Market Risks and Profitability of Deposit Money Banks in Nigeria: A Cointegration and Panel Multiple Regression Analysis

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Abstract

The banking sector plays a pivotal role in the financial market; however, banks' business transactions contribute to changes in the prices of assets. Without adequate strategies by the banks to mitigate and manage their exposures to these risks, their returns may be negatively affected. This work, therefore, examined, within the cohort and semi-experimental research design framework, the effects of market risks on a bank's profitability using a sample of four banks selected through a purposive sampling technique. The co-integration and panel multiple regression analyses conducted showed that management of market risks had long-run effects on the profitability of DMBs in Nigeria. The interest rate had positive effects on bank profitability, while exchange rate and commodity prices reduced performance. The study recommended that banks manage their operations in a way that optimizes their earnings and profits in order to mitigate the risks of loss occasioned by exchange rate dynamics in Nigeria. Also, DMBs should revitalize their interest rate risk management strategies to further boost their earnings through interest income.

Keywords: Market risk, Profitability, Return on Investment, Volatility.

1. Introduction

Globalization of financial systems and the existence of International financial market mechanisms have widened the scope and impact of financial risk, hence the need for an enhanced approach to mitigate risk exposure in every economy's financial system. The financial crisis between 2007 and 2008 raised many questions with respect to the rising cognizance and the need for appropriate risk management frameworks in financial organizations. The situation demands a thorough valuation of the structure and mechanisms of risk management strategies, frameworks, and performance of financial institutions by regulators, academics, experts, and financial watchers from time to time, to determine the suitability of the systems, policies, and procedures in the management of Risks as well as conforming to existing best practices.

Market risk is regarded as the "risk of loss of shareholder's fund due to the bank's financial operation as a result of volatility in prices of equity, interest rates, commodity prices, exchange rates, and other variables" (Wachiaya, 2011), may affect banks' profitability and performance. Specialized strategies are often required to mitigate and manage market risk in banks. According to the Basel Committee on Banking Supervision (2005), many researchers often devote a great deal of time to studying banking activities that generate the most revenue considering the fact that several avenues abound for banks to make returns (Bush and Kick, 2009). Their focus always is

to enhance the returns from their investments in assets with minimal losses. The financial market provides banks with the needed avenue to trade and make returns from their assets.

The need to increase returns has increasingly become one of the primary reasons deposit money banks are constantly under enormous pressure to accept a substantial number of risks. These risk exposures are credit, market, operational, reputational, liquidity risks, and so on. The high rate of failures, financial Scandals, as well as the mounting toxic assets, are some of the major issues that have thrown up the debate on the best possible approach to curb losses from the uncertainties in the financial market in relation to financial products. In Nigeria, the financial sector was overwrought with the dwindling value of credit assets which were anticipated to have been caused by a major decline in money market ratios, idiosyncratic changes in inflation and interest rates, a fall in the international market price of crude oil, as well as unexpected devaluation in the Nigerian currency, compared with major developed economy's exchanges (BGL, 2010).

The Central Bank of Nigeria, in 2004, introduced a guideline for the "Development of Risk Management Frameworks for Individual Risk Elements" (CBN, 2004) and obligated every commercial bank operating in the country to fashion out suitable risk management strategies which must be approved by the top executives of the banks for the management and mitigation of their risk exposures. This led to the adoption of the frameworks in the management of risks in Nigerian banks in an attempt to mitigate risk exposures in order to reduce their level of losses in the industry. With the adoption of the framework, one would have expected a high level of immunity against distress and all other forms of performance distortions in the Nigerian banking industry. Also, the introduction of the Asset Management Corporation of Nigeria (AMCON) to mitigate and address the challenges of non-performing loans in the Nigerian banking industry was another strategy for risk management in banks. Yet these risks are still in existence and possibly affecting banks' returns. This situation indicates the existence of risk management systems and practices vis-à-vis the profitability of deposit money banks in Nigeria. It also calls into question the growing significance of the risk management approaches adopted by Nigerian banks to manage their risks, more specifically market risk exposures, hence a need to examine the effect of risk management strategies on the profitability of the Nigerian banking sector. The performance criteria in other research were mostly returns on equity and returns on assets, but profitability, as used in this work, is proxied by return on investment. The study evaluates the effort of market risk volatility on the profitability of deposit money banks in Nigeria.

2.0 Literature Review

Market risk is the possibility that an investor experiences loss due to factors that affect the overall performance of the financial market in which he is involved (Basel II, 2008). Market risk, also called "systematic risk," cannot be eliminated through diversification, although it can be hedged against. Sources of market risk include recession, political turmoil, change in interest rates, natural disasters, and terrorist attacks (Basel II, 2008). Market risk can be defined as the risk of losses on the balance sheet and off-balance sheet positions arising from adverse movements in market prices. From a regulatory perspective, the market risk stems from all the positions included in banks' trading books, as well as from commodity and foreign exchange risk positions in the whole balance sheet (Basel, 2005). Traditionally, trading book portfolios consist of liquid positions that are easy to trade or hedge. However, developments in banks' portfolios have led to an increase in the presence of credit risk and illiquid positions not suited to the original market capital framework.

To address these flaws, material changes in the market risk framework have been introduced by the Capital Requirements Directives (CRD) III (Basel, 2005).

Market risks in relation to their effect on the banking industry may generally be classified, according to Koch and MacDonald (2014), into three categories, namely, stock price risk, interest rate risk, and foreign exchange risk. Based on this, Wachiaya (2011) states that market risk arises when banks accept financial instruments exposed to market price fluctuations or volatility as security or collateral for loans. Thus, changes in these will, in one way or the other, affect the financial performance of the banks.

In studying the effect of foreign exchange exposure on a firm's financial performance, Gachua (2011) stated that foreign exchange volatility, if left unmitigated, can erode the financial gains of a firm. This can reduce the value of money used for transactions and available for investment. There is always the need to monitor the prevailing value of foreign exchange to decide on investment decisions at every point in time in the bank. Improper valuation may result in a huge loss of investment income. This shows that foreign exchange risk arising from foreign exchange volatility can negatively affect the profitability of banks, leading to poor or dwindling performance.

In determining the impact of interest rate risk on the profitability of banks, Ongore and Kusa (2013) stated that banks dealing with this type of market risk retain a large exposure to interest rates since it is a major determinant of their interest income. Where these risks are dominant, there is usually an income gap, which, if left unplugged, can lead to loss of income, hence a reduction in the level of profitability in that organization. The effect of interest rate risk on profitability is further determined by the net interest margin (NIM). Badawi (2017) suggested that an increase in NIM will indicate reduced exposure of the bank to interest rate volatility or high-interest rate risk, while a decreasing NIM means that the bank could not properly manage the impact of interest rate risk in its operation. Thus, the exposures can negatively impact the interest income, which by implication will reduce its level of profitability.

Bodnar and Martson (1996) reported that a 1995 survey of major financial firms in the United States of America (USA) revealed that at least 90% of the firms agreed that commodity price risks is a major market risk that requires some form of financial engineering in its management, alongside interest rates and foreign exchange risks. It is well known that banks are active in the derivative markets, hence their high exposures to interest rate and foreign exchange risks (Bessis, 2010). Thus, it is not totally surprising that most banks are also very active in the commodities market with business deals in crude oil, precious metals, cash crops, and grains. With increasing relative stability in the commodities market, most banks and other financial institutions are actively involved in the exchange of commodities for their clients. Bessis (2010) maintained that relative stability in the commodities market could enhance the profitability of banks in that risk is minimized, and such income gained can contribute to the growth of the banking industry.

Profitability may be defined as the ability of a given investment to earn a return from its use of assets (Monica, 2014). Profitability in the financial context is the ability of banks to generate earnings and could be referred to as the ability of the banks to record profits after all costs, overheads, and other expenses are deducted. Profitability measures how efficiently the banks are using their assets and managing their operations (Monica, 2014). Profitability measures are important for banks since banks would attract greater investments if they recorded good returns.

Also, creditors would be encouraged to finance their debt. Tahir and Razali (2011) added that increases in profits could influence a rise in market price. Naceur and Goaied (2002) postulated that the profitability factor creates future value to attract new investors.

2.1 Empirical Review

Aloui, Salhi, and Jarboui (2019) examined the impact of corporate governance mechanisms on market risk during the financial crisis. The work adopted stock price return and volatility, exchange rate, and Treasury Bills as proxies for market risk. In the study, sample data of the SBF 120 on a panel of 99 French firms over the period between 2006 and 2015 was divided into three sub-periods of pre, during, and post crises periods. A GARCH and BEKK models were used to capture the effect of volatility and conditional heteroskedasticity of both corporate governance and market risk. The study revealed that high shareholders' protection had a positive and significant impact on stock market returns. Also, shareholders' protection, Treasury Bill, institutional investors, and the board's size had a negative and significant effect on the stock return volatility. The work focused on corporate governance as a means of market risk mitigation with specific emphasis on French firms, without streamlining its impact on the specific firm's profitability.

Chiang and Chan (2017) investigated the effects of foreign ownership on stock return volatility using Taiwanese firm-level data covering a period from 1994 to 2014. The study was necessitated by the increasing observation of the presence of foreign investors and their roles and importance in the country's stock markets. The study period was divided into two subperiods: 1994 to 2001 (before Taiwan joined World Trade Organization (WTO)) and 2002 to 2014 (after Taiwan joined WTO), while the latter period was further divided into three sub-periods: 2002 to 2007 (before the global financial crisis), 2008 to 2009 (during the global financial crisis) and 2010 to 2014 (after the global financial crisis). The results showed that foreign ownership was negatively correlated with stock return volatility during the whole sample period. For the subsample test, the impact was felt the most during the period 2002–2007, the years following Taiwan joined WTO. However, the stabilizing effect was not seen after the global financial crisis in 2008 and post the year. The research was conducted with the main objective of ascertaining the effects of many foreign investors on the country's stock market and with little emphasis on checking the impact of the market risk on firms in the country. The work was a kind of comparative study of certain periods in the country's economy.

Cerchiello and Giudici (2016) studied a big data analysis for financial risk management, which aims to develop a novel systemic risk model that is different from the existing models and can be employed for the analysis of information contained in financial market prices and big data coming from financial tweets, and the estimation of systemic risk models. The authors used two different data sources: financial markets and financial tweets, with the aim of combining them using a Bayesian approach. The study presented the first systemic risk model based on big data and showed its relevance in explaining the interrelationships between financial institutions. The study was focused on model development for the management of financial risk. Its thrust was on market risks that could affect the entire financial market, not bank specific.

Milne (2014) examined the complexities of financial risk management and systemic risks in banks in Canada and discovered that the financial risk management models developed and employed in many firms were complex to implement and difficult to evaluate due to short cuts in existing theoretical models. Milne (2014) compared the models adopted in Canada with those in the

Eurozone, United Kingdom, and USA and found a great disparity between what was obtainable in each of the countries. This work was done in developed economies with a focus on the extent of the complexity of the models adopted without streamlining their impact on banks' performance.

Beasley *et al.* (2008) examined the effect of adopting financial risk management principles on the long-term operation of the firm by investigating the reaction of the equity market to the appointment of a Chief Risk Officer in non-financial firms. Using multiple regression analysis, the findings from the study indicated that market reactions to CRO appointments are positively related to firm size and volatility of previous earnings but negatively related to leverage and the ratio of cash to liabilities. The study was focused on non-financial institutions and used the appointment of a Chief Risk Officer as the only proxy for risk management adoption in the organization.

2.2 Theoretical Framework

Value at Risk (VaR) emerged as a concept in the late 1980s as a result of the stock market crash of 1987, which was the first major financial crisis that led to concerns and worries about firm-wide survival (Jorion, 2006). It is a statistical technique used to measure and quantify the level of financial risk within a firm or investment portfolio over a specific time frame (Dowd, 2005*).* This metric is most commonly used by investment and commercial banks to determine the extent and occurrence ratio of potential losses in their institutional portfolios. Risk managers use VaR to measure and control the level of risk exposure. One can apply VaR calculations to specific positions or whole portfolios or to measure firm-wide risk exposure. VaR modeling determines the potential for loss in the entity being assessed and the probability of occurrence for the defined loss. VaR is measured by assessing the amount of potential loss, the probability of occurrence for the amount of loss, and the time frame.

Investment banks commonly apply VaR modeling to firm-wide risk due to the potential for independent trading desks to expose the firm too highly correlated assets unintentionally. Using a firm-wide VaR assessment allows for the determination of the cumulative risks from aggregated positions held by different trading desks and departments within the institution. Using the data provided by VaR modeling, financial institutions can determine whether they have sufficient capital reserves in place to cover losses or whether higher-than-acceptable risks require them to reduce concentrated holdings (Nassim, 2009).

3.0 Methodology

The research designs adopted for this study are the cohort and a quasi-experimental research design since the study is on a group with a similar risk factor. The study made use of time series data which was analysed using panel data analysis. The study relied on financial records and annual financial statements of Zenith Bank, GTB, First Bank, and UBA in Nigeria to examine how the management of market risks (proxied by interest rate, exchange rate, and commodity prices) affects banks' profitability (proxied by return on investments). The reason for using the tool in this analysis and the sets of data is that they suit the objectives of the study where there is already established information on the proxies of market risk and proxies of the selected banks' profitability.

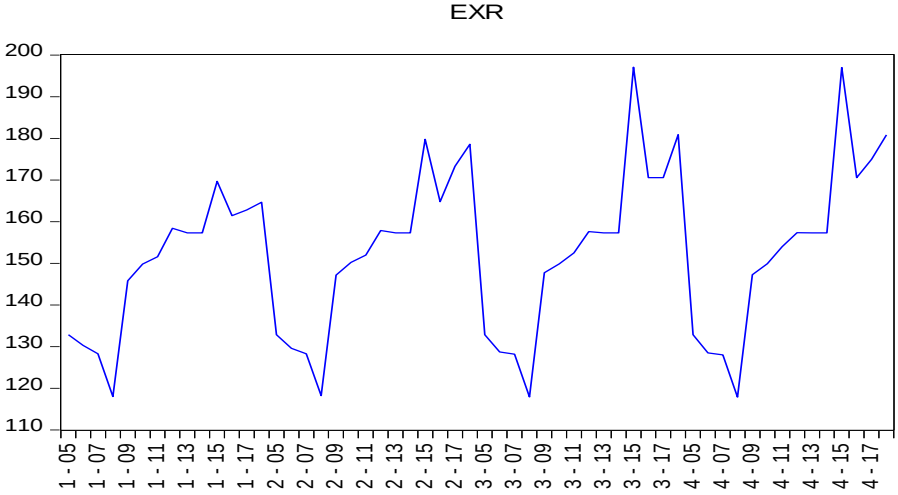
The population of this study was made up of all the 21 deposit money banks in Nigeria; using a purposive sampling technique; four banks were selected for the study based on some unique

characteristics of the banks. These were that the selected banks have strong asset bases, high market shares in the industry, and complete financial reports, with up-to-date information in accordance with Central Bank of Nigeria (CBN) and Securities and Exchange Commission (SEC) regulations, requirements, and directives, as at the time this study was conducted. Furthermore, these banks adopted and implemented financial risk management frameworks immediately after the directive in the year 2004 by CBN. The time frame used was 14 years, from 2005 to 2018.

3.1 Trend Analysis of the Variables

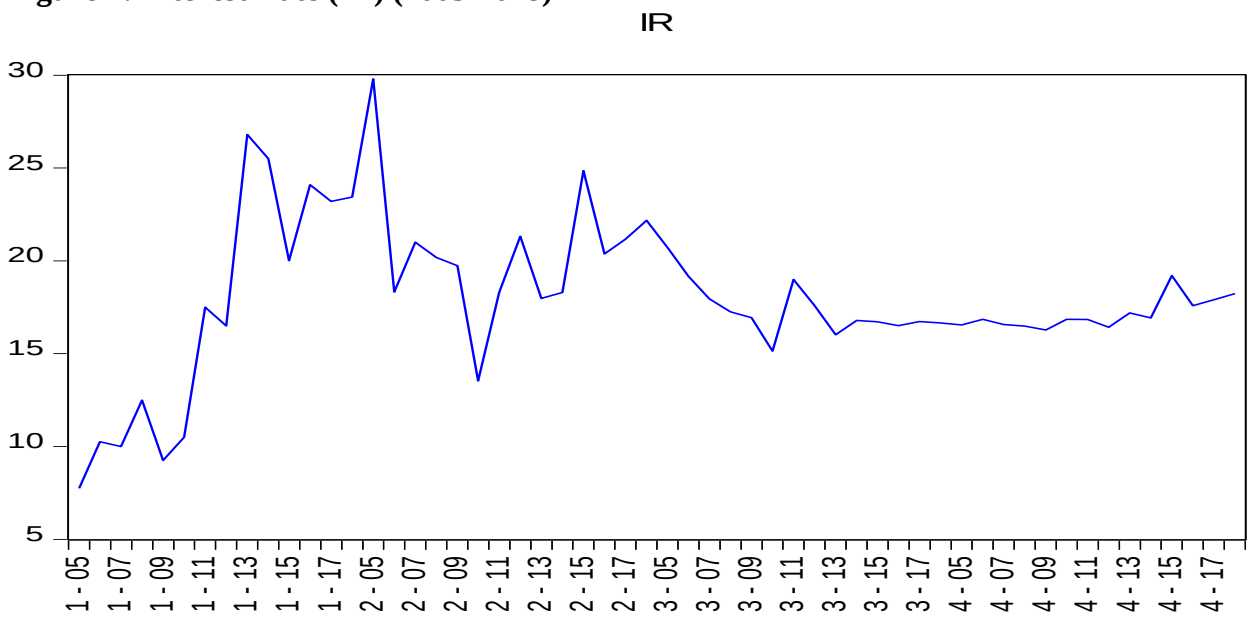
The fluctuations of the variables and parameters employed in the various banks were studied to give a glimpse into what may have motivated the investors to invest in their stocks and how their profitability was affected over the years. Also, the movements of interest rates, exchange rates, and commodity prices are of high importance to Deposit Money Banks (DMBs) since they are active participants and drivers of financial business in the financial markets. Furthermore, since market risks are largely un-diversifiable risks makes, it is an important area of financial risk management by banks since a sizeable portion of their income is from interest income. An examination of the trend of interest rates (IR) and exchange rates (EXR) from 2005 to 2018 indicates a high level of fluctuations year-on-year. This is shown in the diagrams presented in Figures 1 and 2.

Figure 1: Exchange Rate (EXR) (2005-2018)



Source: Author's Computation (2020).

Figure 2: Interest Rate (IR) (2005-2018)



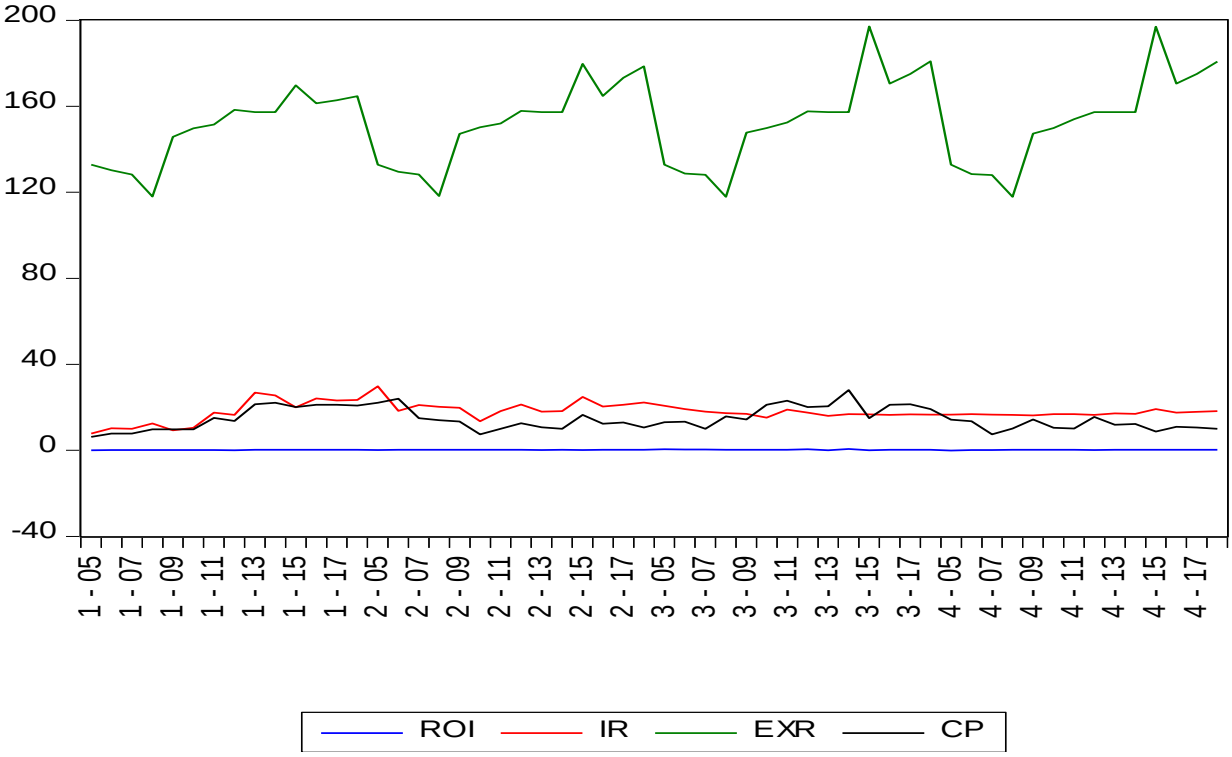
Source: Author's computation (2020)

Figures 1 and 2 indicate the presence of several peaks and lows in the trend of interest rates and exchange rates from 2005 to 2018. This indicates high levels of variability caused by market fluctuations in these variables. Across the four (4) deposit money Banks (DMBs), interest rates (IR) recorded as much as 66.67% and 62.42% increases in First Bank in 2011 and 2013, respectively. At the same time, interest rates also plummeted to levels of 26.00% and 21.53% in the same Bank in 2009 and 2015, respectively. In UBA, interest rate change peaks of 35.08% and 35.87% were recorded in 2011 and 2015, respectively, while the lows were recorded in 2006 and 2010 with a year-on-year decline of 38.52% and 31.41%, respectively. In Zenith Bank, interest rate big positive changes were recorded in 2011 at 25.43% and very low at 10.63% in 2010. In GT Bank, the story was not different, with 2015 recording the highest peak of 13.41% change in interest rate while a negative 8.39% in 2016. Exchange rate fluctuating peaks for First Bank, UBA, Zenith Bank, and GT Bank was 23.56% (2009), 24.47% (2009), 25.27% and 25.28% (2009 and 2015), and 24.91% and 25.25% (2009 and 2015) respectively. Similarly, the local currency recorded significant gains in First Bank, UBA, Zenith Bank, and GT Bank, with year-on-year (YoY) changes of -8.03% (2008), -8.32% (2016), -13.45% (2016) and 13.44% (2016) respectively. This indicates that exchange rate risks were high for these Banks in 2009 and low in 2016, considering the levels of gains and losses recorded in exchanges rate in these years.

Commodity Prices (CP) exhibited the same level of trend behavior similar to those of interest rate (IR) and exchange rate (EXR). The fluctuations were incessant across the four banks from 2005 to 2018. The level of peak increases in CP in the First bank, UBA, Zenith bank, and GT bank were recorded in 2013 (56.20%), 2015 (65.33%), 2008 (58.00%), and 54.31%, respectively. Likewise, across the four banks, the highest losses in commodity prices in the First bank, UBA, Zenith bank, and GT bank were -9.27% (2013), -44.45% (2010), -46.47% (2015) and -45.17% (2007) respectively. The interaction of the profitability of the four banks that were studied with market

risk indicators is shown in Figure 3. The diagram shows the flattening of ROI with incessant fluctuations or changes in IR, EXR, and CP. This presents a picture of how market risks affect the profitability of deposit money banks (DMBs), hence the imperativeness of effective and efficient market risk management in these banks.

Figure 3: ROI, IR, EXR, and CP (2005-2018)



Source: Author's computation (2020).

Correlation and Normality Tests Analysis

Given that three (3) out of the four (4) variables failed to pass the normality tests earlier, a histogram-normality test was conducted after establishing that the variables in the model are free from the unit root problem. The result from the test is shown in Figure 4. The correlation matrix between the variables in the study to show the degree of interaction and relationship between them is presented in Table 1.

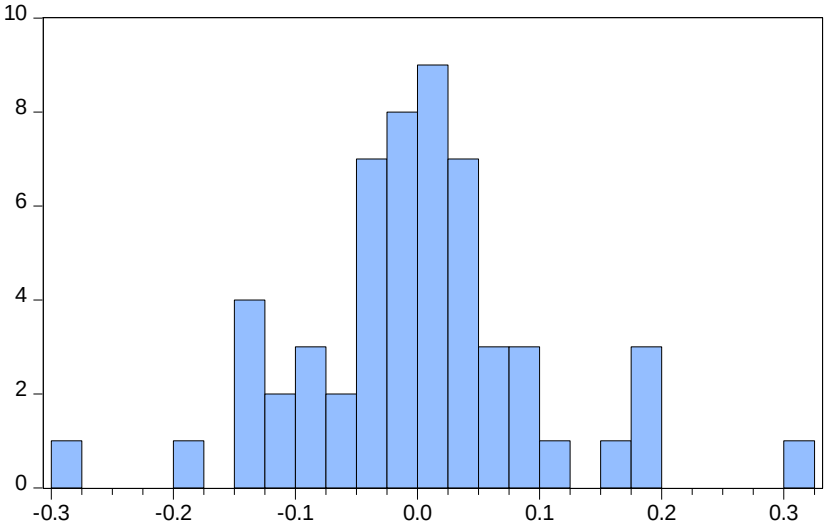
Table 1: Correlation Matrix of the Variables

	ROI	IR	EXR	CP
ROI	1.000000			
IR	0.256652	1.000000		
EXR	0.003751	0.249488	1.000000	
CP	0.308863	0.495478	0.181734	1.000000

Source: Author's computation (2020).

Table 1 shows that a positive correlation exists between all the indicators of market risk (IR, EXR, and CP) and return on investments (ROI). A weak positive correlation was shown to exist between IR and ROI with a correlation value (R) of 0.2566. Also, the correlation between CP and ROI was found to be weak, with a correlation value of 0.3089. However, the correlation between EXR and ROI was found to be very strong at a correlation value of 0.0037.

Figure 4: Histogram-Normality Test



Series: Standardized Residuals
Sample 2005 2018
Observations 56

Mean	-2.38e-17
Median	-0.000572
Maximum	0.322131
Minimum	-0.289772
Std. Dev.	0.100382
Skewness	0.278556
Kurtosis	4.709637
Jarque-Bera	7.544207
Probability	0.023004

Source: Author's computation (2020).

With the Jarque-Bera probability value obtained being 0.023, the variables in the model are said to have passed the normality tests since it is within the 5% significance area. Based on this, the data used were adjusted as normality distributed.

3.3 Model Specification

Given that this study adopted a quasi-experimental design relying on the use of already existing secondary data, the relationship between market risks and the profitability of deposit money banks (DMBs) from 2005 to 2018 is specified using functional and econometric equations. The theoretical underpinning for the model developed for this is based on the theory of portfolio and Value-at-Risk (VaR), which is based on the idea that investors choose to invest in securities depending on the rate of return offered and the risk to which they are exposed. Thus, they will choose portfolios with high returns and associated with minimal risks depending on the average and variance of profitability. On that premise, the model is presented as follows:

Profitability = f (Market Risks) - - - - - - - (1)

Given that the profitability of the banks under study is measured by the Return on Investments (ROI) and the measuring proxies for market risks are interest rates (IR), an exchange rate (EXR), and commodity prices (CP), the functional and econometric relationship earlier stated in Equation 1, is restated as follows:

$$ROI = f(IR, EXR, CP) - \quad --- \quad - \quad --- \quad -- \quad (2)$$

$$ROI = \beta 0 + \beta 1 IR + \beta 2 EXR + \beta 3 CP + \mu i + it - \quad -- \quad (3)$$

Where:

$\beta 0$ is the estimated regression constant factor
$\beta 1, \beta 2,$ and $\beta 3$ are estimated coefficients of the regressors
μi is the stochastic error term

Table 2: Descriptive Analysis of Data

	ROI	**IR**	**EXR**	**CP**
Mean	0.228482	17.98929	152.1777	14.54018
Median	0.231500	17.54500	155.6300	13.49000
Maximum	0.612000	29.80000	197.0700	28.02000
Minimum	-0.060000	7.750000	117.8700	6.250000
Std. Dev.	0.106738	4.145440	19.60934	5.197178
Skewness	0.553227	0.098282	0.079325	0.541036
Kurtosis	5.436921	3.994277	2.517913	2.298509
Jarque-Bera	16.71327	2.396859	0.601014	3.880260
Probability	0.000235	0.301668	0.740443	0.143685
Sum	12.79500	1007.400	8521.950	814.2500
Sum Sq. Dev.	0.626612	945.1570	21148.95	1485.586
Observations	56	56	56	56

Source: Author's Computation (2020).

Table 2 shows that the variables in the study exhibit moderate levels of skewness, ranging from 0.079 for the exchange rate (EXR) to 0.55 for Return on Investments (ROI). This indicates fair levels of symmetrical distribution among the variables. This is further shown by the moderate levels of variability through the obtained results of standard deviation, except for the exchange rate (EXR) with a standard deviation of 19.609, indicating incessant fluctuations of the exchange rate of the local currency (Naira) with respect to the United States Dollar. This is associated with the high volatility of the Nigerian foreign exchange market, which triggers many idiosyncratic fluctuations in the financial market, thus making this particular risk an important one for Deposit Money Banks (DMBs) in Nigeria. Recent developments in the foreign exchange market (FEM), especially the unification of the exchange rate system by the Central Bank of Nigeria in July 2020, are a pointer as to the importance of stabilizing this market. Furthermore, the proximity of the mean and median values across all the variables indicates the level of symmetry in the distribution of the data. However, not all the variables exhibited normality with Jarque-Bera probability values since all indicators of market risks are greater than 0.05. Only the distribution in ROI passed the normality test with a Jarque-Bera probability value of 0.0002. This may be related to the fact that the data on these market risk variables (IR, EXR, and CP) were derived from the outcome of daily, monthly, and annualized financial market activities.

4.3 Unit Root and Co-integration Analysis

In line with Levin, Lin, and Chu (2002) and Johansen (1988), panel unit root tests and cointegration analysis were conducted to ascertain the adequacy of the data for a possible multiple linear regression analysis to determine the relationship between market risks and profitability of Deposit

Money Banks (DMBs) from 2005 to 2018. Based on individual unit root processes the ADF-Fisher Chi-square and PP-Fisher Chi-Square test, the result of the unit root analysis for the variables is presented in Table 3

Table 3: Unit Root Analysis Result

Variable	Test Statistic ADF-Fisher	Prob.	Test Statistic PP-Fisher	Prob.	Order of Integration
ROI	15.9052	0.0438	46.2875	0.0000	I(0)
IR	26.9895	0.0007	73.9489	0.0000	I(1)
EXR	26.9821	0.0007	92.8891	0.0000	I(1)
CP	20.1974	0.0096	24.7138	0.0017	I(0)

Source: Author's computation (2020).

Table 3 indicates that the variables ROI and CP were found to be stationary at the level with their respective probabilities within the 5% acceptable significance region. At the same time, variables IR and EXR were non-stationary at that same order of integration for both ADF-Fisher and PP-Fisher (Philips-Perron Fisher Chi-Square) tests. Further tests for IR and EXR at the order of integration equal to 1 (first difference) show the IR and EXR exhibited stationarity properties with probabilities for both tests less than 0.05. Based on this, the null hypothesis of the existence of a unit root in the variables will fail to hold. The variables ROI, IR, EXR, and CP are free of unit root and thus can be subjected to a cointegration test to determine the existence of a possible long-run relationship between market risks variables and profitability of Deposit money banks (DMBs) as measured by Return on Investments (ROI). The result of the Kao Residual Cointegration test is summarized in Table 4.

Table 4: Summarized Cointegration Test Result for the Model

Statistic	Value	Probability
ADF Test Statistic	-2.121853	0.0169
Residual Variance	0.014827	-
HAC	0.005751	-

Source: Author's computation (2020).

With the null hypothesis of the non-existence of cointegration among the variables, Table 4 shows that the probability of the ADF test statistic value of -2.1218 is 0.0169. This probability value is within the acceptable 95% confidence interval adopted in this study. At the same time, the Residual variance and HAC variance were obtained as 0.014827 and 0.0057, respectively. This indicates the presence of cointegration among ROI, IR, EXR, and CP in the earlier stated model. By this, the null hypothesis of no cointegration among the variables will fail to hold. Thus, it has been established that a possible long-run equilibrium relationship exists between ROI, IR, EXR, and CP. Based on this, a sustained long-run relationship exists between market risks and the profitability of deposit money banks in Nigeria.

Panel Multiple Regression Analysis

Using a cross-section of four deposit money banks and 56 observations across 14 years (2005-2018), the conduct of a panel multiple linear regression was to help establish the nature of the effect or relationship between IR, EXR, CP, and ROI. This was aimed at establishing the extent of interactions between market risks and profitability of deposit money banks and the reliability of the model to explain changes in profitability of the selected deposit money banks in Nigeria. The result of the multiple regression analysis is presented in Table 5.

Table 5: Panel Multiple Linear Regression Result for the Model

Dependent Variable: ROI
Method: Panel Least Squares
Date: 08/20/20 Time: 07:44
Sample: 2005 2018
Periods included: 14
Cross-sections included: 4
Total panel (balanced) observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.170827	0.104903	1.628427	0.1098
IR	0.008456	0.004288	1.972063	0.0543
EXR	-0.000592	0.000673	-0.879840	0.3832
CP	-0.000296	0.003589	-0.082457	0.9346
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.512287	Mean dependent var		0.228482
Adjusted R-squared	0.228078	S.D. dependent var		0.106738
S.E. of regression	0.093779	Akaike info criterion		-1.779287
Sum squared resid	0.430929	Schwarz criterion		-1.526118
Log-likelihood	56.82002	Hannan-Quinn criter.		-1.681133
F-statistic	3.708448	Durbin-Watson stat		2.261428
Prob(F-statistic)	0.004063			

Source: Author's computation (2020).

Table 5 shows that the Return on Investments (ROI) of deposit money banks in Nigeria will change by an average of 17.08 units by 17.08% if all the explanatory variables are held constant (i.e., IR-EXR=CP-0). This implies that the Return on Investments (ROI) of the selected deposit money banks will remain at a minimum of 17.08 units with zero change in interest rate, exchange rate, and commodity price. Similarly, a unit increase in interest rate (IR) will lead to a growth of 0.008 unit change in Return on Investments (ROI) of deposit money banks in Nigeria. This direct relationship is also statistically significant, given the values of the computed t-statistic (1.97206) and its probability (0.0543). This implies the existence of a direct and statistically significant relationship between the interest rate (IR) and profitability in DMBs in Nigeria. Furthermore, a 1 unit change in the value of the exchange rate will contract the Return on Investments (ROI) of the

banks by 0.0006 units, while a unit increase in commodity prices (CP) will also cause a decline in ROI by 0.0003 units. This indicates the existence of an inverse relationship between EXR, CP, and ROI. The extent of this relationship is, however, shown to be statistically insignificant for both explanatory variables, given their respective computed t-statistic and probability values. The probability values for EXR and CP were obtained as 0.3832 and 0.9346, respectively.

Furthermore, the coefficient of determination (R^2) value of 0.5123 indicates a moderate level of the predictive power of IR, EXR, and CP to account for the variations in Return on Investments (ROI). Market risk variables, as used, can only account for 51.23% of the variations in the profitability of deposit money banks in Nigeria. The remaining 48.27% of the variations in ROI are unaccounted for by IR, EXR, and CP. These variations are accounted for by other variables not considered in this study and are shown by the stochastic or random term. Furthermore, the Durbin-Watson statistic value of 2.26 indicates the absence of serial correlation hence the reliability of this model for prediction purposes. Finally, given that the computed F-statistic value was obtained as 3.7084 while the probability value is 0.00041, the model can be said to have goodness-of-fit in explaining the changes in the level of profitability in DMBs in Nigeria. Given this, the null hypothesis of no significant effect between market risks and return on investments in DMBs in Nigeria failed to hold (the probability of F-stat is less than 0.05). Thus, it can be stated that interest rates, exchange rates, and commodity prices have a significant effect on the profitability of DMBs in Nigeria.

5.0 Summary and Conclusion

This study examined market risk and profitability of deposit money banks (DMBs) in Nigeria using cointegration and panel multiple regression analysis. Given that banks are exposed to these undiversifiable risks, the objective of this study was to evaluate the effect of market risk volatility on the profitability of deposit money banks in Nigeria. The market risk was measured with an interest rate, the exchange rate of the Naira to the United States Dollar, and commodity prices, while the proxy was used for the profitability of DMBs returned on investments (ROI). The theoretical inclination of the study was hinged on VaR, given its relevance in measuring quantitatively the extent to which financial risks affect investments portfolio.

The non-diversifiable nature of market risks makes it an important risk that needs to be watched by deposit money banks in Nigeria. The empirical result from this study suggests the existence of a positive relationship between interest rate and profitability but an inverse relationship between exchange rate, commodity prices, and profitability. This indicates that when interest rate risks are managed effectively, the profit of DMBs will appreciate. This also is similar to the volatile exchange rates and commodity prices. With this in mind, it can be stated that market risks showed a long-run effect on the profitability of DMBs in Nigeria, with positive effects from the interest rate and negative effects from the exchange rate and commodity prices.

Therefore, based on the findings of the study, the following recommendations are made:

The banks should manage their operations in a way that optimizes their earnings and profits in order to mitigate the risks of loss occasioned by exchange rate conditions in Nigeria's banking sector. Thus, there is a need for the reengineering of the banking system to take advantage of the exchange rate system in Nigeria. The current regime places DMBs at a high-risk level with possible

contracting of profitability if the status quo is not changed. This could impact on return on investments.

Active participation of DMBs in the commodity market with the perennial increased fluctuation of commodity prices may lead to a reduction in the level of profitability in the banks. There is thus the need for banks to do proper hedging of the risk, involve in product diversification, and be readily flexible with respect to emerging opportunities to be able to manage the risks related to commodity prices in order to enhance profitability.

Finally, the strategy for management of interest rate risks should be improved in DMBs and be fortified in order to further boost earnings through interest income, which the lack of proper management may lead to a dearth of customers due to better offers in some banks.

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