

Basel Capital and Macroeconomic Growth in Nigeria

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Abstract: *The study analyses the effect of Basel Capital on macroeconomic growth in Nigeria. Time series data were obtained from the Central Bank of Nigeria Statistical Bulletin for the period 1986 to 2019. The econometric methods of the Autoregressive Distributed Lag was used to estimate the models while the Augmented Dickey Fuller was employed in testing the stationarity properties of the variables under study. The outcome of these estimations shows that the unit root was non stationary at levels but appears stationary at first difference. Hence, the series were integrated at order I(1). Other econometric tests of normality, autocorrelation and multicollinearity were carried out and the econometric tools of the autoregressive distributed lag and the granger causality test also were used for the test of hypotheses. The econometric results also show a positive and significant relationship between Basel Capital Accords and growth in credit to the private sector and small and medium enterprises. However, the Basel Capital measures do not granger cause credit growth to the private sector and small and medium enterprises. There is also a positive, but not significant relationship between Basel Capital and real gross domestic product. Basel Capital does not granger cause economic growth in Nigeria but economic growth granger cause Basel Capital at the 5% significance level. There is, however, a significantly negative relationship between bank capital and financial sector development in terms of the funding and liquidity of the economy. The results further show that 89%, 68%, 51%, 89% and 91% variations in macroeconomic growth variables are explained by changes in Basel Capital while the general fitness of the model so specified indicates that the relationship is significant at 5% level. The findings of the study in Nigeria support the theory of bank capital channel which postulates that monetary policy actions influences bank lending behaviour through its impact on bank equity. The study concludes that the pursuit of a stronger Basel Capital base in the banking system may produce mixed results for macroeconomic growth in Nigeria. It is recommended that the Basel Capital compliance should include capital conservation buffers and a counter-cyclical buffer as recommended in Basel III with a view to absorbing shocks from loan losses.*

Keywords: *Basel Capital, Macroeconomic Growth, Capital Conservation, Counter-Cyclical, Buffers.*

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I. Introduction

A well capitalized bank can be competitive, stable and solvent in the intermediation process such that it can engender higher economic growth. The banking system being the backbone of any economy, any problem generated within this system will have a significant consequence on the economy and welfare of its citizens (Canta, 2011). This is why banks decide whom to give loans thereby limiting credit extension to riskier borrowers (Freixas & Rochet, 2007). Accordingly, the lender-borrower relationship is important because some agents in the economy cannot efficiently allocate their resources without borrowing from a bank. Similarly, Holmstrom & Tirole (1997) and Kiyotaki & Moore (1997), pointed out that banks tend to amplify business cycle volatility by increasing credits in booms and restricting loans in recessions. Thus, it is agreed that credit business cycle volatility and financial market frictions could harm economic growth by introducing uncertainty and credit rationing, reducing investments and capital formation (Bencivenga & Smith, 1993). The issue of reducing credit supply as well as decreasing credit demand by raising lending rates which may slow down economic growth as result of banks facing higher capital requirements is still under debate in the academia. However, previous studies have focused on investigating the indirect effects of capital requirements on credit supply, bank asset risk, and cost of bank capital, which in turn can affect economic growth (Martynova, 2015). But the issue of investigating the direct effect between capital requirement and economic performance limited literature in Nigeria; therefore this study is novel to unravel the real effect as well as bridging the knowledge gap in literature in Nigeria.

1.1 Statement of the Problem

The global wave of financial deregulation in the last three decades occasioned by the global financial crisis which pulled down many banks and exposed multiple weaknesses in regulation and banking structures,

fostered an interest in the Basel Committee on Banking Supervision agreeing to new rules on the minimum level (capital ratio) and composite structure of Banks capital and examining the relationship between financial development and real sector performance. While the deregulation largely shifted the ownership of the financial sector from the government to the private sector, the onus of the government regulation and supervision also increased simultaneously. This encouraged regulatory authorities to adopt the capital regulation measures.

Traditional monetary theory has largely ignored the role of bank equity, bank centering accounts of how monetary policy affects the real economy usually focused on the role of reserves in determining the volume of demand deposits. However, the bank lending channel thesis maintained that monetary policy actions can also alter the supply of bank loans by changing bank reserves. While reserve requirements play a central role in these theories, bank capital and capital regulations were at best discussed as an afterthought. This study constitutes an attempt to fill this gap by taking the risk-based capital requirements of the Basel Accord explicitly into account. It provides a framework for analyzing the consequences of these regulations for bank lending and the response of lending to monetary policy actions in a dynamic setting.

In the academic literature, there has been debate on the role of bank capital in bank lending and the transmission mechanism. The traditional monetary school believes that bank reserves play critical role in determining the volume of bank lending in particular and the performance of economy in general, the bank lending channel thesis maintains that monetary policy actions can largely alter the supply of bank loans by changing bank reserves. Since the introduction of Basel Capital Accords by the Basel Committee on Banking Supervision (BCBS) in 1988, several studies in developed economies, have established that there is a link between bank capital, bank lending and macroeconomic growth such that bank capital acts as an automatic amplifier for improving macroeconomic activities in an economy. (Blum & Hellwig (1995); Blum, (1999); Woo, (2003); Van den Heuvel, (2009); Albertazzi & Marchetti, (2010); Brun, Henri, & David, (2013); Kapan & Minoiu, (2013); Klaus & Philip, (2013); Buch & Prieto, (2014); Koch & Macdonald, (2015); and Jose, Santiago, Ana, & Camilo, (2017)).

To the best of our knowledge, there is limited literature on the study in Nigeria especially after the 2007-2009 global financial crisis. Although most banks in Nigeria are Basel II compliant, the Central Bank of Nigeria stress tests have been limited to the microprudential, rather than the macroprudential framework; therefore this study is novel to unravel the real effect as well as bridging the knowledge gap in literature in Nigeria.

1.2 Research Objective of the Study

The main objective of the study is to examine the effect of Basel capital on macroeconomic growth in Nigeria. More specifically, the study was to:

1. Determine the relationship between Basel capital and credit to core private sector.
2. Investigate the relationship between Basel capital and credit to Small and Medium Enterprises.
3. Examine the relationship between Basel capital and Real Gross Domestic Product.
4. Evaluate the relationship between Basel capital and funding of the economy.
5. Access the relationship between Basel capital and liquidity of the economy.

1.3 Research Hypotheses

The study tested the hypotheses below stated in the null form

H0₁: There is no significant relationship between Basel capital and credit to core private sector.

H0₂: There is no significant relationship between Basel capital and credit to Small Medium Enterprises.

H0₃: There is no significant relationship between Basel capital and Real Gross Domestic Product.

H0₄: There is no significant relationship between Basel capital and Funding of the Economy.

H0₅: There is no significant relationship between Basel capital and Liquidity in the Economy.

1.4 Significance of the Study

This study is important to policy makers, managers of the economy, the academia and researchers and all stake holders in Nigerian banking business. By analyzing the effects of Basel Capital on macroeconomic growth in Nigeria, it will provide a guide on how to boost vital sectors of the economy by way of provision of credits. Also this study in Nigeria will form a foundation for further studies. The study underscores an important guiding principle to the monetary authority(s) in Nigeria as it calls for adequate attention or policy redirection in favour of macroeconomic and monetary stability. Furthermore, the conceptual and empirical body of literature of this study will be an addition to other works relating to Basel capital, Basel capital channel, monetary transmission mechanism, macroeconomic growth variables etc.

1.5 Scope of the Study

The scope of this study is on Basel capital and macroeconomic growth in Nigeria. The specific context of interest was the effect of Basel capital channel in the banking industry in Nigeria with reference to how the macroeconomic variables react to the risk based capital requirements in Nigeria. This study covers the period 1986 to 2019.

1.6 Limitations of the Study

The primary limitation of the study is that of availability of data that have not been much to analyze the effects of Basel Capital on macroeconomic growth in Nigeria for a wider range of time. However, the published Central Bank of Nigeria and Nigerian Stock Exchange Fact Sheet data on this issue for the period 1986 to 2019 is used.

II. Conceptual Review and Framework

2.1 The Evolving of Basel Accord

The business of banking involves taking and managing risks. Lending, for example, involves the risk that the borrower will not pay back the loan as promised, and paying a fixed rate of interest on term deposits involves the risk that rates will drop, leaving the bank earning less on its investments than it is paying out on deposits. Risk is not unique to banking, of course; all types of companies engaged in international activities, for example, face the risk of unfavorable movements in exchange rates. But changes in banking and financial markets have increased the complexity of banking risks. And the position of banks in modern economies has made the management of banking risks ever more important to financial stability and economic growth.(Ferguson, 2003).

Because of banks' multiple functions, the great degree of leverage they employ in carrying out their economic role, and their access to the safety net, society has a keen interest in the health and wellbeing of the banking system. The level of government regulation and supervision, unique to insured depository institutions, has evolved over the years. As part of the supervisory process, examiners have routinely evaluated the overall health of the institution as well as its risk-management capabilities. In the process, they have also assessed bank loan port-folios and

later, coordinated international efforts led to the more elaborate, though still relatively simple, Basel Capital Accord, which sets forth a framework for capital adequacy standards for large, internationally active banks and serves as the basis for the risk-based capital adequacy standards currently in place for all U.S. banks and bank holding companies. Now proposals are being considered to refine the current framework to take account of changes in banking and the banking system over the fifteen years since the Basel Capital Accord was adopted. (Ferguson, 2003).

2.2 The Basel Accords

The Basel Accords, in particular, are recommended banking regulations that put emphasis on capital measurement system (BCBS, 2009). The basic principle in the Basel rules are that banks should have capital sufficient to cover for the risks they take (Cao, 2011). Differently put, the Basel accords is a set of recommendations for regulation in the banking industry.

2.2.1. Basel I(Minimum capital Requirement)

Basel I is the first Basel accord, issued in 1988. It initially focused on credit risk, but was subsequently refined to incorporate market risk. Basel I accord introduced the first bank capital requirements as discussed below:

1. **Tier 1 Capital**, also called core capital, which includes common shareholders' equity, disclosed reserves or retained earnings, and may also include non-redeemable and non-cumulative preferred stock;
2. **Tier 2 Capital**, also called supplementary capital, which includes undisclosed reserves, revaluation reserves, general provisions and general loan-loss reserves, hybrid debt capital instruments, and subordinated term debt.

3. **Risk Weighted Assets (RWA)**, which is a weighted sum of different categories of asset or off balance sheet exposure of a bank, where weights are assigned according to broad categories or relative riskiness.

Basel I required banks to hold a core capital ratio (Tier 1 Capital-to-RWA) of at least 4%, and a total capital (Tier 1 + Tier 2) Capital to RWA) of at least 8%. The supplementary capital was also limited to 100% of core capital.(BCBS, 2010).

2.2.1.2 Weakness of Basel I

The main shortcomings of Basel I are its missing risk sensitivity, non-inclusion of operational risk, not risk sensitive, no consideration for creditworthiness/diversification, vulnerable to capital arbitrage, lack of flexibility, simple structure, huge gap between regulatory requirements and today's risk management

techniques. One size fits all, no needs and incentives for active regulatory capital management, no incentive for improvements in risk management.(BCBS, 2010).

Table 1: Basel I Bank Capital Regulation

Bank Capital Regulation	Minimum Requirement
Components	
Core capital (Tier 1)	≥ 4% of Risk Weighted Assets
Supplementary capital (Tier 2)	≤ of 100% of Tier 1
Total capital (Tier 1 + Tier 2)	≥ 8% of Risk Weighted Assets

Source: BIS (BCBS) Report (2010)

NOTE: *Capital ratio is left unchanged and it still has to be at least 8%.*

2.2.2 Basel II (The New Capital Framework)

Basel II took into account the weakness of Basel I by incorporating the operational risk and improving the way regulatory capital requirements reflect underlying risks and to address better the financial innovation that occurred in order to reward and encourage continual improvements in risk measurement and control.

2.2.2.1 Pillars of Basel II

Basel II had underlying pillars to assist in the realization of the new capital framework which were pillar 1, 2, and 3.

2.2.2.1.1 Pillar 1

According to the first pillar of Basel II, the minimum capital requirement remains at 8% of risk adjusted assets but that the calculation procedures used in establishing the risk weights have to include credit, market and operational risks with more refined methods being applied to calculate credit risk and explicit measures added to estimate operational risk, however, the methodology to estimate market risk exposure remains the same. Pillar 1 addressed minimum capital requirements, the rules by which a bank calculates its capital ratio and its supervisor assesses whether it is in compliance with the minimum capital threshold. The concept of the capital ratio would remain unchanged. As under Basel I, the numerator of the ratio would be an amount representing the capital available to the bank (its regulatory capital) and the denominator would be an amount representing the risks faced by the bank (its risk weighted assets). As proposed, the minimum required capital ratio (8 percent) and the definition of regulatory capital (certain equity, reserves, and subordinated debt) would not change from Basel I.

2.2.2.1.2 Pillar 2

The second pillar has to do with the supervisory review process geared towards ensuring sound capital management and comprehensive assessment of the risks and the capital adequacy requirements of banking institutions.

The Pillar 2 addressed supervisory oversight. It encompasses the concept that well managed banks should seek to go beyond simple compliance with minimum capital requirements and perform for themselves a comprehensive assessment of whether they have sufficient capital to support their own individual risk profile. It also promotes the notion that supervisors, on the basis of their knowledge of industry practices at a range of institutions, should provide constructive feedback to bank management on their internal assessments. To promote better risk management, pillar two has outlined more specific bank supervision key principles to include:

1. Each bank should assess its internal capital adequacy in light of its risk profile.
2. Supervisors should review internal assessments.
3. Banks should hold capital above regulatory minimum.
4. Supervisors should intervene at an early stage.

Furthermore some specific issues have been addressed under the supervisory process of pillar two, namely: (1) Interest rate (2) Credit risk (3) Market risk (4) Operational risk.

Other aspects of Pillar 2 include: Supervisory transparency and Enhanced cross-border communication and cooperation. (BCBS, 2010).

2.2.2.1.3 Pillar 3

The third pillar aims at instilling market discipline through transparency of banks publicly disclosing key information regarding their risk exposures and capital positions. The Pillar 3 seeks to complement these activities with stronger market discipline by requiring banks to publicly disclose key information that enables market participants to assess an individual bank's risk profile and level of capitalization. This pillar is seen as particularly important because some banks under Basel II would be allowed to rely more heavily on internal methods for determining risk, giving them greater discretion in determining their capital needs. The issues considered by this pillar includes: (i) Disclosure requirements, (ii) Guiding appropriate disclosure and (iii) Interaction with accounting disclosures. (BCBS, 2010).

2.2.3 Basel III: Capital Buffer and Countercyclical

Basel III is a comprehensive set of reform measures developed by the Basel Committee on Banking Supervision (BCBS) to strengthen the regulation, supervision and risk of the banking sector. Furthermore it aimed at improving the banking sector's ability to absorb shocks arising from financial and economic stress, improve risk management, corporate governance and strengthen bank's transparency and disclosures. These reforms are targeted at Bank level or micro prudential regulation which will help raise the resilience of individual banking institutions from period of stress and macro prudential system wide risks that can build up across the banking sector as well as the pro cyclical amplification of those risks over time. (BCBS, 2010)

Table 2: Summary of the Proposed Basel III Regulation.

Bank Capital Regulation	
Components	Minimum Requirement
Core Capital (Tier 1)	$\geq 6\%$ of RWA
of which Common Equity Tier 1	$\geq 4.5\%$ of RWA
Total Capital (Tier 1+ Tier 2)	$\geq 8\%$ of RWA
Capital Conservation Buffer	
Common Equity Tier 1	Additional 2.5% of RWA
Counter-cyclical Buffer	
Common Equity Tier 1	Additional 2.5% of RWA

Source: BIS (BCBS) Report 2010

2.2.4 Basel III Implementation Timeline

The Basel Committee introduced transitional arrangements to implement the new standards. This is to ensure that the banking sector can meet the higher capital requirement through reasonable earnings, retention and raising of capital while still supporting lending to the economy. The transitional arrangements are summarized in the table below.

Table 3: Basel III Implementation Timeline for 2011 - 2014

	2011	2012	2013	2014
Minimum Common Equity	2.0%	2.0%	3.5%	4.0%
Capital Ratio Capital	0%	0%	0%	0%
Conservation Buffer Minimum	2.0%	2.0%	3.5%	4.0%
Common Equity Plus Capital Conservation Buffer				
Phase-in of	0%	0%	0%	2.0%
Minimum	4.0%	4.0%	4.5%	5.5%
Tier 1 Capital Minimum	8.0%	8.0%	8.0%	8.0%
Total Capital Minimum	8.0%	8.0%	8.0%	8.0%
Total Capital Plus Capital Conservation Buffer				

Source: BIS BCBS Report (2010)

Table 4: Basel III Implementation Timeline for 2015 - 2019

	2015	2016	2017	2018	2019
Minimum Common Equity	4.5%	4.5%	4.5%	4.5%	4.5%
Capital Ratio Capital	0%	0.625%	1.25%	1.875%	2.5%
Conservation Buffer					
Minimum Common Equity	4.5%	5.125%	5.75%	6.375%	7.0%
Plus Capital Conservation Buffer					
Phase-in of	40%	60%	80%	100%	100%
Deductions					
Minimum Tier 1Capital	6.0%	6.0%	6.0%	6.0%	6.0%
Minimum Total Capital	8.0%	8.0%	8.0%	8.0%	8.0%
Minimum Total Capital	8.0%	8.25%	9.25%	9.875%	10.5%
Plus					
Capital Conservation Buffer					

Source: BIS BCBS

2.2.5 Basel Accords Implementation in Nigeria

Following the underlying rationale behind the introduction of Basel III requirements on the global scene, the apex regulatory authority of the Nigeria banking industry (CBN) replaced the 10-year old Universal banking model and now requires banks to operate massively as either Regional, National, or International banks with varying capital base of 10, 25 and 50 billion naira respectively. The monoclones include: merchant banking, specialized banking such as micro-finance, mortgage, non-interest banking and development finance banks. An 18-month transition timeline has been set for banks to transit to this new model. The country continues its Basel II implementation with most progress having only been made with Pillar 1 i.e. on minimum capital requirement and risk management. With a **10% minimum regulatory capital requirement**, most of the banks are still relatively well capitalized with over 90% of their Tier 1 being equity since 2009. These efforts are set towards evolving a more resilient and stable banking system in Nigeria and the recent CBN/NDIC's expression of interest to employ a Consultant to plan a road map for Basel II and III implementation is a sign of the beginning of the Nigeria's financial regulator's policy of adopting Basel III into the national regulatory framework (Agbaeze & Onwuka, 2014). How soon this may commence is much awaited as little is seen to be done. However, the likely implications of the new accord for Nigerian banking system will include:

1. The burden of controlling banks internal risk assessment under Pillar 11 of the new accord is placed on expanded and active supervision. For Nigeria to adopt the new proposal, the CBN is expected to build up its expertise substantially in both qualitative and quantitative terms.
2. Substantial quantity of data is required for banking organizations under Basel II. The BIS require banks to store a comprehensive database of operational loss incidents, financial instruments, credit losses and general ledger data to produce a measure of Risk Weighted Assets. The advance internal rating base approach requires a seven years of default data if they are to calculate pillar 1 capital.
3. A formidable challenge for both banks and regulators is the cost of setting up an appropriate Basel II complaint risk control system. The concept of internal rating system still new to Nigerian banks and therefore likely that the adoption of advanced internal rating base will require huge cost outlay. As the issue of cost effectiveness cannot be ignored, balancing of the costs and benefits of its adoption is essential.
4. The internal rating base approach precludes less developed banks having less capital and this has the implication of competitive position of less and well developed banks.
5. Low ratings from external rating agencies due to the high risk profile of Nigerian sovereign (external) debt resulting from huge debt overhang.
6. The incentive to move to more advanced approaches in the structure of the New Accord notwithstanding, the standardized approach will be used by most banks in Nigeria for some years before they could reach the level of sophistication in risk management envisaged by the New Accord. To attain this more rating agencies have to be established to specialize in assessing local companies and banks. (Olajide, 2013).

2.2.6 Basel III and the Macro-economy

The building blocks of Basel III are: (1) higher quality and level of capital, (2) widened risk coverage, (3) prevention of excessive leverage, (4) stronger liquidity, (5) addressing of systemic risk, and (6) higher standards for risk management and supervision.(BCBS, 2010b).These are expected to enhance capital and liquidity regulations of the banking system and therefore reduce the intensity and frequency of financial crisis. Given that output losses from financial crisis can be substantial, as what past crisis episodes have shown, Cao (2011) then, the primary benefit that can be derived from the new framework is the mitigation of adverse macroeconomic effects in terms of foregone output.

Based on several studies reviewed by the Macroeconomic Assessment Group of the Bank for International Settlements (MAG 2011), the cost of a crisis is 19% of pre-crisis GDP if effect of a crisis is temporary while the average probability of a systemic crisis is 4.5% per year for any given country. This is based on the survey of BCBS (2010a) of two articles, namely, Reinhart & Rogoff (2009) and Laeven & Valencia(2008). Both studies were published prior to the failure of Lehman. Countries covered in the study include Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Korea, Luxemburg, Mexico, Netherlands, Russia, Saudia Arabia, South Africa, Sweden, Switzerland, Turkey, United Kingdom and the United States.

Apart from the benefit of reducing the probability of a crisis, Angeline et al. (2011a) argue that tighter regulatory standards may also lead to smaller output fluctuations and, hence, higher welfare even in the absence of banking crises. Based on the various models estimated by Angeline et al. (2011a), a one percentage point increase in the capital to asset ratio reduces the standard deviation of output by 1.0 percent on average. Meanwhile, Angeline et al. (2011b) estimate that a 1% increase in capital reduces output variability in the range of 0.3-2.7% relative to baseline.

Despite the benefits, higher capital requirements also come with costs. In banks' attempt to meet the requirements, they may use a combination of strategies that may have adverse impact on aggregate macroeconomic activity.

According to MAG (2010a), banks choices may in part depend on the length of time over which capital needs to be increased. A longer implementation period will give banks more flexibility as regards the mechanisms they can use to achieve targets. Thus, if Basel III is implemented over longer periods, output effects are expected to be smaller than if implemented over shorter periods. The choice of strategy may likewise depend on the existing capital ratios banks have and the distance from the target. In addition, Cosimano & Hakura (2011) confirm that banks' responses to higher capital requirements will vary considerably from one economy to another, reflecting cross-country variations in the tightness of capital constraints, banks' net cost of raising equity, and elasticities of loan demand with respect to changes in loan rates.

Though the estimated effects of Basel III on GDP differ across studies, the consistent message is that higher capital and liquidity standards have both benefits and costs. Benefits come in the form of reduced crisis probability and output loss or variability, while costs come in the form of reduced GDP relative to baseline.

2.3 Theoretical Thoughts and Empirical Review

2.3.1 Theory of Bank Capital Channel

Accordingly, this theory postulate that monetary policy actions influence bank lending behavior, through its impact on bank equity capital. These monetary policy actions can lead to a change in the financial position of the banking sector, thereby changing the preferences of its shareholder (Markovic, 2006). When bank equity capital is sufficiently low, because of loan losses or some other adverse shocks, the bank will reduce lending because of the capital requirement and the cost of issuing new equity. Even when the capital requirement is not currently binding, the model shows that a low capitalized bank may optimally forgo profitable lending opportunities now to lower the risk of future capital inadequacy. Furthermore, the theory reports that there exist at least two distinct ways in which the level of bank capital may alter the impact of monetary shocks on bank lending and these are through the traditional bank lending channel and the direct mechanism that is known as bank capital channel.

2.3.2 Modigliani-Miller Irrelevance Theory

Modigliani-Miller argued that in the world of perfect capital markets, bank lending decisions are independent of banks institution capital structure, since the bank will always be able to find investors willing to fund viable lending opportunities; the level of bank capital is irrelevant to lending and also to the monetary policy transmission mechanism. (Hubbard, Kuttner & Palia, 2006). This theory or logic of Modigliani and Miller existed as bank's lending depends on its capital structure as well as on lending opportunities and market interest rates. When equity is sufficiently low, because of loan losses or some other adverse shock, the bank will reduce lending because of the capital requirement is not currently binding, the mode shows that a low capitalized bank may optimally forgo profitable lending opportunities now to lower the risk of future capital inadequacy (Chami & Cosimano, 2001, and Meh & Kevin, 2010). Another important attribute of the model is the maturity transformation performed by banks, exposing them to interest rate risk. The result of this is that a monetary tightening, by increasing the short term interest rate, lowers bank profits. Unless the bank can decrease dividends substantially, this will resist over time or cover bank capital given the failure of the Modigliani and Miller logic, less lending. Thus monetary policy affects the supply of bank loans through its effect on bank equity. This dynamic effect of the bank capital channel-amplifies the standard interest rate channel of monetary policy.

2.3.3 Capital Regulation and Risk taking Behavior of Banks in Nigeria

Several scholars have documented that the function of bank capital is to reduce bank risk (Berger, Richard, & Giorgio, 1995; Peeks & Rosengreen, 1995; Altman & Saunders, 2002; Adewumi, 1997 and Koch & Macdonald, 2015). A bank that is adequately capitalized can reduce bank risk in the following ways:

1. By providing a cushion to absorb bank losses. In this regard, losses occasioned by bad loans, poor securities investment, criminal and management misjudgment are cushioned which allows the banks to continue in its operations and in the process the said losses are either corrected or recovered. The bank's capital is said to be the last resort against failures.
2. By building depositors and general public confidence on the banks institutions and creditors reassurance by adequate capital (Adewumi, 1997).
3. Adequate capital serves as a regulator of bank's growth. Peek & Rosengreen (1995) found that hundreds of smaller banks with weak capital base went under through mergers because of burgeoning growth in large business loans, which could only be made by banks with stronger or adequate capital base.
4. The Nigerian banking laws however stipulates that the maximum loan that can be given to a single borrower must not be more than 20% of the shareholders' funds unimpaired by losses. Also banks that fail to maintain the required minimum capital ratios are prohibited from advertising for or accepting new deposits, granting of credit, making investment and paying cash dividend to shareholders.

Furthermore, it is expedient to say that the bank capital channel plays a critical role in its lending behavior. Banks with higher level of capital are in a better position to absorb shock, losses and repay deposit in a timely manner (Bhatta, 2015). Admati et al, (2010), asserted that the role of bank equity became highly recognized after the 2008 financial crises. The crises have apparently strengthened the fact that highly leveraged banks do not create negative externalities. The works of Peek & Rosengren, (1997) and Woo, (2003) based in Japan investigated whether negative shocks to capital induced in the above countries banks restricts lending. The studies provide evidence that negative shocks to bank capital leads to significant decline in lending. Similarly, there has been a debate in literature as to whether stifling of bank capital would lead to a contraction of bank loans supply during recession. It was found that during recession, bank loans supply was contracted due to stifling of capital. Using different methodologies various scholars have shown that loan growth at individual banks was positively related to the initial capital ratio (Bernanke & Lown, 1991). Furthermore they argued that capital-unconstrained banks could react to negative shocks to capital by increasing deposit taking. When banks are not capital constrained there is an expectation of negative linkage between shocks to capital and deposit taking. On the contrary they document a positive link between shocks to capital and the dynamics of deposit. Berger & Udell (1994) conclude that expansion of loan was lower for less capitalized banks but do not detect the sensitivity of loan expansion to capital ratio during recession and favors the hypothesis that capital crunch adversely affects loans expansion during the 1990s.

III. Methodology

3.1 Data

The data are secondary in nature and time series obtained from the publications of the Central Bank of Nigeria statistical bulletin 2019 and Nigeria Stock Exchange Fact Sheet for the period of 1986 to 2019 on bank credits to the private sector (CPS) and credit to small and medium enterprises (CSM) as proxies for banks lending behavior being the dependent variables of the study while the independent variables are the measures of Basel Capital ($BASi$, $BASii$, $BASiii$).

3.2 Model Specification

Following the previous works of Pesaran & Shin (1996), Canta (2011) and Aliero et al.(2013), we assume that the effect of Basel capital channel on macroeconomic variables in Nigeria can be modeled using five sets of models as follows:

$$CPS = f(BASi, BASii, BASiii) \tag{1}$$

To have the estimable version of above equation, equation (1) can be rewritten to have

$$CPS = \beta_0 + \beta_1BASi + \beta_2BASii + \beta_3BASiii + U \tag{2}$$

Where: CPS = Credit to Private Sector

$BASi$ = Basel I Capital (Tier 1 + Tier 2).

$BASii$ = Basel II Capital (Total capital requirement).

$BASiii$ = Basel III Capital Conservation Buffer (CSB) + Counter-Cyclical Buffer (CCB)

U = Error term

$$CSM = f(BASi, BASii, BASiii) \tag{3}$$

We can rewrite equation 3 to have

$$CSM = \beta_0 + \beta_1BASi + \beta_2BASii + \beta_3BASiii + U \tag{4}$$

Where:

CSM = Credit to Small and Medium Enterprises

BASi = Basel I Capital (Tier 1 + Tier 2).

BASii = Basel II Capital (Total capital requirement).

BASiii = Basel III Capital Conservation Buffer (CSB) + Counter-Cyclical Buffer (CCB).

U = Error term

IV. Results and Discussions

4.1 Unit Root Test

Table 1 Unit Root Test for Measures of Basel Capital

	D(BASi)	D(BASii)	D(BASiii)
ADF Statistics	-7.587722	-6.903685	-6.284499
1%	-3.679322	-3.679322	-3.679322
5%	-2.967767	-2.967767	-2.967767
10%	-2.622989	-2.622989	-2.622989
Probability	0.0000	0.0000	0.0000

Source: E-view 9.0 Output

The study conducted stationary test for the Basel capital channel variables using the Augmented Dickey Fuller (ADF) unit root test. The results are summarized and presented in table 1 for each of the variables studied. From the above table it is obvious that the three variables were non stationary at levels but appears stationary at first difference. Hence, the series are all integrated of order 1(1). This is evidence by the fact that the absolute values of the ADF test statistics are all greater than the MacKinnon critical values at 1%, 5%, and 10% level significance and thus the respective null hypotheses of non-stationary are rejected, implying the absence of unit root among the variables.

Table 2 Unit Root Test for Selected Macroeconomic Variables in Nigeria

	D(CPS)	D(SME)	D(RGDP)	D(FDI1)	D(FDI11)
ADF Statistics	-3.742833	-6.747184	-7.494608	-3.997403	-3.820481
1%	-3.679322	-3.679322	-3.679322	-3.679322	-3.679322
5%	-2.967769	-2.967767	-2.967767	-2.967767	-2.967767
10%	-2.622989	-2.622989	-2.622989	-2.622989	-2.622989
Probability	0.0086	0.0000	0.0000	0.0046	0.0071

Source: E-view 9.0 Output

The study conducted stationary test for the selected macroeconomic variables using the Augmented Dickey Fuller (ADF) unit root test. The results are summarized and presented in table 3 for each of the variables studied. From the above table it is obvious that all the selected macroeconomic variables were non stationary at levels but appears stationary at first difference. Hence, the series are all integrated of order 1(1). This is evidence by the fact that the absolute values of the ADF test statistics are all greater than the MacKinnon critical values at 1%, 5%, and 10% level significance and thus the respective null hypotheses of non-stationary are rejected, implying the absence of unit root among the variables.

4.2 Relationship between Basel Capital and Bank Lending Behavior

Table 3 Autoregressive Distributed Lag (ARDL) Results for Basel Capital and CPS

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
CPS(-1)	0.478330	0.351294	1.361621	0.2006
CPS(-2)	-0.417282	0.492191	-0.847805	0.4146
CPS(-3)	-0.036859	0.509674	-0.072319	0.9436
CPS(-4)	0.898983	0.473097	1.900208	0.0839
BASi	0.104338	1.488245	0.070108	0.9454
BASii	3.548238	1.753683	2.023306	0.0080
BASii(-1)	3.609792	3.081279	1.171524	0.0261
BASii(-2)	-6.290792	1.931521	-3.256912	0.0076
BASii(-3)	0.618392	2.611562	0.236790	0.8172
BASii(-4)	3.136528	2.311307	1.357036	0.2020

BASiii	-0.984963	0.339355	-2.902456	0.0144
BASiii(-1)	-0.787566	0.456055	-1.726910	0.1121
BASiii(-2)	-0.442777	0.253565	-1.746204	0.1086
BASiii(-3)	-0.724596	0.311443	-2.326576	0.0401
BASiii(-4)	-1.217085	0.304761	-3.993579	0.0021
C	11.60274	12.00310	0.966646	0.3545
R-squared	0.893054	Mean dependent var		12.97778
Adjusted R-squared	0.747219	S.D. dependent var		7.771859
S.E. of regression	3.907481	Akaike info criterion		5.850907
Sum squared resid	167.9525	Schwarz criterion		6.618810
Log likelihood	-62.98724	Hannan-Quinn criter.		6.079245
F-statistic	6.123729	Durbin-Watson stat		1.889550
Prob(F-statistic)	0.002206			

*Note: p-values and any subsequent tests do not account for model selection

Source: E-view 9.0 output

The ARDL results in table 3 above captures model 1 of this study. Both the global statistic and the diagnostic test indicated that the utility, forecasting and predictive power of the model as specified was very high. We can thus rely on the relative results to make inferences on the relationship between the variables under study. A cursory look at table 4 above shows that Basel I capital (BASi) is positively related to growth in credit to the private sector (CPS) at a coefficient of 0.1043 but statistically insignificant at 5% level of significance at a probability of 0.9454. This means that 1.1 increments in the provision of Basel I capital will lead to 12.1043 increases in CPS. On the other hand, Basel II capital (BASii) relates positively with the growth in credit to the private sector though not significant in the current period at 5% level. This is demonstrated with the coefficient of 3.5482 at a probability of 0.0080. Though this significant at 10%, it is not accepted as our significance level. However, it turned negative and statistically significant at 5% with a coefficient of -6.2908 and probability of 0.0076 when lagged in the second period. Also Basel III capital (BASiii) is statistically significant at 5% level but with a negative probability and coefficient of (-0.9850 and 0.0144) for the current period, (-0.7246 and 0.0401) for the third period and -1.2171 and 0.0021 for the fourth period respectively when lagged. In addition, the coefficient of determination (R^2) of 0.89 in Table 4 shows that 89 percent of variation in growth of credit to the private sector is explained by changes in Basel capital. This relationship is significant at the 5% level since the F-statistic of 6.1237 falls outside the critical region of ± 0.0022 . Hence we reject the H_0 , and accept the alternate.

Table 4 Pairwise Granger Causality Tests for Basel Capital and CPS

Null Hypothesis:	Obs	F-Statistic	Prob.
BASi does not Granger Cause CPS	29	0.28778	0.7525
CPS does not Granger Cause BASi		0.43405	0.6529
BASii does not Granger Cause CPS	29	1.06422	0.0007
CPS does not Granger Cause BASii		0.21290	0.8097
BASiii does not Granger Cause CPS	29	0.10279	0.9027
CPS does not Granger Cause BASiii		0.12265	0.8851
BASii does not Granger Cause BASi	29	0.57833	0.5685
BASi does not Granger Cause BASii		0.93912	0.4049
BASiii does not Granger Cause BASi	29	0.08027	0.9231
BASi does not Granger Cause BASiii		0.70820	0.5025
BASiii does not Granger Cause BASii	29	0.86320	0.4345
BASii does not Granger Cause BASiii		1.05049	0.3653

Source: E-view 9.0 Output

The results in table 4 shows that a F-statistics of 0.2878 and 0.1028 at 5% level of significance, for Basel I (BASi) and (0.2878 and 0.1028) for Basel III (BASiii) capital. Similarly they record a probability of 0.7525 and 0.9027 for both Basel I and III. This is indication that Basel I and Basel III capital does not cause growth in credit to the private sector (CPS) as there probability is above the stipulated 5% significance level. However, it was also observed from results that causality runs unidirectional from Basel II capital (BASii) to growth in credit to the private sector as shown by the F-statistic and probability of 1.0642 and 0.0007 respectively. This implies that an enhancement in Basel II capital (BASii) will trigger up growth in credit to private sector. Further, it suggests that as banks continue to comply with the provision of Basel II capital, growth in credit to the private sector will be raised as well.

Table 5 Autoregressive Distributed Lag Results for Basel Capital and Credit to SMEs

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SME	0.943866	0.168145	5.613400	0.0000
BASi	-4.604238	1.572343	-2.928266	0.0076
BASi(-1)	3.358290	1.605479	2.091768	0.0477
BASii	2.321630	1.728992	1.342765	0.0192
BASii(-1)	-3.440260	1.627584	-2.113722	0.0456
BASiii	-0.068078	0.206255	-0.330067	0.7443
C	19.31019	9.335211	2.068533	0.0500
R-squared	0.682227	Mean dependent var		5.514000
Adjusted R-squared	0.599330	S.D. dependent var		7.207350
S.E. of regression	4.562145	Akaike info criterion		6.074426
Sum squared resid	478.7029	Schwarz criterion		6.401373
Log likelihood	-84.11640	Hannan-Quinn criter.		6.179019
F-statistic	8.229790	Durbin-Watson stat		1.963761
Prob(F-statistic)	0.000080			

*Note: p-values and any subsequent tests do not account for model selection.

Source: E-view 9.0 output

The ARDL results in table 5 above, the global statistics and the diagnostic test (DWT) indicated that the utility, forecasting and predictive power of the model as specified was at 0.68 percent. Based on the ARDL results, we can rely on the relative and global statistics results to make inferences on the relationship between the variables under study. Taking a keen look at Table 6 it shows that Basel I capital (BASi) is negatively related and statistically significant to growth in credits to SMEs at a coefficient of 4.6042 and probability of 0.0076. Furthermore, Basel I lagged in period 1 with a coefficient and probability of 3.3583 and 0.0477 is an indication that there is a positive and significant relationship between Basel I capital and growth in credit to SMEs. On the other hand, Basel II capital (BASii) relates positively but statistically significant at 5% level. This is confirmed by the Basel II coefficient of 2.3216 and probability of 0.0192. However, Basel II capital lagged in period 1 turned a negative relationship with a coefficient of -3.4402 but significant with a probability of 0.0456. This means that there is an inverse relationship between Basel II capital and growth in credit to SMEs. Basel III capital (BASiii) records a beta coefficient of -0.0681 and probability of 0.7443. Going by this, it means that there is a negative relationship between Basel III capital and growth in credit to SMEs which is statistically insignificant at 5% level. In addition, the coefficient of determination (R^2) of 0.68 in Table 6 shows that 68 percent of variation in growth of credit to the private sector is explained by changes in Basel capital. This relationship is significant at the 5% level since the F-statistic of 8.2298 falls outside the critical region of 0.0001. Hence we reject the H_0 , and accept the alternate.

Table 6 Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
BASi does not Granger Cause SME	29	0.85541	0.4377
SME does not Granger Cause BASi		9.09658	0.0011
BASii does not Granger Cause SME	29	1.46560	0.0050
SME does not Granger Cause BASii		3.04631	0.0062
BASiii does not Granger Cause SME	29	0.04181	0.9591
SME does not Granger Cause BASiii		0.13677	0.8728
BASii does not Granger Cause BASi	29	0.57833	0.5685
BASi does not Granger Cause BASii		0.93912	0.4049
BASiii does not Granger Cause BASi	29	0.08027	0.9231
BASi does not Granger Cause BASiii		0.70820	0.5025
BASiii does not Granger Cause BASii	29	0.86320	0.4345
BASii does not Granger Cause BASiii		1.05049	0.3653

Source: E-view 9.0 output

The results in Table 6 shows that at 5% level of significance causality does not flow from Basel I capital (BASi) to growth in SMEs, this is confirmed by the F-statistics and probability of (0.8554 and 0.4377). But F-statistics and probability shows that causality runs unidirectional from SMEs to Basel I and this is significant at 5%. The F-statistics (1.4656 and 3.0463) and probability (0.0050 and 0.0062) for Basel II capital (BASii) shows that there exist a bi-directional causality between Basel II and SMEs but this is significant at 10%, while for Basel III capital (BASiii), the F-statistics of 0.0418 and 0.1368 and the probability of 0.9591 and 0.8728 records that there is no causality between Basel III capital (BASiii) and credit to SMEs. Therefore, the hypothesis of there is no causality is rejected in place of the alternate.

4.3 Discussion of Findings

Our discussions centers on the findings. Accordingly, the empirical findings for Nigeria support the theory of bank capital channel that postulate that monetary policy actions influence bank lending behavior, through its impact on bank equity capital. These monetary policy actions can lead to a change in the financial position of the banking sector, thereby changing the preferences of its shareholder (Markovic, 2006). When bank equity capital is sufficiently low, because of loan losses or some other adverse shocks, the bank will reduce lending because of the capital requirement and the cost of issuing new equity. Even when the capital requirement is not currently binding, the model shows that a low capitalized bank may optimally forgo profitable lending opportunities now to lower the risk of future capital inadequacy. Contrarily, our empirical results for Nigeria contradict the Modigliani-Miller irrelevance theory that argued that in the world of perfect capital markets, bank lending decisions are independent of banks institution capital structure, since the bank will always be able to find investors willing to fund viable lending opportunities; the level of bank capital is irrelevant to lending and also to the monetary policy transmission mechanism. (Hubbard, Kuttner & Palia, 2006). This theory or logic of Modigliani and Miller existed as bank's lending depends on its capital structure as well as on lending opportunities and market interest rates. When equity is sufficiently low, because of loan losses or some other adverse shock, the bank will reduce lending because of the capital requirement is not currently binding, the mode shows that a low capitalized bank may optimally forgo profitable lending opportunities now to lower the risk of future capital inadequacy (Chami & Cosimano, 2001, and Meh & Kevin, 2010). Previous studies on the subject provide evidence on the positive relationship between Bank capital and lending behavior. Because this studies were all in advanced economies, it was essential to study whether the same principles would hold given the dynamics of emerging market economies of which Nigeria is one. Empirically, our findings agreed with the works of Berger et al, (1995), Peeks & Rosengreen, (1995); Adewumi, (1997); Bernanke & Lown (1999), Altman & Saunders, (2002); Woo (2003), Albertazzi & Marchetti (2010); Buch & Prieto (2014); Koch & Macdonald, (2015); Bernanke & Lown (1999); Woo (2003), Albertazzi & Marchetti (2010); Klaus & Philipp, (2013) and Jose, Santiago, Ana, & Camilo (2017) in which they opined that under-capitalized banks reduce their lending more than well capitalized one and therefore the well capitalized positively influences lending behavior in Nigeria. However, this position was contradicted by the works of

Kapan & Minoiu (2013) who argued that better capitalized banks with lower leverage ratio are exposed to financial market shocks decreased their supply of loans less than other banks.

V. Conclusions

We conclude that the study centers on Basel capital channel and lending behavior of banking institutions in Nigeria between the periods 1986 through 2019 and that result of the study were direct and concise in determining the effects of Basel capital on lending behaviors in Nigeria. Without any prejudice, the findings of the study in Nigeria supports the theory of bank capital channel which postulates that monetary policy actions influence bank lending behavior, through its impact on bank equity capital. These submissions are predicated on the rigorous analysis on the relationship of the variables modeled in the study. Basel capital influences growth in credit to the private sector (CPS) and growth in credit to small and medium enterprises (SMEs). Based on this, we recommend as follows:

1. The Central Bank of Nigeria should focus adequate attention in ensuring macroeconomic and monetary stability to enable not only banking business but other businesses to thrive in the country/economy.
2. The monetary authority as a prudential regulator should monitor the banks compliance to the provisions of the Basel capital accords.
3. Banks should maintain both conservation buffer (CSB) and counter-cyclical buffer (CCB) with the view to absorbing emerging shocks from loan losses.

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