# The Effect of Market Risk on the Performance of Commercial Banks in Nigeria

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## ABSTRACT

This study investigated the effect of market risk on the performance of deposit money banks in Nigeria for the period 1994 to 2019. The core measures of market risk adopted in the study are interest rate, exchange rate, stock price and inflation rate risks. Financial performance of banks was represented by return on assets (ROA), return on equity (ROE) and yield on earning assets (YEA). The data for analysis is from the NDIC Annual Reports and Accounts, and CBN Statistical Bulletins. The ARDL technique was employed for data analysis. The results showed that exchange rate risk has positive association with the three measures of bank performance, while interest rate risk relates negatively with return on assets and yield to earning assets but positively with return on equity and insignificant with the three proxies of bank performance. Also, inflation and stock price risks have positive and insignificant effect on bank performance. The Adjusted $R^2$ revealed that market risk has a substantial effect on the performance of deposit money banks in Nigeria.

## INTRODUCTION
### Background to the Study

The role of the financial system in economic growth and development cannot be overemphasized as the financial system has been recognized as the engine that drives growth, (Levine 2002). The need to maintain a sound and efficient financial sector therefore becomes pertinent. Banks being the key players in this sector have a dominant role to play in this respect. The nature of services rendered by banks exposes them to great risks. Essentially, banks perform three basic functions, financial intermediation, asset transformation and money creation. These functions have a lot of risks associated with them. Financial intermediation faces the risk of loan repayment default, asset transformation is affected by variations and volatility in interest rates and money creation may lead to inflationary and other macroeconomic risks. These risks affect the performance as well as the survival of banks all over the world. Internally, banks have to battle with the problems of credit defaults, liquidity shortages, regulatory issues as well as maintenance of capital adequacy standards. In addition to these internal risk exposures, banks have to face the problems of uncertainty and volatility inherent in their economic environment. The foremost among the challenges facing the banking sector of today is that of understanding and managing risk in a competitive economic environment.

One of the lessons from the banking sector crises of the 1990s in Nigeria is the need for the implementation of sound and efficient risk management practices in the Nigerian banking sector. In a bid to conform to global best standards, Uwuigbe, Uwuigbe and Oyeowo (2015) noted that the adoption of macroeconomic policies like deregulation, globalization of operations, financial innovations, and international prudential guidelines among others has brought remarkable changes in the Nigerian banking arena and these changes come with increased levels of risk. Also in Nigeria where the

consumer confidence index is low (Alajekwu, Okoro, Obialor & Ibenta, 2017), banking business is even riskier. The work of Ibenta (2005) identified two categories of risk facing every organization as unavoidable and avoidable risks. Unavoidable risks affect all industries irrespective of sector and are beyond the control of the organization. These are the systematic or market risks. Avoidable risks emanate from the internal operations of the industry and as such they are under the control of the organization. These are the unsystematic or unique risks. Systematic as well as unsystematic risks arise in the course of banking business. The unsystematic risks include credit, liquidity, operational, capital adequacy, reputational risks among others, while the systematic or market risks include interest rate, exchange rate, stock price as well as inflation risks. Interest rate risk is the risk that affects the value of an interest-yielding security as a result of unexpected moves in the interest rate. Exchange rate risk affects investment in foreign currency as a result of fluctuations in an investor's local currency compared to foreign investment currency. Equity or stock price risk arises as a result of changes in stock prices in the financial market, while inflation risk is the possibility that a general and persistent increase in price levels will reduce the value of an asset or the purchasing power of a stream of income. Inflation increases the nominal value of securities and this adversely affects the value of fixed income securities.

Market risk is thus all about the uncertainties in the external environment. It is the risk arising from the volatility in the market that affects banks' returns. This risk is exogenous to the banking sector because it emanates from policies and activities outside their banking operations. Ideally, market risk is outside the control of the banks, as it is determined by factors that affect the overall economy (Aruwa & Musa, 2014). As a result market risk by its nature can only be hedged but cannot be diversified away completely (Santomero, 1997). Considering the role of banks in economic growth and development, a detailed investigation of how they manage this risk becomes pertinent.

Generally, empirical studies confirm that risks have effect on bank performance. Most of these studies in Nigeria concentrated on one unsystematic risk exposure like credit risk; (Ogbulu & Eze 2016; Nwanna & Oguezue 2017); liquidity risk (Okaro & Nwakoby 2016; Ayunku 2017); capital adequacy risk; (Udom & Eze 2018, Eyo & Amenawo 2015), among others. Those who veered into systematic risk investigated only one or two market risk exposures: Kolapo & Fapetu 2015, Oladele, Amos & Adedeji

2017 – interest rate risk; Osuka & Duruechi 2018, Osundina, Osundina, Jayeoba & Olayinka 2016 – exchange rate risk. While some researchers found a positive relationship, others found a negative insignificant effect, and others did not indicate the direction of the effect. This study therefore seeks as its main objective to examine the effect of market risk as a whole on the performance of commercial banks in Nigeria. The specific objective is to examine the effect of interest rate, exchange rate, stock price and inflation risk on the performance of commercial banks in Nigeria.

## Conceptual Literature
## Market Risk

As noted earlier, market risk is all about the uncertainties in the external environment. It is the risk arising from the volatility in the market that affects the banks' return. It emanates from fluctuations in market prices, especially changes in interest rates, foreign exchange rates, equity or stock prices and commodity prices. Equally, market risk can also emanate from where banks accept financial instruments exposed to market price volatility as collateral for loans (Muriithi, Muturi & Waweru, 2016). These changes in market prices (interest rate, exchange rate, equity and commodity prices) cause uncertainties in the expected bank returns (Soyemi, Ogunleye, & Ashogbon 2014). Saunders & Cornett (2006) view market risk as the uncertainty relating to the earnings from business portfolio of financial institutions. In the words of Pyle (1997), it is the fluctuations in asset value as a result of changes in instrumental economic factors such as equity and commodity prices, exchange rates and interest rate.

In another perspective, Ekinci (2016) defined market risk as "the risk of losses in the liquid portfolio" which arise from the movements in market prices and consisting of interest rate, currency, equity and commodity risks. The losses in liquid portfolio arise from the propensity that financial instrument's value will fluctuate as a result of market price changes, regardless of whether these changes are caused by factors typical for individual instruments or their issuer (counterparty), or by factors pertaining to all the instruments traded on the market (Mubbushar, 2016). Market risk specifically refers to systematic risks which include interest rate, foreign exchange, stock price and inflation rate risks. These risks are imposed on the banks by external forces like the Central Bank of Nigeria (CBN), Policy and Foreign Exchange Market operations.

The main issue as far as market risk is concerned is that it is beyond the control of banks and as such cannot be mitigated by diversification

(Santomero,1997).These forms of risk, according to Muriithi*et al*(2016) affect the financial performance of banks.

## Financial Performance

Financial performance has earned varying definitions from various authors. The general idea in all these definitions is that financial performance connotes generation of financial gains from the use of money. According to Udom and Eze (2018), financial performance is an assessment of the financial conditions or profitability of a bank in order to gain insight into the health of the bank using an index that relates two pieces of financial data called financial ratios. It can be defined as the firm's ability to generate new resources (usually net income and cash from operation) from its day-to-day operations over a specified period of time (Adesugba & Bambale, 2016).

In the opinion of the European Central Bank (ECB, 2010), financial performance is the corporate capacity to generate sustainable profits.

Operationally, financial performance for banks can be measured using the turnover made during the year and ability to sustain it, extension of branches to the grassroots, net profit of the bank, computerization of its operations, net profit after tax ratio, share of credit in domestic credit, return on capital employed, return on equity, share price, improvement in the employee performance and return on assets (Naccur, 2003; Okafor, Kelikume & Umoren 2010).

In the research literature, the fundamental measure of financial performance is profitability indices. The typical measures for bank performance are Return on Assets (ROA), Return on Equity (ROE), Net Interest Margin (NIM) and Yield to Earning Assets (YEA). (NDIC Annual Reports and Accounts 2016).

The ROA depends on the bank's policy decisions as well as uncontrollable factors relating to the economy and government regulations. Rivard and Thomas (1997) suggest that bank profitability is best measured by ROA in that ROA is not distorted by high equity multipliers and it represents a better measure of the ability of the firm to generate returns on its portfolio of assets. ROA gives an idea of the level of efficiency of the bank's management in using its assets to generate earnings. ROA is computed as the ratio of income to total assets (Olalekan & Adeyinka, 2013).

Another measure of bank performance is the Return on Equity, ROE. ROE measures the rate of return for ownership interest (shareholders' equity) of common stock owners. It measures the efficiency of a firm at generating profits from each unit of shareholder's equity. Return on equity is calculated by dividing net income after taxes by owners' equity (Adesugba & Bambale, 2016).

The Net Interest Margin, NIM measures the difference between the interest income generated by banks and the amount of interest paid out to their lenders (for example, deposits), relative to the amount of their (interest earning) assets (Adesugba & Bambale, 2016). It is usually expressed as a percentage of what the financial institution earns on loans in a specific time period and other assets minus the interest paid on borrowed funds divided by the average amount of the assets on which it earned income in that time period (the average earning assets). Equity investors are concerned with the firm's ability to generate, maintain, and increase income. The growth of the net interest margin is very logical in impacting positively on the profitability of banks. The more the margin of interests on loans and other deposit increases, the more profitable the bank becomes and this high-profit margin is expected to offset any risk in the operations of the bank.

Lastly, Yield to Earning Assets (YEA) is a financial solvency ratio that compares an organization's interest income to the assets that actually generated it. Specifically, it measures the level of performance of an asset by looking at the yield or how much income generated by the asset at a particular point in time. It is considered a better performance indicator than net interest margin in that it relates yield to the asset that earned it (NDIC, 2016). Thus it excludes all non-earning assets from the measure. In the context of this study, YEA is defined as a measure of the total interest, dividend and fee income earned on loans and investments as a percentage of average earning assets (NDIC, 2016). High YEA indicates that a bank is performing well in its loan and credit administration as well as in its investment policies. Low YEA indicates that the bank is in a position where it may not be able to cover losses and hence could face the risk of insolvency.

Generally, stakeholders are interested in these measures of financial performance in the banking industry (Njimanted, Akume&Aquilas2017). Analysis of income is of vital concern, especially to stockholders, because they derive revenue in the form of dividends. Further, increased profits can cause an increase in market price, leading to capital gains (Nimer, Warrad, & Omari, 2013).

## Theoretical Framework

This study of the effect of market risk on firm performance is anchored on the Modern Portfolio Theory (MPT) propounded by H. Markowitz in 1952. Portfolio theory is a mathematical framework that

facilitates the classification, estimation and control of the sources of investment risk and returns (Ibenta, 2005). According to this theory, a portfolio of assets is selected in such a way that the expected return is maximized for a given level of risk. The core of this theory is that a collection of different kinds of financial assets is less risky than just one type of asset. The summary of portfolio theory and management is that: "diversification of investment can reduce the overall risk below that of individual projects taken separately; individual projects are evaluated not only by reference to their expected return but also with regard to their contribution to overall risk of the portfolio; the portfolio effect of a project must be favourable for diversification to achieve risk reduction" (Ibenta, 2005).

## Market Risk and Bank Performance

Fluctuations in asset value can result from changes in economic factors such as equity and commodity prices, exchange rates and interest rates. Such fluctuations constitute a risk to the general public, investors and business organisations like banks. For the fact that these fluctuations affect the entire economy they are named 'market risk'.

To the bank, market risk is capable of altering the projected financial performance. The occurrence of any of these risks improves or hampers the financial performance of banks depending on whether it is to the bank's advantage or disadvantage. For instance, for banks that have a long position, an increase in the foreign exchange rate (which means a loss in local currency value), would result in again for a bank (Ekinci, 2016). In the face of the relative expectations regarding relative purchasing power disparity, Deniz and Hüseyin (2016) averred that foreign exchange risk is the most widely used instrument to increase after-tax returns. Firms can leverage on periods of disparity when local currency is overvalued to realize substantial foreign exchange gains, but they will incur substantial losses when markets adjust themselves. This is to say that foreign exchange risk is more or less a double-edged sword, one leading to improved performance and the other harmful to corporate performance. Generally, existing literature posits that if risk exposures in banks are adequately managed, regardless of the source, it will definitely enhance their efficiency and profitability and thus promote economic growth and general business development.

## Empirical Review

A number of studies have been carried out within and outside Nigeria to investigate the effect of market risk exposures on the performance of banks.

Ekinci (2016) investigated the effects of credit and market risks on bank performance in the Turkish banking sector using OLS regression method of analysis. The study adopted interest rate and foreign exchange risks as proxies for market risk. Two different proxies were used to measure interest rate risk – interest rate spread and commercial loan interest rate. Interest rate risk was found to have a significant positive effect on bank performance when interest rate spread was adopted but was insignificant with commercial loan interest rate. There was also a significant positive relationship between foreign exchange rate risk and bank performance which was attributed to the banks' imperfect hedging against foreign exchange rate fluctuations.

Osundina*et al* (2016) examined the effect of exchange rate fluctuations on banks' performance in Nigeria from 2005 to 2014. The result of ARCH LM test confirmed the fluctuating nature of the exchange rate in Nigeria. The study revealed that exchange rate fluctuations had an insignificant effect on bank profitability when ROA was used, but had a significant negative effect on banks' liquidity using LDR. The study thus concludes that exchange rate fluctuation affects bank performance depending on the measure of bank performance adopted in the study. It was recommended that measures to hedge against foreign exchange risk should be put in place as the bank's liquidity position is a reflection of its overall financial health.

Amenawo, Riman and Akpan (2016) used data from 12 largest banks in Nigeria (8 national banks and 4 international banks) to examine the effect of currency fluctuation on commercial banks' profitability. Three major currencies –the pound, dollar and yen – were used in the study. Fluctuations arising from British pounds and US dollar exert a negative effect on banks performance without the endogenous control variables (bank characteristics), while Yen had a positive effect. This weakens the ability of banks to make profit in their international transactions and this adversely affects economic activities in Nigeria. With the inclusion of control variables, the result was significant with dollar, indicating that bank characteristic variables could cushion the banks against currency fluctuations. Fluctuations from Japanese Yen do not have a negative influence on bank performance in Nigeria due to the fact that Yen is not a highly tradable currency in Nigeria.

Kolapo and Fapetu (2015) investigated the effect of interest rate on the performance of commercial banks in Nigeria. The study employed data obtained from a sample of six (6) Tier 1 capital banks. Results from the fixed effect regression method established an insignificant effect of interest rate risk on bank performance. However, the researchers noted that the

study was restricted to banks having Tier 1 capital, using only three measures of interest risk. This implies that banks having Tier 2 capital plus more measures of interest rate risk may give a different result.

Oladele, Amos and Adedeji (2017) studied the effect of interest rate on the profitability of deposit money banks in Nigeria. A sample of 21 deposit money banks were used and the result of the regression analysis showed that all the proxies of interest rate adopted in the study (lending rate, inter-bank rate, treasury bills rate and monetary policy rate) have significant positive effect on bank performance measured by return on assets.

In another study, Gbadebo and Ogbonna (2019) investigated the relationship between marketing interest rates and profitability of deposit money banks in Nigeria. The study used panel data spanning from 2005 to 2018 with deposit interest rate (DIR) and lending interest rate (LIR) as proxies for marketing interest rate, and ROA and ROE as proxies for the dependent variable-banks' profitability. The findings revealed that the effect is subjective to the proxy used for market interest rate as DIR had negative and insignificant effect on bank profitability, while LIR had positive and significant effect on bank profitability.

Muriithi, Muturi and Waweru (2016) examined the effect of market risk on the profitability of commercial banks in Kenya. The study revealed that banks' profits are greatly reduced by increased exposure to market risk both in the short run as well as in the long run, and thus advised the banks to adopt measures such as securitization to mitigate interest and foreign exchange risks.

Kolapo and Naheem (2020) using Autoregressive Conditional Heteroskedasticity (ARCH) and Granger Causality estimation techniques studied the link between exchange rate risk and financial sector performance in Nigeria. Quarterly time series data from 2008 to 2017 were used for the study. Financial performance was measured with financial intermediation index of shareholders' equity while exchange rate, interest rate and consumer price index risks were the explanatory variables. The study found out that exchange rate shocks impact negatively as well as significantly on financial performance and recommended effective stabilizing measures for exchange rates in Nigeria.

Empirically, literature that investigated the effect of market risk in its totality on the performance of the Nigerian banks is sparse. The present study addresses this issue satisfactorily by incorporating all the variables of market risk in one study in order to give a better insight into the effect of market risk on bank performance in Nigeria.

## Methodology
The *ex-post facto* research design was adopted to examine the effect of market risk on the performance of commercial banks in Nigeria. The study made use of secondary data obtained from the Nigerian Deposit Insurance Corporation (NDIC) Annual Reports and Accounts

## Model Specification
The functional relationship in the model specification is that financial performance of banks is a function of market risk and stated thus: Financial Performance = f(Market Risk). This means that market risk can influence financial performance of banks. In literature the core measure of financial performance is profitability. The three main measures of profitability used as proxies for financial performance in this study are Return on Equity (ROE), Return on Assets (ROA) and Yield to Earning Assets (YEA). The core measures of market risk adopted in this study are interest rate, exchange rate, stock price and inflation risks. The model of this study was adapted from the work done by Lambe (2015) in Nigeria. The functional relationship of the model is: PAT = f(ER, INF, INT, TA) where: PAT = Profit after tax as proxy for Bank Performance; ER= Foreign Exchange Risk; INF = Inflation Risk; INT = Interest Rate Risk; TA = Total Asset of Bank.

The present study modified this model by using the three variables of financial performance – ROE, ROA, and YEA instead of PAT. The study also replaced total asset of bank by stock price risk as one of the proxies of market risk. Stock price is considered a more direct form of market risk. Equity is very sensitive to any change in the economy thus equity or stock price is one of the most significant parts of market risk. The functional relationship of the model of this study is: FP = f(INTR, EXR, SPR, INFR).

The equations are stated as follows:
$$ROE = e_0 + e_1 INTR + e_2 EXR + e_3 SPR + e_4 INFR + \mu: \quad \dots \dots (1)$$

$$ROA = e_0 + e_1 INTR + e_2 EXR + e_3 SPR + e_4 INFR + \mu: \quad \dots \dots (2)$$

$$YEA = e_0 + e_1 INTR + e_2 EXR + e_3 SPR + e_4 INFR + \mu: \quad \dots \dots (3)$$

Where ROE, ROA and YEA are the dependent variables and proxy for financial performance; INTR = Interest Rate Risk, EXR = Exchange Rate Risk, SPR = Stock Price Risk and INFR = Inflation Risk.

These are the independent variables and proxy for marker risk, $e_0$ is the constant and $e_1$, $e_2$, $e_3$ and $e_4$ are the coefficients of the regression while μ is the error term.

### Data Analysis
The econometric tool of analysis was employed using E-views 9.0.

In order to avoid spurious regression results, Augmented Dickey Fuller (ADF) test was employed to check the stationarity of the data.

**Table I: Result of ADF Test at Level**

| Variables | Intercept | Trend & Intercept | None | Remark |
|---|---|---|---|---|
| ROA | -5.060992 (0.00)* | -5.104118 (0.00)* | -3.474122 (0.00)* | Stationary |
| ROE | -4.539777 (0.00)* | -5.012941 (0.00)* | -0.991442 (0.28) | Stationary |
| YEA | -5.461942 (0.00)* | -5.517817 (0.00)* | 1.062187 (0.91) | Stationary |
| INTR | -2.652588 (0.09) | -2.405893 (0.36) | -0.081704 (0.64) | Not Stationary |
| EXR | -2.126161 (0.23) | -2.126923 (0.50) | -0.055923 (0.65) | Not Stationary |
| SPR | -2.719733 (0.08) | -1.950696 (0.59) | 1.444635 (0.95) | Not Stationary |
| INFR | -3.032964 (0.04)** | -4.305091 (0.02)** | -2.652248 (0.01)* | Stationary |

*Note: The optimal lag for ADF test is selected based on the Akaike Info Criteria (AIC), p-values are in parentheses where (*) & (**) denote significance at 1% and 5% respective*

**Table II: Result of ADF Test at First Difference**

| Variables | Intercept | Trend & Intercept | None | Remark |
|---|---|---|---|---|
| ROA | -5.803598 (0.00)* | -5.657047 (0.00)* | -5.969790 (0.00)* | Stationary |
| ROE | -5.659980 (0.00)* | -5.574343 (0.00)* | -5.824873 (0.00)* | Stationary |
| YEA | -3.354466 (0.03)** | -4.151432 (0.03)** | -5.172636 (0.00)* | Stationary |
| INTR | -4.907151 (0.00)* | -5.681780 (0.00)* | -4.905028 (0.00)* | Stationary |
| EXR | -4.670755 (0.00)* | -4.595829 (0.00)* | -4.797070 (0.00)* | Stationary |
| SPR | -3.772674 (0.01)* | -3.889579 (0.03)** | -3.736590 (0.00)* | Stationary |
| INFR | -4.644919 (0.00)* | -5.544927 (0.00)* | -4.510042 (0.00)* | Stationary |

*Note: The optimal lag for ADF test is selected based on the Akaike Info Criteria (AIC), p-values are in parentheses where (*) &(**) denote significance at 1% and 5% respectively.*

The multiple regression technique was used in this study. Since the variables employed in the analyses tend to have a mixture of level {0(1)} and first difference {1(1)} stationarity status, the Autoregressive Distributive Lag (ARDL) tool of estimation was used. The bounds test estimation of the equations tests for the existence of a long run relationship among the variables by conducting an F-test.

### Residual and Stability Diagnostics
**Table III: Serial Correlation LM Test**

| Estimated Equation | F-statistic | P-value |
|---|---|---|
| ROA → INTR + EXR + SPR + INFR | 1.765928 | 0.2316 |
| ROE → INTR + EXR + SPR + INFR | 0.851937 | 0.4554 |
| YEA → INTR + EXR + SPR + INFR | 0.939573 | 0.4629 |

The serial correlation LM test was performed to avoid the issue of variables in the model being serially correlated. The presence of serial correlation in a model is a violation of the classical assumptions of a linear regression model. The serial correlation output above reveals that the variables in the models were not serially correlated owing to the insignificant (at 5% significance level) p-value of the F-statistic. The serial correlation LM test was conducted to determine the reliability of the ARDL results.

### Cointegration ARDL Result
**Table IV: Bound Test for Market Risk and Commercial Bank Performance**

| | ROA | ROE | YEA |
|---|---|---|---|
| F-Statistic | 8.74 | 9.99 | 17.34 |
| Lower Bound @ 5% Critical Value Bound | 2.86 | 2.86 | 2.86 |
| Upper Bound @ 5% Critical Value Bound | 4.01 | 4.01 | 4.01 |

The unit root test through ADF proved that the variables are stationary and have no stationarity defect that may encumber the result of the analysis. If the F-statistic of bound test is higher than the lower and the upper bound critical value at 5% significance level, the null hypothesis which states that there is no long-run relationship is rejected, whereas if the F-statistic of bound test is less than the lower and the upper bound critical value at 5% significance level, then long-run relationship is established. The table above supports the presence of a long run relationship between market risk and commercial banks' financial performance, indicating that market risk relates with commercial banks financial performance in the long run.

### Nature of ARDL Long Run relationship and Speed of Correction to Equilibrium

With the evidence of a long run relationship between market risk and commercial banks' financial performance, it is econometrically mandatory to ascertain the speed of adjustment of the variables that are co-integrated that is, the error correction model (ECM).

### Table V: ARDL Error Correction for Market Risk and Commercial Bank Performance

| Variables | Short Run Co-integrating Form | | | | | |
| | ROA | | ROE | | YEA | |
| | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. |
|---|---|---|---|---|---|---|
| D(INTR) | -0.044818 | 0.8626 | 0.137411 | 0.9769 | -31.343946 | 0.0304 |
| D(EXR) | 0.946077 | 0.6548 | 12.296850 | 0.7110 | 276.882245 | 0.1715 |
| D(SPR) | 7.253649 | 0.0032 | 20.446184 | 0.5470 | 38.701657 | 0.7276 |
| D(INFR) | -0.054631 | 0.3231 | -1.547597 | 0.1120 | -24.912667 | 0.0000 |
| CointEq(-1) | -1.136947 | 0.0000 | -1.405948 | 0.0000 | -18.384347 | 0.0087 |
| Long Run Coefficient | | | | | | |
| INTR | -0.039420 | 0.8622 | 0.097735 | 0.9769 | 4.831973 | 0.0008 |
| EXR | 2.801848 | 0.1506 | 8.746304 | 0.7128 | 0.804233 | 0.9317 |
| SPR | -0.846894 | 0.2460 | -39.20901 | 0.0007 | 5.890575 | 0.0995 |
| INFR | -0.152422 | 0.0060 | -2.238363 | 0.0034 | 0.462605 | 0.0545 |
| C | -0.579715 | 0.9677 | 407.9132 | 0.0322 | -126.2782 | 0.0192 |

The ECM result indicates that the three measures of financial performance of commercial banks - return on assets, return on equity and yield on earning assets - disclose the expected negative sign and are statistically significant. This confirms the assertion that market risk and financial performance of deposit money banks adjust to equilibrium following disequilibrium in past periods. The coefficients of the ECM for ROA (1.13), ROE (1.40) and YEA (18.38) confirm that any long run disequilibrium can conveniently be corrected within current year for return on assets, return on equity and yield on earning assets.

### Short Run Relationship

The Auto-Regressive Distributive Lag (ARDL) model was utilized in estimating the short-run relationship between market risk and financial performance of commercial banks. The choice of the ARDL against the traditional OLS was strictly based on the mixed order of integration of the variables. The Adjusted R-square, F-statistic, Durbin Watson and coefficients of the individual variables were the statistical criteria for interpretation of the regression result.

### Commercial Bank Financial Performance and Market Risk

| Variables | ROA | | ROE | | YEA | |
| | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. |
|---|---|---|---|---|---|---|
| INTR | -1.844047 | 0.0929 | 0.798707 | 0.8644 | -19.71946 | 0.1363 |
| INTR(-1) | -0.646229 | 0.1148 | -3.761536 | 0.4580 | -29.11691 | 0.1541 |
| EXR | 3.383997 | 0.3086 | 1.195599 | 0.9753 | 203.1711 | 0.1589 |
| EXR(-1) | 7.913085 | 0.0447 | | | -124.7725 | 0.2325 |
| SPR | 2.014020 | 0.6036 | 39.20302 | 0.4463 | 3.875253 | 0.9630 |
| SPR(-1) | -9.171395 | 0.0884 | -99.23236 | 0.2044 | 3.083214 | 0.9714 |
| INFR | 0.057346 | 0.7653 | 3.589743 | 0.1879 | -3.188351 | 0.6288 |
| INFR(-1) | -0.489714 | 0.0772 | -1.850526 | 0.3425 | 9.888050 | 0.1360 |
| C | 182.4465 | 0.0838 | 613.4020 | 0.0916 | 996.6734 | 0.2119 |
| R-squared | 0.941933 | | 0.809115 | | 0.991806 | |
| Adjusted R-squared | 0.724183 | | 0.546649 | | 0.975419 | |

| S.E. of regression | 1.629853 | | 33.33981 | | 55.99116 | |
| Sum squared resid | 10.62568 | | 8892.344 | | 18810.06 | |
| Log likelihood | -22.05419 | | -89.35091 | | -92.48806 | |
| F-statistic | 4.325746 | | 3.082738 | | 60.52304 | |
| Prob(F-statistic) | 0.083454 | | 0.060470 | | 0.000030 | |
| Durbin-Watson stat | 3.053078 | | 2.389709 | | 1.809566 | |

Judging from the result of the adjusted coefficient of determination (Adj $R^2$) in the table above, 72.42%, 54.66% and 97.54% of changes in return on assets, return on equity and yield on earning assets respectively were attributed to market risk as expressed by interest rate risk, exchange rate risk, stock price risk and inflation risk. Market risk significantly explained the variations in yield on earning assets but would not for return on assets and return on equity. The issue of autocorrelation was not evident in the models as the Durbin Watson coefficients are within the acceptable range of no autocorrelation in a model. On the relative statistic of the models estimated, the result shows that interest rate risk has a negative insignificant relationship with return on assets and yield on earning assets but a positive relationship with return on equity. Exchange rate risk depicts the presence of an insignificant positive relationship with return on assets, return on equity and yield on earning assets. Similarly, stock price risk has an insignificant positive relationship with return on assets, return on equity and yield on earning assets. Inflation risk was observed to have an insignificant positive relationship with return on assets and return on equity, but a negative relationship with the yield on earning assets.

**Test of Hypothesis (at 5% level of significance)**
$H_0$: Market risk has no significant effect on the financial performance of commercial banks in Nigeria.

The results of F-statistics for ROA, ROE and YEA models are 4.325746, 3.082738 and 60.52304 with p.values of 0.083454, 0.060470 and 0.000030 respectively. Based on the results of the p.values, the study concludes that market risk has a significant effect on commercial bank yield to earning asset and no significant effect on return on asset and return on equity.

**Summary of Findings**
The study used four explanatory variables (interest rate, exchange rate, stock price and inflation rate risks) to study the effect of market risk on the performance of commercial banks in Nigeria.

Exchange rate and stock price risks have positive association with the three measures of financial performance, in line with apriori expectations, while interest rate relates negatively with return on assets and yield on earning assets, also in line with apriori expectation, but positively with return on equity, refuting the expected negative relationship. Inflation risk is positive for return on assets and return on equity contrary to the expected negative relation, but negative as expected for yield on earning assets. The positive correlation between exchange rate risk and bank performance refutes the negative association found by Amenawo et al (2016). Interest rate risk has an insignificant effect on bank performance, confirming the findings of Kolapo and Fapetu (2015). Stock price and inflation risks both have positive and insignificant relationship with all the three measures of bank financial performance.

**Conclusion and Recommendations**
Market risk has a substantial effect on the performance of commercial banks in Nigeria. The uncertainties from the external environment are a threat to the financial sector. In the face of the high level of financial risks inherent in the financial system, ECM revealed that market risk has not been adequately managed in Nigeria. This implies that banks can increase their risk levels for a marginal increase in their performance level.

Based on the findings of this study, we recommend that deposit money banks in Nigeria should improve on their exchange rate risk management dynamics in order to enhance firm performance. The cumulative effect of risk factors regarding exchange rate, interest rate, inflation and stock market shocks is capable of distorting corporate performance. The Management of the deposit money banks therefore should ensure compliance with bank regulations and corporate governance rules. More so, the Central Bank of Nigeria and other regulators should strive to enforce risk identification, assessment, measurement and control mechanism, in line with best global practices in other to avoid financial crisis and also improve on bank performances.

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