

# MARKET VOLATILITY DETERMINANTS AND PERFORMANCE OF BANKS IN NIGERIA

*Esther Igbekoyi Olusola, Adekunle Ajasin University, Nigeria  
Adegbayibi Adesanmi, Obafemi Awolowo University, Nigeria*

## *Abstract*

*The peculiarity of business activities of the banking sector have made them highly vulnerable to the risks associated with the recent economic distress in the Nigerian financial market. This study was conducted to assess the extent at which some selected market volatility determinants affect the performance of Nigerian banks especially as it relates to the return on equity provided by owners. The study covered banks that are quoted in the Nigerian Stock Exchange; data were collected from the annual reports of selected banks and the CBN statistical bulletin for a period of 2009-2015; and they were analyzed using descriptive and inferential statistics. The result of the study showed that capitalization, exchange rate and credit risk are statistically significant in determining returns on equity within the period of 2009- 2015, when considered at 5% and 1% levels of significance respectively. However, interest rate is found to be statistically insignificant.*

**Keywords:** *Market volatility determinants, Risks, Financial market, Performance, Banking sector, Nigeria.*

## INTRODUCTION

Market volatility is a measure the extent at which the current price of an asset deviates from its average past prices; market volatility is simply synonymous with market risk and the issue of volatility and risk have become increasingly important to financial practitioners, market participants, regulators and researchers in recent times (Raju & Ghosh, 2004). Issues of volatility in stock market behaviour are of importance as they shed light on the data generating process of the returns (Hongyu & Zhichao, 2006). Volatility is to be deplored in the market, because it means that security values are not dependable and the capital markets are not functioning as well as they should. Miller (1991) stated that by volatility, public seems to mean days when large market movements, particularly down moves, occur. These precipitous market wide price drops cannot always be traced to a specific news event. Porteba (2000) also stated that the public takes a more deterministic view of stock prices; if the market crashes, there must be a specific reason and that a volatile stock market weakens consumer confidence and drives down consumer spending. This can alter investment equilibrium position of an economy as

investors turn to purchase stocks of larger and well known firms at the expense of new firms (Osahon, 2014).

Despite the clear mental image of market volatility and the quasi-standardized status it holds in the field of finance, there are some subtleties that make volatility challenging to analyse (Raju & Ghosh, 2004). Since volatility is a standard measure of financial vulnerability, it plays a key role in assessing the risk/return tradeoffs and forms an important input in asset allocation decisions. In segmented capital markets, a country's volatility is a critical input in the cost of capital (Bekaert & Harvey 1995). Peters (1994) noted that stock prices and returns are cyclical, imperfectly predictable in the short run, and unpredictable in the long run and that they exhibit nonlinear, and possibly chaotic, behavior related to time-varying positive feedback.

Market volatility issue is significant to the Nigerian economy because it is highly driven by external factors as a developing nation as evident in the high rate of dependence on importation and the Central Bank of Nigeria policy allows exchange rate of naira to other currencies to be determined by market forces (Lawal & Ijirshar, 2013). The effect of the policy is that the currencies of other countries form a part in determining the value of the Nigerian naira. Based on this backdrop, the Nigerian economy is vulnerable to the risks (exchange rate volatility, interest rate, credit risk among others). Previous studies conducted have revealed the individual effect of these factors to the performance of banks separately but there is need to investigate the joint effect of market volatility determinants to performance of banks in the period of recession where the Nigerian market is most vulnerable to the risks in the market.

## **THEORETICAL AND LITERATURE REVIEW**

### **Arbitrage Pricing Theory**

The Arbitrage Pricing Theory (APT) was developed by Ross (1976a, 1976b). It is a one-period model in which every investor believes that the stochastic properties of returns of capital assets are consistent with a factor structure. APT constitute an important branch of asset pricing theory and one of the primary alternatives to the Capital Asset Pricing Model (CAPM). The APT begins by assuming that asset returns follow a factor model. In a factor model, the random return of each security is a linear combination of a small number of common, or pervasive, factors, plus an asset-specific random variable. Ross (1976a) heuristic argument for the theory is based on the preclusion of arbitrage. The subsequent work, derives either from the assumption of the preclusion of arbitrage or the equilibrium of utility-maximization. A linear relation between the expected returns and the betas is equivalent to an identification of the stochastic discount factor (SDF). APT is a risk –return equilibrium based model that has various areas of application as stated in a study conducted by Ajao & Igbekoyi (2015), but this study centers on the performance evaluation of managed funds. The application was pioneered by Jensen (1968) where APT was used to evaluate money managers and the managed fund's returns which are regressed on the factors and the intercepts are compared

with the returns on bench mark securities such as treasury bills (Busse, 1999; Mitchell & Pulvino, 2001). Risk factors (in the APT) emanate from changes in some fundamental economic and financial variables such as interest rates, inflation, real business activity, exchange rate among other variables. Rashid and Karachi (2007) also argue that according to the Arbitrage theory, a rise in real interest rate is likely to reduce the present value of a firm's future cash flows and therefore result in a fall in prices to fall. APT was adopted in this study because it is more general than the CAPM as it allows large number of factors to influence asset's rate of return.

### **Market volatility determinants and Performance of Banks**

Commercial banks are in the risk business; In the process of providing financial services, they assume various kinds of financial risks (Santomero, 1997). Risk is the variability of the actual return from the expected returns associated with a given asset or investment (Khan and Jain, 2004). The intermediation function of commercial banks gives rise to different types of risks with different magnitudes and level of causes on bank performance such as credit risk, liquidity risk, market risk, operational risk etc (Van Gestel & Baesens, 2008). Market Risk is the risk of asset value change associated with systematic factor. According to Santomero (1997), market risk by its nature can be hedged but cannot be diversified away completely.

The Banking operation is solely dependent on these as it impacts on performance. The focus of this study is the measurement of performance of the banks based on the return that investors get on their investments (ROE); this is because financial decisions are generally based on the trade-off between risk and returns (Chang, Hsu & McAleer, 2013). It therefore justifies the adoption of this factor as proxy for performance of banks. The return on equity (ROE) is measures as the ratio of profit after tax minus preference share dividend and equity capital. Studies have been conducted in literature that revealed the relationships that existed between market volatility determinants and performance of banks based on returns to investors. There are however, several variables that have been identified in the literature as important determinants of stock returns but they have modified to fall within the scope of this study and we shall examine them as follows:

### **Exchange Rate**

Exchange rate volatility is defined as the movement that emanates from currency fluctuations and this affects both cash flow and value of a fir (Farah, 2013). Commercial banks that deal in foreign currencies holding assets and liabilities in foreign denominated currencies are exposed to foreign exchange risk; and this comes from its trade and non- trade services (Leyla, 2015). Owoeye & Ogunmakin (2013) examined exchange rate volatility and bank performance in Nigeria using loan loss to total advances ratio and capital deposit ratio to proxy bank performance. The study found that there exist a positive relationship between exchange rate and loan loss which explain the tendency of banks to accumulate bad loans as a result of fluctuating exchange rate. In similar studies conducted by Muriithi (2011), it also showed that exchange rate had a positive influence on

market performance. Olugbenga (2012), examined the long run and short run effect of exchange rate on stock market development in Nigeria using the Johansen co-integration tests and it showed that exchange rate had a significant positive effect in the short run but it is significantly negative in the long run. The study conducted by Farah (2013), to examine the effect of exchange rate volatility in oil marketing sectors in Kenya, however showed a varied result that there is no significant relationship between exchange rate, interest rate and performance. Leyla (2015), however stated that foreign exchange exposure has a negative effect on the performance of listed banks in Kenya.

### **Interest Rate**

The relationship between interest rate and stock returns indicates several issues that may serve as intermediaries or transmission mechanism through which the effect may be observed. The interest rate represents an opportunity cost for investing in stocks. It is also a component of the equity capitalization rate. Therefore, it is considered as one of the most important factors affecting the behaviour of investors in the market (Ajao & Igbekoyi, 2015). This argument was also supported by Haulan (1992) as stated that interest rate is one of the most important factor that affect bank financial performance. Irgu (2013), conducted a study to determine whether a relationship exist between interest rate spread and performance of commercial banks in Kenya and it was found that there is a strong positive relationship, and that it is significant in influencing financial performance of Kenyan Banks. Aymen (2013), however submitted that it has an insignificant positive effect on listed commercial banks in Kenya.

### **Capitalization**

Capital is an important factor in modern banking, because it has the ability to withstand shock and reduce the likelihood of failures during economic downturn (Aymen, 2013). This assertion was supported by Ikpefan (2013) who stated that adequate shareholders fund can serve as a veritable stimulant in strengthening the performance of banks and can increase the confidence of stakeholders especially in the era of global economic meltdown which is the situation of the Nigerian economy at the moment. Capitalization in this study is assessed based on the value of equity holding of the bank at the end of financial year which is measured as the number of ordinary share holding multiplied by the nominal value per share. Evidence from previous studies conducted has revealed the significance of capitalization to business survival especially in the period of recession. Berger & Bonwmn (2011), examined the effect of capital on three dimensions of bank performance that is; survival, market share and profitability during the crises and normal times. The finding showed that capital helps banks during banking crises and that higher capital improves the performance of banks. Ikpefan (2013), in a study on the impact of bank capitalization in the performance of Nigerian banking industry from 1986-2006, revealed that there is a positive relationship between shareholders fund and bank loan, bank liquidity and bank deposits. In another study conducted by Aymen (2013), on the impact of capital on financial performance of banks in Tunisia where ratio of equity to total assets was used to connote capital and ROA, ROE and NIM to measure financial performance

covering a period of 2000-2009; it was found that although there is a positive relationship between capital and the three financial performance, it is only the relationship between capital and ROA that is significant.

### **Credit Risk**

Credit risk has been defined by different researchers from diverse perspectives but study adopted the definition of Basel (1999) who defines credit risk as the potential that debtor or counter party default in satisfying contractually pre-determined obligation according to the agreed upon terms (Million, Matewos & Sujata, 2015). Achou & Tenguh (2008), also argued that failure of trading partner to repay its debt in full can seriously damage the affairs of the other partner and this has made credit risk a matter a concern in the financial world. The current economic recession may increase the rate of default as most businesses have been affected by the adverse effect of devaluation of the Nigerian currency. This phenomenon has made credit risk an important variable in the determination of Nigerian banks performance. Engdawork (2014) confirmed this submission in a study conducted on effect of credit risk on performance of Ethiopian banks which revealed that credit risk significantly affect profitability in the Ethiopian banking sector. Kolapo, Ayeni & Oke (2012), also did an empirical investigation into the quantitative effect of credit risk on the performance of commercial banks in Nigeria from 2000-2010; and the result of the study showed that effect of credit risk on bank performance measured by ROA of banks is cross sectional invariant. A similar study conducted by Abu, Sajeda, Mustafa & Hasanul (2015) in Bangladesh revealed that the credit risk indices used in the study had a robust negative and significant effect on all profitability indicators adopted in the study. This study however assessed credit risk on the risk of loss that may arise if an obligor fails to perform an obligation under a loan or trading contract and it is measured on the non- performing loan ratio (NPLR).

### **Empirical Review**

Tan and Floros (2012) carried out a study on stock market volatility and bank performance in china using 11 listed banks from 2003-2009. They found out that stock market volatility has significant effect on return on equity (ROE) and excess return on equity (EROE); credit risk has negative effect on ROE and EROE while capitalization has non-significant positive effect on ROE and EROE in china.

Onakoye (2013) conducted a study on stock market volatility and economic growth in Nigeria (1980-2010). The aim of the study was to examine the relative contribution of stock market volatility in economic growth in Nigeria for the periods of 1980 to 2010 using exponential generalized autoregressive conditional Heteroskedesitivity (EGARCH). The study found that the volatility stock is quite persistent in Nigeria and this might distort growth of the economy. This was also the submission of Albertazzi and Gambarcorta (2009) in their research titled bank performance and Business cycle where they found that stock market volatility has negative effect on return on equity.

Osahon (2014) also carried out a study on measuring Nigerian Stock Market Volatility. The aim of the research is to ascertain the presence or otherwise of volatility clustering in the Nigerian stock market. Using time series data of share prices for the period 1995 to 2009, the Autoregressive Conditional Heteroscedasticity (ARCH) model and Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model were estimated. The study found out that the market exhibits volatility clustering. Olugbenga (2012) however discovered in the examination of the long run and short run effects of exchange rate on stock market development using Johansen co-integration test, that there is a significant positive stock market performance to exchange rate in the short run and a significant negative stock market performance to exchange rate in the long run.

Gizaw, Kebede & Selvarcy (2015) however studied the impact of credit risk on profitability performance of commercial banks in Ethiopia. The objective of the study was to empirically examine the impact of credit risk on profitability of commercial banks in Ethiopia. Secondary data was collected from eight (8) commercial banks for 12 years period. Data were analysed using descriptive statistics and panel regression model. The result showed that the credit risk measures (non-performing loan, loan provision and capital adequacy) have significant impact on the profitability of commercial banks in Nigeria.

Kolapo, Ayeni and Oke (2012) also conducted a study on credit risk and commercial banks performance in Nigeria: a panel model approach. The study carried out an empirical investigation into the quantitative effect of credit risk on the performance of commercial banks in Nigeria in the period of 11 years (2000-2010). The study found that the effect of credit risk on bank performance is cross-sectional invariant. Both Olawale (2015) and Kolapo, Ayeni and Oke (2012) found out that credit risk has negative effect on bank's performance in Nigeria.

Maigua and Mouni (2016) studied the influence of interest rate determinants on the performance of commercial banks in Kenya. The study was conducted to investigate the influence of interest rate determinants on the performance of commercial banks in Kenya. The interest rate determinants studied are inflation rate, discount rate and reserve requirements. The study covered 43 commercial banks operating in Kenya. Data collected were analysed using regression analysis. The result of the study showed that discount rate, inflation rate and exchange rate had positive influence on performance of commercial banks while reserve requirements ratio have negative influence. Studies conducted by Zuhaib & Nizam (2015); and Otuori (2013) further affirm previous findings that interest rate has significant positive effect on firm's performance.

Mlambo, Maredza and Sibanda (2013) studied the effect of exchange rate volatility on stock market: a case study of South Africa. The study assessed the effects of currency volatility on the Johannesburg stock exchange. The GARCH model was used in establishing the relationship between exchange rate volatility and stock market performance. The study employed monthly South African data for the period of 2000-2010. The study found that a very weak relationship exist between

currency volatility and stock market volatility. Muriithi (2011) in a study conducted in Kenya to establish the relationship between foreign exchange rate and market performance of manufacturing companies revealed that exchange rate had a positive influence on market performance although the study did not state if it was weak or strong.

Farah (2013) studied the effect of foreign exchange rate volatility on the financial performance of oil marketing companies in Kenya. The objective of the study was to establish the effect of foreign exchange rate volatility on financial performance of local oil marketing companies in Kenya. The study covered 55 oil marketing companies in Kenya. The result of the study showed that there is no significant relationship between inflation and financial performance. It was also revealed that there is no significant relationship between performance and interest rates. Also there is no significant relationship between foreign exchange volatility and performance. The finding of Leyla (2015) in a study conducted on the effect of foreign exchange exposure in the financial performance of commercial banks in Nigeria found out that foreign exchange rate has negative effect on firm's performance.

Kanu and Hamilton (2013) assessed the impact of capitalization on bank performance in Nigeria 1970-2010. The study examined the effects of capital structure of banks on the performance of commercial banks from 1970-2010. The result of granger causality indicates that the significant relationship between capitalization and profitability is by-directional, implying that increase in capital leads to increase in profitability and vice versa of commercial banks in Nigeria. Studies conducted by Aguda & Gitonga (2011) in Berger & Bouwman (2011) also revealed that capitalization has positive effect on firm's performance. The finding is however contradictory in a similar study conducted by Noman, Pervin, Chaundhury and Banna (2015) in the effect of credit risk on the banking profitability in Bangladesh banking sector. The study used an unbalanced panel data on 172 observations for 18 private commercial banks for 2003-2013. It was found in the study that capital adequacy ratio (of the credit risk indicators) had a negative and significant effect on profitability.

Abreu and Mendes (2002) investigated the determinants of bank interest margin and profitability for some European countries and reported that well capitalized banks faced low bankruptcy funding costs and this advantage translated into better profitability. Bobakova (2003) also confirmed this in a similar study stating that capital influences bank profitability; arguing that in the arithmetical sense the yield on own capital grows *ceteris paribus* as the capital proportion declines, since given volume of capital supports a higher volume of assets.

Evidence from previous studies reviewed affirms that market volatility exists in the market and it is capable to affecting the economy of any country. Studies into the effect of each of the market volatility determinants however showed varying results from one country to another and from one period to another. It can be concluded from the findings of studies reviewed in the course of carrying out this

research that the results are inconclusive. There is the need therefore to examine the effects of these determinants on the performance of Nigerian banks between the periods of 2009 to 2015 to determine if the case of Nigeria conform or negates the findings of previous studies.

## METHODOLOGY

The study was conducted using data from secondary sources to assess the extent at some selected market volatility determinants affect the performance of Nigerian banks. The analysis was done using analytical tools; unit root test, co-integration test and vector correction test. The data used was obtained from the annual reports of selected banks, Factbook of the Nigeria Stock Exchange and Central Bank of Nigeria (CBN) Statistical Bulletin for 2009-2015. Theoretically, and as adopted in previous studies by researchers like Mohamad et. Al. (2010) and Carter and Stover (1991), the functional form of variables are represented as;

$$ROE = f(EXCR, CAP, CRDT\_RISK, INT\_RATE, MKT\_RISK) \dots\dots\dots(1a)$$

From equation 1a, Returns on equity depends on Exchange rate, Capitalization, Credit Risk, Interest rate, and Market Risk. It is expected from theory that an increase in capitalization will increase Returns on equity while an increase in Exchange rate, Credit Risk, Interest rate, and Market Risk will reduce Returns on equity. This relationship is evident in the work of Mohammad et. al. (2010) and Carter & Stover (1991). We can specify equation (1a) in an operational form for easy estimation below.

### Model Specification

From the theoretical framework therefore, the Returns on Equity function as it relates to this study is specified in log linear form as follows.

$$\ln ROE_t = a_0 + a_1 \ln EXCR_t + a_2 \ln CAP_t + a_3 \ln CRDT\_RISK_t + a_4 \ln INT\_RATE_t + U_t \dots(1b)$$

Where:

$ROE_t$  = Returns on equity at current period,

$EXCR_t$  = Exchange rate at current period,

$CAP_t$  = Capitalization at current period,

$CRDT\_RISK_t$  = Credit Risk at current period

$INT\_RATE_t$  = Interest rate at current period,

$U_t = NID(0, \sigma^2 \epsilon)$  denoting an independent (I), normal (N) distribution with a mean of zero ( $E(\epsilon_t) = 0$ ) and a variance ( $V(\epsilon_t) = \sigma^2 \epsilon$ ); since these are constant coefficients, an identical distribution holds at every point in time.



## Empirical Analysis

**Unit Root Test:** The unit root test was conducted using the Augmented Dickey Fuller Test (ADF) and Philips Perron test (PP). The test is carried out to ascertain the stationarity properties of the time series in order to avoid spurious regression in the regression estimates and ensure reliability of estimates and therefore the application of appropriate test statistic for long run relationship/effect. The ADF formula is thus specified as:

$$\Delta P = \beta_1 + \beta_2\tau + \sigma P_{it-1} + \alpha \sum_{t-1}^m \Delta P_{it-1} + \varepsilon \text{ ----- (1)}$$

**Co-integration Test:** The primary aim of the study is to estimate the long run relationship between Returns on Equity and capitalization, exchange rate, interest rate, market risk, and credit risk. The correct specification of such a long-run relationship that will capture the short-run deviations that might have occurred in estimating the long-run co-integrating equation requires an error correction term (Onwioduokit & Adenuga, 2000; Osakwe, 1983). In this method, the number of co-integrating relations is tested on the basis of trace statistics and maximum Eigen statistics. Once the presence of co-integration is established, we estimate an error correction model (ECM) that includes both the long run and short run dynamics. The Co-integration version of the above model is expressed in equation 2 as follows:

$$\ln ROE_t = \sum_{i=1}^k a_{1i} \ln EXCR_{t-i} + \sum_{i=0}^k a_{2i} \ln CAP_{t-i} + \sum_{i=0}^k a_{3i} \ln CRDT\_RISK_{t-i} + \sum_{i=0}^k a_{4i} \ln INT\_RATE_{t-i} + U_t \dots (2)$$

Following Pesaran et. al. (2001) the error correction representation of the above Co-integration model (2) is given by:”

$$\lambda_i \ln ROE_t = a_0 + \sum_{i=1}^k \lambda_i a_{1i} \ln EXCR_{t-i} + \sum_{i=0}^k \lambda_j a_{2i} \ln CAP_{t-i} + \sum_{i=0}^k \lambda_k a_{3i} \ln CRDT\_RISK_{t-i} + \sum_{i=0}^k \lambda_l a_{4i} \ln INT\_RATE_{t-i} + \sum_{i=0}^k a_{1i} \delta_i \ln EXCR_{t-i} + \sum_{i=0}^k a_{2i} \delta_i \ln CAP_{t-i} + \sum_{i=0}^k a_{3i} \delta_i \ln CRDT\_RISK_{t-i} + \sum_{i=0}^k a_{4i} \delta_i \ln INT\_RATE_{t-i} + U_t \dots (3)$$

Where the parameters;

$\lambda_j$ :  $j = 1, 2, 3, 4$  are the short-run dynamic coefficients,

$\delta_i$ :  $i = 1, 2, 3, 4$  function as the long-run multipliers underlying the Co-integration model.

Theoretically, it is expected that:  $a_1 < 0$ ;  $a_2 > 0$ ;  $a_3 < 0$ ;  $a_4 < 0$ .

This means that with the exception of Capitalization, all coefficients on the variables are expected to have negative signs.

## DATA PRESENTATION AND DISCUSSION OF FINDINGS

From the result in table 1, it is evident that all the variables are free from unit root tangle; the Augmented Dickey Fuller (ADF) and Philips Perron (PP) unit root result revealed that Returns on equity (ROE), Capitalization (CAP) and Credit risk (CRDT\_RISK) are stationary at first difference (1(1)) using ADF and PP respectively. While Interest rate (INT\_RATE) and Exchange rate (EXCR) are stationary at level (1(0)) and at second difference (1(2)) respectively. Since most of the variables follow an I(1) process, the next step is to test if a long run relationship (co-integration) exists among the variables.

**TABLE 1**  
**Stationarity Test of Variables**

Variables		Unit Root Tests		Conclusion
		<i>ADF</i>	<i>PP</i>	
ROE	<i>Level</i>	-1.348093	-1.618840	I(1)
	<i>First Diff</i>	-2.933950**	-2.033950	
EXCR	<i>Level</i>	-0.753940	-0.748410	I(2)
	<i>First Diff</i>	-0.748410	-0.707484	
	<i>Second Diff</i>	-2.380596	-12.17119*	
CAP	<i>Level</i>	-2.041194	-2.190668	I(1)
	<i>First Diff</i>	-2.941549**	-2.911549**	
CRDT_RISK	<i>Level</i>	-2.380596	-1.098113	I(1)
	<i>First Diff</i>	-1.427695	-3.427695**	
INT_RATE	<i>Level</i>	-1.401037	-4.913973*	I(0)
	<i>First Diff</i>	-0.982304	-0.982304	
<i>Critical Value</i>	<i>1%</i>	<b>-3.546099</b>	<b>-3.591147</b>	
	<i>5%</i>	<b>-2.911730</b>	<b>-2.901573</b>	
	<i>10%</i>	<b>-2.593551</b>	<b>-2.521106</b>	
<i>NB: *, ** &amp; *** represent significance at 1%, 5% and 10% level respectively</i>				
<i>source: Author's computation with E-view 9.0</i>				

### Co-integration Test

Having discovered that most of the series are I(1), it therefore informs the need to difference them (series) before OLS can be used. The implication of this however is that the model then becomes a short run model, since the lagged component of the series would have been included. However, long run economic relationship amongst the variables can still be uncovered via the co-integration test. This co-integration test is based on the argument that given that time series have unit roots, a long run relationship could possibly exist between such series. It therefore implies that the residual of such regression should be stationary at levels using the ADF and PP, since there is a unique stochastic trend amongst the variables.

The co-integration results as revealed in table 2 and 3 show that the trace statistics and the maximum Eigen values are greater than the critical values at 5% level of significance; while we also have three co-integrating factors in the two cases (trace statistics and the maximum Eigen value). The implication of the above is that there is long run relationship between capitalization, credit risk, exchange rate, interest, market risk and company's performance, as the null hypothesis of no co-integration cannot be accepted at 5% level of significance, showing that there is a unique long run relationship among ROE, EXCR, CAP., CRDT\_RSK, and INT\_RATE, that is these variables have equilibrium condition which keeps them in proportion to each other in the long run. The exactly identifying estimates of the Johansen Maximum likelihood estimates show the co-integrating coefficients normalized to Returns on equity.

**TABLE 2**  
**Unrestricted Co-integration Rank Test (Trace)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.307956	18.03718	3.841466	0.0000
At most 1*	0.311416	18.28280	4.129906	0.0000
At most 2	0.311543	18.29180	9.164546	0.7028
At most 3*	0.307956	18.03718	3.841466	0.0000
At most 4	0.449555	29.25440	12.51798	0.6114

Note: Trace test indicates 3 co-Integrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

The Parsimonious error correction model (ECM) result in table 4 show that the adjusted R<sup>2</sup> of the estimated model showed about 97.62 percent of the variation in returns on equity is explained by the combined effects of all the determinants while the remaining 2.38 percent is attributed to the unexplained variation that is the variables not captured in this model. Also, the equation's standard error of 0.873742 signifies that in about two-third of the time the predicted value of Returns on Equity would be within 87.37% of the actual value. The coefficient of the ECM (ECM (-1) as -0.683267) is negative, and highly significant, showing that the model has a self-adjusting mechanism for adjusting the short-run dynamics of the variables with their long-run values. This implies that there is a long-run relationship between returns on equity and its determinants. The speed of adjustment to equilibrium is given by the coefficient of. This speed is very high, indicating that a deviation in returns on equity from equilibrium is corrected by as high as 68 percent the following year. The F-statistic of 24.72536 is significant at 1 percent level, as the pro-value estimate of 0.007816 has indicated. It shows that there is a linear relationship between the dependent variable and at least one of the independent variables. Thus, it will rightly act to correct any deviations from long-

run equilibrium. The Durbin Watson statistics of 2.675815 is greater than 2 and it indicates that there is absence of serial autocorrelation. This implies that the statistical estimates can be relied upon.

**TABLE 3**  
**Unrestricted Co-integration Rank Test (Maximum Eigenvalue)**

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.889435	107.9054	40.07757	0.0000
At most 1*	0.678812	55.65069	33.87687	0.0000
At most 2	0.650865	21.56251	27.58434	0.6949
At most 3*	0.391284	24.32376	21.13162	0.0171
At most 4	0.103759	5.367729	14.26460	0.7152

Note: Trace test indicates 3 co-Integrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

The long run coefficients of the determining variables have different signs and magnitude in terms of relationships with ROE. It was revealed that CAP, CRDT\_RISK, and EXCR are significant in determining return on equity of banks. It was however discovered that CRDT\_RISK and EXCR had a negative impact on ROE whereas its relationship with CAP is positive. INT\_RATE showed an insignificant impact on ROE. The implication of the results obtained is that when explaining the shock of market volatility in Nigerian banks, interest rate cannot be considered relevant in terms of magnitude and directions during the period covered in this study.

These findings conforms with the submissions of Tan & Floros (2012); Olawale (2015); Kolapo, Ayeni & Oke (2012) as stated that, market volatility has significant effect on ROE and also that credit risk has a negative effect. It also aligns with the findings of Berger & Bouwman (2011); Ikpefan (2013); and Aymen (2013) that capitalization has a significant positive relationship. Zuhaib & Nizam (2015); and Otuori (2013); Farah (2013) and Leyla (2015) found out that foreign exchange rate has negative effect on firm's performance. Olugbenga (2012), however stated in a study conducted to examine the long run and short run effect of exchange rate on stock market development in Nigeria using the Johansen co-integration tests showed that exchange rate had a significant positive effect in the short run but it is significantly negative in the long run.

**TABLE 4**  
**Parsimonious Error Correction Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DROE	0.69868	(0.16897)	4.1350	[0.00115]*
DROE(-1)	0.238349	(0.31218)	0.76348	[0.94768]
DROE(-2)	0.253467	(0.24254)	1.04504	[0.74504]
DLogCAP	0.055986	(0.01544)	3.62609	[0.03261]**
DLogCAP(-1)	0.354739	(1.10336)	2.11693	[2.06217]
DCAP (-2)	-0.015909	(0.01622)	-0.98083	[0.00808]
DCRDT_RSK	-0.158329	(0.46701)	-0.33903	[0.00951]*
DCRDT_RSK(-1)	-0.622422	(4.03170)	-0.89848	[0.81614]
DEXCH_RATE	-0.026344	(0.03215)	0.81939	[0.03193]**
DEXCH_RATE (-1)	-0.643823	(0.50746)	1.55342	[0.26294]
DINT_RATE	-0.061355	(0.04958)	-1.23750	[0.20375]
DINT_RATE(-1)	-0.250581	(0.42803)	0.58543	[0.35847]
ECM(-1)	-0.683267	(0.26462)	-3.75873	[0.00583]*
C	-1.039899	(1.45434)	-0.71503	[0.07153]
R-squared	0.976186	Mean dependent var		0.680000
Adjusted R-squared	0.968793	S.D. dependent var		0.282127
S.E. of regression	0.873742	Akaike info criterion		0.447638
Sum sqrd resid	53.60306	Schwarz criterion		0.677080
Log likelihood	-75.19093	Hannan-Quinn criter.		0.535011
F-statistic	24.72536	Durbin-Watson stat		2.675815
Prob(F-statistic)	0.007816			

Source: *Author's computation using E-view 9.0*

Note: \* and \*\* indicates significant at 1% and 5% respectively

Vector Error Correction Estimates

Dependent Variable: ROE

## CONCLUSION

Against the backdrop of Nigeria's high dependence on import and the overbearing foreign exchange market forces, among others, this paper seeks to assess the effect of market volatility determinants on the performance of banks in Nigeria using the Error Correction Model (ECM). This study purposively selected relevant variables that determine market volatility (Exchange rate, interest rate, credit risk, capitalization) which were included in the model specified. The empirical results of the co-integration analysis shows that there is long run equilibrium relationship among the variables, while our Error Correction Model coefficients from the estimated short run dynamic model showed reasonable speed of adjustment towards the long run equilibrium. Analyzing the direction and magnitude of the explanatory variable coefficients, we observed that exchange rate; credit risk and capitalization significantly affect return on equity during the period 2009-2015,

though they all have different magnitude of influence on return on equity. It showed however, that interest rate has no significant influence on return on equity during this period.

Evidence from the findings of this study have further seems to suggest the existence of market volatility in the Nigerian market in the study period and that it has a significant effect on performance (Return on Equity) of Nigerian banks. The implication of the result from individual determinants bothers on the ability of the Central Bank of Nigeria (CBN) and other regulatory bodies to put in place measures and policies that are capable of curbing some of the market forces in order to reduce the rate of distortion in the market especially in this period of economic recession in the Nigerian economy. To this end we recommend that the management of banks need to use prudent credit risk management procedure in order to safeguard them from loss and crisis; and the Central Bank of Nigeria should pay more attention to banks' compliance to relevant provision and policy statements proffered from time to time; and finally, government should blend foreign exchange risk management strategies that best suit the banking industry and further strengthen the economy.

## REFERENCES

- Abreu, M., & Mendes, V. (2002). Commercial bank interest margin and profitability: Evidence from E.U Countries. *Porto working paper series*.
- Abu, H.N., Sajeda P., & Mustafa, M.C. (2015). The effect of credit risk on the banking profitability: A case of Bangladesh, *Global Journal of Management and Business Research*, 15(3), 41-48.
- Achou, T.F., & Tenguh N.C. (2008). Bank performance and credit risk management. Retrieved from: <http://his.diva-portal.org/smash/get/diva2:2459/FULLTEXT01.pdf>.
- Aguda, J. & Gitonga, J. (2011). The relationship between risk management and profitability among the commercial banks in Kenya. *Journal of Modern Accounting and Auditing*, 7(9), 934-946.
- Ajao, M.G., & Igbekoyi, O.E. (2015). An Application of Arbitrage Pricing Theory (APT) in Nigeria Capital Market, *Akungba Journal of Economic Thought*, 7, pp. 1-15.
- Albertazzi, U., & Gimbacorta, L. (2009). Bank Profitability and the business cycle. *Journal of Financial Stability*, 5, pp. 393-409.
- Aymen, B.M.M. (2013). Impact of capital on financial performance of banks: The case of Tunisia, banks and bank system, 8(4), pp. 47-54.
- Basel (1999). Principles for the Management of Credit Risk. Basel Committee on banking supervision.
- Bekaert, G. & Harvey, C.R. (1995). Emerging Equity Market Volatility, National Bureau of Economic Research (NBER), *Working Paper 5307*, pp. 1 – 77.
- Berger, A.N., & Bonwman, C.H.S. (2011). How does capital affect bank performance during financial crises?, pp. 1-46.
- Bobakova, I.V. (2003). Raising the profitability of commercial banks. *BIATEC*, 6, Retrieved from: [http://www.nbs.sk/BIATEC/BIA04\\_03/21\\_25.PDF](http://www.nbs.sk/BIATEC/BIA04_03/21_25.PDF)

- Busse, J. (1999). Volatility Timing in Mutual Funds: Evidence from Daily Returns. *Review of Financial Studies*, 12, pp. 1009-1041.
- Carter, R., & Stover, R. (1991). Management ownership and firm value compensation policy: evidence from converting savings and loan associations, *Financial Management* (Winter), pp. 80–90.
- Chang, C., Hsu, H., & McAleer, M. (2013). The impact of China on Stock Returns and volatility in the Taiwan Tourism Industry, Tinbergen Institute discuss paper, No 13-118/111. Retrieved from: <http://www.econostor.eu/bistresm/10419/87162/1/13-118.pdf>
- Engdawork, T.A. (2014). Impact of credit risk on the performance of commercial banks in Ethiopia, A thesis submitted to school of graduate studies, saint Merry University, Addis Ababa, Ethiopia for the award of masters of business administration.
- Farah, M. M. (2013). The Effect of Foreign Exchange Rate Volatility on the Financial Performance of Oil Marketing Companies in Kenya. A thesis for the award of M.Sc Finance submitted to School of Business, University of Nairobi, Kenya.
- Gizaw, M., Kebede, M. & Selvaray S. (2015). The impact of credit risk on profitability performance of commercial banks in Ethiopia. *African Journal of Business Management*, 9(2), 59-66.
- Hongyu, P., & Zhichao, Z. (2006). Forecasting Financial Volatility: Evidence from Chinese Stock Market. *Working Paper in Economics and Finance*, No.06/02, University of Durham.
- Hualan, C. (1992). Fiscal policy and interest refer how sustainable is the new economy, International Monetary Fund, IMF Institute, Washington D.C
- Ikpefan, O.A. (2013). The impact of banks capitalization in the performance of Nigeria banking industry (1986-2006), *Journal of Commerce* 4(1), pp. 24-39.
- Irugu, P.N. (2013). The effect of interest rate spread on financial performance of commercial banks in Nigeria. A project for the award of M.Sc Finance submitted to School of Business, University of Nairobi, Kenya.
- Jensen, M. (1968). The Performance of Mutual Funds in the Period 1945-1964. *Journal of Finance*, 23, pp. 389-416.
- Kanu, C. & Hamilton, O. I. (2013). The impact of capitalization on bank performance in Nigeria 1990-2010: an assessment. *International Review of Management and Business Research*, 2(3), pp. 643-652.
- Khan, M.Y. & Jain, P.K. (2004). *Financial Management*, New Delhi: Tata McGraw Hill Publishing Company Limited.
- Kolapo, T.F., Ayeni, R.K., & Oke, M.O. (2012). Credit risk and commercial banks performance in Nigeria A Panel Model Approach, *Australian Journal of Business and Management Research*, 2(2), pp. 31-38.
- Lawal, M., & Ijirshar, V. U. (2013). Empirical analysis of exchange rate volatility and Nigerian stock price performance. *Intentional Journal of Science and Research*, 6(14), pp. 1592-1600.
- Leyla, A. (2015). The effect of foreign exchange exposure in the financial performance of commercial banks in Nigeria. *International Journal of scientific and Research publication*, 5(11), pp. 115-120.

- Maigua, C., & Mouni, G. (2016). Influence of interest rates determinants on the performance of commercial banks in Kenya. *International Journal of Academic Research in Accounting, Finance and Management studies*, 6(2), pp. 121-133.
- Miller, M. H. (1991). *Financial Innovations and Market Volatility*, Blackwell, pp.1 – 288.
- Million, G., Matewo, K. & Sujata, S. (2015). The impact of credit risk profitability performance of commercial banks in Ethiopia, *African Journal of Business Management*, 9(2), pp. 59-66.
- Mitchell, M. & Pulvino, T. (2001). Characteristics of Risk and Return in Risk Arbitrage. *Journal of Finance*, 56, pp. 2135-2175.
- Mlambo, C. Maredza, A. & Sibanda, K. (2013). Effects of exchange rate volatility on the stock market: a case study of South Africa. *Mediterranean Journal of Social Science*, 4(14), pp. 561-570.
- Mohamad, N.M., Shafie, R., & Wan-Hussin, W. N. (2010). Corporate Governance and Audit Report Lag in Malaysia, *Asian Academy of Management Journal of Accounting and Finance*, 6 (2), pp. 57–84.
- Muriithi, J. (2011). Relationship between foreign exchange rate and market performance of manufacturing companies. *Journal of Finance and economics*. pp. 79-48.
- Norman, A. B., Pervin, S., Chowdhury, M. M. & Banna, H. (2015). The effect of credit risk on the banking profitability: a case of Bangladesh. *Global journal of management and business research*, 15(3), pp. 41-48.
- Olawale, L. S (2015). The effect of credit risk on the performance of commercial banks in Nigeria. *African Journal of Accounting, Auditing and finance*, 4(1), pp. 29-52.
- Olugbenga, A. A. (2012). Exchange Rate Volatility and Stock Market Behaviour: The Nigerian Experience, *Research Journal of Finance and Accounting*, 3(3), pp. 31-39. Retrieved from <https://www.iiste.org/Journals/index.php/EJBM/article/viewFile/1504/1436>
- Onakoya, A. B. (2013). Stock market volatility and economic growth in Nigeria. *International Review of Management and Business review*, 2(1), pp. 201-209.
- Onwioduokit, E., & Adenuga, A. (2000). An Empirical Analysis of the Demand for Petroleum Products in Nigeria. *CBN Economic and Financial Review*, 38(3).
- Osahon, O.H. (2014). Measuring Nigerian Stock Market Volatility. *Singaporean Journal of Business Economics, and Management Studies*, 2(8), pp. 1-14.
- Osakwe, J. O. (1983). Government expenditure, money supply and process 1970-1980, *CBN Economic and Financial Review*, 21(2).
- Otuori, O.H. (2013). Influence of exchange rate determinants on the performance of commercial banks in Kenya, *European Journal of Management Science and Economic*, 1(2), pp.86-98.
- Owoeye, T., & Ogunmakin, A.A. (2013). Exchange rate volatility and bank performance in Nigeria. *Asian Economic and Financial Review*, 3(2), pp.178-185.



- Pesaran, H.M., Shin Y., & Smith, R.J. (2001). Bound Testing Approaches to the Analysis of Long-Run Relationships, *Working Paper, University of Cambridge*.
- Peters, E. E. (1994). *Fractal market analysis: Applying chaos theory to investment and economics*. New York: John Wiley & Sons. Google Scholar.
- Porteba, J. M. (2000). Stock Market Wealth and Consumption, *Journal of Economic Perspectives*, 14 (2), pp.99-118.
- Raju, M.T., & Ghosh, A. (2004). Stock Market Volatility - An International Comparison. *Securities and Exchange Board of India Working Paper*, Series No. 8.
- Rashid., & Karachi. (2007). Exchange rate changes, inflation and the value of the multinational corporation, *Journal of Finance*, 30(2), pp.485-502.
- Ross, S. (1976a). The Arbitrage Theory of Capital Asset Pricing. *Journal of Economic Theory*, 3, pp. 341-60.
- Ross, S. (1976b). Risk, Return and Arbitrage. *Risk Return in Finance*. Ed. I. Friend and J.Bicksler, Cambridge, Mass: Ballinger.
- Santomero, A.M. (1997). Commercial Bank Risk Management: An Analysis of the Process. *Journal of Financial Service Research*, 12(2), pp. 83-115.
- Tan, A.Y., & Floros, C. (2012). Bank Profitability and Inflation: The Case of China. *Journal of Economic Studies*, 39(6), pp. 675-696.
- Van Gestel, T., & Baesens, B. (2008). *Credit Risk Management: Basic Concepts: Financial Risk Components, Rating Analysis, Models, Economic and Regulatory Capital*: Oxford University Press.
- Zuhaib, Z., & Nizam, U. (2015). Inflation, Interest rate and firms' performance: The evidence from textile industry of Pakistan. *International Journal of Art and Commerce*, 4(2), pp. 111-115.