International Journal of Management and Commerce
www.managementjournal.in
Online ISSN: 2664-6854; Print ISSN: 2664-6846
Received: 06-05-2019; Accepted: 05-06-2019; Published: 12-06-2019
Volume 1; Issue 3; 2019; Page No. 27-34

International regulatory capital requirements; An effective tool for market and operational risk management in Banks; The Nigerian perspective

Dr. SLC Adamgbo[1], Dr. JI Kenn-Ndubuisi[2]
[1] Department of Banking & Finance, Kenule Beeson Saro-Wiwa Polytechnic, Bori City, Nigeria
[2] Department of Banking and Finance, Rivers State University, Nkpolu Oroworokwu, Port Harcourt, Nigeria

Abstract
This study examines the effectiveness of International Regulatory Capital Requirements in managing operational and market risk in banks. The study is aimed at finding out whether higher international regulatory capital provisions such as Basel III will effectively ameliorate risk in banks, to x-rayed how banks can enhance their risk management activities to cushion loss and failure. Our model specified approaches for computing risk-weighted assets for operational and market risk for the purpose of determining the effectiveness of international regulatory capital. In carrying out this study, the time series data of fifteen quoted Commercial banks operating in Nigeria were obtained. The study adopts the quasi-experimental research design, as we estimate the data using the multiple regression technique. Series of statistical test are carried out at different stages to achieve the study objectives. Our findings unveil that there exists a statistical short and long run negative equilibrium relationship between operational risk, market risk and higher international regulatory capital requirements. Our results confirm that stricter capital like Basel III international regulatory capital is strong weigh against OPR and MKR among Nigeria Commercial Banks. A causal bidirectional link was established the studied variables. This suggests that higher capital standards are an effective risk ameliorating mechanism that can salvage banks from eminent loss and failure. Hence we recommend the full implementation of Basel III capital provisions in the Nigeria banking scene.

Keywords: regulatory capital, capital adequacy, market and operational risk, countercyclical, procyclicality capital buffers, systemic risk

1. Introduction

Banking business like any other business faces several risks. Considering the systemic importance role played by banks in the economy it is important that they are cautioned to properly identify, understood and managed risk since they are custodian of customers' funds and also to coerce the most needed public confidence. One of the major reasons for the refinement of Basel I to Basel II was to address operational and market risk other than credit risk. Capital adequacy has remained an effective regulatory tool used by regulators that can guarantee bank soundness and stability globally. No wonder, Kuzugu and Kuzugu (2017) [14] asserts that capital is crucial if banks are to be protected from banking risks. In pursuance of this, both National and International regulators emphasised measures aimed at making banking institutions capitally adequate at all time. Adamgbo, *et al* (2019) [2] also, in their work the implications of Basel capital regulation posits that adequate regulatory capital will make banks remain active and advert risk of failure as well as eminent bank crisis leading to financial crisis. A sound banking system will translate to a vibrant financial sector and in turn a sound economy.

The Basel Capital Accords are aimed at enhancing risk management function of banks and to strengthen the stability of the banking system. Basel provisions are guidelines to encourage convergence toward common standards in the banking sector worldwide. The Basel Capital Accords had evolved over time due to the growth of international risks. The buffer capital adequacy theory is all about creating discipline for banks' risk taking behavior and to ensure that banks are capitally sound, stable and liquid enough to withstand and absorb shocks.

Regulatory capital requirements remain the sure means of achieving financial stability. In recognition of this fact, regulators globally place much premium on the need for the institutions to hold and maintain sufficient capital. In Nigeria BOFIA compelled banks to adhere to capital adequacy measures as determined by the Apex bank or face with revocation of their operating license. In line with international best practices, the CBN in preparation for the full implementation of Basel III provisions has taken some proactive steps by incorporating some principles embedded in Basel III capital Accord in its guidelines years away from 2019 deadline. Without gain saying, this has produced laudable results. These actions and the various reforms have resulted to firm controls against synthetic securitization designed to manipulate bank's capital adequacy requirements. Prominent among which are, the Internal Capital Adequacy Assessment (ICAAP) the new supervisory regulations for assessing bank's capital level, disclosure of financial reporting and risk management activities to the CBN.

Banking industry has awakened to risk management, especially since the Global Financial Crisis (GFC) of 2007/2008.The failure of Basel II Capital Accord to address the global financial saga necessitated further enhancement in the Basel capital provisions leading to Basel III by the Basel Committee on Bank supervision (BCBS). The present accord provides stricter capital requirements to strengthened the institutions in terms of what

funding qualities as capital, while aiming at enhancing banks as lenders to create "Capital Conservation and Countercyclical Buffers" which seeks to protect the industry from shocks emanating from within and outside the domestic economy of operation. Besides, the BCBS specifications as contained in the capital Accord, BCBS compelled banks to migrate to the new accounting standard known as the International Financial Reporting Standard (IFRS) to improve on disclosure by forcing lenders to make provisions (Capital Reserves) for current and future losses. Adamgbo *et al* (2019) [2] in their works; "modeling capital adequacy dynamics and liquidity risk management" and the "effects of capital adequacy on credit risk management within the Basel capital adequacy framework". Calibrated the effectiveness of regulatory capital requirements in risk management. Their findings unveil that capital regulations will reduce bank risks and thereby avert systemic failure in the Nigeria banking system.

The banking industry by their nature is highly fragile due to services rendered. Financial accommodation provided by banks place them at various risks capable of jeopardizing their nominated role in any monetary economy. Credit extension being a major source of bank income is as well the cause of most bank failure. Banking failure is generic and contagious, hence the need for the institutions to be cautioned by way of regulatory capital requirements. In the world over, regulatory capital requirements is an effective mechanism to curtail bank risk-taking behavior and management. As Nigeria prepares to fully implement Basel III, this study is a proof for the workability of Basel III in the Nigerian banking sector.

However, apart from factors directly or indirectly relating to credit extension which may disrupts banking business, there are events that can cause bank loss or failure. These factors among others may include operational weakness and changes in the market conditions as well as man-made catastrophes. It is in the light of this reasoning that this paper seeks to investigate how higher regulatory capital standards can effectively cushion banks loss attributable to operational and market risk among quoted commercial banks in Nigeria.

2. Literature Review

Conceptual

From the regulator's point of view, bank capital is the core measure of the financial strength of a bank. A part from measures adopted by national banking regulators, the main banking regulatory framework consists of international standards enacted by the Basel Committee on Bank supervision (BCBS) in Basel I, II and III. Regulatory capital in bank enables it to protect lenders and depositors from losses, command public confident and also to meet customer needs. This view was affirmed by Kuzugu and Kuzugu (2017) [14] when they argued that capital is crucial if banks are to be protected from bank risks. They further stressed that in order to ensure financial stability in the banking system; banks need to hold sufficient capital to support their risk exposures.

Natalya (2015) [18] asserted that having better capitalized banks enhances financial stability by reducing bank risk-taking incentives and increasing bank's buffers against losses.

Hellmann (1999) holds that a combination of deposit rate ceiling and capital requirements will help address risks in banks. Deesik *et al* (1988) [8] opined that the use of simple capital ratios in regulation is an effective means to address the insolvency risk of banks. In the word of Hellmann, bank risk-taking is restrained only if the risk-based capital standard is stringent enough.

According to the Bank of International Settlement (BIS), operational risk relates to losses resulting from inadequate or failed internal processes, people and systems or from external events while adding that operational losses occurred in banks due to human errors or mistakes. On the other hand, Crouhy *et al* (2014) [7] sees operational risk as arising from operational weaknesses including management failure, inadequate systems, faulty controls, and fraud, natural and man-made catastrophes.

The Bank for International Settlement (BIS) defines market risk as the risk of losses in the bank's trading book due to changes in equity prices, interest rates, credit spreads and other systemic indicators whose values are set in a public market. Bessis (2015) [4] definition of market risk falls in line with the BIS view; he defines market risk as the risk of losses in on-or off balance sheet positions that arise from movements in market prices.

Theoretical Review

The capital buffer theory suggests that the excessive increase in capital than required decreases the risk of banks (Jokipii and Milne, 2010) [11]. The theory holds that capital buffer may increase the performance of banks by reducing the rate of lending, which increases the demand for loans. From the regulators' point of view, capital buffer regulations targeting the creation of adequate capital buffers are designed to reduce the procyclicality in lending by creating the countercyclical buffers that will be utilize during period of financial stress.

The Agency theory in broad terms emphasized the relationship that exists between the principal (owner) and the agent (manager) in business. In banks, this commonly applied to shareholders as principal, and the company executive as agent. The theory assumes that the interests of a principal and that of an agent are not always in alignment. In the view of proponents of this theory, the agent is the decision-maker who incurs little or no risk because any losses therefore are born by the principal. This entails that disputes may arise differently in goals or in risk aversion. They therefore hold that bank manager (agent) should take decisions that will reduce the agency loss since compensation is performance-based. In this wise, a balance is achieved between principal and agent. Put it differently, agency theory is a means of resolving disputes between shareholders as principal and agent and alignment of parties' interests.

The franchise value theory, the traditional theory suggests that high franchise value limits bank risk-taking incentives. That is high franchise value allows banks to borrow more, so it can take risk on a large scale. The theory holds that significant risk-taking in institutions with a high franchise value seem to contradict the traditional predictions of corporate financial models (Natalya, *et al* 2014) [17]. The theory stressed that shareholders are protected by limited liability and therefore have incentives to take risk to maximize their option like payoff, but as the shareholders' value increases, shareholders internalize more of the downside, so their risk-taking incentive declines. It holds that a bank's franchise value belongs to its shareholders and is lost in bankruptcy, so a high franchise value should reduce bank risk-taking.

The moral hazard theory, in banking, moral hazard occurs when banks increases their risk exposures. According to the Wikipedia, this happen especially when someone else bears the cost of the

loss. Moral hazard can also be viewed when one's action(s) may be detrimental to another after a financial transaction must have taken place. Moral hazard persists when a party makes decision about how much risk to take, while the other party bears the cost if things go bad. Adding that the party isolated from the risk behaves differently from how it would have should it be fully exposed to the risk. Again, the theory also maintains that moral hazard may arise under information asymmetry where the risk-taking party knows more than the party who bears the consequences of the risk. Moral hazard hypothesis also help in resolving the non-align interests of the principal and agent. The theory therefore maintained that the party with more information about its actions or intentions has a tendency or incentive to behave inappropriately from the party with little or no information. This therefore imply that since shareholders (principal) usually cannot completely monitor the bank manager (agent) hence the need for taking quality lending decisions while ensuring strong adherence to regulatory capital requirements in avoidance of eminent losses that may arise from such decisions should thing turn otherwise.

Empirical Review

Silva (2017) [20] using Blum's Model Provides computed values of the threshold requirements for which risk chosen by banks converges to zero bankruptcy cost and social optimum. He asserted that these values depend critically on the initial equity of the bank. The author affirmed that constant capital requirements could effectively reduce bank risk-taking and thus achieve the zero bankruptcy cost as well as social efficient level of risk. He however pointed out that this effect requires a very high level of capital requirement which may not be practicable.

Milne (2001) [16] examined the incentive effect of capital requirements on bank's portfolio choice. The author concludes that in the short-run banks struggling to meet regulatory capital requirements will reduce holding of highly risky assets, while well capitalized banks face little pressure from regulatory measures in allocating their portfolio. He however, concludes that risk-based capital requirements have no impact on bank's portfolio choice.

Hellmann, *et al* (2000) [10] investigated the effect of capital standards in the environment of competition. They argued that capital requirement reduces banks moral hazard by putting their equity at risk, which they regard as capital-at-risk effect. The authors concluded that capital requirements in a competitive deposit ameliorate bank risk while recommending that a combination of deposit rate ceiling and capital requirement will help address risks in banks.

Mark, *et al* (2014) [15] examined bank capital for operational risk; a "Tale of fragility". They assert that operational risk is harder to measure and model. According to them, it cannot be straight forwardly eliminated through simple adjustment like selling a position. They posits that operational risk tends to be about 9.13% of the total risk, and that regulatory capital regime is surprisingly more rigidly model focused for this risk than others at least in US. The focus of their study was the absence of incentives to invest in and improve business control processes through granting of regulatory capital relief. They therefore contended that regulatory capital requirements have to be based on methodologies that are simpler, more standards, more stable and robust.

Daulovid (2019) [9] evaluated the impact of macro prudential capital regulation on bank capital, risk-taking behavior, and solvency. Among other things, their focus was on identifying the role of exogenous policy changes in bank level capital requirements across Systemically Important Banks (SIBs) in Europe. The study unveiled that a one percent point hike in capital requirements leads to an average CETI capital level increases of thirteen (13) percent improving their loss absorption capacity. Their study concludes that while no cost reduction in asset was found, there exists a substitution effects toward riskier assets.

Nguyen, *et al* (2019) [19] examined Banks Risk Management; A regulatory perspective. The purpose of their study was to investigate the role regulatory factors play in risk management with emphasis on risk based capital regulation. Their findings conform to earlier studies that capital regulation reduces bank risk taking-behaviour.

Calem and Rob (1999) [6] developed a dynamic model which allows for variation of bank's capital position over time and across banks to predict risk-taking behavior under capital regulation. The views of these authors in the above model were calibrated using empirical data on US banks from 1984 to 1993. The authors showed that under increasingly stringent capital requirements, the level of bank's risk-taking depends on the bank's current capital position with a roughly u-shaped relationship, and that bank risk-taking is constrained only if the risk based capital standards is stringent enough.

Khemaies, & Nidhal, (2016) [13] examined the impact of prudential regulation on bank capital and risk-taking: The case of MENA countries. Their study assessed the simultaneous impact of regulatory pressures on bank's capital and risk-taking behavior. Using a panel data of 24 banks operating in the MENA region between 2004 and 2012. Their findings revealed that prudential regulations failed in reducing bank's risk-taking incentives and increasing capital. They found out that bank profitability has positive association with capitalization level. They therefore, concluded that there exists a strong negative link between bank size and risk, adding that large banks in the studied region better managed their risks level through diversification.

Daesik, & Santomero, (1988) [8] studied Risk in Banking and Capital regulation. Their primary objective was to investigate the role of bank capital regulation in risk control using the mean-variance model. Their results showed that the use of a simple capital ratio in regulation is an ineffective means to combat the insolvency risk of banks. Secondly, it was also found that capital ratio regulation can theoretically correct risk weights under the risk-based capital plan, as they concluded that correct risk weights are restrictions on asset composition can alter the optimal portfolio choice of banking firms.

Natalya, (2015) [18] examined how higher bank capital requirements affects economic growth; A survey. The study found that there is a little evidence of a direct effect. The study focused was on the indirect effects of capital requirements on credit supply, bank asset, risk and cost of bank capital which in turn can affects economic growth. The study unveiled that banks facing higher capital requirements can reduce credit supply as well decreases credit demand by raising lending rates which may slow down economic growth. The author therefore contended that having a better capitalized banks enhances financial stability

by reducing bank risk-taking incentives and increasing banks' buffers against losses.

3. Methodology

Our sample consists of fifteen (15) quoted commercial banks operating in Nigeria. The periods covered from 1989 to 2015. This spanned through the pre and post banking consolidation regimes. Time series data compiled by the Nigeria Stock Exchange (NSE) from annual reports of sampled banks are used. The study adopts the secondary data analysis within the quasi-experimental research design to estimate the multiple regression equations specified above. The nature of the study is time series based.

Measurement of Variables

Dependent Variable

The dependent variables in the study are;

Operational Risk (OPR)

Operational risk can be quantify by; the basic indicator approach (BIA)

The standardized Approach (STA) and The Advanced Measurement Approach (AMA)

The measurement of operational risk is straight forward and it is based on the firm's income to determine its capital requirements. Banks activities are group into eight (8) business levies. Each business line's gross income is considered a broad indicator for the likely scale of OPR in terms of beta factor which measures the volatility or systemic risk of a security or portfolio in comparison with the whole market.

Market risk is measured by value-at-risk (Var). Value at risk measures how the market value of an asset or of a portfolio of assets is likely to decrease over a certain time period under normal conditions.

Independent Variable

The independent variable is categorized into three (3) with five (5) variants each. The capital includes; the capital adequacy, capital reserves, and capital deductions variables as prescribed in Basel III Capital Accord.

Under capital adequacy we have; Tier 1 capital, Tier II capital, capital conservation Buffer, Minimum Total capital ratio and countercyclical capital buffers (Tier 1, Tier II, CCB, MTC & CCyB).

Under Capital Reserves we have; Leverage ratio, Liquidity coverage ratio, Minimum payout ratio, net stable funding, and Pledge deposit (LR, LCR, MPR, NSF and PD).

Basel III capital deductions include; Deferred Tax Asset, Investment Deductions, Non-Significant Investment Deduction, Investment Risk Deduction and Profit Equalization Reduction (DTA, ID, NSID, IRD & PER).

Model Specification

From the objective of the study, the model specified below captures the two type of risks and Basel III capital Provisions.

$OPR = f(Basel)$ 1

$MKR = f(Basel)$ 2

Disaggregating equations 1 and 2 above we formulate the effectiveness of Basel III capital adequacy, reserves and deductions on operational and market risk as follows;

$$OPR = \beta_0 + \beta_1 Tier\ 1 + \beta_2 Tier\ II + \beta_3 CCB + \beta_4 MTC + \beta_5 CCyB + \mu \quad 3$$

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

$$OPR = \beta_0 + \beta_1 LR + \beta_2 LCR + \beta_3 MPR + \beta_4 NSF + \beta_5 PD + \mu \quad 4$$

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

$$OPR = \beta_0 + \beta_1 DTA + \beta_2 ID + \beta_3 SID + \beta_4 IRR + \beta_5 PER + \mu \quad 5$$

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

$$MKR = \beta_0 + \beta_1 Tier\ 1 + \beta_2 Tier\ II + \beta_3 CCB + \beta_4 MTC + \beta_5 CCyB + \mu \quad 6$$

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

$$MKR = \beta_0 + \beta_1 LR + \beta_2 LCR + \beta_3 MPR + \beta_4 NSF + \beta_5 PD + \mu \quad 7$$

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

$$MKR = \beta_0 + \beta_1 DTA + \beta_2 ID + \beta_3 SID + \beta_4 IRR + \beta_5 PER + \mu \quad 8$$

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

Where; Tier I, Tier II, CCB, MTC, CCyB, LR, LCR, MRR, NSF, PD, DTA, ID, NSID, IRR and PER as defined above.

μ = error term

β_0 = Regression intercept

$\beta_1 - \beta_5$ = Coefficient of the independent to the dependent variables.

4. Results Presentation and Discussion

The Unit Root Result

Table 1

Variables	Augmented Dickey-Fuller test statistic			
	Level	Prob.	1st Diff	Prob
TIER 1	-3.313864**	0.0212	-	-
TIER II	-3.385016**	0.0176	-	-
LCR	-2.302872	0.1785	-3.511412**	0.0108
CCB	-1.973955	0.1564	-3.908302***	0.0011
LR	-4.192549***	0.0032	-	-
MTC	-1.986388	0.1609	-3.515495**	0.0256
CCyB	-3.893181***	0.0036	-	-
OPR	-3.084227**	0.0107	-	-
MPR	-5.092594***	0.004	-	-
LIQR	-3.725868**	0.0361	-	-
MKTR	-4.688832***	0.0051	-	-
NSF	-4.898979***	0.0006	-	-
PD	-3.618734**	0.0127	-	-

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

Source: E-views 9.0 output

Macro-economic time series data usually exhibit stochastic trend removable by differencing. The results above show that while all other parameters were stationary at level, LCR, CCB and MTC were stationary at first differencing and statistically significant at 5% and 1% percent. This therefore calls for a long-run relationship.

Cointegration Test

The Cointegration test using the Johansen and Juselius approach which contains likelihood ratio test of statistic, the maximum eigenvalue and the trace statistic is applied to determine the long run equilibrium relationship existence among our studied parameters; taking into cognizance the effects of including intercept and trend in models as recommended in the Johansen

Cointegration test is a more robust than Engel granger in testing Cointegration relationship. We considered each based on the three specified models (Capital adequacy, Reserves and deductions). As can be depicted in the results above; the test unveils existence of a long run equilibrium relationship between Basel III regulatory capital, Operational and market risks. This further point to the suitability of adopting the unrestricted VAR approach at levels.

VAR Results with Basel III regulatory Capital Measures, Operational and Market Risk.

Table 2

	C	Tier 1	Tier 2	CCB	MTC	CCyB
OPR	11.89070	1.333754	5.368776	3.721933	2.035291	-94.20139
	(4.20739)	(5.15955)	(4.26474)	(2.35243)	(7.74863)	(36.3337)
	[2.82615]	[0.25850]	[1.25888]	[1.58216]	[0.26266]	[-2.59267]
MKTR	-0.595065	6.182436	3.440816	3.843355	5.397382	-25.11687
	(5.21779)	(2.72863)	(2.09100)	(1.27173)	(3.45866)	(24.0193)
	[-0.11405]	[2.26576]	[1.64554]	[3.02214]	[1.56054]	[-1.04569]

Source: E-views 9.0 output

VAR model for Basel IIIRegulatory Capital Reserves and MKR and OPR Risk Management

Table 3

	C	LR	LCR	MPR	NSF	PD
OPR	3.134591	22.65682	4.640638	29.97638	6.493080	1.807138
	(3.97452)	(21.0280)	(3.30069)	(23.9521)	(3.00398)	(2.55851)
	[0.78867]	[1.07746]	[1.40596]	[1.25151]	[2.16149]	[0.70633]
MKTR	16.17250	20.39759	5.857162	25.87369	6.154122	1.423940
	(7.21638)	(19.1183)	(3.19590)	(20.6891)	(2.33817)	(2.47103)
	[2.24108]	[1.06691]	[1.83271]	[1.25059]	[2.63203]	[0.57625]

Source: E-views 9.0 output

VAR model for Basel IIIRegulatory Capital Deductions and MKR and OPR Risk Management

Table 4

	C	DTA	ID	NSID	IRR	PER
OPR	7.998657	-6.145467	9.570547	2.826726	4.039737	3.017108
	(2.25621)	(4.34856)	(4.22077)	(3.09241)	(7.89291)	(8.16395)
	[3.54517]	[-1.41322]	[2.26749]	[0.91409]	[0.51182]	[0.36956]
MKTR	8.175198	2.138084	9.330446	5.678003	3.764133	4.884089
	(6.16195)	(3.70317)	(3.61128)	(2.97436)	(6.99110)	(5.99030)
	[1.32672]	[0.57737]	[2.58369]	[1.90898]	[0.53842]	[0.81533]

Source: E-views 9.0 output

The variables in the model above are considered as endogenous variables for VAR models with the assumption that they are interrelated. We therefore assume that since operational and market risks are influenced by regulatory capital requirements, we consider the impact of the accumulated lag values of Basel III capital on the two risk categories. The results above indicate that there is an insignificant influence of the Basel III capital measures and operational risk. Only Tier to total risk has a significant influence on market risk.

VAR model for Basel III capital reserves and the two risk class (OPR and MKR) shows that Net Stable Funding (NSE) ratio has a significant influence on operational and market risk. This is an indication that NSF a component of Basel capital reserves has strong influence on OPR and MKR risk.

VAR model for Basel II capital deductions and OPR and MKR risks. A close look at the table indicates that Non-Significant Investment Deduction (NSID) influenced OPR and MKR risk significantly.

Granger causality test result between OPR and MKR Risk Management, and Basel III Regulatory Capital Adequacy Measures

Table 5

Null Hypothesis:	Obs	F-Statistic	Probability
TIER1 does not Granger Cause OPR	26	8.68180	0.00724
OPR does not Granger Cause TIER1		0.06076	0.80748
TIER2 does not Granger Cause OPR	26	0.04223	0.83898
OPR does not Granger Cause TIER2		3.12897	0.09017

Source: E-views 9.0 output

Granger causality test result between OPR and MKR Risk Management, and Basel III Regulatory Capital Reserves

Table 6

Null Hypothesis:	Obs	F-Statistic	Prob.
LR does not Granger Cause OPR	25	3.29012	0.0582
OPR does not Granger Cause LR		0.24450	0.7854
MKTR does not Granger Cause MPR		0.95512	0.4016

Source: E-views 9.0 output

Granger Causality test results, here we analyse the statistical causality link between operational, market risk and Basel III regulatory capital measures. Performing bivariate Granger causality test, to assess whether information on one variable can help in the prediction of the outcome of some other variables, given past information on the later. The results in the table above shows that operational risk is not granger caused by other capital adequacy measures but granger causes Capital Conservation Buffer (CCB) while were not significant.

The result further presents a unidirectional link between OPR and LR but LR link OPR was insignificant. The result also shows that Maximum Payout Ratio (MPR) granger causes market risk at 5% levels significantly. Our result also indicates that OPR granger caused Non-Significant Investment Deductions (NSID) and existence of a unidirectional link between them. The causal relationship of market risk and Basel III capital deductions was not significant.

Response of Market Risk to Basel III Regulatory Capital Deductions

Impulse response functions are dynamic simulations showing the response of endogenous variables over time to a given shock. It helps in tracing the contemporaneous and future paths of the key response variables to a one standard deviation increase in the current value of the stimulus variable. By this, we attempt to examine the effects of Basel III regulatory capital measures on operational and market risk. From the figure above, it shows that OPR responded positively at the beginning of the year to CCyB, Tier II, capital to OPR towards the third quarter of the period horizon, negatively. Its response to tier I capital to OPR and MTC

ratio appeared insignificant throughout the period under consideration.

Response of OPR to Basel III capital reserve shows that OPR responded to shocks in capital reserves positively in the first three months in NSF ratio, LR but declines thereafter throughout the period under horizon. The shocks from PD were insignificant.

The response of OPR to Basel III capital deductions was positive in the three months to shocks in DTA and PER but remain insignificant after the mid-year period to shocks in the capital reserves through the time horizon.

The response of MKR to tier I and tier II was positive in the first two months and after the mid-year period, while it response to MTC was negative at the beginning of the period, but skewed towards positive after the third months and then dropped again towards the end of the period. The response of MKR to CCB was negative all through the first half of the year but positive between the seventh and eight months.

The response of MKR to shocks in MPR decreased significantly in the first three months, they later experienced an increase in the next two months and thereafter remained insignificant. MKR also recorded a slight decrease to shocks in LR and LCR before normalising.

The above result shows that MKR response to capital deductions was insignificant with a slight short run increase to DTA and decrease in IRR.

Variance Decomposition (VD) of OPR by Basel III Regulatory Capital Adequacy Measure

Table 7

Period	S.E.	OPR	TIER1	TIER2	CCB	MTC	CCyB
1	0.377151	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.418542	81.26773	0.012811	2.515098	1.176894	0.201579	14.82588
3	0.431578	76.44175	0.024908	4.133089	1.275673	3.259496	14.86509
4	0.459392	72.59571	0.481801	4.190316	4.045828	3.374088	15.31226
5	0.501081	62.90165	2.552898	4.659757	3.717539	3.667462	22.50069
6	0.588765	56.81650	1.922854	11.36065	5.481892	2.659392	21.75871
7	0.624709	60.03296	2.127692	10.11210	5.267762	2.778466	19.68102
8	0.714056	48.13714	1.661966	20.28750	6.140791	2.189300	21.58330
9	0.828533	50.24747	1.512591	20.28512	5.271134	1.727902	20.95578
10	0.853334	51.70836	2.001489	19.78736	4.991158	1.748350	19.76329
11	0.938898	44.83284	1.773002	24.51850	5.555555	1.459434	21.86066
12	1.056847	45.59064	1.576645	23.66172	5.776347	1.151939	22.24271
Cholesky Ordering: OPR TIER1 TIER2 CCB MTC CCyB							

Source: E-views 9.0 output

Variance Decomposition of Operational Risk by Basel III Regulatory Capital Reserves

Table 8

Period	S.E.	OPR	LR	LCR	MPR	NSF	PD
1	0.361881	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.384874	89.66727	0.057447	1.640670	5.844237	2.767912	0.022464
3	0.497868	53.58908	27.92225	7.902751	4.863245	5.650680	0.071991
4	0.515936	49.98431	26.32583	13.15265	5.125259	5.327335	0.084617
5	0.522283	48.77717	26.52867	14.37078	5.026422	5.210081	0.086876
6	0.523537	48.63090	26.45622	14.31459	5.096483	5.354671	0.147141
7	0.524109	48.52505	26.40264	14.41008	5.115842	5.343045	0.203343
8	0.524852	48.47712	26.45690	14.41866	5.101717	5.340688	0.204922
9	0.525119	48.44437	26.47196	14.40740	5.100938	5.337682	0.237645
10	0.525329	48.40604	26.47737	14.39799	5.097397	5.366858	0.254353
11	0.525476	48.38639	26.47891	14.39502	5.096746	5.388718	0.254218
12	0.525528	48.38128	26.47375	14.39475	5.097959	5.390832	0.261421
Cholesky Ordering: OPR LR LCR MPR NSF PD							

Source: E-views 9.0 output

Variance Decomposition of Operational Risk by Basel III Regulatory Capital Deduction

Table 9

Period	S.E.	OPR	DTA	ID	NSID	IRR	PER
1	0.313226	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.412112	61.85268	6.680639	14.57530	8.256674	0.615460	8.019238
3	0.461249	52.04086	13.11532	11.63738	12.79707	3.358322	7.051050
4	0.474511	49.24913	12.45591	12.11510	14.14753	3.186671	8.845659
5	0.484964	47.15594	12.26128	11.65866	14.42756	3.474807	11.02176
6	0.493301	45.80992	12.13658	12.75714	13.98805	4.289143	11.01917
7	0.494333	45.62188	12.16978	12.70389	14.24179	4.289402	10.97326
8	0.495815	45.37292	12.14357	12.78247	14.20278	4.319743	11.17852
9	0.496256	45.30243	12.15413	12.75977	14.22197	4.393762	11.16793
10	0.496455	45.27734	12.18018	12.75045	14.21302	4.420075	11.15894
11	0.496666	45.23901	12.17115	12.75530	14.25511	4.418524	11.16090
12	0.496851	45.20595	12.16238	12.74616	14.26349	4.437669	11.18435
Cholesky Ordering: OPR DTA ID NSID IRR PER							

Source: E-views 9.0 output

Variance Decomposition of Market Risk by Basel III Regulatory Capital Adequacy Measures

Table 10

Period	S.E.	MKTR	TIER1	TIER2	CCB	MTC	CCyB
1	0.912723	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.995582	89.20729	1.747769	3.198737	0.022924	4.946121	0.877159
3	1.142174	71.92408	18.80590	3.607981	0.458156	4.168746	1.035141
4	1.199174	67.61750	17.33582	7.355480	0.417311	4.293156	2.980739
5	1.267001	67.16669	15.61483	7.129541	1.834895	4.275994	3.978047
6	1.303798	63.64287	15.24489	7.636121	4.068263	4.640321	4.767538
7	1.324108	61.77696	14.78219	7.422081	4.560210	4.897806	6.560744
8	1.428919	53.12032	14.61152	9.101925	7.517669	4.642569	11.00599
9	1.491923	48.72960	14.02688	14.73049	7.108639	4.385742	11.01865
10	1.512821	48.44197	13.64725	14.34767	8.036686	4.417546	11.10888
11	1.530896	47.49986	13.54982	15.23428	7.848385	5.005625	10.86204
12	1.550718	46.34130	13.20627	14.84958	9.140670	5.276725	11.18544
Cholesky Ordering: MKTR TIER1 TIER2 CCB MTC CCyB							

Source: E-views 9.0 output

Variance Decomposition of Market Risk by Basel III Regulatory Capital Reserves

Table 11

Period	S.E.	MKTR	LR	LCR	MPR	NSF	PD
1	0.710888	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.794292	80.16013	1.272357	11.73288	0.021633	6.801130	0.011870
3	1.060081	57.51483	1.439616	7.763609	18.88276	5.257027	9.142157
4	1.121957	51.40912	2.290609	9.367255	23.54347	5.198893	8.190656
5	1.159449	49.13637	2.428439	9.284106	23.93405	5.128482	10.08855
6	1.195088	46.25489	4.777429	8.791246	24.13331	6.518628	9.524504
7	1.218817	46.82105	4.593235	9.590240	23.24801	6.568555	9.178913
8	1.228284	46.25358	5.302924	9.713014	22.89244	6.788374	9.049666
9	1.233555	46.12742	5.510034	9.778472	22.80925	6.731978	9.042841
10	1.236496	46.04363	5.484329	10.00829	22.76214	6.700260	9.001353
11	1.238267	45.94458	5.623151	10.00716	22.71185	6.698699	9.014558
12	1.239601	45.85104	5.729939	10.01906	22.69184	6.712890	8.995236
Cholesky Ordering: MKTR LR LCR MPR NSF PD							

Source: E-views 9.0 output

Variance Decomposition of Market Risk by Basel III Regulatory Capital Deductions

Table 12

Period	S.E.	MKTR	DTA	ID	NSID	IRR	PER
1	1.125527	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.183400	95.41628	2.663983	0.056191	0.206367	1.651705	0.005476
3	1.243132	94.48577	2.444626	0.121650	0.262007	2.663723	0.022228
4	1.253217	93.71697	2.602600	0.144826	0.530015	2.931736	0.073849
5	1.258527	93.45671	2.721345	0.144828	0.631303	2.956428	0.089385
6	1.261439	93.18588	2.732476	0.165092	0.804983	2.953150	0.158420
7	1.262666	93.04334	2.729968	0.180381	0.910019	2.977328	0.158966
8	1.263395	92.95176	2.747987	0.186771	0.965927	2.974090	0.173463
9	1.263932	92.87462	2.746474	0.203144	0.993352	3.001831	0.180583
10	1.264163	92.85476	2.754341	0.206001	1.001480	3.002490	0.180930
11	1.264266	92.84023	2.755010	0.209490	1.005461	3.006384	0.183427
12	1.264321	92.83620	2.758324	0.209719	1.005413	3.006773	0.183573
Cholesky Ordering: MKTR DTA ID NSID IRR PER							

Source: E-views 9.0 output

The (VD) result above indicates that OPR accounts for 81.21% of own shocks in the first two months, but later declined to 45.59% followed by tier I which accounted 23.66% and CCB for 22.24% in the long run respectively. Countercyclical Capital Buffers (CCyB) only account for 5.77% after the 12th months. All other capital adequacy measures appeared insignificant to shocks in OPR.

The Variance Decomposition of OPR by Basel III capital reserves maintained an average of 48% of own shocks from the fifth month throughout the period. By the end of the year, LR accounted for 26.47% of shock in OPR, while LCR contributed 14.30%, MPR 5.09%, NSF 5.39% and PD 0.26% respectively.

Variance Decomposition of OPR by Basel III capital deductions as can be observed from the table above shows that OPR contributed an average of 45% of own shocks after the first sixth months. DTA and ID accounted for 12.15% each, while NSID contributed 14.26% to shocks in OPR in the long run. IRD and PER accounted for an average shocks of 4.28% and 11.16% each to shocks in OPR.

Variance Decomposition of MKR by Basel III capital adequacy measures. The above result shows that MKR accounted for 46.34% of won shock by the end of the period while capital adequacy measures combined to account for 53.64%.

The Variance Decomposition of MKR by Basel III capital reserves shows that MKR account for 46% of own shocks in the long run among the reserves capital. LR accounted for 5.7%, LCR 10%, MPR 22.67%, NSF ratios 6.7% and PD 8.9% respectively in the long run.

The Variance Decomposition of MKR by Basel III capital deductions indicates that MKR accounted for 92% own shocks all through the period. DTA account for 2.15%, ID, PER, standards was found to have both short and long run equilibrium relationship statistically and significantly. This points to the fact that Basel III capital requirement would be an effective tool for operational and market risk management. This position was confirmed as the Basel III capital provisions significantly alter fluctuations in OPR and MKR.

This study further affirm that the procyclicality i.e. the tendency that financial variables will fluctuate around a trend during economic cycle to which banks are sensitive and would be addressed if regulators in the country implements higher capital standards.

The unidirectional link between Basel III capital requirements is a pointer to the fact that implementation of Basel III capital accords is a good omen for Commercial Banks in Nigeria. It also indicates that a complementary international capital measures with existing national requirements will combine and ameliorate OPR and MKR.

Our findings unveil a strong significant relationship, MKR and higher capital standards suggest that the financial system at large is subjective and related to changes in the economy circle.

NSID contributed less than 1% on the average to the shocks in MKR in the long run while IRR accounted for an average of 3%.

5. Conclusion and Policy Implications

Due to the nature of banking business, risk management is one of the core activities in a bank and its fundamental long term profitability (Liquidity) and stability stricter regulatory capital encourage banks to hold sufficient capital to withstand shocks and in meeting the expectations of its publics.

This study revelations conform to the views of other scholars that stringent capital requirements is an effective risk ameliorating mechanism that could leverage bank risk management activities and curtail its risk-taking behavior. This study results therefore is in favour of the need to regulate bank capital, suggesting that the application of international higher capital requirements in the Nigeria banking system will help banks address their operational and market risk effectively.

Findings in this work prove the workability of higher capital standards like Basel III requirements in the Nigeria banking industry. The causality unidirectional link between OPR and MKR and Basel III capital requirements is an indication that capital buffers would result to improving risk management in banks. Also, that banks when significantly boost in terms of capital requirements will improve profitability which will guarantee banks soundness, safety and stability. This will in turn avert possible financial crisis leading economic slowdown at large.

References

1. Adamgbo SLC, Toby AJ, Kenn-Ndubuisi JI. Implications of Basel III Capital Provisions on Bank Risk Management Practices among Nigeria Commercial Banks, Scholars Journal of Economics, Business and Management. 2019; 6(9): 460-471.
2. Adamgbo SLC, Toby AJ, Momodu AA, Imegi JC. Modelling Bank Capital adequacy Dynamics and Liquidity risk management, Empirical evidence from the Nigeria Commercial Banks. International Journal of Contemporary Research Review. 2019; 10(7):1976-4852.
3. Adamgbo SLC, Toby AJ, Momodu AA, Imegi JC. The effects of capital adequacy on credit risk management among commercial banks in Nigeria; within the Basel capital adequacy framework. International Journal of Contemporary Research and Review. 2019; 10(7):1976 – 4852.
4. Bessis J. Risk Management in banking, 4th ed. John Wiley & Sons, West Sussex, 2015.
5. Blum JM. Do Capital Adequacy requirements reduce risks in banking? Journal of Banking & Finance. 1999; 23:755-771.
6. Calem P, Rob R. The impact of capital-based regulation on bank risk-taking. Econs Papers, Journal of Financial Intermediation. 1999; 18(4):317-352.
7. Crouhy M, Galai D, Mark R. The essentials of risk management, 2nd ed. McGraw-Hill, 2014.
8. Daesik K, Santomero AM. Risk in Banking and Capital Regulation. Journal of Finance, 1988, 53(5).

9. Daulovid E. Has regulatory capital made banks safer? Skin in the game vs moral hazard, European System Risk Board (ESRB), European System of Financial supervision, working Paper series No, 2019, 19.
10. Hellmann T, Murdock K, Stiglitz J. Liberalization, Moral Hazard in Banking, and prudential regulation; are capital requirements enough. American Econs. Remark. 2000; 90:147-165.
11. Jokipii T, Milne A. Bank capital buffer and risk adjustment decisions. Journal of Financial Stability, 2010.
12. Johansen S, Juselius K. Maximum likelihood Estimation and influence on Co-integration with applications to the Demand for Money, Oxford Bulletin of Economics and Statistics. 1990; 52(2):0305-90495300.
13. Khemaies B, Nidhal M. The Impact of Prudential regulation on bank capital and risk-taking. The case of MENA countries, the Spanish Review of Financial Economics, 2016; 14(2):51-56.
14. Kuzugu S, Kuzugu M. Enhancing the Risk Management Functions in Banking: Capital Allocation and Banking Regulations, 2017.
15. Mark A, Schuermann T, Scott HS. Bank Capital for Operational Risk; A Tale of Fragility and Instability, Harvard John M. Olin Discussion paper series No 763, Risk mgmt, Fin. Inst, 2014, 227.
16. Milne A, Whalley AE. Bank Capital Regulation and incentives or risk taking. SSRN, 2001.
17. Natalya M, Ratnovaki L. Franchise Value and Risk-Taking in modern Banks, working Paper No. 430, De NederLandsche Bank, 2014.
18. Natalya M. Effect of Bank Capital requirements on economic growth: a survey, DNB working paper No. 467, De Nederlandsche Bank, Research Department Amsterdam, the Nether Lands, 2015.
19. Nguyen TTQ, Christophe G. Bank Risk Management: A Regulatory Perspective, 2019.
20. Silva N. Capital Regulation and Bank Risk taking. Completing Blum's Picture, Working Papers Central Bank of Chile, 2007, 416.