

## **The Effect of Capital Adequacy on Credit Risk Management among Commercial Banks in Nigeria; Within the Basel Capital Adequacy Framework**

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### **Abstract:**

This study analyses the effects of capital adequacy measures on credit risk management practices in Nigeria. The study applies the quasi experimental research design. The secondary time series data were obtained from annual report of the fifteen (15) quoted commercial banks in Nigeria as compiled in the Nigeria Stock Exchange Fact book for the period 1989 to 2015. The dependent variable; credit risk was modelled with the five (5) variants of capital adequacy measures as prescribed in Basel III provisions as our dependent variables. The independent variables were categorized under Tier I, Tier II, capital to total assets, capital conservation Buffer (CCB), Minimum Total capital Ratio (MTC) and counter cyclical capital Buffer (CCyB). The multivariate regression technique was specified and results obtained based on E-views version 9.0. The unit root result shows that the variables were stationary at levels in all except MTC which was stationary at first difference. The cointegration result shows existence of a long run equilibrium relationship between credit risk and capital adequacy. The VAR result shows that changes in credit risk were statistically and significantly influenced by capital adequacy measures. The bi-variate causality test unveils that credit risk granger-causes Tier I, capital to total risk assets, hence there exist a bidirectional link between credit risk and capital adequacy (CCB) though credit risk granger-cause more. The Impulse Response Function result shows that credit risk responded normally and negatively to the selected capital adequacy measures except for MTC ratio. The variance decomposition result unveils that credit risk accounted for own shocks up to 79.30%, this points to the critical nature of credit risk to bank survival and growth. This study concludes that transition from Basel II to Basel III will further mitigate risk management under Basel III capital framework and will also avert systemic failure in banks in Nigeria. It is recommended that risk management should be a matter of policy focus and priority among regulators and operators of bank in Nigeria.

**Key words:** Credit risk, Capital adequacy, financial system crisis, fragility, stability, risk factors.

### **Introduction:**

The practice of mitigating losses arising from borrowers' default has long been a challenge for financial institutions. The banking industry by nature of services and products traded are expose to losses that can endanger their stability and

survival. Risk management in banks is one of the core activities that can guarantee long-term profitability and stability. Capital adequacy regulation is one of the most popular instrument used in current banking regulation at national and

international levels to ensure that bank maintain adequate capital to absorb shocks or losses which banks are very sensitive to. Therefore, the relationship between bank capital and risk management is a critical bank management option that need to be kept under serious watch and has been found to leverage banks against systematic and unsystematic risk.

The banking system is an important and most critical sub-system of the main economy. Its importance linkage to the economy as a whole perhaps accounts for it's to be mostly regulated. The financial intermediation role of the banking sector exposes it to risk of failure with losses capable of undermining public confidence in the banking system. Consequently, this affect other sectors of the economy. The industry is regulated and supervised more than other sectors of the economy (NDIC, 2016).

The contagious effect of banking crisis is capable of sparking financial crisis therefore, need for banks to have adequate capital commensurate with risk taking. The lessons learned from the Global Financial Crisis (GFC) of 2007/2008 has made regulators to step-up capital requirements to significantly increase capital and adhere to stringent liquidity mandates. The global financial saga was a consequence of the subprime credit leading to default risk which affected the US banks. Baxter (2012) asserts that banks meeting the new capital standards will put a big dent in banks' return on equity and make it harder for them to exceed their cost of capital. Baesens (2008) posits that why banks need to carefully monitor risk is that regulators require them to do it.

The banking system globally have dealt with a lot of problems ranging from financial system fragility and crisis resulting from the risk taking behavior of banks. The various amendment in Basel capital had always aim at improving banking system stability through capital adequacy to risk and filling the gap arising from banking sector crisis (Demirque-Kunt Detragiache & Tressel, 2006), Njanike (2009) found that absence of effective credit risk management led to the occurrence of banking crisis and that the

growing economies places more responsibilities on the financial sector for the channeling of investible funds. On the other hand, any economy starved of funding through bank credit facilities is likely to have a passive financial sector as there maybe absent of incentives to invest. Credit risk has been one of the critical risk factor accounting for banks' illiquidity, credit rationing, credit suspension and probably banking crisis. Werner (1992) in his quantity theory of credit found out that bank credit creation for GDP transactions granger-causes nominal GDP growth while credit creation for financial transactions explains asset prices and banking crisis. Boffey & Robson (1995) and Poudel (2012) identified credit risk as the greatest risk factor on bank's performance.

Afriyie & Akotey (2012) also in their work asserted that credit risk situation of a bank is exacerbated by low capital adequacy ratios and liquidity. Bulk of other empirically works on credit risk and bank performance or profitability points to the fact that credit risk has significant impact on bank performance and profitability. Prominent among these works are that of Kargi (2011), Kurawa & Garba (2014), Abiola & Olausi (2014) and Boahene etal (2012) among others.

In a bid to contribute to the body of literature in this subject area, this study seeks to analyse the relationship between capital adequacy and credit risk management in Nigeria using time series data of (1989 - 2015) from the Nigeria stock Exchange factbook. It is against this background that this work seeks to provide answers to the question "what is the relationship between Basel capital adequacy measures and credit risk management in Nigeria while incorporating the five (5) variants of capital adequacy as prescribed in Basel I, II & III.

## **Literature Review:**

### **Theoretical Concepts;**

Hawley, F. B. (1893) developed the risk theory of profit which holds that risk in business arose from product obsolescence, a sudden fall in prices, superior substitutes, natural calamities or scarcity of certain crucial materials. According to him the

essential function of an entrepreneur is to take risk, a function that cannot be delegated. He contended that profit is a reward for bearing risk. Hawey believed that those who have risk taking ability in dynamic production have a sound claim on the reward, called profit, thus assuming risk grants entrepreneur a claim to a reward above the actual business risk. He added that the assumption of risk is annoying leading to trouble, anxiety and disutility among the businessmen of several kinds. He further opined that some risks are inherent in every business enterprise in view of the speculative nature of the business they undertake. Thus in the banking industry credit risk is inherent because banking business is risk taking in nature.

### **Credit risk and capital adequacy:**

#### **Credit risk:**

According to the Basel Committee on Bank supervision (BCBS, 2000) credit risk is define as “the potential loss that a bank borrower or counterparty will default as repayment fall due”. Default occurs because the debtors are unable to honour their contractual obligations or choose not to do so even when resources is there. Credit risk is measured by the ratio of loan loss reserves to gross total loans portfolio. Its shows how much of the total loan portfolio has been provided with the corresponding reserve but has not been charged off. This therefore implies that higher credit risk ratio is an indication of poorer loan quality. Therefore credit risk is a direct consequence of counterparty ill-performance. According to Kargi (2014) credit risk in bank occurs whenever banks’ funds are extended, committed, invested or otherwise exposed through other sources. Bank faces credit risk in a number of ways; including interbank transactions, acceptances, bonds and other sources of financial commitments and or investment.

$$CR = \frac{\text{Loan Loss Reserve}}{\text{Total Loan Portfolio}}$$

#### **Capital Adequacy;**

Capital adequacy measures a bank’s financial strength expressed by the ratio of its capital (net worth and subordinated debt) to it weighted credit exposure in terms of loans (Mendoza et al 2017).

Some scholars defined capital adequacy as capital risk-weighted asset ratio and it is used to assure depositors’ confidence in the banking system and by extension the financial system stability. Without any prejudice banks need to hold substantial amount of owner’s capital in relation to the amount of loan involve as well as the riskiness. BCBS (2015) under the new proposal have expanded capital adequacy in recent times. Capital adequacy ratios is define as  $\frac{\text{Shareholder's fund}}{\text{Total Assets}}$ . Therefore capital to absorb risks is one of the essential parts bank need to consider. Basel capital accords introduced capital ratios to demonstrate the strength of risk management.

As a result, in recognition of the vital role of capital ratio has led us to use indicators to measure the strength of credit risk management which lay the foundation of our research.

#### **Empirical Review:**

Mendoza, R & Rivera, J.P.R (2017) examined credit risk and capital adequacy of the 567 rural banks in Philippines to determine how both variables affect bank profitability using the Arellano-Bond estimated. They found out that credit risk has a negative and statistically significant relationship with profitability. Their study findings suggested that it is imperative for banks to understand which risk factors have greater impact on performance and use better risk-adjusted performance measurement to support their strategies.

Taiwo, J.N etal (2017) Investigated the quantitative effects of credit risk management on the performance of Nigeria’s deposit money bank (DBMs) and bank lending growth over the period of 17 years (1998 - 2014). Their study applied the multiple linear regression model to analyse the five series data. The study showed that sound credit risk management can boost investors and savers’ confidence in Banks thereby leading growth in funds for loans and advances which leads to increased bank profitability. They concluded that credit risk has an insignificant impact on the growth and loans and advances of MDBs in Nigeria.

Thilo, P. and Welzel, P (2002) examined credit risk and the role of capital adequacy regulation using the

industrial organization approach to the micro economics of banking and modeled a large banks which is risk neutral and faces credit uncertainty in its loans business. The study showed that capital adequacy regulation induces the bank to behave as it were risk averse. Risk management was examined in the framework of the proposed new Basel capital accord. It was found that capital adequacy hedging operations are explicitly accounted for reducing the risk position of a bank.

Thuinbi, G (2014) studied the effects of credit risk and working capital on capital adequacy on commercial banks in Kenya. The objective of the study was to understand factors affecting capital adequacy in commercial banks in Kenya. They adopted the descriptive research design on the 43 banks in the studied country. The study established a direct relationship between capital adequacy, credit risk, working capital and bank size.

Poudel (2012) appraised the impact of credit risk management in bank’s financial performance in Nepal using time series data spanning from 2001 to 2011. The result indicates that credit risk management is an important predictor of banks’ financial performance.

**Methodology:**

The study used time series data obtained from the annual report of fifteen (15) quoted commercial banks in Nigeria compiled and expressed in ratios by the Nigeria Stock Exchange (NSE) spanning 1989 – 2015. This study seeks to analyse whether there exist any dynamic relationship between capital adequacy and credit risk management. Usually, macroeconomic monetary data exhibit stochastic

trend removable through differencing. We tested the order of integration of the variables using the Augumented Dickey Fuller (ADF). In testing the relationship at both short and long run we employed the OLS and cointegration using the Johansen conintegration approach which contains likelihood ratio test of statistic, the maximum eigenvalue and the trace statistic. VAR model was employed to establishing the relationship in the variables of study. The granger-causality was conducted to analyse the statistical link between capital adequacy ratios and credit risk management. The impulse response (IRF) was carried out to analyse the response of credit risk management indicators to bank capital adequacy. The variance decomposition test was conducted to show how much percentage of the total variance is explained by each component as well as determining the direction of effects between the variables.

**Model Specification:**

From the objectives of the study, the model specified below captures the five variants of capital adequacy measure within the Basel framework and credit risk.

$$\text{Risk} = f(\text{capital adequacy ratios}) \dots (1.1)$$

Disaggregating equation 1 above, we formulate the effects of capital adequacy on credit risk management practices thus;

$$\text{CR} = f(\text{Tier I, Tier II, CCB, MTC, CCyB}) \dots (1.2)$$

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 > 0$$

$$\text{CR} = \beta_0 + \beta_1 \text{Tier I} + \beta_2 \text{Tier II} + \beta_3 \text{CCB} + \beta_4 \text{MTC} + \beta_5 \text{CCyB} + \mu_i \dots (1.3)$$

<p>Where:</p> <p><b>CR</b> = Credit Risk</p> <p><b>Tier I</b> = Tier I Capital to Total Assets</p> <p><b>Tier II</b> = Tier II Capital to Total Assets</p> <p><b>CCB</b> = Capital Conservation Buffer</p> <p><b>MTC</b> = Maximum Total Capital</p> <p><b>CCyB</b> = Counter-cyclical capital Buffer</p>	<p><math>\mu</math> = Error term</p> <p><math>\beta_0</math> = Regression intercept</p> <p><math>\beta_1 - \beta_5</math> = Coefficient of the independent variable to the dependent variable.</p>
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**Results and Discussion:**

**Table: 1 The Unit Root Result.**

Variables	Augmented Dickey-Fuller test statistic			
	Level	Prob.	1 <sup>st</sup> Diff	Prob
CR	-3.421012***	0.0136	-	-
TIER 1	-3.313864**	0.0212	-	-
TIER II	-3.385016**	0.0176	-	-
CCB	-1.973955	0.1564	-3.908302***	0.0011
MTC	-1.986388	0.1609	-3.515495**	0.0256
CCyB	-3.893181***	0.0036	-	-

Note:\*, \*\*, \*\*\* statistically significant at 10%, 5% and 1% significant level

Source: E-view 9.0

**Johansen Cointegration Result for Capital Adequacy Measures**

Series: CR TIER1 TIER2 D(CCB,2) D(MTC,2) CCyB

Lags interval: 1 to 1

	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.980356	234.8159	94.15	103.18	None **
0.916305	144.4264	68.52	76.07	At most 1 **
0.883137	87.37315	47.21	54.46	At most 2 **
0.554102	37.99785	29.68	35.65	At most 3 **
0.411339	19.42153	15.41	20.04	At most 4 *
0.269854	7.233741	3.76	6.65	At most 5 **

\*(\*\*) denotes rejection of the hypothesis at 5%(1%) significance level  
L.R. test indicates 6 cointegrating equation(s) at 5% significance level

**VAR model for Basel Capital Adequacy Measures and Credit Risk Management Practice**

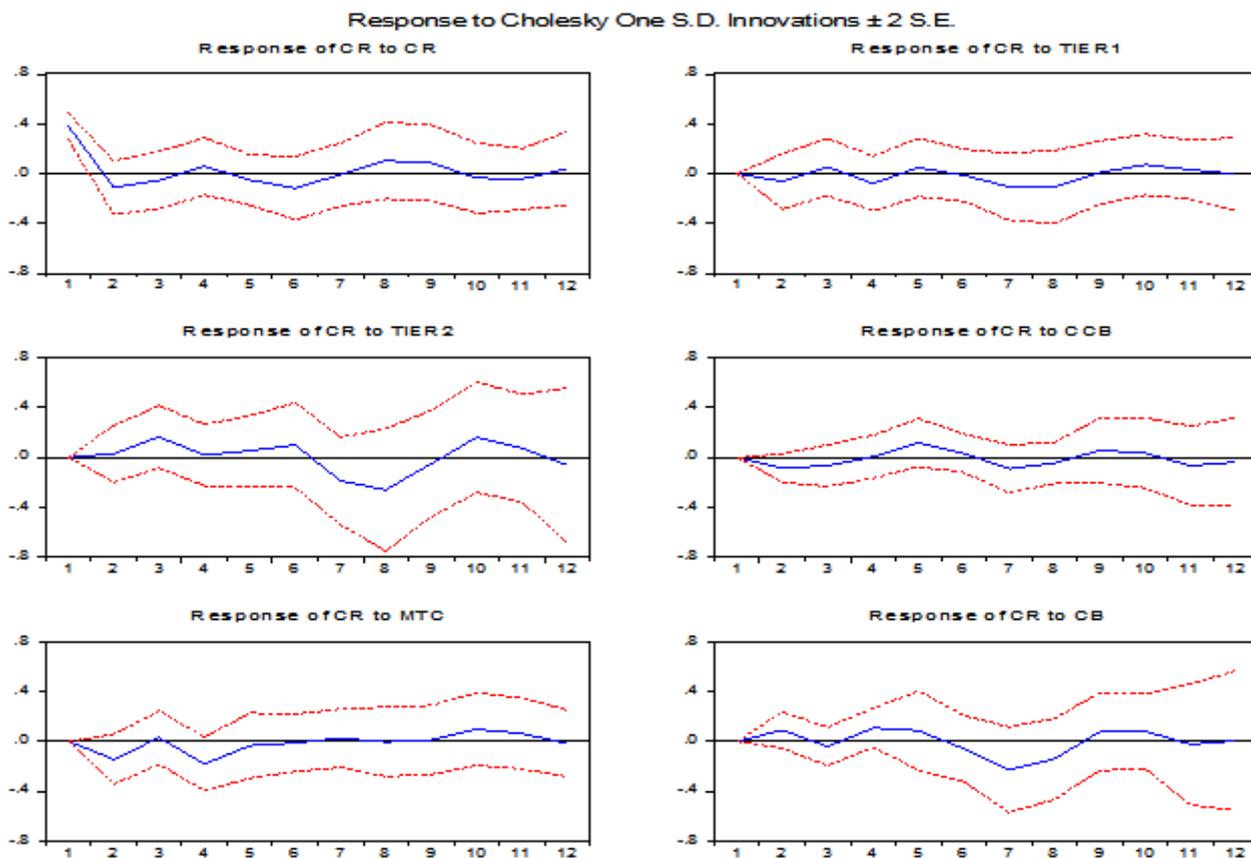
	C	TIER1	TIER2	CCB	MTC	CCyB
CR	7.911158	0.820354	4.371267	5.866193	8.465524	-4.584289
	(3.32001)	(3.79780)	(3.35165)	(1.81725)	(6.27055)	(34.9485)
	[ 2.38287]	[ 0.21601]	[ 1.30421]	[ 3.22806]	[ 1.35004]	[-0.13117]

Source: E-views 9.0

**Granger causality test result between Credit Risk Management Practice and Basel Capital Adequacy Measures**

Null Hypothesis:	Obs	F-Statistic	Probability
TIER1 does not Granger Cause CR	25	1.49492	0.24828
CR does not Granger Cause TIER1		3.31604	0.05705

### Impulse Response Function of Credit risk to capital adequacy



Source: E-views 9.0

### Variance Decomposition of Credit Risk by Basel Capital Adequacy Measures

Period	S.E.	CR	TIER1	TIER2	CCB	MTC	CCyB
1	0.379621	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.444205	79.30420	1.921114	0.441373	3.694578	10.51817	4.120565
3	0.487001	67.18080	2.744382	11.85228	4.924725	9.117047	4.180768
4	0.540766	55.65859	4.362215	9.744950	4.002569	18.77841	7.453267
5	0.568161	51.23055	4.671428	9.751006	7.931275	17.35957	9.056178
6	0.592930	50.95798	4.344457	11.80345	7.590515	15.98488	9.318711
7	0.677148	39.08166	5.771772	16.79625	7.587288	12.38739	18.37564
8	0.755371	33.31198	6.694215	25.33534	6.446269	9.958090	18.25410
9	0.768197	33.47725	6.483535	24.93274	6.791744	9.650047	18.66468
10	0.799736	31.09399	6.759147	27.04688	6.464515	10.35991	18.27556
11	0.810583	30.55487	6.732937	27.17468	6.954197	10.70233	17.88099
12	0.815091	30.46217	6.661713	27.46263	7.091626	10.63403	17.68783

Cholesky Ordering: CR TIER1 TIER2 CCB MTC CCyB

Source: E-views 9.0

The OLS result shows that capital adequacy components accounted for approximately 15% in changes in credit risk given the  $r^2$  value of 0.150490. While the unit root result was built on 1(0) and 1(1) as the capital adequacy variables were found to be stationary at levels except MTC which was stationary at first difference. Our cointegration result shows existence of a long run equilibrium relationship between capital adequacy measures and credit risk management practices and further points to the suitability of adopting the unrestricted VAR approach at levels.

In applying VAR, we considered the impact of the accumulated lag values of capital adequacy on credit risk management. Our result of VAR unveils that fluctuations in credit risk are statistically influenced by CCyB while other capital adequacy components appeared insignificant to changes in credit risk.

To analyse the statistical causality link between credit risk and capital adequacy measures we perform the bivariate granger-causality test. The Granger (1969) approach assesses whether past information on one variable helps in the prediction of the outcome of some other variable, given the past information on the latter. Our granger-causality result unveils that credit risk granger-causes Tier I capital to total risk assets at 10% levels. Also that there exist a bidirectional relationship between credit risk and capital conservation Buffer (CCB) though credit risk granger-cause more significantly than CCB.

The Impulse Response Functions (IRF) are dynamic simulations showing the response of an endogenous variable over time to a given shock. A close look at the IRF result indicates that credit risk responded proximately normal to the selected capital adequacy measures. It shows that CR responded slightly negative towards the mid-year except for MTC ratio.

The result of variance decomposition analysis shows that credit risk in the short run (2 months) was mostly affected by own shocks up to 79.30% and by MTC (10.52%) in the long run (12 months)

by own shocks (30.46%) and followed by the shocks of Tier II (27.46%), CCyB, MTC, CCB and Tier I capital in the followings 17.68%, 10.63%, 7.09% and 66.66% respectively.

### **Conclusion:**

Based on the result of our findings, there exist both short and long run equilibrium relationship between credit risk and capital adequacy.

Our findings suggests that capital adequacy measures are effective risk management mechanism that can effectively and significantly reduce credit risk situation in banks.

Our findings also unveils a bidirectional link between credit risk and capital adequacy. However, Credit risk was found to granger-cause capital adequacy more.

### **Recommendations:**

1. Risk management should be a matter of priority and policy focus in bank management.
2. Credit risk is found to the most critical risk factor in banks, hence the need for more stringent measures to prosecute credit defaulters.
3. Regulators in collaboration with the Nigeria Government should come up with implementation framework of Basel III capital Accords. This is so viewed because stricter capital standards remain the best option to beef up adequate capital to ameliorate credit risk.
4. Regulators and Central Bank of Nigeria to review and update the prudential guideline for licensed banks in keeping pace with the current trend in the sector.

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Received: 2019-06-22

Accepted 2019-07-02

Publish Online 2019-07-04

