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The effect of Regulatory Pressure on Risk-Weighted Capital Adequacy of Insurers in Nigeria

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Abstract
The growing concern for insurance soundness and occasional solvency regulations deserves empirical investigation, as the insurance industry in Nigeria appears to be illiquid to undertake high risk underwriting. This paper examines the effect of the three levels of regulatory pressures of intervention, control and safety on the risk weighted capital adequacy (RWCA) of insurance companies in Nigeria along with such influencers of RWCA as insurance equity multiplier, insurance deposit structure, and size of insurance company. Secondary data were used while regression statistics was used in analyzing the data. Results show that, RWCAR is significantly and negatively sensitive to the intervention level of regulatory pressure while it is significantly and positively sensitive to each of control and safety levels of regulatory pressure. These findings provide important insight for managers and regulators of insurance companies to understand the role and the effect of the identified regulatory levels on the volume of capital considered to be adequate for operational effectiveness, efficiency and in the attainment of adequate solvency margin for indemnification of the insured.

Keywords: Capital adequacy, capital structure, insurance firms, regulatory pressure, insurance solvency.

1.0 Introduction

The insurance sector in any economy plays a huge role in sustaining the existence of every insured entity due to its risk mitigating ability and guaranteed longevity amongst other attributes. The indemnification, risk brokerages and sharing, the 'peace-of-mind experience', job creation, contribution to the growth of gross domestic product (GDPr), among others are some thought benefits of insurance as a risk management strategy (Akpan, 2013). According to Aspal & Nazneen (2014), sound financial performance of insurance companies rewards stakeholders for their investment and encourages more investment in the economy. These and many other roles of insurance call for better, strong and sound insurance sector since their risk can be catastrophic and may be difficult to indemnify. Insolvency risk may threaten insurer's ability to indemnify its subjects from the risk of loss upon the occurrence of the insured-against event.

In order to ensure that insurance companies themselves are not vulnerable to such risk, they need to hold an appreciable volume of capital considered to be adequate. This requirement is believed to fortify and make insurance companies stronger and better able to borne the risk that may occur. This suggests that the overall wellness of insurance companies is dependent on its

capital adequacy. Capital adequacy is defined as a situation where a firm's adjusted capital is adequate to take up all unexpected losses arising in the future and cover fixed asset. It is one of the indicators of the financial health of companies and it is helpful in detecting and prompting action to gauge or prevent bankruptcy and protecting stakeholders' confident. It is a safeguard that protect stakeholders' interest and maintain stability in insurance sector, financial system and the economy, (Aspal & Nazneen, 2014).

In view of the above, interest on capital base as well as the adequacy of capital held by insurance companies has grown globally. It is an important issue of concern in developing economies where insurance sector is considered weak and prone to insolvency. In Nigeria and other countries, insurance capital base has become the target of frequent regulatory actions. As in many developing countries, Nigeria's insurance sector has suffered a number of problems including poor image and low patronage. These problems are typical of developing countries due to high market frictions and imperfections which encourage high level of renting behaviours among insurers. As a result, cases of insurance insolvency seems to be rampant and this seems to force regulatory agencies such as the National Insurance Commission (NAICOM) into action to ensure that insurance capital is adequate for risk underwriting and investment to protect the insured as well the investors (NAICOM, 2014).

This move by NAICOM usually forces insurers to engage in involuntary capital structure decisions, which according to Marques & Santos (2004) are decisions made to meet and comply with the requirements of minimum capital adequacy ratio (regulatory capital) set by the regulator (NAICOM). The present study focuses on the later aspect of capital structure decisions – the involuntary decisions. Besides this forceful engagement, insurance companies, by nature of its operations, would always often prefer to have a capital ratio that is above the regulatory ratio for a number of reasons. One and probably the most important of all the reasons is that of hedging to avoid the expensive practice of raising new capital in short time by selling new shares. When this happens, having an adequate capital ratio that meet and perhaps surpasses the statutory requirement becomes an issue of concern. This concern is heightened in the face of the overtly criticized risk-based capitalization (RBC) rules. Some scholars have argued that compliance with RBC requirement to maintain adequate capital ratio is a harsh rule with a number of shortcomings (Seifert & Gonene, 2010). One of the shortcomings is that the calculations of capital adequacy imposed harsh capital requirement along several dimensions.

Another shortcoming of interest is that the calculation does not include covariance adjustment within risk groups, so the benefits of risk diversification are hardly recognized optimally (Lewis, 1998). A number of factors tend to influence the perception of capital adequacy regulation in insurance sector. Many perceive that the insurance industry is already overcapitalized. In this case, shortage of capital may be less a problem than overcapitalization. At this instance, NAICOME set three levels of regulatory capital requirements which insurance companies must adhere to. These levels are intervention level, control level and safety level. At intervention level, the capital adequacy ratio of insurance companies should not be less than 100%; at control level, insurers are required to hold capital adequacy between 100% and 130% and at safety level, insurers capital adequacy is above 130%.

Given these regulatory thresholds, the question to find answers to would be first, how many insurance companies in Nigeria

can be classified as requiring intervention; second, how many requires control and third how many are considered safe? In other words, how sensitive is the capital adequacy ratio of Nigerian insurers to each of these levels of regulatory requirement? Since empirical studies in this area are scarce, the current study is set out to:

i. Examine the sensitivity of risk-weighted capital adequacy of insurers to the intervention level of regulatory pressure in Nigeria.

ii. Investigate the sensitivity of risk-weighted capital adequacy of insurers to the control level of regulatory pressure in Nigeria.

iii examine the sensitivity of risk-weighted capital adequacy of insurers to the safety level of regulatory pressure in Nigeria.

This paper is organized in five sections. Following this section one is section two which is the review of relevant theories and literature. Section three is the methodology and data set for this study. Section four contains the econometric results, model estimation and evaluation, interpretations and discussion of the results. Section five focuses on conclusion, implications and recommendations.

2.0 Literature review

Risk weighted capitalization (RWC) as a concept requires firms to hold capital according to the level of risk assumed. As a policy, it is used by regulators as a barometer for assessing the soundness and financial health of economic entities. To practitioner, it is seen as instrument of oppression and unnecessary government interference in smooth operation of firms. There are varied interpretations, views, opinions, perspectives, strategic responses and resistance to RBC, especially in the financial sector of many economies. Overall, RBC is technically a policy directive aimed at strengthening the financial capacity of financial institutions like banking and insurance companies in order to encourage investment, growth and stability of the sector and development of the economy. This is because financially unsound and unhealthy firms do not only lead to lost in investment, but also cannot support a productive economy.

Consequently, RWC which came to practices in the early 1990s (Hartman, Braithwaite, Butsic *et al.*, 1992) is also seen as an indicator of good financial health of financial institutions around the globe. It first took place in banks under the aegis of Basel I, which later metamorphosed into Basel II and Basel III afterwards. For insurance firms, it came in the name of Solvency I, and is yet to evolve globally into Solvency II. As a relatively new concept that have made inroad into insurance sector, adequate understanding is required in order to appreciate its potentials as a pendulum for sound economic decisions by all economic being for improved and desired economic living. As international regulatory requirement, RBC is basically used for both banks and insurance. In view of the varied conjectures which, at best, result in growing resentment to RBC, it is imperative to review RBC in the light of possible antecedents and consequences on financial structures of insurance companies.

Risk-weighted of risk-based capital adequacy ratio (RBCAR), from insurance perspective, is a measure of capital considered to be adequate and available to support insurers' operation as stipulated by regulatory body – NAICOM (BNM, 2013). It is basically the total of insurance fund and shareholders' funds of an insurance company held for purposes of supporting the total capital required by NAICOM. From this standpoint, it could be inferred that beyond statutorily required capital, insurance companies still need a capital ratio that will support the one

set by regulatory body. This is a case of an involuntary capital.

There are many ways risk-weighted capital adequacy ratio is calculated. Covering all mathematical maneuvers and algorithms that are involves in such calculation is beyond the scope of this study. For our purpose, we will rely on the formula provided by BNM (2013) and CBN (2013) for calculating risk-based capital ratio thus:

$$\text{RBCAR} = \frac{\text{Total Capital Available}}{\text{Total Capital Required}} \text{ X } 100\%$$

The theoretical assumption of the above formula is that, the higher the ratio, the better the insurer's financial strength to meet its liabilities. Used in banking sector, a higher ratio signifies bank's ability to fulfill the liabilities and other risk such as operational, credit and market risks. Since insurance also face these risks, this proposition also applies within insurance sector. A higher RBCAR reveals its internal strength to bear up losses in crisis period.

Regulatory pressure is government requirement and directive to insurance companies operating in Nigeria to hold sufficient capital to be able cover losses. At the Insurers Committee Retreat held on 15th and 16th February, 2018 in Abeokuta, all insurance companies in the Nigerian insurance industry agreed by a consensus that it is desirous to recapitalize their capital not only because the government has required them to but also due to the effect of some macroeconomic and institutional factors on insurers, 2008 global financial crisis, inability of some insurers to keep contractual commitments made to their stakeholders including the insured, inadequate capital structure, taking too much risk, eminence insolvencies which has eroded public confidence that eventually would lead to decline in insurance companies among other factors. The bottom-line of action to gauge against the risks is to recapitalize according to the level of risk assumed by an insurer. Thus a minimum risk-based capital ratio was fixed at 130% as a safety level, 120% as control level, and 100% as intervention level. Each of the levels, indicator, specific actions by insurer, affected insurer and by regulatory and safety parameters are presented in Table 1.

By this arrangement, insurers with capital adequacy equal at intervention level are required to report to the regulatory bodies as indication of potential insolvency. This means that if insurance company's capital is above 100% and pt to 129% ratios, the company is in relatively good standing and from 130% the companies are considered strong and safe. To know if data is sensitive to this requirement we will organised our data by defining additional variable by creating dummy variable to represent this requirement and thereafter test to see if the data will be sensitive to the requirement. This would mean including three dummy variables in our estimated model to test whether the coefficient of firms with higher or above required adequacy actually differs from firms with lower capital adequacy.

The justification for government interventions in terms of minimum capital requirement for institutions appears to be premised on portfolio regulatory theory). This theory is best suited for the arguments advanced for the sensitivity of insurance capital to regulatory pressure or requirements. Portfolio regulatory theory, which is one of the theories of bank capital adequacy, argues that profit and wealth

maximization are the principal aims of every economic entity including financial institutions. Its basic dictate that regulating financial institutions is necessary for maintaining safety and soundness of the financial system. This is to ensure that these institutions are better positioned to meet its liabilities with relative easiness. In the opinion of Ikpefan (2013), this desire propelled regulatory agency to enforce tighter and mandatory solvency and liquidity requirement and compliance on the institutions. A number of authors have adopted this theory in explaining the why banks rant in ascertaining appropriate capital adequacy ratio (Akani & Lucky, 2015; Calem & Rob, 1996). And because insurance companies are also financial institutions, this theory is considered relevant to explaining the envisaged relationship.

Opinion and empirical findings on capital adequacy differs according to authors and settings with respect to spatial or geographical context of investigation. For instance, Aspal & Nazneen (2014) defined capital adequacy as "…a percentage ratio of a bank's primary capital to its assets, used as a measure of its financial strength and stability". The author explained further that capital adequacy is a measure of the overall financial position and ability of management to meet the requirement for additional capital of the banks. As in many studies like Aspal & Nazneen (2014) Abba, Peter., & Inyang (2013), adequacy of capital is a strong indicator of financial safety and soundness of a firm.

In whatever usage, capital adequacy is important in as much the same way as capital is to any organization. Capital absorbs losses, promote public confidence, controls asset growth, protect depositors and funds etc. These functions of capital are very important in insurance companies which deal with risks. Emphasizing the importance of CAR, regulators in Malaysia(BNM, 2013), Nigeria (CBN, 2013), and other countries require insurers to submit their CAR every year.

Table 1. Regulatory pressure levels, indicators, actions plans and safety parameters of RBCAR

Different Regulatory Levels		Indicators	Insurer's (Action Plan)	Regulatory (Action Plan)	Safety parameters
1 (Safety Levels)	x ≥ 130 %	Firms well run; all financial and non-financial indicators within acceptable range.	No action required regular filings continue	No action required regular review of returns continue	The parameters show that excess over the Minimum Solvency Capital Requiremen

2 (Control Level)	120 % ≤ x < 130 %	Company reasonably well run, most financial and non-financial indicators within acceptable range, but few outside range or deterioratin g	• Submit business strategies on how to sustain its solvency level. • Prepare and submit a five-year cash flow projection to the Commission. • Organize a meeting of its Executive Management and the Commission. • Appoint actuaries to evaluate any improvement made by the Company and also identify areas that still need to be worked on.	Regular filings of returns, intensive monitoring, until company returns to control level1. Any other measures as the Commission may deem fit in the circumstance.	t of each of the Tiers
3 (Control Level)	100 % ≤ x < 120 %	Company generally in acceptable status, but a number of indicators outside range, or have been deterioratin g	• In addition to action plan in control level 2, Insurers to inject additional capital to enhance its capital base. • Limit redemption/repurchase of equity instruments (shares). • Limit payment of dividends until the desired outcome is achieved. • Limit its Management's expenses. • No new international expansion. • Restrict/restructur e new investments. • Organize periodic meetings of Board of Directors and the Commission. • Comply with special inspection activities to monitor compliance.	Commission questions management on the issues raised by analysis. More intensive monitoring until company returns to control level 1. Other measures as the Commission may deem fit in the circumstance.	

4 (Intervention Level)	x < 100 %	Significant number of indicators outside acceptable range, or have shown significant deterioration	• Submit periodic Board Contingency Recovery and Resolution Plan. • Restrict new investment and/or restructure existing investment. • Limit management expenses. • Inject capital to enhance TBMSC. • Not transact any further business until injection of additional capital. • Not pay any form of dividend. • Remove from office any of its staff who might have contributed to the problem of the company. • Shall call upon the Commission for assistance to control part or whole affairs of the insurer. • Take further steps that would prevent final winding up and/or liquidation of the company.	• Intervention to be considered. • including extra capital requirements, • restricting new business • M&A or ending the company if all else fails. • Other measures the Commission may deem fit in the circumstance	Less than base safety level at Tier Based Minimum Solvency Capital (TBMSC)

Source: NAICOM (2018)

Inference from CNB (2013), capital adequacy has presently gone beyond being a regulatory and supervisory instrument. As could be inferred from several studies(Abba, Peter, & Inyang, 2013; Abusharba, Triyuwono, Ismail, & Rahman, 2013; Akani & Lucky, 2015; Anggono, 2014; Wen, 2009; Williams, 2011), capital adequacy has become a monetary policy tool of achieving financial stability. Section 7 (2) of BOFIA states that any banks that fail to comply with the capital adequacy within such period as may be determined by the CBN shall be a ground for revocation of license. This goes to explain how important capital adequacy is to financial institutions, the regulatory agencies, the government, and to the economy at large. This assertion has variously been explains in several studies Sequel to this, capital adequacy is no longer a debatable issue. What has attracted interest in the present rift regulatory environment is the ratio of capital considered to be adequate and what determined that ratio.

In retrospect of the predictions of the applied base theories and past empirical evidences,

the following hypotheses are developed to analyze the objectives of the study:

H1: Risk-weighted capital adequacy of insurers is significantly sensitive to the intervention level of regulatory pressure in Nigeria.

H2: Risk-weighted capital adequacy of insurers is significantly sensitive to the control level of regulatory pressure in Nigeria.

H3: Risk-weighted capital adequacy of insurers is significantly sensitive to the safety level of regulatory pressure in Nigeria.

H4: The sensitivities of RBCAR to regulatory pressure have significant structural change

3.0 Methodology and Data Set

The research approach and design adopted in this study is quantitative and descriptive as the study seeks to know how the explained variable has been affected by the explanatory variable in the study. Secondary data was used in this study. The data was cross sectional since it was collected within one year from data stream of the National insurance Commission (NAICOM) and annual report of 32 insurance companies, selected based on the availability of data for the year 2019. In the study, RBCAR as the dependent variable and regulatory pressure: intervention level, control level and safety level constitute the independent variables while deposit structure, equity multiplier, and firm size are the control variables. These variables, the measurement and expected signs are presented in Table 2

Table 2: Variable Measurement and econometric notations

Variables	Notation	Measurement	Predicted signs
Dependent:			
Risk-base capital adequacy ratio	RBCAR	Percentage of total capital available to total risk-based capital required	
Independent:			
Regulatory Pressure (Intervention Level)	SOL1	Dummy variable 1 for firms with RBCAR less that 100% otherwise zero (0)	+/-
Regulatory Pressure (Control Level)	SOL2	Dummy variable 1 for firms with RBCAR greater that 100% but less than 130 otherwise zero (0)	+/-
Regulatory Pressure (Safety Level)	SOL3	Dummy variable 1 for firms with RBCAR greater that 130% otherwise zero (0)	+/-
Control Variables			
Deposit structure	DARK	Ratio of insurance premium to insurance asset	+
Equity multiplier	EQM	Ratio of insurance assets to insurance stockholder's equity	-
Insurance Size	SIZE	The natural logarithm of total asset	+/-

The model used in this study is multiple regression models, the baseline of which is specified below:

$$Y_t = \beta_0 + \beta_{1\to n} \sum_{t=1}^{n} X_t + \varepsilon_t \quad (1)$$

From model (1), models 2 to 4 are derived and applied in testing the sensitivity of the RBCAR to the different levels of regulatory pressure namely intervention level, control level and safety level. Model 5 is used to analyze structural change due to sensitivity of RBCAR to the three levels of regulatory thresholds.

$$RBCAR_t = \beta_0 + \beta_1 DARK_t + \beta_2 EQM_t + \beta_3 SIZE_t + \beta_4 SOL1_t\ \varepsilon_t \quad (2)$$

$$RBCAR_t = \lambda_0 + \lambda_1 DARK_t + \lambda_2 EQM_t + \lambda_3 SIZE_t + \lambda_4 SOL2_t\ e_t \quad (3)$$

$$RBCAR_t = \delta_0 + \delta_1 DARK_t + \delta_2 EQM_t + \delta_3 SIZE_t + \delta_4 SOL3_t\ \mu_t \quad (4)$$

$$F = \frac{[(SSE_1 - SSE_2)/m]}{SSE_2 / n - k} \quad (5)$$

Where, y = dependent variables (risk-weighted capital adequacy ratio, RBCAR), $\beta_0 = \lambda_0 = \delta_0$ = Constant; $\beta_{1\sim4} = \lambda_{1\sim4} = \delta_{1\sim4}$ = coefficient of explanatory variables, $\sum_{t=1}^{n} X_t$ = vector of explanatory variables, and $\varepsilon_t = e_t = \mu_t$ = Error term; F = test statistics; SSE_1 = sum of square residual of restricted model; SSE_2 = sum of square residual of unrestricted model; m = number of restrictions; n = number of observations; k = number of independent variables. All notations in the models are as defined in Table 2.

The above OLS model is adapted from previous studies such as Abusharba et al., (2013); Akani & Lucky (2015); Bokhari & Ali (2006); El-Ansary, & Hafez (2016); Mekonnen, (2015); Raharjo., Hakim., Manurung, & Maulana (2014); Shingjergji, Ali & Hyseni (2015); Wen (2009); Williams (2011) amongst others. These models are considered to contain variable suitable and relevant to insurance sector. As stated earlier, these studies were conducted in banking sector and in different economies. Some of the findings differ from theoretical point of view.

The population of the study here is described in terms of the number of insurance companies. thus, The study will cover a total of thirty two (32) insurance companies that are listed in the Nigerian Stock Exchange (NSE) Nigeria. Being cross sectional study, the period of the study was 2019 and all firms studied have been in existence with their financial data available up to 2019.

4.0 Empirical Results and Discussion

4.1 Descriptive and Correlation statistics:

The result of the descriptive and correlation statistics for this study is presented in Table 3. From the table, the key variables namely RBCAR, DARK, EQM, SIZE, SOL1, SOL2, and SOL3 each has a mean value of 91.49%, 0.46%, 2.04%, 10.06%, 0.75, 0.25, and 0.13 respectively. This means that, on average, Nigerian insurance firms a level of capital requirements slightly less than the threshold of 100, with an asset based that can only cover about 0.45% of premium, 2.06% of shareholders' equity and the firms can only boost of 10.06% strength in its size. It appears

that 75% of the insurers have their capital at intervention level, 25% insurers have capital within control level and 13% have capital at safety level. In all, this does not suggest that the insurance companies in Nigeria are sufficiently solvent to the level of sustainable profitable operations. This data possesses requisite feature for empirical analysis.

Table 3 - Descriptive and correlation Statistics of variables

Var	Mean	SD	RBCAR	DARK	EQM	SIZE	SOL1	SOL2	SOL3
RBCAR	91.49	54.21	1						
DARK	0.46	0.33	0.64	1					
EQM	2.04	1.18	-0.16	-0.40	1				
SIZE	10.06	0.31	0.10	-0.59	0.71	1			
SOL1	0.75	0.44	-0.76	-0.36	0.09	-0.20	1		
SOL2	0.25	0.44	0.76	0.36	-0.09	0.20	-1.00	1	
SOL3	0.13	0.44	0.87	0.61	-0.18	0.01	-0.65	0.65	1

Further, the result in Table 3 reveal that all explanatory variables are not highly correlated since their correlation coefficients are all less than 80% threshold specified by Cooper & Schindler (2014). With this, multicollinearity problem is less likely to occur in the estimated parameters. However, to ensure that there are no hidden and unobservable multicollinearity problems in the coefficient of the predicting variables, we perform VIF test on all models.

4.2 Result of RBCAR sensitivity to regulatory pressure

The general objective of the study was to test the sensitivity of RBCAR to regulatory pressure, which was fixed at three levels of intervention (100≤SOL), control (100≥Sol≤130), and safety (Sol≥130). The result of the test of the corresponding hypothesis is presented in Table 4. In the table, model 1 is estimated as restricted model since it contains less variables to account for the proportion of variance explained by control variables only while models 2 to 4 is estimated as unrestricted models since each contains one more variable (of interest) to be able to distinguish the variance explained by the additional variable of interest, which is represented by the differential intercepts.

From the result, the differential intercepts or coefficient ($\beta SOL1$) of -23.42 for intervention level is significant at 0.05 level and negative while that of control level (βSOL2): 23.42, and safety level (βSOL3): 52.46 are significant and positive at 0.05 and 0.001 levels respectively. This means that the explained variable (RBCAR) is significantly sensitive to three levels of regulatory requirements of intervention: SOL1 (100≤SOL); control: SOL2 (100≥Sol≤130); and safety: SOL3 (Sol≥130). Consequently the hypotheses developed for this study are all supported. Thus, this could be interpreted to mean that insurers with RBCAR less than 100% are -N23.42mil less adequately capitalized and it requires regulatory intervention by means of capital injection to safe the companies. But insurers with RBCAR falling within 100% and 130% are N23.42mil adequately capitalized and they only require regulatory control. Finally insurers with RBCAR above 130 are about N52.46mil more adequately capitalized and they require no regulatory action except for sustainability measures.

Table 4: Result of sensitivity of RBCAR to regulatory Pressure

	Model 1	Model 2 Intervention Level (100≤SOL)	Model 3 Control Level (100≥Sol≤130)	Model 4 Safety Level (Sol≥130)
Model parameters				
Constant	-1,915(175.6)***	-1,553(227.9)***	-1,577(220.9)***	-1,411(198.8)***
Dark	179.5(12.57)***	155.9(15.62)***	155.9(15.62)***	128.6(17.21)***
Eqm	-23.41(4.019)***	-18.99(4.220)***	-18.99(4.220)***	-17.31(3.713)***
Size	196.0(17.68)***	162.0(22.23)***	162.0(22.23)***	146.4(19.83)***
sol1		-23.42(10.28)**		
sol2			23.42(10.28)**	
sol3				52.46(14.13)***
Observations	32	32	32	32
Model Characteristics				
R-squared	0.893	0.9102	0.9102	0. 929
Adj. R^2	0.870	0.8969	0.8969	0.919
Change in Adj. R^2	0.00	0.027	0.027	0.049
F-Stat.	75.65(0.00)***	68.45(0.00)***	68.45(0.00)***	88.53(0.00)***
D-W *d* Test	2.14	**1.86**	**1.86**	1.99
Model Diagnostics				
R. RESET	0.38(0.54)	1.29(0.27)	1.29(0.27)	0.46(0.51)
B-P-G *test*	1.70(0.189)	1.49(0.23)	1.49(0.23)	1.38(0.27)
VIF	2.06	3.04	3.04	3.61
SSE	9748.38	8175.96	8175.96	6452.99

NOTE: Standard errors in parentheses (for model parameters), p-values in parentheses (for model characteristics and diagnostics); B-P-G *test* (Bruse-Peagan-Godfrey) TEST for Heteroskedasticity; R- RESET (Ramsey RESET) for model misspecification; VIF (variance Inflation Factor) for multi-colinearity test; SSE (Sum squared residual) for test of sensitivity of RBCAR to different levels of regulatory pressure; *** p<0.01, ** p<0.05, * p<0.1

In determining if these sensitivities have led to significant structural changes in the relationship between RBCAR and other variables (i.e. deposit structure, equity multiplier and insurance size) in the model than the regulatory levels proxy by the three levels of regulatory requirement ratio, we test hypothesis 4 using model 5 by analyzing the explanatory power of restricted and unrestricted models comparatively as presented in Table 5.

The null (*Ho*) hypothesis is that the sensitivities of RBCAR to regulatory pressure do not have significant structural change. This would mean that $\beta = \lambda = \delta \neq 0$

while the alternate hypothesis (H_A) is that the sensitivities of RBCAR to regulatory pressure do have significant structural change; meaning that, $\beta = \lambda = \delta = 0$. The results of the test of this hypothesis as shown in Table 5 shows that all calculated F-values are greater than critical F-value, and as such we reject the null hypothesis, meaning $\beta = \lambda = \delta \neq 0$. This means that there has been significant structural change in the relationship between insurance capital adequacy, deposit structure, equity multiplier, and insurance size with respect to each level of regulatory capital requirement ratio. Again, the results are sensitive to the change in policy requirement. The last hypothesis (H4) is therefore retained.

Table 5 Results of structural change due to RBCAR sensitivity to Regulatory pressure

Model 2 Intervention Level (100≤SOL1)	Model 3 Control Level (100≥SOL2≤130)	Model 4 Safety Level (SOL3≥130)
$F = \frac{[(9748.38 - 8175.96)/1]}{8175.96 / (32 - 5)}$	$F = \frac{[(9748.38 - 8175.96)/1]}{8175.96 / (32 - 5)}$	$F = \frac{[(9748.38 - 6452.99)/1]}{6452.99 / (32 - 5)}$
$F = \frac{1572.42}{302.81}$	$F = \frac{1572.42}{302.81}$	$F = \frac{1572.42}{239.00}$
Calculated F = 5.19	***CalculatedF = 5.19***	***Calculated F = 6.58***
Critical F* ($F_{(27, 1)}$) **= 4.21**	Critical F* ($F_{(27, 1)}$) **= 4.21**	Critical F* ($F_{(27, 1)}$) **= 4.21**

Source: Authors' computation

The above results imply that the imposition of capital adequacy ratios for insurers to meet has caused about 75% of insurance companies to implement regulatory directive by NAICOM (2018), which among other things would be to discontinue further investment while restructuring their existing investment to generate profit. They will have to reduce the expenses on management and increase or inject new capital, stop dividend payment, disengage unproductive staff via staff performance auditing, and seek the assistance of the regulatory body in the area of control of their affairs to prevent winding up of the company. On part of the regulator, they could intervene by means of either financial assistance or imposition of extra capital requirement and may even recommend dissolution of the companies. This would mean significant structural changes in the operations of 75% of the insurance companies in Nigeria; and, such change could come in the form of merger and acquisition rather than complete winding up of the companies.

Also by the results of this study, about 25% of insurance companies in Nigeria would have to re-strategized on how to sustain their current solvency level, focus on cash flow planning for a period of say five years, invite the regulatory agency to their meetings for advise, seek the services of an Actuaries to help the company in evaluating any improvement the company has made and any other aspect the company may need to improve upon. The companies may also need to inject additional capital boost their capital base, stop redeeming and repurchasing of equity instruments like shares, stop dividend payment, stop expenses on management, reduce cross boarder expansion, restrict and restructure new investments, and other directives as specified by NAICOM (2018) in Table 1. On part of the regulator, there would be intensive monitoring and ensuring that the affected companies fill in their returns regularly until the company move to safety

level. Finally, the result further implies that a total of 13% of insurance companies in Nigeria are safe and requires no regulatory intervention except for purposes of sustainability directives such as regular review and filings of returns.

Put together, the result reveals the state of insurance industry in Nigeria which is the fact not many insurance companies are sufficiently solvent to undertake high risk underwriting operations in Nigeria

5.0. Concluding Remarks

This study was carried out to assess the sensitivity of risk-base capital adequacy of insurance companies to regulatory pressures in Nigeria. Three levels of regulation namely intervention, control and safety were examined. The study has discussed a number of relevant literatures conceptually, theoretically and empirically. From the result of the analysis, it is concluded that RBCAR is highly and significantly sensitive to the regulatory pressure in Nigeria. Specifically, RBCAR is significantly and negatively sensitive to the intervention level of regulatory pressure while it is significantly and positively sensitive to each of control and safety levels of regulatory pressure. Therefore, the management of most insurance companies in Nigeria requires government involvement with stiffer measure to forestall possible insolvency and liquidation of the companies while a few insurance companies require such degree of intervention rather some control measures to enable the companies stay afloat. The findings from this study have some implication for practice and policy as well as decision-making. This study has given an insight into possible directions for managerial and regulatory actions to tackle the impending insolvency threats to the soundness and stability of insurance firms in Nigeria. However, this study is limited by small sample. In view of the limitation, further researches should expand the frontier of analysis to include more sample companies.

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