Modeling Internal Determinants of Capital Adequacy in Insurance Companies

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Abstracts

The growing concern for insurance soundness and occasional solvency regulations requires that factors that are likely to affect capital adequacy and cause insolvency be investigated. This paper examines the role of equity multiplier, deposit structure, liquidity and size of insurers in determining insurance capital adequacy. Secondary data were collected from a sample of 32 insurance firms while regression statistics was used to analyze the data. Result shows that deposit structure and size each has a significant positive effect while equity multiplier has a significant negative effect on capital adequacy. Liquidity is not among the internal determinants of capital adequacy of Insurers. These findings provide important insight for managers and regulators of insurance companies to understand the role and the effect that identified factors have 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 insure

Keywords - Capital adequacy, capital structure, insurers, insurance solvency, liquidity

Introduction

The importance of insurance sector in an economy globally stems from its risk mitigating ability and guaranteed longevity of the insured vis-à-vis object of insurable interest. As explained by Akpan (2013), insurance as a business function contribution to the growth and development of an economy through its indemnification role to the insured, risk brokerage and sharing role, the 'peace-of-mind experience' to the insured, job creation. The author further explained that insurance is also a risk management strategy which plays an important financial intermediation function that results in value creation. Therefore, it could be inferred that a sound financial performance of insurance firms rewards stakeholders in terms of indemnification of insured and returns to investors thus encouraging more investments in the economy; hence, the growing concern for adequate capitalization. Capital adequacy requirements are established with the intention to reduce insurance insolvency risk (Ahmed, 2016) and guarantee the going-concern concept of businesses and personal longevity in the face of catastrophic loss (Akpan, 2013).

Insolvency risk may threaten insurer's ability to indemnify the insured. In order to ensure that insurance companies themselves are not vulnerable to such risk, they need to hold an appreciable volume of capital. In view of this, interest on capital base as well as the adequacy of capital held by insurance companies appears to take priority in insurance management and a target of regulatory actions in many countries. As in many developing countries, Nigerian insurance sector is faced with such problems as poor image, low patronage, inadequate capitalization, ceding which result in capital flight and less returns to stakeholders and leakage in the economy, frequent regulatory intervention that resulted in policy inconsistencies and disproportionate extinction of insurance companies, market frictions among other problems (Akpan, 2013; Seifert & Gonene, 2010).

From theoretical point of view, Nigeria and indeed other emerging markets are a better testing ground for validating most finance theories since the proof or otherwise of the theories require the conditions of market imperfection which characterizes emerging countries (Seifert & Gonene, 2010). Apart from the theoretical satisfaction for this investigation, insurance companies generally seem to have been overlooked in scholarly researches involving capital adequacy ratio. This statement could be

traced to the review of about 124 articles on capital structure by Santos & Farinelli (2015) where none of the studies was specifically conducted within insurance firms.

Furthermore, inferences from Marques & Santos (2004), and Raharjo, Hakim, Manurung, &

Maulana (2014) suggest that insurance capital structure consist of voluntary and involuntary decisions. Under voluntary, decisions are made based on the determining factors hypothesized in the theory of a firm's capital structure in general (theory of capital structure of the firm). Under involuntary, decisions are made to meet and comply with the requirements of minimum capital adequacy ratio set by the regulator (regulatory capital). The present study focuses on the former aspect of capital structure decisions – the voluntary decisions partly because of the need to know the determinants of capital structure in order to used them and hedged against the expensive practice of raising new capital in short time by selling new shares to boost capital stock. This being so would further mean that, knowing the determinants of capital adequacy beyond statutory requirement is of immense importance.

The above implies that even though capital adequacy ratio is specified by regulatory agency, insurance companies have a role to play in determining or influencing or better still in achieving the set ratio and beyond. The regulatory agency only specifies the ratio as a benchmark, and it is left for the companies to achieve that ratio. The question that follows is: do all insurance companies meet this ratio at one time? The answer may sure well be No! Then, why do others meet and the rest do not meet this ratio? The answer presupposes that some firms focused on some specific activities to achieve and most often surpassed the set ratio than others. The worry that follows is what factors or what are those activities that the firm could focus and pursue most in order to achieve this ratio? This is where a study on the determinants of capital adequacy ratios matters and becomes of research interest in financial institutions like insurance firms.

The quest for adequacy of capital can leads to intense competition which results in a loose underwriting standard. But what level of capital is required and what determined the level has not been deliberated or mentioned in these conjectural arguments. The observed shortcoming in RBC rule (Akpan & Evbayiro-Osagie, 2020) could also be, to an extent, a consequential side show of the lack of understanding of the factors that determine capital adequacy. Moreover, the adequacy of insurance capital is probably a less debatable issue instead the ratio of capital considered to be adequate enough to curb of insolvency and what determined that ratio is a source of concern.

Although the relationship between capital adequacy and insurance insolvency seems to have been considered passively in some studies (Ahmed, 2016), the determinants of insurance capital

adequacy itself suffer empirical literature. Even in the famous risk-based capital (RBC) formula developed by the National Association of Insurance Commissioners (NAIC) and the Centre for Insurance Policy and Research (CIPR) as a tool to assist regulators in the financial analysis of insurance companies (NAIC, 2015), what determined capital adequacy is not overt in the model (NAIC, 2015).

This is testamentary to the fact that there is need to investigate capital adequacy in insurance companies. Lewis (1998) and Ediz, Michael, & Perraudin (1998) were earliest authors who acknowledged the importance of capital adequacy from insurance perspective by saying that '…capital requirements are among the greatest weapons against insolvency…but the capital to hold for gauging insolvency should be determined beyond statutory requirement'. This proposition came at the heels of diverse perceptions of insurance capitalization, and reflect the notion that while some people may perceived that insurance industry is already overcapitalized, in which case, shortage of capital is less a problem than overcapitalization, others may hold contrary views. However, a common grounds seems to exist among these groups which is the fact that what level of capital is adequate and what determined that level appears arguably conjectural than empirical.

Empirically, much as works have been done in the banking sector, and factors such as equity multiplier, bank size, liquidity, deposit structure, regulatory pressure etc were found to influence bank capital adequacy (Abusharba et al., 2013; Akani & Lucky, 2015; El-Ansary & Hafez, 2016 and Ikpefan, 2013). In insurance firms, these factors seem to have been overlooked in past researches involving capital adequacy. Since insurance firms are also financial institutions, it is of relevance and importance to also investigate if these factors can also influence capital adequacy in insurance companies. In general therefore, this study sought to find out if equity multiplier, deposit structure, liquidity and size of insurance company are statistically significant determinants of insurance capital adequacy in Nigeria. Specific objectives are to investigate:

1. The influence of equity multiplier, liquidity, and size of an insurance company on insurers' capital adequacy in the absence of insurance deposit structure;
2. The effect of insurance deposit structure, liquidity, and size of an insurance company and on insurers' capital adequacy in the absence of equity multiplier;
3. The effect of insurance deposit structure, equity multiplier, and size of an insurance company on insurers' capital adequacy in the absence of liquidity;

4. The influence of insurance deposit structure, equity multiplier, and liquidity on insurers' capital adequacy in the absence of size of an insurance company.

To achieve the objective of the study, we develop and test the general hypothesis that equity multiplier, deposit structure, liquidity, and size of insurance company are statistically significant determinants of insurance capital adequacy in Nigeria. Specific hypothesis are:

H1: Excluding deposit structure, equity multiplier, liquidity, and size of an insurance company will have a joint and statistically significantly influence on insurers' capital adequacy.

H2 Excluding equity multiplier, deposit structure, liquidity, and size of an insurance company will have a joint and statistically significantly influence on insurers' capital adequacy.

H3 Excluding liquidity, deposit structure, equity multiplier, and size of an insurance company will have a joint and statistically significantly influence on insurers' capital adequacy.

H4 Excluding size of an insurance company, deposit structure, equity multiplier, and liquidity will have a joint and statistically significantly influence on insurers' capital adequacy.

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, summary and implications

Literature review

Conceptual Discourses

This section focuses on relevant concepts such as capital adequacy, capital adequacy ratio and its determinants. Generally, opinion and empirical findings on capital adequacy differs according to authors and settings with respect to spatial or geographical context of investigation. Earlier, equity multiplier, bank size, liquidity, deposit structure, and regulatory pressure etc were found to influence bank capital adequacy. Within insurance companies, these factors are investigated and for clarification, discussions on these factors are germane.

Capital adequacy is a measure of the overall financial position and ability of management to meet the requirement for additional capital of the firms. This definition collaborate with the description of capital adequacy for insurance by Bank Negara Malaysia (BNM) which is that capital adequacy, "…allow greater flexibility for an insurer to operate at different risk levels in line with its business strategies, so long as it holds commensurate capital and observes the prudential safeguards set by Bank Negara Malaysia,…improve transparency…allow for pre-emptive supervisory actions to be taken…etc". Thus, adequacy of capital is a strong indicator of financial safety and soundness of a firms including insurance (Aspal & Nazneen, 2014; Abba, Zachariah, & Inyang, 2013).

Insurance capital adequacy is a measure of the adequacy of capital available in the insurance and shareholders' funds of the insurer to support the total capital required (Aspal & Nazneen, 2014; BNM, 2013). The theoretical assumption is that, the higher the above ratio, the better the insurer's financial strength to meet its liabilities. A higher ICAR reveals insurer's internal strength to bear losses in crisis period.

Capital adequacy ratio - In view of the above, it follows that capital adequacy ratio (CAR) can be defined as a percentage ratio of a firm's primary capital to its assets, used as a measure of its financial strength and stability (Aspal & Nazneen, 2014). Emphasizing the importance of CAR, regulators in Malaysia (BNM, 2013), Nigeria (CBN, 2013), and other countries require insurers to submit their CAR every year. Inferring from CBN (2013), CAR has gone beyond being a regulatory and supervisory instrument to being a monetary policy tool for achieving financial stability (Abba, et al., 2013; Abusharba, Triyuwono, Ismail, & Rahman, 2013; Akani & Lucky, 2015; Anggono, 2014; Wen, 2009; and Williams, 2011).

Insurance deposit structure (DEST) - Deposit Structure in insurance is in the form of premium. Unlike banks, depositors (the insured) do not, in strict sense, expect high returns on these deposits except the policy was profit-based. As was used by Abusharba et al. (2013) in banking sector this factor is mostly used in capital adequacy investigations and it is expected theoretically that IDES would have a positive effect on capital adequacy ratio.

Insurance equity multiplier (EQM) - Equity Multiplier is a share of deposit in non-equity liabilities used in some cases as a measure of leverage. According to Bokhari & Ali (2006), the smaller the equity base, the greater will be the financial leverage and equity multiplier. Higher equity multiplier converts a normal return on assets into a high return on equity thereby improving capital adequacy (Koch, & Macdonalds, 2010). But share of deposits (equity multiplier) was found to have a strong and significant negative effect on capital adequacy ratio (β= -225.41, t-stats= -3.06, p=.003).

Liquidity (LIQ): Liquidity is a firm's ability to finance daily operations and it is usually measured as the ratio of liquid assets to total assets. Generally, firms that hold a reduced level of liquid assets are confronted with the risk of not being able to finance daily operations. High liquidity reduces liquidity risks and increases capital (Abusharba et al., 2013; Mekonnen, 2015). Therefore, this study expects that liquidity may have a positive effect on capital adequacy.

Size of insurance company (SIZE) - Firm Size is the most widely studied firm characteristics in empirical studies involving firm capital structure, risk management and performance. According to Büyükşalvarci and Abdioğlu, (2011), the size of a firm is very important because it relates directly and most proximately to bank ownership characteristics and it give access to equity capital. This may be the reason why it is the mostly studied firm characteristics and the reason why it is adopted in this study. Given the duality of firm size, expectations are either positive or negative.

Theoretical underpinnings

Theoretically, the relation between the determinant of capital adequacy ratio (equity multiplier, deposit structure, firm size, etc) and capital adequacy ratio draws support from two categories of theories namely the theory of risk capital and theories of bank capital adequacy (i.e. the buffer theory of capital).

The ***theory of risk capital*** states that firms dealing with customers and counterparties and are not prepared to bear significant default risk must put up enough risk capital to maintain an acceptable credit quality for their obligation (Erel, Myers & Read, 2015). Inarguably, all firms deploy risk capital in as much as equity forms part of their financing structure. This statement buds from the definition of equity as risk capital, which is practically calculated as the capital needed to keep the firm's probability of ruin below some defined level (Shimpi, 2002).

Risk capital from theoretical point of view is the additional capital a firm requires to cover the financial consequences of its business risks. The amount of risk capital depends on the risk tolerance of the firm. This implies that insurance need a capital ratio that will allow them to provide indemnity to the insured. This may mean that equity multiplier, which has a link between leverage and liquidity each of which represents firm characteristics and risk measure respectively, plays an important role in the determination of capital adequacy. This being so, requires that a critical assessment of the possible factors that can help the insurers reach that ratio becomes essential.

***Theories of bank capital adequacy*:** This theory is discussed under two theories namely the buffer theory of capital and the portfolio regulatory theory but the former which is relevant to this study is discussed. By *Buffer Theory of Capital Adequacy,* financial institutions are considered to be affected by monetary and macro-economic shocks. And the objective of having adequate capital is to absorb these shocks and stays afloat in business. In this situation, holding more capital by way of more deposits (or premium) as a buffer to cushion the negative trend in profit due to the shocks becomes desirous.

An increase in premium would lead to large asset as well as increase in size of insurance companies. This is most important where there is high volatility in capital ratio. As explained by Calem and Rob (1996), this theory predicts that a bank (in our case insurance firms) approaching the regulatory minimum capital ratio may, for sake of renting and hedging, be incentivized to go beyond and increase that ratio by driving more premium as a risk reduction strategy against regulatory costs triggered by a breach of the capital requirement. At this point, premium increase and size of insurance firms could be among the determinants of capital ratio upon which this theory is applied.

Empirical reviews

There are a number of past empirical studies on the determinant of capital adequacy ratios (See Akani, & Lucky, 2015; AL-Mutairi & Nase, 2015; Aspal & Nazneen, 2014; Bokhari & Ali, 2006; El- Ansary, Osama & Hafez, 2016; Mekonnen, 2015; Raharjo, Hakim, Manurung, & Maulana, 2014; Shingjergji, Ali & Hyseni, 2015; Abusharba et al., 2013; Wen, 2009; Williams, 2011). In these studies, many of which are carried out in banks, the determinant of capital adequacy ratio in banks revealed a number of firm characteristics such as firm size, deposit structure, performance factors such as profitability, asset quality, management efficiency, earning quality, liquidity, sensitivity, returns on

asset, returns on equity, return on investment, loan, operational efficiency, equity multiplier, net interest margin.

According to Bokhari & Ali (2006), these factors are valid within financial institutions globally including insurance companies. In this study, performance-related factors are excluded because of the potential problem of endogeneity as reported in some studies (Ezike, & Oke, 2013; Olalekan & Adeyinka, 2013). It is however, one of the limitations of this study and an area recommended for further study in insurance sector. Thus, this study will adopt firm characteristic and risk-related factors that are mostly studied within banks as considered relevant within insurance sector. These include firm size, deposit structure (as firm characteristics); equity multiplier and liquidity (as risk-related factor). And our empirical review focuses briefly on these factors.

Abusharba et al., (2013) studied deposit structure in banking sector as a ratio of bank deposit to bank capital. They found that deposit structure have a positive effect on capital adequacy ratio. Koch & Macdonalds (2010) studied equity multiplier (dividing total assets by stockholder's equity) and found it relating inversely to capital ratio. This was against his prior explanation and expectation that that a higher equity multiplier will converts a normal return on assets into a high return on equity thereby improve capital adequacy. In their study, they found that share of deposits (equity multiplier) has a strong and significant negative effect on capital adequacy ratio (β= -225.41, t-stats= -3.06, p=.003).

Abusharba et al. (2013) and Mekonnen (2015) wrote on liquidity averring it to be an important variable in the study of capital structure adequacy. Measured as the ratio of liquid assets to total assets, the authors stated generally that banks which hold a reduced level of liquid assets are confronted with the risk of not being able to finance daily operations. The high liquidity ratio reduces liquidity risks and increases capital. Therefore, this study expects that liquidity may have a positive effect on capital adequacy.

In terms of firm size, Büyükşalvarci & Abdioğlu (2011) argued that large firms prefer keeping their good ratings and a considerable market determined excess capital reserves and as such would have high capital adequacy ratio. Contrary to this assertion, findings from Jackson, Gropp and Heider (2007 cited in Irawan & Anggono, 2015) that a firm's asset-size is an important determinant of its capital ratio in an inverse direction, which means that larger banks have lower capital adequacy ratios.

Also firm size may serve as its asset diversification which reduces its risk exposure as well as capital adequacy. El-Ansary, & Hafez (2016) also found a negative relationship between bank size and bank capital adequacy ratio. Shingjergji and Hyseni (2015) found a positive relationship between bank size and capital adequacy ratio. Given the duality of firm size, expectations are either positive or negative. In this study it is expected that the size of insurance firms will have either negative or positive significant relationship with insurance capital adequacy ratio.

Methods and Data Set

In this study, the research design adopted is descriptive research design. In terms of population and sample, data were collected from 32 insurance firms whose data were availability for the year 2019. The data were drawn from the data stream of the National insurance Commission (NAICOM) and selected companies' annual audited report for 2019 making it a cross sectional type of data structure. This study has two classes of variables namely the dependent variables and the independent variables, which are discussed in the subsection that follow. The variables upon which data were collected, their measurement, notations as used in this study as wellas apriori expectations are presented in Table 1.

Table 1: Variable Measurement and econometric notations

Variables	Notation	Measurement	Predicted signs
Dependent:			
Capital adequacy ratio	CAR	Percentage of total capital available to total capital required	
Independent:			
Deposit structure	DEST	Ratio of insurance premium to insurance asset	+
Equity multiplier	EQM	Ratio of insurance assets to insurance stockholder's equity	-
Liquidity	LIQ	Ratio of capital to equity less reserves	+
Insurance Size	SIZE	The natural logarithm of total asset	+/-

Models specification - In order to determine the effect of independent variables on the dependent variable, multiple linear regression models were applied. The baseline regression equation (Eqn. 1) and the corresponding regression models for general and specific objectives of the study are specified below:

$$Y_t = \square_0 + \square_{1\square n} \sum_{t=1}^{n} \square_t + \square_t \text{...(Eqn.1)}$$

$$CAR_t = \square_0 + \square_1 DEST_t + \square_2 EQM_t + \square_3 LIQ_t + \square_4 SIZE_t + \square_t \text{......(Model 1)}$$

$$CAR_t = \square_0 + \square_1 EQM_t + \square_2 LIQ_t + \square_3 SIZE_t + \square_t \text{........................(Model 2)}$$

$$CAR_t = \square_0 + \square_1 DEST_t + \square_2 LIQ_t + \square_3 SIZE_t + \square_t \text{......................(Model 3)}$$

$$CAR_t = \square_0 + \square_1 DEST_t + \square_2 EQM_t + \square_3 SIZE_t + \square_t \text{....................(Model 4)}$$

$$CAR_t = \square_0 + \square_1 DEST_t + \square_2 EQM_t + \square_3 LIQ_t + \square_t \text{.....................(Model 5)}$$

Where, *Y* = dependent variables (capital adequacy ratio, CAR), $\square_0$ = Constant, $\square_{1\square n}$ = coefficient of explanatory variables, $\sum_{t=1}^{n} X_t$ = vector of explanatory variables, and $\square_t$ = Error term

The above OLS model is adapted from previous studies and is considered to contain variable suitable and relevant to insurance sector. Past studies that used this model include 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. As stated earlier, these studies were conducted in banking sector and in different economies. Some of the findings differ from theoretical point of view.

Empirical Results and Discussion

Descriptive and correlation statistics:

The result of the descriptive statistics for this study is presented in Table 4.1. From the table, the key variables, their mean and standard deviation values are CAR (91.49, 54.21), DEST (0.46, 0.33), EQM (2.04, 1.18), LIQ (2.86, 1.65) and SIZE (10.06, 0.31). This means that, on average, the level of required capital held by Nigerian insurers is less than the threshold of 100million. Thus, their asset based can only cover about 0.45% of premium, 2.06% of shareholders' equity and 2.86% of any obligations that may arise on their daily operations whereas, the firms can only boost of 10.06% strength in its size. In all, this does not suggest that the insurance companies in Nigeria are sufficiently solvent to the level of sustainable profitable operations. The variance in these estimates is less than 2% except for CAR which estimate may be inaccurate due to high standard deviation. However, the data possesses requisite feature for empirical analysis.

Table 2: Descriptive and correlation Statistics of variables

Var	Mean	SD	CAR	DEST	EQM	LIQ
SIZE CAR	91.49	54.21	1			
DEST	0.46	0.33	0.64	1		
EQM	2.04	1.18	-0.16	-0.40	1	
LIQ	2.86	1.65	-0.39	-0.75	0.64	1
SIZE	10.06	0.31	0.10	-0.59	0.71	0.75	1

In table 4.2, the result reveal that all variables are not highly correlated since their coefficient are all less than 80% (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.

Regression result for internal determinants of CAR

The regression results of the general and specific objective of the study as obtained from models 1 to 5 for the internal determinants of CAR are presented in Table 4.3. Based on the F-Stat values of 65.3 (for model 1), 110.21 (for model 2), 41.54 (for model 3), 75.65 (for model 4), and 7.20 (for model 5), each of which is statistically significant at 1%, it can be said that all models predicting internal determinants of CAR of insurance companies in Nigeria are statistically significant. Consequently, all hypotheses are retained. Whereas the result is quite interesting, it should be noted that some of the models predicting these relationships have violated some requisite econometric assumptions for their reliability and validity.

There is therefore the need to choose from amongst these models, the 'best' predicting model based on model characteristics and diagnostic results using such statistics as the R^2, Adj. R^2, coefficients signs, and D-W *d* test, model (R. RESET) specification test and B-P-G *test.* From Table 4.3, model 4 is found to be most suitable for predicting internal determinant of risk weighted capital ratio. This is because it has good predicting power, correct coefficient signs, and insignificant change in Adj. R^2

while other models lack basic qualifying econometric properties. For instance, Models 1 and 2 both clearly failedRamsey RESET test of misspecification and has a wrong coefficient sign. Model 3 has a wrong coefficient sign, failed autocorrelation test and has tendency for hetroscedasticity. And finally, Model 5 has low predicting power, wrong sign, a low R^2 and adjusted R^2.

Table 4.3: Results of internal determinants of CAR Models

	Model 1	Model 2 (Without DEST)	Model 3 (Without EQM)	Model 4 (Without LIQ)	Model 5 (Without SIZE)
Model parameters					
Constant	-2,018(170.6)***	-1,592(375.3)***	-1,603(209.8)***	-1,915(175.6)***	9.759(35.12)
DEST	159.4(14.78)***		142.2(20.05)***	179.5(12.57)***	
131.2(35.88)*** EQM		-20.63(3.96)***	-11.15(8.726)		-23.41(4.019)***
1.606(8.58) LIQ		-8.327(3.71)**	-32.61(6.68)***	-14.39(4.91)***	
6.358(8.62) SIZE		209.1(17.52)***	178.9(39.12)***	166.0(21.50)***	196.0(17.68)***
Observations	32	32	32	32	32
Model Characteristics					
R-squared	0.910	**0.521**	0.819	0.893	**0.434**

Adj. R^2	0.89	**0.47**	0.797	0.87	**0.37**
Change in Adj. R^2	0.00	**0.42**	0.093	0.02	**0.52**
F-Stat.	65.31(0.00)***	10.21(0.00) ***	41.54(0.00) ***	75.65(0.00) ***	7.20(0.00) ***
D-W *d* Test	1.89	2.05	**1.58**	2.14	1.89
Model Diagnostics					
R. RESET	**4.25(0.0495)***	**3.04(0.005)****	1.55(0.223)	0.38(0.54)	1.43(0.24)
B-P-G *test*	1.96(0.128)	0.830(0.489)	2.921(0.051)	1.70(0.189)	
0.48(0.697) VIF	2,85	2.46	2.68	2.06	
2.50					

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; *** p<0.01, ** p<0.05, * p<0.1; Models with figures in **BOLD** are considered bad models.

From model 4, which is the 'best' predictor of internal determinants of CAR, liquidity is not among the determinants of capital adequacy of insurance in Nigeria. The result shows that, on average, the overall capital held by insurance companies in Nigerian falls short of required minimum level by about -N1915.00mil. Furthermore, the result revealed that an increase in deposit structure (premium) will increase capital adequacy of insurance by about N179.50mil and this contribution is statistically significant just as predicted by the theory. Also, an increase in equity multiplier will significantly reduce capital adequacy by about -N23.41mil. Finally, the result showed that an increase in the size of insurance firms will significantly increase insurance capital adequacy by about N196.00mil and this agrees with the underlying theory of capital adequacy.

Individually, contributions of each of deposit structure, equity multiplier and insurance size is statistically significant. On the model used, the f–test value of 75.65, which is significant at 5% as its p-value (0.000) < 0.05 indicates that the model is valid. Thus, deposit structure, equity multiplier, and insurance size jointly explain significantly the variations in capital adequacy of insurance firms in Nigeria. The economic implication of this finding is that, to increase capital adequacy ratio, insurers could focus on deposit structure, and size while relaxing emphasis on equity multiplier. This is because, the higher the deposit structure and larger the size of insurance firms, the more adequate the capital level of insurance companies. On the contrary, the higher the equity multiplier, the less adequate the level of capital held by insurance companies in Nigeria. The R square (R^2) value of 0.893 indicates that 89.3% variability in capital adequacy can be explained jointly by deposit structure, equity multiplier and size of insurance firms.

These results are consistent with past studies (Ahmed, 2016; Akani & Lucky, 2015; AL-Mutairi & Nase, 2015). Although previous studies were in banking sector, the new insight this study has provided is that the factors determining capital adequacy in banks also applies to insurance companies and may also

apply to other similar financial institutions. However, contrary to past studies, large coefficients are observed in deposit structure and insurance size which is also supported by past study (Bokhari & Ali, 2006). These findings is supported by the fundamental theory of risk capital, buffer theory of capital upon which the study was based.

Concluding Remarks and Recommendations

In this study, we have argued and provided insight into possible influencing factors of insurance capital adequacy in Nigeria. These factors range from firm characteristic to risk factors. However, in order of the magnitude of effect, the size of insurance company has the greatest significant positive contribution to insurance capital adequacy, followed by insurance deposit structure while insurance equity multiplier has the greatest significant negative contribution to insurance capital adequacy. Insurance liquidity is not among the factors determining insurance capital adequacy. Overall, we conclude that insurance deposit structure, equity multiplier and size of an insurer are key determinants of insurance capital adequacy in Nigeria.

This report has some limitations which further researchers could consider in their future research. This study limited by small sample, model used a well as independent variables included in the model. Performance-based factors were not considered due to potential problem of endogeneity. In view of the limitation, further researches should include performance-based measures; increase sample and adopt alternative methodology that could correct for the presence and possible effect of endogeneity problem on the estimated results. Again, this study used cross sectional data whereas many past studies used time series data, and few other studies used panel data models in banking sector. Further studies are required in this direction with a more robust model using time series data as well as panel data to find out many ways of determining capital adequacy in insurance firms.

In view of the above, this study recommends that practitioner and insurance regulators should pay attention to financing policy and credit risk management to devise appropriate equity multiplier and optimum leverage decision. They should also revise their premium policy for appropriate deposit/premium management, as well as asset management for incentivize measures that will make insurers strive for growth and become large to leverage on the advantage of its size for the attainment of desired capital adequacy. Also management should monitor risk factors as they both

have significant positive (*sic* deposit structure) as well as significant negative (*sic* equity multiplier) effect on capital adequacy while cutting back on frequent liquidity management.

References

Abba, G. O., Zachariah, P., & Inyang, E. E. (2013). Capital adequacy ratio and banking risks in the Nigeria money deposit banks. *Research Journal of Finance and Accounting, 4*(17): 17-25.

Abdullah, A. M., & Naser, K. (2015). Determinants of capital structure of banking sector in GCC: an empirical investigation. *Asian Economic and Financial Review*, *5*(7), 959.

Abusharba, M. T., Triyuwono, I., Ismail, M., & Rahman, A. F. (2013). Determinants of capital adequacy ratio (CAR) in Indonesian Islamic commercial banks. *Global review of accounting and finance, 4*(1), 139-170..

Ahmed, I. (2016). Effect of capital size on the profitability of listed insurance firms in Nigeria. *African Journal of Management, 10*(5), 109–113

Akani, H. W., & Lucky, A. L. (2015). Econometrics analysis of capital adequacy ratios and the impact on profitability of commercial banks in Nigeria. *IOSR Journal of economics and finance, 6*(6), 11-24.

Akpan, S. S. (2013). Life insurance business in Akwa Ibom State : Challenges and strategic options. *Journal of Business and Management, 9*(1), 31–37.

Akpan, S. S., & Evbayiro-Osagie, E. I. (2020). The effect of Regulatory Pressure on Risk-Weighted Capital Adequacy of Insurers in Nigeria. *International Journal of Intellectual Discourse* (Forthcoming)

Anggono, A. H. (2014). Determinants of capital adequacy ratio (CAR) in 19 commercial banks (Case Study : Period 2008 – 2013). *Journal of Business and Management*, *3*(7), 752 – 764

Aspal, P. K.., & Nazneen, A. (2014). An empirical analysis of capital adequacy in the Indian private sector Banks. *American J. of Research Communication*, *2*(11), 28–42.

BNM – Bank Negara Malaysia (2013). Risk-based capital framework for insurers. Central Bank of Malaysia.

Bokhari, H. I., & Ali, M. S. (2006). Determinants of Capital Adequacy Ratio In Banking Sector: An Empirical Analysis From Pakistan. *Acedemy of Contemporary Research Journal*, 5–17.

Büyükşalvarci, A., & Abdioğlu, H. (2011). Determinants of capital adequacy ratio in Turkish Banks: A panel data analysis. *African Journal of Business Management*, *5*(27)

Calem, P. S., & Rob, R. (1996). The impact of capital based regulations on bank risk taking. A dynamic model. *Finance and Economic Discussions Series.*, *96*, 1–44.

CBN - Central Bank of Nigeria (2013). Risk-based capital. Abuja: CBN.

Cooper, D. R., & Schindler, P. S. (2014). Business Research Methods.© The McGraw− Hill Companies.

Ediz, T., Michael, I., & Perraudin, W. (1998). The impact of capital requirements on UK bank behavior. *Economic Policy Review*, 4, 15–22.

El-Ansary, O. A., & Hafez, H. M. (2016). Determinants of capital adequacy ratio : An empirical study on Egyptian banks: *Corporate Ownership & Control, 13*, 806 – 816.

Erel, I., Myers, S. C., & Read, J. A. (2015). A theory of risk capital. *Journal of Financial Economics*, *118*(3), 620–635.

Ezike, J. E. & Oke, M. O. (2013). Capital Adequacy Standards, Basle Accord and Bank Performance : the Nigerian Experience (A Case Study of Selected Banks in Nigeria). *Asian Economic and Financial Review*, *3*(2), 146–159.

Hovakimian, A., & Kane, E. J. (2000). Effectiveness of Capital Regulation at U.S. Commercial Banks, 1985 to 1994. *Journal of Finance, 55*(1), 451 - 468.

Ikpefan, O. (2013). Capital adequacy management and performance in the Nigerian commercial bank (1986-2006). *African Journal of Business Management*, *7*(30), 2938–2950.

Irawan, K., & Anggono, H. A. (2015). A study of capital adequacy ratio and its determinants in Indonesian banks: A panel data analysis. *International Journal of Management and Applied Science, 1*(9), 98-101.

Koch, T. W. and Macdonald, S. S. (2010), "Bank Management. 7th ed. Mason, Ohio, USA: South- Western CENGAGE Learning.

Lewis, R. E. (1998). Capital from an insurance company perspective. *FRBNY Economic Policy Review*, 183–185.

Marques, M. O., & Coutinho dos Santos, M. J. (2004). Capital Structure Policy and Determinants : Theory and Managerial Evidence. *EFMA 2004 Basel Meetings Paper*, 1–53. http://doi.org/http://dx.doi.org/10.2139/ssrn.494143

Mekonnen, Y. (2015). Determinants of capital adequacy of Ethiopia commercial banks. *European Scientific Journal, 11*(25), 315–331.

NAIC - National Association of Insurance Commissioners (2015). Risk Based Capital. http://www.naic.org/cipr_legislative_reference.htm

Olalekan, A., & Adeyinka, S. (2013). Capital adequacy and banks' profitability: an empirical evidence from Nigeria. *American International Journal of Contemporary Research, 3*(10), 87-93.

Raharjo, P. G., Hakim, D. B., Manurung, A. H., & Maulana. T. N. A. (2014). Determinant of capital ratio: A panel data. *Buletin Ekonomi Moneter Dan Perbankan, 16*(4), 395-414.

Rime, B. (2001). Capital requirements and bank behavior: Empirical evidence for Switzerland. *Journal of Banking & Finance, 25*, 789–805

Santos, D. F. L., & Farinelli, J. D. M. (2015). Analysis of approaches to capital structure: A Literature Review. *Business and Management Review, 4*(5), 290-304.

Seifert, B. & Gonene, H. (2010). Pecking Order Behavior in Emerging Markets n. *Journal of International Financial Management and Accounting*, *21*(1), 1–31

Shimpi, P. A. (2002). Integrating risk management and capital management. *Journal of Applied Corporate Finance, 14*(4), 27–40.

Shingjergji, A., & Hyseni, M. (2015). The determinants of the capital adequacy ratio in the Albanian banking system during 2007-2014. *International Journal of Economics, Commerce and Management, 3*(1), 1-10.

Umoren, N. J., Akpan, S. S., & Ntekop. O. J. (2012). Government policy changes and sustainable entrepreneurship development in Nigeria. *Journal of Entrepreneurship Research*, *2*(1), 192 – 206.

Wen, T. C. (2009). *The determinants of bank capital ratio in East Asia*. Terengganu: Graduates School of Business, Faculty of Business and Accountancy, University Malaysia Terengganu.

Williams, H. T. (2011). Determinants of capital adequacy in the Banking Sub-Sector of the Nigeria Economy : Efficacy of Camels. (A Model Specification with Co-Integration Analysis). *International Journal of Academic Research in Business and Social Sciences, 1(3), 233*