that is, high lending rate. In other words, B_3 indicates the difference in the effect of lending rate on investment between the two sides of the structural break.

By estimating regressions with different values of $\pi\alpha$, the optimal value of $\pi\alpha$ is ascertained by obtaining the value that minimizes the sum of squared residuals and maximizes the adjusted R^2 from the respective regressions. Lending rate at this threshold, impacts on private investment significantly. The values of $\pi\alpha$ were varied from 18% to 31%. This range was chosen because the observed maximum lending rates during the period (2000-2013) covered by the study remained within this band.

3.2 Data and its sources

The estimated model utilized quarterly time series data for the period 2000 to 2013 sourced from the Central Bank of Nigeria (CBN) Annual Report and Statement of

Accounts and Statistical Bulletin. Data on GDP, private domestic investment and public investment were computed using log transformation method. The log transformation helps in smoothing time trend in the dataset (Mubarik, 2005). Other variables such as maximum lending rates, treasury bill rates, deposit rates, inflation and exchange rate³ obtained in their rates needed no log transformation. They were rather lagged by one time period to incorporate feedback over time since the relationship between private domestic investment and these variables may not always be instantaneous.

³ For the analysis, both the interbank and official rates identified the same threshold lending rate. We however adopted the interbank rate in the model since it yields the highest R^2 and is the most accessible source by authorized dealers.

4.0 Empirical Analysis and Results

4.1 Results of Stationarity Test

We began the analysis by testing the unit roots of all the variables included in the model to determine their stationary levels. This test is necessary due to the non-stationary tendencies of most time series. The results are shown on Table 3.

Table 3: Levels of Integration of variables

VARIABLES	ADF TEST	PP TEST
	Order of Integration	Order of Integration
LGPDI	I(1)	I(1)
LGGDP	I(1)	I(1)
MLR(-1)	I(1)	I(1)
EXCHR(-1)	I(0)	I(1)
INF(-1)	I(1)	I(1)
TBR	I(1)	I(1)
DPR	I(0)	I(1)

According to the ADF test, all the variables (except exchange rate and deposit rate) were integrated of order one. However the Phillip Perron (PP) results showed that all the data series were found to be stationary after taking their first differences. Thus, based on the results in Table 3, we reject the null hypothesis and safely concluded that the variables are stationary. This implies that the variables are I (1) series, that is, integrated of order 1.

4.2 Factors Affecting Lending Rates in Nigeria

Empirical estimates of macroeconomic variables affecting lending rates are presented in Table 4 below.

Table 4: Estimates of the macroeconomic determinants of lending rates in Nigeria

Dependent variable: MLR

Variables	Coefficients	Standard Errors	t- statistics
Exchange rate (EXCHR)	0.187046*	0.037639	4.969523
Gross Domestic product (LOGGDP)	-0.910575*	1.519696	-0.599182
Inflation (INF)	0.071499	0.087031	0.821536
Savings Deposit Rate (SDR)	1.798551*	0.736655	2.441510
Treasury Bill Rate (TBR)	0.679829*	0.101953	6.668033
R ²	0.723371		
Adjusted R ²	0.693302		
F-statistic	24.05750*		
Durbin-Watson stat.	1.790403		

* denotes significance at 1%

The key regression statistics indicates that R² (72.3%) is high implying that the model has a satisfactory overall goodness of fit. It also implies that about 72% of the variation in lending rate is explained by the model. In addition, the Durbin Watson Statistic (1.8) implies the absence of autocorrelation in the residuals. The significance level of F-statistic suggests that the five independent variables jointly impact lending rate.

In terms of specific variables, the result showed a negative and significant relationship between GDP and lending rate. An increase of 1.0 per cent in GDP would lead to a 0.91 percent decrease in lending rate. This is contrary to the business cycle argument which states that as the economy expands, lending rates are expected to increase due to high demand for loans. However, the negative relationship shown by the result could be explained by banks' fear of loan default. As an import dependent economy with huge infrastructural deficit and substantial exposure to macroeconomic shocks, the probability of loan default remains high. This tends to exert upward pressure on lending rate to enable the banks compensate for the risk of default. This finding is similar to other works that

examined the determinants of interest rate spread in developing countries (Randall, 1998; Moore and Gragwell, 2000).

Apart from GDP, all other variables exhibited positive relationships with lending rates. Though inflation was insignificant, the result indicated that a 1.0 per cent increase in inflation would translate to a 0.07 percent increase in lending rate. High and volatile inflation tend to affect financial intermediation negatively due to its upward pressure on lending rate. The positive relationship between lending rate and treasury bill rate suggests that investment in government securities could create shortage of loanable funds and would in turn result in high lending rates to enable banks compensate for the high cost of funds. The positive relationship between lending rate and deposit rates could be attributed to the markup or premium which commercial banks usually set in order to maximize profit.

4.3 Co-integration Test: The Engle-Granger Two-Step Procedure

The Engle-Granger Two-Step Procedure for co-integration test was adopted to examine the extent of relationship between private domestic investment and each of the explanatory variables. If co-integration was confirmed between the variables, then it is possible to use the information on one variable to predict the other in the long run.

Given that the entire model as presented in Table 3, is integrated of order one $I(1)$, and that the study is a single equation model, we employed the Engle - Granger two step method.

Table 5: Engle - Granger Co-integration Test

	t-Statistics
Augumented Dickey-Fuller test statistics	-5.69*
Critical values (Engle-Granger):	
1% level	-5.28
5% level	-4.71
10% level	-4.43

* denotes significance at 1%

The results shows that the ADF test statistic in absolute term is greater than the critical values at 1%, 5% and 10% significant levels, it implies that the residuals are stationary. This means that there is a long run relationship between all the variables used in the private investment function, suggesting the convergence of long-term values of the variables without possibility of changes in their behaviors.

4.4 The Error Correction Model (ECM) Presentation

The Error Correction Model (ECM) was used to remedy any disequilibrium that existed previously in the model. The result of the error correction model obtained is presented in Table 6 below. A close examination of the results indicates that the error correction model has a high coefficient of determination of 92.0 per cent. The R-square indicates the proportion of change in the dependent variable that was attributable to the explanatory variables. According to the F-statistic, the overall model is statistically significant at both 1.0 and 5.0 per cent levels. The Error Correction Term (ECT) in the model indicates the speed of adjustment from short run equilibrium to the long run equilibrium state. The ECT (-1) has a value of -0.38 and is statistically significant at 1.0 per cent. This implies that the ECT corrects disequilibrium of the system at a speed of 38.0 per cent quarterly.

Table 6: Results of the Error Correction Model

Dependent variable: DLGPD

Variables	Coefficients	Standard Errors	t- statistics
C	-0.115260	0.190807	-0.604065
DMLR_1	-0.015666**	0.006543	-2.394220
DEXCHR_1	0.001791	0.006056	0.295649
DINF_1	-0.003445	0.005142	-0.669965
DLGDP	0.122946**	0.305164	0.402884
DLGPD1_1	1.028831*	0.045877	22.42580
ECT(-1)	-0.380971*	0.107007	-3.560223
R ²	0.924961		
Adjusted R ²	0.915382		
F-statistic	96.55747		
Durbin-Watson stat.	1.550521		

*denotes significance at 1%; ** denotes significance at 5%.

We disregarded the use of Durbin-Watson statistic in testing for serial correlation since the specified model contains lagged variables (Ramanathan, 1995). Instead, we employed the Breusch-Godfrey Lagrange Multiplier (LM) test, as presented in Table 7. The null hypothesis of LM test states that no serial correlation exists up to lag order 1. The decision rule is to accept H_0 if the probabilities of the F-statistic and the observed R^2 of the equation exceeds 0.05. Since the probabilities of both F-statistic (0.532) and the R^2 (0.391) are greater than 0.05, it implies the absence of serial autocorrelation. We therefore accept the null hypothesis that there is no serial correlation up to lag order 1 at the 95% level of confidence.

Table 7: Results Breusch-Godfrey Lagrange Multiplier Test for Serial Correlation

F-statistic	3.936727	Prob. F(1,46)	0.532
Obs*R-squared	4.257052	Prob. Chi-Square (1)	0.391

Furthermore, the results in Table 6 indicate that while both lending rate (MLR), and inflation (INF) exhibited negative relationship with private investment, only MLR was significant. Similarly, exchange rate (EXCHR), GDP and PDI showed positive relationship with private investment but only PDI_1 was found to be significant.

According to the coefficients, a 1% increase in MLR and INF, will bring about 1.5% and 0.3% decrease in private domestic investment respectively. Also, a 1% rise in exchange rate (EXCHR) and GDP could result in about 0.1% and 12.3% increase in private domestic investment respectively.

From the result, our variable of interest MLR indicates a negative and significant relationship with private domestic investment which agrees with economic theory that low interest rate reduces the cost of borrowing and attracts more funds for investment.

4.5 Estimated Results from the Determination of Threshold Lending Rate Model through the Quadratic Function

Following the work of Younus and Akhteruzzaman (2012), we employed the equation $LGPDI = C + \beta_1 MLR + \beta_2 MLR^2 + U$ to estimate the lending rate threshold.

To obtain the inverted -U shape, we expect $\beta_1 > 0$ and $\beta_2 < 0$.

Table 8, showed the results of the estimated optimal lending rate using the quadratic model.

Table 8: Estimates of the investment function with quadratic lending rate Dependent variable = LGPDI

Variable	Coefficient	Std. Error	t-Statistic
C	-3.361063	3.509054	-0.957826
MLR(-1)	0.889370*	0.296090	3.003717
MLR(-1) ^2	-0.020718*	0.006132	-3.378884
R ²	0.345358		
Adjusted R ²	0.320655		
F-statistic	13.98015		
Durbin-Watson stat	2.17		

*denotes significance at 1%

From the results above, the marginal effect of lending rate on private investment holding other factors constant, is

$$\partial(\text{LGPD I}) / \partial \text{MLR} = \beta_1 + 2\beta_2 \text{MLR}$$

The second order condition of investment maximization is also satisfied with respect to lending rate meaning that $(\partial^2 \text{LGPD I} / \partial \text{MLR}^2) < 0$, the inverted curve, that is, $(\partial^2 \text{LGPD I} / \partial \text{MLR}^2) = 2\beta_2 = 2(-0.020718) = -0.0414$

Solving for the threshold lending rate:

$$(\partial \text{LGPD I} / \partial \text{MLR}) 0.88937 / 2(0.020718) \text{MLR} = 0$$

$$\text{Or MLR} = 0.88937 / 0.041436$$

$$= \mathbf{21.463}$$

Consequently, the estimated quadratic equation for the sample data between 2000 and 2013 provided a threshold lending rate of 21.46%. This implies that the impact of the level of lending rate up to 21.46% on private domestic investment remains positive but any rise beyond this level tends to hurt investment.

4.6 Estimation of the Threshold Lending Rate using the Mehrara and Karsalari, (2011) Method

To determine the optimal lending rate that would maximize private sector growth, we conducted a series of regression equations and examined the effects of different lending rates along with other relevant variables as regressors on the private investment model. With the basic model, the expression $D(\pi_o - \pi_a)$ was iterated for different values of lending rates ranging between 18% and 31%. The choice of the range of 18-31% was based on the fact that the lowest lending rate during the period of study (2000-2013) was 18% while the highest was 31%.

The optimal threshold is the rate with the minimum Residual Sum of Square (RSS) and maximum R^2 . The results based on repeated iterations of the threshold model for the different values of expected lending rate threshold are presented on Table 9.

In general, the results of the regression statistics showed that RSS minimization occurs at the threshold of 21% where it recorded the lowest value of 2.146345. To further corroborate the result, the threshold lending rate of 21% also recorded the highest R^2 of 83.9% and a highest positive contribution to private domestic investment as indicated by a combined coefficient ($\beta_2 + \beta_3$) of 0.27.

This result suggests that the effects of lending rates as shown by the signs of the coefficients of the lending rates dummies maintain positive values between 18% and 21%. This implies that lending rates within this range impacts positively on private domestic investment. Conversely, the coefficients of lending rate dummy beyond 21% possess negative signs indicating that lending rates beyond 21% tend to be harmful to private domestic investment.

Table 9: Estimated long run coefficients for $\pi\alpha = 18\% - 31\%$

Dependent variable: PDI

Dummy Variables	Coefficients		Error sum of square	R^2
	$\pi\alpha$	MLR		
$\pi\alpha = 18$	0.123693	-0.042688	2.406923	0.8203
$\pi\alpha = 19$	0.038975	-0.042762	2.460070	0.8164
$\pi\alpha = 20$	0.265276	-0.059760	2.221527	0.8342
$\pi\alpha = 21$	0.330901	-0.058229	2.146345	0.8398
$\pi\alpha = 22$	-0.048583	-0.044150	2.458099	0.8165
$\pi\alpha = 23$	-0.057572	-0.031337	2.451329	0.8171
$\pi\alpha = 24$	-0.189653	-0.019815	2.367747	0.8233
$\pi\alpha = 25$	-0.058398	-0.042320	2.461909	0.8162
$\pi\alpha = 26$	-0.130563	-0.047846	2.445184	0.8175
$\pi\alpha = 27$	-0.145857	-0.030512	2.410006	0.8201
$\pi\alpha = 28$	-0.261539	-0.025418	2.256193	0.8316
$\pi\alpha = 29$	-0.011330	-0.037174	2.463942	0.8161
$\pi\alpha = 30$	-0.007680	-0.037972	2.464103	0.8160
$\pi\alpha = 31$	-0.377008	-0.025907	2.176060	0.8376

These results suggest that lending rate between 21% - 21.5% might be optimal for private investment growth. The policy implication of the findings is that permitting lending rates beyond 21.5% is likely to inhibit private domestic investment. The comparison of both estimated models (quadratic model and iterative model) showed a similar threshold level of lending rates with two close values. While the quadratic function estimated an optimal rate of 21.5%, the simulated model suggested 21% as the threshold lending rate.

It should be noted that the treasury bills rate of 10.0% establishes the floor lending rate since no financial institution would be ready to lend below the treasury bill rate. With the treasury bill rate of 10.0% (July, 2014), prime lending rate at 16.4%, deposit rate at 9.0%, and inflation rate at 8.3% the following optimum spreads apply:

- Optimum spread over risk free rate: **11.0 -11.5%**
- Spread over prime borrowers: **5.0%**
- Interest rate spread: **12.0 %**
- Real interest rate: **13.0 %**

Given an average inflation rate of 12.1% during the study period, the real lending rate (nominal lending rate less inflation) at the threshold level is about 8.9%. High infrastructural costs may, also, have been responsible for the seemingly high threshold level of lending rate.

5.0 Conclusion and Policy Implications

The paper investigated key macroeconomic factors affecting maximum lending rates and estimated threshold lending rate in Nigeria. The study employed quarterly data series covering 2000-2013 and adopted the OLS to estimate key determinants of maximum lending rate and applied the quadratic function and the iterative model for the threshold lending rate. Factors that significantly affected maximum lending rates in Nigeria include GDP, exchange rate, TB rate and deposit rate.

For the threshold analysis, this paper relied on the research works carried out by McKinnon (1973) and Shaw (1973) which suggested the likely positive effect of

interest rate on private investment particularly in developing economies. This argument connotes the existence of positive relationship between interest rate and private investment which is a contradiction of the traditional economic theory that expresses negative relationship between the two variables.

Results of the quadratic model estimated a threshold of 21.46% while the iterative threshold method identified 21% as the threshold lending rate. The foregoing analysis, therefore, suggests a threshold lending rate between 21% - 21.5% This implies that relatively low and positive real interest rates can induce savings and investment while excessively high interest rate beyond a certain threshold can be harmful to investment.

The policy implication of this study is the need for government to strengthen collaboration with financial institutions to put appropriate policies and strategies in place to reduce bank's lending rate. This could be achieved by exploring strategies that could reduce treasury bill rate, deposit rate and achieve stable exchange rate.

APPENDIX

Appendix1: Maturity structure of DMBs in Nigeria

Maturity structure of DMBs Deposit Liabilities (Per Cent)						
Tenor/Period	2007	2008	2009	2010	2011	2012
0-30 days	74.10	72.70	73.30	76.30	76.50	77.00
31-90 days	12.30	13.10	15.00	14.40	12.60	13.80
91-181 days	4.30	6.20	4.70	3.40	4.50	3.70
181-365 days	2.60	2.70	2.70	2.80	4.21	3.30
Short - term	93.30	94.80	95.70	96.90	97.77	97.80
Medium -term 1-3 yr	3.30	5.20	4.10	2.10	2.14	2.16
Long-term 3yr >	3.30	0.03	0.10	1.10	0.09	0.01
Total	100.00	100.00	100.00	100.00	100.00	100.00

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