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Effect of Market Risk on the Financial Performance of Listed Deposit Money Banks in Nigeria

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Abstract

This study investigates the effect of market risk on the performance of listed deposit money banks in Nigeria. The research adopts ex post facto research design. The target population comprised 13 deposit money banks listed on the Nigeria Exchange Limited (NGX) between 2006 - 2021. Secondary data was utilized. The study measures market risk using the degree of financial leverage (DFL), Interest rate risk (IRR), and Gearing ratio (GER). The study measured financial performance using return on equity (ROE) while the panel data analysis technique and GMM method were used to analyse the data with the aid of STATA Version 15. The result of the study revealed that iinterest rate risk has a negative and significant effect, while DFI and GER have negative but insignificant effect on ROE. Amongst others, the study recommended that managers should leverage on the utilization of financial instruments to reduce their interest rate risk exposure.

Keywords: *Market risk, interest rate risk, degree of financial leverage, gearing ratio, return on equity*

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Background to the Study

The deposit money banks (DMBs) are the key drivers of the economy through the financial services they provide and have proven to be one of the most important segments of the economy. Their intermediation role has been recognized as the catalyst for economic growth and development across the world. The activities of DMBs have achieved great prominence in the Nigerian economic environment, especially with its predominant role in accepting deposits and credit creation. Market risk entails losses caused by unfavorable evolution of interest rates, exchange rates and market prices of primary and derivative financial instruments held by the bank in transactional portfolio (Adina, 2015). Market risk also emanate from fluctuation in interest rate and foreign exchange rate affect their return since banks accept financial instruments exposed to market price volatility as collateral for loans (Luqman, 2015). All over the world, market risk has been identified as a principal source of income fluctuations in financial institutions. Market risks can lead to significant losses very quickly in volatile market conditions and also complete institutional collapse in severe situations. Fundamentally, market risks can be classified as absolute risk or relative risks. If one considers risk in currency terms, one is concerned with absolute market risk whereas, if one considers risk in terms of distance from a benchmark (as many investment funds do), one is concerned with relative market risk. Generally, the various types of market risk occur in one of two shapes either as directional risk or as non-directional risk. Directional risk refers to linear exposures to changes of market rates. Non-directional risk refers to non-linear exposures to volatility risk and exposures to basis risk, which is unexpected changes in the price relationship between a financial variable and its intended hedge (Dimitropoulos et al., 2010).

Banks are subject to market risk in both the management of their balance sheets and in their trading operations. Market risk is generally considered as the risk that the value of a portfolio will decrease due to the change in value of the market risk factors. Market risks may be divided into interest rate risk and exchange rate risk (Dimitropoulos et al., 2010). Market risk which comprises of exchange rate and interest rate risks also affects the financial performance of deposit money banks. Usually, market risks are outside the control of the banks, as they are determined by factors that affect the overall economy (Aruwa & Musa, 2014). Furthermore, existing studies on the effect of market risk on the performance of DMBs such as Wachiaya (2011), Nimalathasan and Pratheepkanth (2012) and Gatsi et al. (2013), have adopted a narrow approach with limited variables. This current study adopts return on equity (ROE) as a performance variable and incorporates more proxies into the components of these key financial risk variables to ensure its robustness and inclusiveness to better assess the overall effect of market risk on the financial performance of DMBs in Nigeria within a more recent scope.

The hypotheses that would be tested in this study are stated in their null forms:

$H0_1$: Interest rate risk has no significant effect on the financial performance of listed deposit money banks in Nigeria

$H0_2$: Degree of financial leverage has no significant effect on the financial performance of listed deposit money banks in Nigeria

$H0_3$: Gearing ratio has no significant effect on the financial performance of listed deposit money banks in Nigeria

Literature Review

Concept of Market Risk

Odubuasi et al. (2020) defined market risk as the risk to earnings arising from changes in underlying economic factors such as interest rates or exchange rates, or from fluctuations in bond, equity or commodity prices. It is the risk of loss (or gain) arising from unexpected changes in market prices (e.g., such as security prices) or market rates (e.g., such as interest or exchange rates). Market risk refers to the risk of loss emanating from the erratic valuation in the price of assets due to the adverse movements in market prices. More precisely, market risk may occur due to reasons that disturb the general performance of the financial markets, mostly external factors. These factors include: interest rate risk, currency risk, equity risk and commodity risk. Market risk is also known as systemic risk. It is uncontrollable and cannot be avoided through diversification, but it can be hedged by financial services firms, particularly banks. For instance, larger chunks of deposit money banks (DMBs) resources are invested in instruments that have higher risk in the markets. This category of risk constitutes the source of the problems of a great number of DMBs (CBN, 2014). In this study market risk is measured by degree of financial leverage (DFL), Interest rate risk (IRR) and Gearing ratio.

(a) Degree of Financial Leverage (DFL)

A DMB is described as leveraged if it is financed partly through debt simply because of the tax shield element of debt. But debt carries a fixed cost, which means that if the company increases its debt the degree of financial leverage also increases. The degree of financial leverage measures the ratio of earnings before interest and taxes (EBIT) to earnings before taxes (EBIT – Interest expenses) which shows the debt amount that a business is obligated to pay back. This mode of computation focuses directly on the impact of interest on income before taxes (Gatsi et al., 2013). Banks could prosper by taking reasonable leverage risk or could become insolvent if the risk is out of control. The degree of financial leverage is practically a measure of the degree of financial risk, thus the higher the ratio is, the more risky the business is considered to be as it relies too much on debts and any changes within the economic environment or in interest rates may have an extremely negative impact on how the business evolves (Isedu & Erhabor, 2021).

(b) Interest Rate Risk (IRR)

Interest rate risk (IRR) is the risk associated with bank lending or deposit interest rate volatility. It is the potential loss to the income or economic value of equity of the bank as a result of adverse movement in interest rates. When the deposit money bank lending interest rate is less than the deposit rate, or when the lending interest rate of the bank is greater than the market rate, or the deposit interest rate is less than the market rate, banks may face interest rate risk (Dimitropoulos et al., 2010).

Most of the loans and receivables of the balance sheet of banks and term or saving deposits, generate revenues and costs that are driven by interest rates and since interest rates are

unstable, so are such earnings (Bessis, 2010). Though interest rate risk is obvious for borrowers and lenders with variable rates, those that engaged in fixed rate transactions are not exempt from interest rate risks because of the opportunity cost that arises from market movements (Bessis, 2010). Interest rate risk also includes those that occurs due to the change or fluctuation of the interest rate on assets such as bond or loan. For example, as interest rises, the value of the bond falls and if the interest rate falls, the price of the bond rises. Generally, interest rate risk is commonly measured by the duration of the bond (Bessis, 2010).

According to Greuning and Bratanovic (2020), the combination of a volatile interest rate environment, deregulation, and a growing array of on and off-balance-sheet products have made the management of interest rate risk a growing challenge. At the same time, informed use of interest rate derivatives - such as financial futures and interest rate swaps - can help banks manage and reduce the interest rate exposure that is inherent in their business. Bank regulators and supervisors therefore place great emphasis on the evaluation of bank interest rate risk management, particularly since the Basel Committee recommends the implementation of market risk-based capital charges. Deposit money banks generally encounter interest rate risk from five main sources namely basis risk, yield curve risk, repricing risk, option risk, and hedging risk.

(i) Basis Risk: Basis risk is a source of interest rate risk that is presented when yield on asset and costs on liability are based on different bases. In some circumstances different bases will move at different rates or in different directions, which can cause erratic changes in revenues and expenses. Basis risk arises from imperfect correlation in the adjustment of the rates earned and paid on different instruments with otherwise similar repricing characteristics. When interest rates change, these differences can give rise to unexpected changes in the cash flows and earnings spread among assets, liabilities, and off-balance-sheet instruments of similar maturities or repricing frequencies (Greuning & Bratanovic, 2020). According to Bhattacharya (2010), basis risk occurs when the yield on assets and cost of liabilities is measured on different rates (bases). E.g, LIBOR (London interbank offered rate) versus US prime rate. These various bases will shift in different directions and at different rates in some situations which is a cause of inconsistent changes in income and expenses.

(ii) Yield Curve Risk: Yield curve risk materialises when yield curve shifts adversely affect a bank's income or underlying economic value. The interest rate on the short-term investment is lower than interest rate on long-term investment. The bank usually takes short-term loans at low interest rates and invests that money in long-term assets, which gives higher rates. Although, the short-term rate and long-term rate can fluctuate to a large extent, which can cause erratic changes in revenues and expenses of the banks (Ghosh, 2012).

(iii) Repricing Risk: This risk happens due to repricing of assets and liabilities at different times and rates. The primary and most often discussed source of interest rate risk stems from timing differences in the maturity of fixed rates and the repricing of the floating rates of bank assets, liabilities, and off-balance sheet positions. The basic tool used for measuring repricing risk is duration, which assumes a parallel shift in the yield curve. Also, repricing mismatches

expose a bank to risk deriving from changes in the slope and shape of the yield curve (nonparallel shifts). For example, if a loan has a variable interest rate, it will generate more income for the lender if the interest rate increases, but on the other hand it will be a less interest income when rate decreases. If the loan is funded with fixed rated deposits, the bank's interest margin will fluctuate (Vyas & Singh, 2010).

(iv) Option Risk: An increasingly important source of interest rate risk stems from the options embedded in many bank asset, liability, and off-balance-sheet portfolios. This risk arises due to the choice available in some assets and liabilities. If not adequately managed, options can pose significant risk to a banking institution because the options held by customers, both explicit and embedded, are generally exercised at the advantage of the holder and to the disadvantage of the bank. Moreover, an increasing array of options can involve significant leverage, which can magnify the influences (both negative and positive) of option positions on the financial condition of a bank. E.g., in mortgage loan, the option risk arises if the payment is made early because of the changes in the interest rate. This will result in loss of income for the lender. This type of risk is difficult to measure and control (Vyas & Singh, 2010).

(v) Hedging Risk: Interest rate risk can be hedged using fixed income instruments or interest rate swaps. Interest rate risk can be reduced by buying bonds with shorter duration, or by entering into a fixed-for floating interest rate swap. The interest rate is influenced by the liquidity condition in the financial market, price movements, fiscal and monetary policy, exchange rate movements, development in local and international financial markets and asset holding preferences. It is challenging to forecast the interest rate movements that may increase, decrease or remain constant over a time period. It is the responsibility of the financial analyst of the bank to analyse the interest rate movements critically and draw a guideline on interest rate movements for a deposit money bank (Greuning & Bratanovic, 2020).

If a bank manages its asset and liability in such a way that the bank earns reasonable income on its assets and has low costs on its liabilities, profits will be high. However, how well a bank manages its assets and liabilities is affected by the spread between the interest earned on the bank's assets and the interest costs on its liabilities. Net interest margin measures this spread (Edem, 2017). In this study interest rate risk is measured by net interest margin (NIM). Net interest margin is a measure of the difference between the interest income generated by banks and the amount of interest paid out to their lenders, relative to the amount of their interest-earning assets (Edem, 2017). If the bank can raise funds with liabilities that have low interest costs and acquire assets with high interest income, then net interest margin will be high, and the bank is likely to make high profit. If the interest cost of its liabilities rises relative to the interest earned on its assets, then the net interest margin will fall, and bank profitability will be affected (Edem, 2017). Fluctuations in net interest margins could be an important source of uncertainty in bank profitability and could have adverse effects for particular banks (Abubakar, 2022).

(c) Gearing Ratio (GER)

The gearing ratio is an indicator of financial leverage that shows how creditor financing or equity capital supports deposit money bank's activities. It indicates a financial ratio that compares borrowed funds to owner's equity capital. In this study, gearing ratio is measured by debt to asset ratio. The debt-to-assets ratio is determined by dividing a firm's total debts by its total assets (Kassi et al., 2019). Total-debt-to-total-assets is a leverage ratio that defines how much debt a company owns compared to its assets. Furthermore, it reveals the percentage of total assets that were financed by debts. Using this metric, analysts can compare one company's leverage with that of other companies in the same industry. This information can reflect how financially stable a company is. The higher the ratio, the higher the degree of leverage (DoL) and, consequently, the higher the risk of investing in that company (Hayes, 2023).

Investors use the ratio to evaluate whether the company has enough funds to meet its current debt obligations and to assess whether the company can pay a return on its investment. Creditors use the ratio to see how much debt the company already has and whether the company can repay its existing debt. This will determine whether additional loans will be extended to the firm. A high gearing ratio typically indicates a high degree of leverage, although this does not always indicate a company is in poor financial condition (Kenton, 2022). Instead, a company with a high gearing ratio has a riskier financing structure than a company with a lower gearing ratio. Regulated entities typically have higher gearing ratios as they can operate with higher levels of debt. In addition, companies in monopolistic situations often operate with higher gearing ratios as their strategic marketing position puts them at a lower risk of default. Industries that use expensive fixed assets typically have higher gearing ratios, as these fixed assets are often financed with debt (Kenton, 2022).

A ratio greater than 1 show that a considerable portion of the assets is funded by debt. In other words, the company has more liabilities than assets. A high ratio also indicates that a company may be putting itself at risk of defaulting on its loans if interest rates were to rise suddenly. A ratio below 0.5, meanwhile, indicates that a greater portion of a company's assets is funded by equity. This often gives a company more flexibility, as companies can increase, decrease, pause, or cancel future dividend plans to shareholders. Alternatively, once locked into debt obligations, a company is often legally bound to that agreement (Hayes, 2023). Some studies revealed that the debt-to-assets ratio had a positive effect on companies' financial performance (Davydov, 2016; Detthamrong et al., 2017). Siyanbola et al. (2015) found a positive effect of gearing ratio on financial performance from their study on Nigerian companies. However, other studies found a negative association between the debt-to-assets ratio and the firms' performance (Zelgalve & Herzkalne, 2015; Le & Phan 2017). Likewise, Amraoui et al. (2018) found a significant negative relationship between debt-to-assets ratio and financial performance of 52 firms listed in Morocco, and Kassi et al. (2019) found a negative relationship between the gearing ratio and financial performance in six pharmaceutical companies quoted in Nigeria.

Concept of Financial Performance

Financial performance is used as a general measure of a firm's overall financial status over a given period of time. The financial performance is measured using accounting key performance indicators such as return on assets, return on equity, earnings before interest and tax, and economic value added. The advantage of these measurements is their general availability since every profit-oriented organization produces these figures for their yearly financial statements (Chenhall & Langfield-Smith, 2007). This study adopted the use of return on equity (ROE) as an indication of a firm's overall financial health (Bodie et al., 2011).

ROE is commonly used to measure the profitability of banks. ROE represents the rate of return received from equity invested in banks. It is the amount of net income returned as a percentage of shareholders equity. ROE measures profitability by revealing how much profit a bank can generates with shareholders' investment. Thus, ROE measures how much the bank is earning on their equity investment. In general, financial analysts consider return on equity ratios in the 15 - 20% range as representing attractive levels of investment quality (Richard, 2015). ROE also hinges on the capital management activities. If the banks use capital more efficiently, they will have a better financial leverage and consequently a higher ROE. Because a higher financial leverage multiplier indicates that banks can leverage on a smaller base of stakeholder's fund and produce higher interest-bearing assets leading to the optimization of earnings (Hosna, et al 2009). The reasons for the growing popularity of ROE is, simply that it is not asset-dependent. ROE can be applied to any line of business or any product. This flexibility allows deposit money banks with differing asset structures to be compared to each other, or even for banks to be compared to other types of businesses. The asset-independency of ROE also allows a bank to compare internal product line performance to each other. Perhaps most importantly, this permit looking at the comparative profitability of lines of business like deposit services (Hosna et al., 2009).

Empirical Review

Market Risk and Financial Performance of DMBs

Ngetich and Wanjau (2011) examine the effects of interest rate spread on the level of non-performing assets in commercial banks in Kenya. The 2008 study adopted a descriptive research design on a sample of all 43 commercial banks operating in Kenya. The study make use of primary and secondary data collected from banks supervision report. The study use both quantitative and qualitative data analysis techniques. The data obtained from the research instruments were analyzed using Statistical Package for Social Science (SPSS). The dependent variable is credit risk management while the independent variables are loan advances, regulation, cost of loan, interest rate spreads (IRS) and non-performing assets (NPAs). The study concludes that interest rate spread affect performing assets in banks as it increases the cost of loans charged on the borrowers. They further recommend that, commercial banks in Kenya should assess their clients and charge interest rates accordingly as ineffective interest rate policy can increase the level of interest rates and consequently non-performing assets. Ngetich and Wanjau's study introduces few concrete markets risk variables, but with a narrow scope. This current study makes use of degree of financial leverage, interest rate risk and foreign exchange exposure and a wider scope to measure the effect of market risk on ROE of listed deposit money banks in Nigeria.

Wachiaya (2011) embarked on a study to identify the market risk management techniques used by commercial banks in Kenya and their suitability in mitigating financial losses. The research design adopted in the study was a census survey. The population consisted of the 43 commercial banks licensed to operate in Kenya as listed by the Central Bank of Kenya. Primary data collection through the use of a questionnaire was used to gather information from the target population on issues relevant to the study. To a very large extent, the main techniques used were scenario analysis and stress testing. Mark-to-market of securities was used to some extent. The finding of the study revealed that limits ensured management of risk exposure within the bank's risk appetite and that limits ensured banks took acceptable limits as approved by the shareholders and there was prudent management of market risk. The study recommended that, banks in Kenya should adopt best practices in order to put market risk exposure under control to mitigate the effects of losses due to market risk. Wachiaya's study make use of primary data only without showing the effect of market risk using balance sheet indicators. The current study is different from past studies because it investigated the effect of market risk on financial performance using more reliable secondary financial indicators.

Nimalathasan and Pratheepkanth (2012) examined the impact of systematic (market) risk management on profitability of selected financial institutions in Sri Lanka from 2007 to 2011, by using secondary data. In their study, systematic risk management was measured using degree of financial leverage (DFL) and degree of operating leverage (DOL) as independent variable and profitability measured by net profit, return on capital employed (ROCE) and return on equity (ROE) as the dependent variable. The study used the DFL and DOL as two independent variables to determine their effect on profitability. Operational hypotheses were formulated, and the regression results revealed that systematic risk management has a positive association with profitability. The study also indicated that systematic risk management is enhanced by DFL and DOL in the selected financial institutions where the beneficial impacts are observed on profitability. Their study used the DFL and DOL as two independent variables to determine the effect on profitability. Though this is relevant, the current study had to put degree of financial leverage into consideration.

Ngalawa and Ngare (2013) carried out their study on interest rate risk management on commercial banks in Kenya. They analysed interest rate sensitivity gaps obtained from financial reports of 10 commercial banks listed in the Nairobi securities exchange for the period 2008 to 2012. The method of analysis adopted was standardized interest rate shock approach proposed within the new Basel Capital Accord (Basel II) and the principles for the management and supervision of interest rate risk. The dependent variable is the interest rate risk (IRR) proxied by change in net interest income. The independent variables are the standard deviation of interest rate (volatility of the interest rates) of 91 days treasury bill rate, 181 days T-bill rate, 364 days T-bill rate, inter-bank rate and size of the bank. They found in Kenya, that commercial banks typically retain a large exposure to interest rates that can be predicted through the income gap. They also established the sensitivity of income gaps to market interest rates as determined by the central bank of Kenya (CBK) through treasury instruments. Quantitatively, a 200 basis point change in CBK rates would lead to a change of net income equivalent to 0.4% of total assets of the bank. They recommended further research

on wider sample of banks over a longer time series period to establish a comprehensive effect of interest risk exposure on Kenyan financial performance.

Odeke and Odongo (2014) investigated the relationship between interest rate risk exposure and financial performance of commercial banks in Uganda. Secondary data was collected from 2009 to 2011 from the final accounts of banks. The approach was mainly quantitative technique. The dependent performance variables are the return on asset (ROA), return on equity (ROE) and bank efficiency. While the independent interest rate risk exposure variables are assets and liability margin, basis risk, maturity/reprising gap analysis. The overall multiple regression analysis of interest rate risk exposure and bank performance shows generally a positive relationship except basis risk. The study indicated that maturity gaps contributed more to bank performance, followed by assets and liabilities margins, and basis risk with low influence on the financial performance of commercial banks in Uganda. They recommended that, commercial banks need to develop policies and resources to manage asset and liability duration mismatches effectively. Odeke and Odongo (2014) study did not consider gearing ratio (GER) and degree of financial leverage (DFL) among the independent variables. This current study used panel data, GMM model and GER and DFL to assess its effect on ROE of listed deposit money banks in Nigeria.

Ahmed (2015) evaluated the effect of foreign exchange exposure on the financial performance of selected listed commercial banks in Kenya. The independent foreign exchange exposure variables are; political stability, inflation, interest rate and fraud. The dependent performance variables is the foreign exchange risk management. The study make use of secondary and primary data and adopted descriptive research design. Data was analysed using SPSS. The multiple regression analysis result shows that foreign exchange exposure has negative effect on the performance of listed commercial banks in Kenya. However, interest rates have an insignificant positive effect on commercial bank performance. The study recommended that, commercial banks in Kenya should explore avenues to enhance capacities within firms for managing foreign currency risk exposure through continued education and professional training that are practical oriented for finance specialists, other bankers and consultants.

Eke et al. (2015) examined interest rate and commercial banks' lending operations in Nigeria: A structural break analysis using chow test. The period was divided into two policy regime periods; the regulated interest rate era spanning 1970 to 1986 and the deregulated period 1987 to 2013. The study used the classical least squares method. The Chow test was applied to examine if there was any significant difference in the relationship between interest rate and commercial banks' lending for the two periods. The dependent variable is loans and advances. The independent variables are monetary policy rate, interest rates spread (Deposit minus lending rate), statutory Liquidity ratio, exchange rate and inflation rate. The result for the interest rate regulation era showed that interest rate spread, and statutory liquidity ratio had negative and significant effect on the volume of commercial banks' loans, while fixed exchange rate had negative and insignificant impact on banks' loans and advances. For the deregulation era, interest rate spread, statutory liquidity ratio and inflation rate were found not to have significantly impacted on commercial banks' loans and advances for the period.

Fapetu and Kolapo (2015) carried out a study on influence of interest rate risk on the performance of deposit money banks (DMBs) in Nigeria between 2002 and 2011. The regression model use return on assets (ROA) to measure bank performance of DMBs as a function of interest rate risk indexed with loans to asset ratio, average lending ratio, and risk of interest diversity. The study employed fixed effect regression method. The result of the study shows that, each measure of interest rate risk has an insignificant effect on bank performance. Hence, it was concluded that interest rate risk has no significant influence on performance of DMBs in Nigeria. Fapetu and Kolapo's findings is not in concurrence with existing studies and apriori expectation. This conflicting empirical result lack convergence implying that the study did not establish a clear relationship between market risk and financial performance. Hence, the manner in which market risk influences financial performance is still inconclusive. This study employed more concrete market risk variable such as degree of financial leverage, interest rate risk, gearing ratio and also adopted a wider scope spectrum for the study.

Muriithi et al. (2016b) studied the effect of market risk on financial performance of commercial banks in Kenya. The study covered 10-years period from 2005 to 2014 and used the balance sheets components and financial ratios of 43 commercial banks. Market risk was measured by degree of financial leverage, interest rate risk and foreign exchange exposure while financial performance was measured by return on equity. Panel data techniques of random effects, fixed effects estimation and generalized method of moments were used. From the results financial leverage, interest rate and foreign exchange exposure have negative and significant relationship with bank profitability. They recommended that for commercial banks to reduce their interest rate risk and foreign currency risk exposure, they should consider finding ways of mitigating the market risks by use of financial instruments such as financial derivatives and be active in derivatives markets.

Yuksel and Zengin (2016) assessed identifying the determinants of interest rate risk of the banks: A case of Turkish banking sector. Annual secondary data for 10 years periods of 20 banks from 2006 to 2015 was analysed by using panel logit method. SPSS 22 program was used in the analysis process. The dependent variable is interest rate risk (proxied by ratio of interest sensitive liabilities to interest sensitive assets). The independent variables are net interest margin, total loans, total assets, total deposits, derivatives, return on assets, international interest rate, non-performing loans, growth rate, exchange rate, short-term external debt, and inflation. Findings showed that banks which have higher number of deposits, are exposed to higher amount of interest rate risk. And that, there is a negative relationship between the amount of capital and interest rate risk. That is, banks that have lower amount of capital are face with higher interest rate risk. Thus, it can be said that higher amount of capital decreases interest rate risk for Turkish banks. The authors recommended that Turkish banks should increase capital amount to manage interest rate risk more effectively.

Ab-Hamid et al. (2018) studied bank market risk and efficiency of commercial banks in Malaysia. Their study covers 16 years period, from 2000 to 2015. The dependent variable is bank market risk, measured from the daily stock price using historical expected shortfall (ES) method. The independent variables are the cost and profit efficiencies (EF), early warning

system (EWS), natural logarithm of total assets (SZ), total equity to total assets (CP), nonperforming loan to total loan (NPLL), noninterest income to revenue (NI), Return on Average Assets (ROAA) and marketable securities to total assets (MS). The panel data and the stochastic frontier analysis (SFA), early warning system (EWS) and panel data analysis were constructed using STATA software (version 14). Using the expected shortfall and stochastic frontier analysis, they estimate the cost and profit efficiencies and analysed the effects on market risk. The results showed that the bank market risk exposure decreases and both cost and profit efficiencies affect market risk. They recommended that bank managers and supervisors could apply the results as a basis for formulating business strategy and developing banking policy.

Etuk et al. (2019) studied estimating and predicting value at risk in selected banks of Nigeria stock market. Their study examines and estimates the performance of Gaussian Density, weighted estimator, and extreme value theory models in measuring value at risk (VaR) using data of some selected banks in Nigeria. Value at risk is one of the risk measures used in the financial markets to estimate market risk. The results of the weighted estimator of VaR estimate for in-sample predictions, shows that the p-value of Guaranty Trust Bank was able to estimate VaR correctly. The out-of-sample predictions indicated that extreme value estimates with the p-values greater than have specified VaR correctly. Out-of-sample predictions confirm the good performance of extreme value theory. Hence, VaR prediction showed extreme value theory method outperforms other methods in forecasting VaR.

Adesina et al. (2020) examined market risk hedging strategy and financial performance at Nigeria Stock Exchange listed banks. Longitudinal cross-sectional survey research design was adopted. The study data of 20 samples from 28 listed banks was collected from the audited financial statements from 2009 to 2018. The secondary data for the study were collected. Correlation analysis and generalized least squares (GLS) regression analysis model was used to establish the relationship and significance between the study variables. STATA statistical software version 10 was used for data analyses. Financial Performance was proxied by (P/E) ratio while the market risk indicator was proxied by market risk hedging strategy. The study found out that there is positive relationship between market risk hedging strategy and price earnings ratio which is the measure of financial performance of the listed banks. They recommended that there is need for the listed banks to effectively manage their risk as it was found that risk management positively influence financial performance of listed banks.

Mukolu and Adeleke (2020) appraised lending rates and the performance of deposit money banks in Nigeria. Their study collected secondary data from 21 banks over 11-year period from 2001 to 2016. The study examined the correlation between independent variables such as, Monetary policy ratio (MPR), total deposit (TD), lending rate (LR), cash reserves ratio (CRR) and dependent variables, return on asset (ROA) and return on equity (ROE) of deposit money banks in Nigeria. The study utilized correlation analysis and multiple regression analysis as an estimation technique for the study. Multiple regression analysis was used to estimate the data for twenty-one (21) commercial banks. The result confirmed that the lending rate has significant and positive effects on the performance of Nigeria deposit money banks. The

implication of this is that monetary policy rate, and cash reserve ratio have a positive impact on bank performance, but they are not statistically significant.

Oywoki et al. (2020) analysed market interest rate and profitability of listed commercial banks in Kenya. Longitudinal research design was adopted in this panel data. Their study consisted of 11 listed deposit money banks over 15-year period from 2003 to 2017. Secondary data were obtained from the audited annual report of the listed banks. The dependent variable was return on asset (ROA). While independent variables are real interest rate, nominal interest rate and interbank rate. Autoregressive distributed lag (ARDL) models were used. Findings showed that, real and interbank possess a progressive notable influence on ROA, whereas nominal has a negative notable influence on ROA. The research results show that concentration on market interest rates influence banks' profitability positively and the influence is relatively significant. The study recommended that, there is obligation of the government to continuously monitoring interest rate levels because it would aid to protect borrowers from exploitation by registered deposit money banks at NSE in Kenya. Therefore, listed commercial banks should adopt other avenues for income generation to be more profitable. Oywoki et al. (2020) study adopted interest rate variables to measure market risk and these variables exhibit mixed results. However, in general, the relationship between market risk and bank financial performance is usually negative. Hence, a rational investor will prefer the allocation of an optimum mix of risky and less risky investments in their portfolio to minimize losses and maximize returns. The existing empirical studies reviewed support this assertion. This study utilizes standard predictor variables to examine the results of the empirical findings.

Theoretical Framework

Firm Value Maximization Theory

Firm value maximization theories states that firms can hedge to reduce certain costs or capital market imperfections related to volatile cash flows. There are typically three lines of explanations. First, hedging can reduce deadweight costs of financial distress (Mayers & Smith, 1982; Smith & Stulz, 1985). Second, hedging may also be motivated by tax incentives. When firms face a convex tax function, hedging should help reduce expected taxes (Mayers & Smith, 1982; Smith & Stulz, 1985). Hedging can also increase a firm's debt capacity, by generating greater tax advantages from greater leverage (Leland, 1998). These two explanations imply that corporate hedging can add value when firms face convex costs such as progressive taxation and bankruptcy costs. Similarly, MacKay and Moeller (2007) argue that hedging can add value if revenues are concave in product prices.

This theory is based on the fact that, exchange rate exposure has potentially positive or negative impact on the profitability and value of the firm. This is captured in the valuation process in terms of the firm 's stock returns. Thus, the approach to modeling the exchange rate exposure has been to regress the exchange rate on firms' returns. Based on research of Smith and Stultz (1985), the tax structure would influence a company's hedging decision. As long as the cost of hedging is not too large, a firm that can reduce the variability of its pre-tax firm value through hedging would be able to reduce its expected tax liability and increase its

expected post-tax firm value. Fisher's (1907) on interest rates made it clear that the value of an investment project is equal to the discounted cash flow that this investment generates to its owner(s). The most simple and intuitive formula illustrating this principle is the investment formula calculating the present value of a single investment project under certainty.

Extreme Value Theory

Extreme value theory (EVT) is a tool used to determine probabilities (Risks) associated with extreme events. It is used by investors in situations where there is expectation of occurrence of higher stress on investment portfolios. The EVT is also used to model the behaviour of tips (Maxima) and or dips (Minima) in a series of asset returns. Bernoulli (1709), discussed the mean largest distance from the origin when N points lie at random on a straight line of length (Johnson et al., 1995). A century later Fourier stated that, in the Gaussian case, the probability of a deviation being more than three times the square root of two standard deviations from the mean is about 1 in 50,000, and consequently could be omitted (Kinnison, 1985).The financial institutions with significant amounts of trading activity proved to be very vulnerable to extreme market movements and, in time, the measurement of market risk became a primary concern for regulators and also for internal risk control. This calls for indicators showing the risk exposure of firms and the effect of risk reducing measures.

Value-at-Risk (VaR) approach was the standard measure of financial risks and other risks such as industrial risk management. Basically, it is used to measure the expected loss over a period of time for known distribution of known probability and under normal market conditions. Value-at-Risk (VaR) has been established as a standard tool among financial institutions to depict the downside risk of a market portfolio. It measures the maximum loss of the portfolio value that will occur over some period at some specific confidence level due to risky market factors (Jorion, 1997). Deposit money banks and banks holding companies with an important trading portfolio are subject to market risk requirements. They have been required to hold capital against their defined market risk exposures, and, the necessary capital is a function of banks' own risk estimates.

As a result, several alternative methods have been proposed for estimating VaR, one of which being the Extreme Value Theory (EVT). EVT methods make VaR estimations based only on the data in the tails as opposed to fitting the entire distribution and can make separate estimations for left and right tails (Diebold et al., 2000). Proper estimation of VaR is necessary in that it needs to accurately capture the level of risk exposure that the firm is exposed to, but if it overestimates the risk level, then the firm will unnecessarily set aside excess capital to cover the risk, when that capital could have been better invested elsewhere (Hull, 2012). Extreme value theory helps in determining the minimum and the maximum capital that should be set aside to cover the market risks. To achieve this goal the banks need to manage the market risk by managing the financial leverage. Recently, Portfolio managers, Investors, Risk managers, claim managers etc, have become more concerned over occurrences under extreme market conditions.

Methodology

This study adopted the ex-post facto research design. The population of this study comprised of all the thirteen (13) DMBs listed on the floor of the Nigerian Exchange Limited (NGX) as of December 31, 2021 (CBN, 2022). These thirteen (13) DMBs are currently trading on the floors of the NGX. The data obtained covered the period of 16 years from 2006 to 2021 post consolidation period. Hence, the expected financial year observation is 208 (i.e., 13 x 16 = 208). This study employed secondary data which were sourced from the audited annual financial statement and reports of the listed DMBs and Nigerian Exchange Limited (NGX). The Panel data was employed because it helps to study the behaviour of each bank over time and across space (Gil-García & Puron-Cid, 2013). The balanced panel data collected was analysed quantitatively using panel data analysis technique. The specified static panel regression model is essentially estimated using the pooled regression method, fixed effects (FE) method or random effects (RE) method using the Hausman specification test to decide the appropriateness between fixed and random effects that best fits the panel regression data. The short run model was estimated using Generalized Method of Moments (GMM) estimator to check the dynamism and how the performance of the immediate previous period affects the current period performance. The formulated model was then estimated using the ordinary least squares (OLS) and panel data analysis technique. The statistical tool for analysis was done using STATA Version 15 software.

The study assumed that the independent variables and the dependent variable have a general multiplicative Cobb Douglas functional relationship shown in equation 1.

$$FPERF = f(DFL, NIM, GER) \quad (1)$$

Upon linearization and parametization, the panel model of the functional form 1 becomes:

$$FPERF_{it} = \alpha_0 + \alpha_1 DFL_{i,t} + \alpha_2 NIM_{i,t} + \alpha_3 GER + \theta_i + \varepsilon_{i,t} \quad (2)$$

In which $FPERF_{it}$ represents the performance of bank i at time t, α_0 stands for the model intercept, $DFL_{i,t}$ is the degree of financial leverage of bank i at time t, interest rate risk is proxied by net interest margin $NIM_{i,t}$ for bank i at time t, $GER_{i,t}$ is gearing ratio for bank i at time t. θ_i is the bank specific effect that is assumed to be normally distributed with a constant variance. $\varepsilon_{i,t}$ is the error term which is assumed to have a normal distribution.

And the short run model as:

$$FPERF_{it} = \alpha_0 + \beta ROE_{t-1} + \alpha_1 DFL_{i,t} + \alpha_2 NIM_{i,t} + \alpha_3 GER + \theta_i + \varepsilon_{i,t} \quad (3)$$

Table 1: Measurement of Variables

Variable	Proxy	Measurement	Source	Study replicate
Financial performance	Return on equity (FPERF)	Net income / Total equity capital	DMBs Annual financial reports	Muriithi (2016), Iyinomen et al. (2020), Siriba (2020).
Market risk	Degree of financial leverage (DFL)	EBIT / EBIT – interest	DMBs Annual financial reports	Muriithi et al. (2016b), Isedu and Erhabor (2021).
	Interest rate risk (NIM)	Net interest income / Total assets	DMBs Annual financial reports	Aruwa and Musa (2014), Fadun and Oye (2020)
	Gearing ratio (GER)	Total debt / Total assets	DMBs Annual financial reports	Siyanbola et al. (2015), Le and Phan 2017), Kassi et al., (2019).

Source: Author's Compilation, 2023.

Results and Discussions

This section presents the results of the various statistical analyses carried out to achieve the purpose of this study. While descriptive statistics reveal mean, standard deviation, minimum and maximum values of all variables of the study, the correlation analysis and unit root test seek to find the nature of relationship and stationarity of the variables. The panel data and OLS analyses depict the impact of each of the explanatory variables on DMBs' financial performance (Measured by return on assets ROE) in Nigeria.

Descriptive Statistics

Descriptive statistics is the term given for the analysis of data that helps describe, show or summarize data in a meaningful way such that, for example, patterns might emerge from the data. The result of the descriptive statistics for this study is presented in Table 2 below:

Table 2: Descriptive Statistics

Variables	Mean	Std. Dev.	Min.	Max.
ROE	8.52	39.36	-358.57	122.19
DFL	3.16	49.96	-47.03	672.14
NIM	-1.34	0.18	-2.31	-0.49
GER	90.50	31.11	-1.60	108.08

The descriptive statistics of all variables used are presented in Table 1. This summarizes the data used, mean as a measure of central tendency and standard deviation, minimum and maximum as a measure of variability.

i. Out of the four (4) variables used, gearing ratio has the highest yearly mean of 90.50 and interest rate risk has the lowest yearly mean of -1.34.
ii. The mean value of Return on Equity is 8.52; this show on the average the Return on Equity value of the firms used in the study.
iii. From the standard deviation which measure the dispersion of the data relative to its mean shows that larger number of variables have low deviation from their mean while only few have high deviation from their mean.
iv. Also, the minimum and maximum of each variable are summarized, and their essence is to tell the lowest and the highest values of an observation. From the outcomes, all the observations fall within their minimum and maximum. The maximum value is 122.19 and the minimum value is -358.57. This suggests that the value for Return on Equity varies across the firms with a standard deviation figure of 39.36.

Correlation between Market Risk Components and Performance of DMBs

Table 3: Correlation Matrix

	ROE	DFL	NIM	DAR
ROE	1			
DFL	0.0375	1		
NIM	-0.1868	0.0137	1	
GER	-0.0753	-0.0234	0.1103	1

Market risk is assessed through degree of financial leverage (DFL), net interest margin (NIM), and gearing ratio. The results show that ROE is insignificantly positively correlated with DFL while insignificantly negatively correlated with NIM and GER. DFL, as indicated by a correlation coefficient of 0.0375, has an insignificant positive relationship with ROE. This suggests that increased borrowing or leverage by banks might lead to improved performance, though this relationship is not statistically significant. On the other hand, NIM has an insignificant negative correlation of -0.1868 with ROE, indicating that changes in lending rates, reflected in NIM, may not strongly correlate with bank performance. Also, GER has an insignificant negative correlation of -0.0753 with ROE, indicating that more liabilities than assets may be putting a DMB at risk of defaulting on its loans if interest rates were to rise suddenly which may not correlate with bank performance. Lastly, there is an insignificant negative correlation between DFL, NIM and GER, implying that they move in different directions, which is consistent with expectations.

Empirical Findings

The study presents the findings as follows; (1) The model is presented separately and its post-estimation diagnostics are discussed to establish the reliability of the findings (2) the study presents Hausman test random and fixed effects estimates (3) the study estimates and presents the GMM specification while presenting the instruments used and discussing the post-estimation diagnostics of the GMM model.

Post Estimation Tests for the Effect of Market Risk on the Financial Performance DMBs

The post-estimation diagnostics test between the Fixed and random effects specification shows:

Table 4.

Post-estimation test	Coefficient	p-value
Heteroscedasticity (Breusch-Godfrey test) Test	225	0.5361
Autocorrelation (Breusch-Godfrey Serial Correlation LM) Test	18.240	0.2100
Normality Test	1.77	0.4136

Heteroskedasticity Test

H_0: Errors are Homoscedastic

H_1: Errors are Heteroscedastic

Breusch-Godfrey test was 225 with *p*-value of 0.5361 and this means that the null hypothesis of errors is homoscedastic will be accepted and alternative hypothesis of errors are heteroscedastic will be rejected.

Autocorrelation Test

H_0: Errors are not autocorrelated

H_1: Errors are autocorrelated

Breusch-Godfrey Serial Correlation LM Test was 18.240 with a *p*-value of 0.2100 means that null hypothesis of errors is not autocorrelated will be accepted and alternative hypothesis of errors are autocorrelated will be rejected.

Normality Test

H_0: Joint hypothesis of skewness and kurtosis are zero

H_1: Joint hypothesis of skewness and kurtosis are not zero

The Jarque-Bera was 1.77 with a *p*-value of 0.4136 implies that the null hypothesis should be accepted, which mean that the null hypothesis of the Jarque-Bera test is a joint hypothesis of the skewness being zero and the excess kurtosis being zero, the data are consistent, and they are normally distributed.

Hausman Test

Table 5 shows the result of the Hausman test and the test statistics have a chi statistic of 9.14 with two degrees of freedom and a corresponding *p*-value of 0.010.

Table 5: Hausman Test

Test Statistic Chi2(2)	***p*-value**
9.14	0.010

Therefore, the null hypothesis that the regressors and individual heterogeneity are strictly exogenous is rejected at five percent (5%) level of significance. Therefore, the fixed effect is preferred over random effect. In the long-run, interpretation will be done on fixed effect.

Hansen J Test of Over-Identification Restrictions

Furthermore, the Hansen J statistic is 6.37 with a corresponding *p*-value greater than 0.1. Therefore, the null hypothesis of the validity of the overidentifying restrictions for the instruments is not rejected at one percent level of significance. Therefore, the instruments employed by the model are appropriate and lead to precise consistent estimates.

Effect of Market Risk on the Financial Performance of Listed DMBs

Table 6 shows the fixed effect estimates for the effect of market risk on the financial performance of listed deposit money banks in Nigeria.

Table 6: GMM Regression Output

Roe	Coef.	Std.Err	Z	P>z	[95% Conf.Interval]	
$ROE_{L1.}$	-0.33746	0.082245	-4.1	0.000	-0.49866	-0.17627
DFL	-0.00254	0.050667	-0.05	0.96	-0.10185	0.096765
NIM	-47.9582	14.45196	-3.32	0.001	-76.2835	-19.6329
GER	0.012217	0.26444	0.05	0.963	-0.50608	0.53051
Combined Variable = 0						
(1) DFL = 0						
(2) NIM = 0						
(3) GER = 0						
chi2(3) = 11.20						
Prob > chi2 = 0.0107						

Source: Extracted from STATA Output

Interest rate risk is the only significant variable out of the three variables used as the measure of market risk and it has a coefficient of -47.95 which is statistically significant at five percent (5%) level of significant. This means that the coefficient of interest rate risk is significantly different from zero at five percent level of significance. Therefore, a one percent increase in the interest rate will reduce return on equity by -47.958. DFI has a negative and insignificant effect on return on equity as indicated by its coefficient value of -0.00254 and the p-value of 0.96. GER has a negative coefficient value of 0.012217 with a p-value of 0.96 which also mean it has no significant effect. The analysis shows that the F-statistic is 11.20 with a p-value of 0.0107. Since the p-value is less than 5% the result implies that the joint coefficient of the variables is statistically significant. The market risk model indicated a ρ-value of 0.0107 which is less than 0.05. That is, ($\rho = 0.0107 < 0.05$). The overall effect of market risk on the financial performance of deposit money banks in Nigeria is therefore rejected. Therefore, market risk significantly affects the financial performance of listed deposit money banks in Nigeria.

Discussion of Findings

Effect of Market Risk on the Financial Performance of Listed Deposit Money Banks in Nigeria

The study was set to establish whether market risk affects the financial performance of listed deposit money banks in Nigeria. The findings reveal that net interest margin have a negative and significant effect on the financial performance of DMBs in Nigeria. This implies that interest rate risk does significantly affect the performance of listed deposit money banks in Nigeria in the period within the scope of this study holding other factors constant. The result is that net interest margin which is a measure of market risk has negative and expectedly significant effect on financial performance when combined with other deposit money bank risks. Therefore, market risk negatively influences financial performance of listed deposit money banks in Nigeria. This finding agrees with the results of Eke et al. (2015), Muriithi (2016), and Yuksel and Zengin (2016).

Conclusion

The study also investigated the impact of market risk on the financial performance of listed deposit money banks in Nigeria by considering the degree of financial leverage, net interest margin, and gearing ratio as independent variables. The analysis of the market risk shows that interest rate risk exposure has an adverse impact on deposit money bank's performance in Nigeria. This situation explains that banks, which have higher amounts of deposits are exposed to a higher amount of interest rate risk. Therefore, the monitoring and control of market risk has become one of the banking supervisors' priorities so that the loss that occurred does not spread to other banks. Generally, risk that are within the control of the banks do not distort their performance however, those outside their control have negative effects on the financial performance of the banks.

Recommendations

(i) The managers of listed deposit money banks in Nigeria should leverage on the utilization of financial instruments such as financial derivatives and asset securitization and be active in derivatives markets which will reduce their interest rate risk exposure.

(ii) Also, banks that have lower amount of capital are faced with higher interest rate risk, hence higher amount of capital decreases interest rate risk. Therefore, listed deposit money banks in Nigeria should leverage on technology to increase their capital base to manage interest rate risk more effectively.

(iii) Additionally, the Central Bank of Nigeria should collaborate with DMBs in Nigeria to emphasize the need to put in place alternative business gateways for financial institutions. By doing so, DMBs will earn revenue using non-interest avenues. The result is that there will be decrease in market interest rates since DMBs will not be required to increase interest rates to generate more returns. If the market interest rates are reduced, Nigerians can afford loans and therefore improved businesses and economic development.

Reference

Ab-Hamid, F. M., Abdul-Rahman, A., Abdul-Majid, M., & Janor, H. (2018). Bank market risk and efficiency of commercial banks in Malaysia, *Journal Pengurusan 51(2017), 249-259. https://doi.org/10.17576/pengurusan-2018-51-21*

Abubakar, A. (2022). Market risk and market value of listed deposit money banks in Nigeria, *Islamic Banking, Accounting and Finance International Conference (iBAF).*

Adesina, T., Nasieku, T., & Oluoch, O. (2020). Market risk hedging strategy and financial performance at Nigeria stock exchange listed banks. *European Journal of Business and Management, 12*(15),1-7.

Adina, A. (2015). The performance, banking risks and their regulation, *Procedia Economics and Finance, 20*(1), 35 – 43.

Ahmed, L. (2015). The effect of foreign exchange exposure on the financial performance of commercial banks in Kenya. *International Journal of Scientific and Research Publications*, *5*(11), 115-130.

Amraoui, M., Jianmu, Y., Havidz, S. A. H., & Ali, H. (2017). The impact of capital structure on firms performance in Morocco, *International Journal of Application or Innovation in Engineering and Mangement*, 6(10), 11-16.

Aruwa, S. A. S., & Musa, A. O. (2014). Risk components and the financial performance of deposit money banks in Nigeria, *International Journal of Social Sciences and Entrepreneurship*, *1*(11), 514-522.

Bernoulli, N., (1709). *De Usu Artis Conjectandi In Jure*, PhD thesis, University of Basel, Basel Doctoral thesis, Basel, Switzerland, 284–326.

Bessis, J. (2010). *Risk management in banking.* 3rd edition, Hoboken, NJ, USA: Wiley, 831.

Bhattercharya, K. M. (2010). *Risk management in Indian banks*, Himalaya Publishing house, Mumbai, India.

Bodie, Z., Kane, A., & Marcus, A. J. (2011). *Investment and portfolio management,* McGraw-Hill Irwin.

CBN. (2022). *Annual reports*, Deposit money banks in Nigeria

CBN. (2014). Risk management in financial service industry, *Understanding monetary policies series, 40*. 1-34.

Chenhall, R. H., & Langfield-Smith, K. (2007). Multiple perspectives of performance *measures, European Management Journal*, *25(4), 266-282.*

Davydov, D. (2016). Debt structure and corporate performance in emerging markets, *Research in International Business and Finance*, 38(1), 299–311. https://doi:10.1016/j.ribaf.2016.04.005

Detthamrong, U., Chancharat, N., & Vithessonthi, C. (2017). Corporate governance, capital structure and firm performance: Evidence from Thailand, *Research in International Business and Finance, 42*(1)., 689–709. https://doi:10.1016/j.ribaf.2017.07.011

Diebold, F. X., Schuermann, T., & Stroughhair, J. D. (2000). Pitfalls and opportunities in the use of extreme value theory in risk management, *Journal of Risk Finance 1*(2), 30-35.

Dimitropoulos, P. E., Asteriou, D., & Koumanakos, E. (2010). The relevance of earnings and cash flows in a heavily regulated industry: Evidence from the Greek banking sector, *Journal in Advances in Accounting*, *26*(2), 290-303.

Edem, B. D. (2017). Liquidity management and performance of deposit money banks in Nigeria (1986-2011): An investigation. *International Journal of Economics, Finance and Management Sciences, 5*(3), 146-161. https://doi.org/10.11648/j.ijefm.20170503.13

Eke, F. A., Eke, I. C., & Inyang, O. G. (2015). Interest rate and commercial banks' lending operations in Nigeria: A structural break analysis using chow test, *Global Journal of Social Sciences, 14*(15), 9-22. http://dx.doi.org/10.4314/gjss.v14i1.2

Etuk, I. E., Musa, Y., & Gulumbe, S. U. (2019). Estimating and predicting value at risk in selected banks of Nigeria stock market, *International Journal of Statistics and Applications, 9*(4), 117-121. https://doi.org/10.5923/j.statistics.20190904.03

Fapetu, D., & Kolapo, F. T. (2015). The influence of interest rate risk on the performance of money banks in Nigeria. *International Journal of Economics, Commerce and Management, 5*(3), 1-15.

Fisher, I. (1907). *The rate of interest: Its nature, determination and relation to economic Phenomena*, New York: Macmillan.

Gatsi, J. G., Gadzo, S. G., & Akoto, R. K. (2013). Degree of financial and operating leverage and profitability of insurance firms in Ghana, *International Business and Management*, *7*(2), 57-65.

Ghosh, A. (2012). *Managing risks in commercial and retail banking*. Chichester, UK: John Wiley and Sons Inc. http://site.ebrary.com/lib/westminsterintl/docDetail.action?docID=10538600

Gil-García, J. R., & Puron-Cid, Y. G. (2013). Using panel data techniques for social science research: An illustrative case and some guidelines, *CIENCIA ergo-sum, 21*(3), 203-216.

Greuning, H. V. & Bratanovic, S. B. (2020). *Analyzing banking risk*. A framework for assessing corporate governance and risk management, World Bank (4th ed.). https://openknowledge.worldbank.org/bitstream/handle/10986/33860/9781464814464.pdf?sequence=2&isAllowed=y

Hayes, A. (2023). *Total-debt-to-total-assets ratio: Meaning, formula, and what's good,* https://www.investopedia.com/ask/answers/08/negative-shareholder-equity.asp

Hosna, A., Manzura, B., & Juanjuan, S. (2009). *Credit risk management and profitability in commercial bank in Sweden*, University of Gothenburg, graduate school of business, economics and law. https://gupea.ub.gu.se/bitstream/2077/20857/1/gupea_2077_20857_1.pdf

Hull, J. (2012). *Risk management and financial institutions. 3rd edition*, 733. John Wiley & Sons.

Isedu, M., & Erhabor, O. J. (2021). Does financial risks have effects on the performance of deposit money banks in Nigeria? *Saudi Journal of Business and Management Studies, 6*(3), 71-85. http://dx.doi.org/10.36348/sjbms.2021.v06i03.004

Johnson, L. N., Kotz, S., & Balakrishnan, N. (1995). *Continuous univariate distributions, 2nd edition*, Wiley, New York.

Jorion, P. (1997). Value at risk: The new benchmark in controlling market risk. *Irwin, Chicago*, *1*, 997.

Kassi, D. F., Rathnayake, D. N., & Edjoukou, A. J. R. (2019). Market risk and financial performance of non-financial companies listed on the Moroccan Stock Exchange, *Journal of Risks, 7*(1), 1-24. http://dx.doi.org/doi.10.3390/risks7010020

Kenton, W. (2022). *M Gearing ratios: Definition, types of ratios, and how to calculate*, https://www.investopedia.com/terms/g/gearingratio.asp

Kinnison, R. R. (1985). *Applied extreme value statistics*, New York: Macmillan.

Le, T. P. V., & Phan, T. B. N. (2017). Capital structure and firm performance: Empirical evidence from a small transition country*, Research in International Business and Finance, 42*(1), 710–726. http://doi:10.1016/j.ribaf.2017.07.012

Leland, H. E. (1998). Agency costs, risk management, and capital structure, *Journal of Finance 53*(4), 1213-1243

Luqman, O. (2015). The effect of global financial crisis on Nigeria economy, *Social Science Research Network Journal, 1(1), 1-18.* http://doi.org/10.2139/ssrn.2673947

Mackay, P., & Moeller, S. (2007). The value of corporate risk management, *Journal of Finance, 62*(3), 1379-1419.

Mayers, D., & Smith, C. (1982). On the corporate demand for insurance. *Journal of Business, 55*(2), 281-296.

Mukolu, M. O., & Adeleke, K. O. (2020). Lending rates and the performance of deposit money banks in Nigeria, *International Journal of Management Studies and Social Science Research, 2*(1), 1-8.

Muriithi, G. A. (2016). The effect of financial risk on financial performance of commercial banks
in Kenya. Doctoral Thesis, Jomo Kenyatta University of Agriculture and Technology.

Muriithi, J. G., Waweru, K. M., & Muturi, W. M. (2016b). The effect of market risk on financial performance of commercial banks in Kenya, *Journal of Finance and Accounting,* 4(4), 225-233. http://dx.doi.org/10.11648/j.jfa.20160404.18

Ngalawa, J., & Ngare, P. (2013). Interest rate risk management for commercial banks in Kenya, *Journal of Economics and Finance*.

Ngetich, J., C., & Wanjau, K. (2011). The effects of interest rate spread on the level of non-performing assets: A case of commercial banks in Kenya, *International Journal of Business and Public Management, 1*(1), 58-65.

Nimalathasan, B., & Pratheepkanth, P. (2012). Systematic risk management and profitability: A case study of selected financial institutions in Sri Lanka, *Global Journal of Management and Business Research*, *12*(17), 1-18.

Odeke, S., & Odongo, J. (2014). Interest rate risk exposure and financial performance of commercial banks in Uganda, *Research Journal of Finance and Accounting,* 5(2), 1-15

Odubuasi, A., Wilson-Oshilim, U. D., & Ifurueze, M. (2020). Effect of market risks on the financial performance of firms in Nigeria. *European Journal of Accounting, Auditing and Finance Research, 8*(6), 28-45.

Oywoki, D. R., Muganda, M., & Ondiek, A. (2020). Market interest rate and profitability of listed commercial banks in Kenya, *International Journal of Multidisciplinary and Current Research, 18*(20), 1-11.

Richard, L. (2015). *Profitability indicator ratios*, Return on assets.

Siyanbola, T. T., Olaoye, S. A., Olurin, O. T. (2015). Impact of gearing on performance of companies, *Arabian Journal of Business and Management Review, 3(1), 1-14.*

Smith, C., & Stulz, R. (1985). The determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis 20*(4), 391-406.

Vyas, M., & Singh, S. (2010). Risk management in banking sector, *BVIMR Management dge*, 4(1), 15-24.

Wachiaya, J. (2011*). A survey of market risk management techniques by commercial banks in Kenya and their suitability in mitigating financial loss*, Doctoral thesis, University of Nairobi, Kenya.

Yuksel, S., & Zengin. S. (2016). Identifying the determinants of interest rate risk of the banks: A case of Turkish banking sector. *International Journal of Research in Business and Social Science, 5*(6), 12 – 28. https://doi.org/10.20525/ijrbs.v5i6.569

Zelgalve, E., & Herzkalne, I. (2015). The impact of debt ratios on corporate financial performance: The case of Baltic listed companies, *Applied Economics: Systematic Research,* 9(1), 107–125. https://doi:10.7220/aesr.2335.8742.2015.9.1.7