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## *An empirical Investigation of the Risk-Return Relationship for Listed Manufacturing firms in Nigeria*

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# An empirical Investigation of the Risk-Return Relationship for Listed Manufacturing firms in Nigeria

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***Abstract***

*This study investigates the relationship between various dimensions of risk and stock returns among listed manufacturing firms in Nigeria from 2012 to 2023. Using a panel data regression framework, the study examines how systematic risk, total risk, and firm-specific financial indicators influence firm value, proxied by Tobin's Q. The findings reveal that systematic risk has significantly negative impacts on stock returns, reflecting investor aversion to market-wide volatility. In contrast, total risk captured through firm-specific volatility shows a positive association with firm value, indicating speculative investor behavior or perceived growth opportunities in volatile firms. Additionally, leverage, liquidity, and exchange rate volatility negatively affects stock valuation, while firm size also exhibits an inverse relationship. Return on assets (ROA), however, was not a significant predictor of stock performance, suggesting weak investor confidence in accounting profitability. Based on these findings, the study recommends strategic risk management, improved financial reporting, and optimization of capital structure, and policy support for listed manufacturing firms.*

***Keywords:*** *Systematic Risk, Tobin's Q, Total Risk, Returns*

## 1. Introduction

The relationship between risk and return forms the bedrock of modern financial theory and is fundamental to understanding investment behavior, asset valuation, and corporate financial planning. Introduced by Markowitz (1952) through the mean-variance optimization framework and later extended by Sharpe (1964) and Lintner (1965) through the Capital Asset Pricing Model (CAPM), this relationship suggests that rational investors demand a premium for assuming additional risk. The CAPM remains a dominant framework in finance, positing a linear connection between an asset's expected return and its systematic risk (beta). While extensively validated in developed markets, the empirical robustness of this theory in emerging economies has been mixed due to distinct market structures and operational inefficiencies.

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In the context of Nigeria, one of Africa's largest frontier markets, the practical applicability of the risk-return paradigm remains uncertain. The Nigerian capital market is characterized by shallow depth, regulatory bottlenecks, and volatility driven by macroeconomic instability, foreign exchange fluctuations, and low investor sentiment. Such factors often distort asset pricing mechanisms, making it difficult to predict whether investors are adequately compensated for the risks borne (Gbadebo & Oyedeko, 2021). For instance, during periods of currency devaluation or abrupt policy reversal, such as the sudden removal of fuel subsidies in 2023, market reaction is often swift and unpredictable, complicating return expectations and portfolio diversification strategies.

The manufacturing sector in Nigeria holds strategic importance due to its potential to drive industrialization, reduce unemployment, and support economic diversification. Despite this, it remains one of the most vulnerable sectors, exposed to both systemic and firm-specific risks, including inconsistent energy supply, infrastructural deficits, high input costs, and exchange rate volatility. Several manufacturing firms in Nigeria have faced production and profitability challenges linked to input scarcity and currency devaluation, which directly influence investor confidence and stock performance. As noted by Kawu, Babangida, and Alex (2018), these factors not only impact firm-level performance but also distort the overall risk-return dynamics within the sector.

Although a number of studies have examined the risk-return relationship in the Nigerian stock market, few have focused specifically on the manufacturing sector. Existing literature tends to aggregate all quoted firms, thereby masking important sectoral distinctions. For instance, Dauda et al. (2021) analyzed the risk-return profile of financial service firms, while Ogbeiwi and Okoughenu (2020) assessed corporate risk broadly without isolating manufacturing-specific indicators. This lack of disaggregation weakens the practical relevance of such studies, especially given the heterogeneity in operating conditions across sectors. Manufacturing firms often face challenges that are qualitatively different from those encountered in the financial or service sectors, necessitating a tailored analysis.

Moreover, empirical findings on the Nigerian market have often contradicted theoretical expectations. Bello and Adedokun (2011) found inconsistencies in the pricing of risk among listed firms, while Amah (2024) observed a non-linear and sometimes inverse relationship between risk and return among firms on the premium board of the Nigerian Stock Exchange. These divergent results suggest that the classical linear models may not fully capture the complexities of the Nigerian investment landscape. Additionally, global shocks such as the COVID-19 pandemic have reshaped investor behavior, risk perception, and capital flows. Deari and Trinh (2022) argue that such structural shifts necessitate a re-examination of traditional models to reflect new market realities, particularly in economies vulnerable to external disruptions.

Given these empirical inconsistencies and sectoral gaps, a focused investigation into the risk-return characteristics of listed manufacturing firms in Nigeria becomes imperative. Such an analysis will provide insights into whether the returns on manufacturing stocks appropriately reflect the risks borne by investors and how sector-specific challenges influence market behavior. Informed investment decisions, portfolio optimization, and policy formulations depend on accurate, context-sensitive assessments of risk-adjusted returns. It is against this background that this study investigates the risk-return characteristics of quoted manufacturing firms in the Nigerian stock market.

### 1.2 Statement of the Problem

Understanding the relationship between risk and return in emerging markets such as Nigeria, remains a critical yet unresolved issue in investment analysis. While theoretical models like the Capital Asset Pricing Model (CAPM) posit a positive, linear relationship between systematic risk and expected return (Sharpe, 1964; Lintner, 1965), empirical studies from the Nigerian capital market often report conflicting or inconclusive results (Bello & Adedokun, 2011; Amah, 2024). The situation is further complicated within the manufacturing sector, where firms operate under persistent macroeconomic instability, policy inconsistency, high operational costs, and infrastructural deficits. These conditions create unique risk exposures that conventional pricing models may not accurately capture, yet little effort has been made to examine this sector in isolation.

Despite the manufacturing sector's strategic importance to Nigeria's economic diversification and industrialization agenda, existing research often adopts an aggregated approach, combining data across various sectors and masking sector-specific risk-return patterns. As noted by Ogbeiwi and Okoughenu (2020), and Dauda et al. (2021), such generalizations limit the practical applicability of findings and hinder the development of sector-sensitive investment strategies. Moreover, the reliance on traditional risk indicators like beta may fail to reflect the actual volatility and return dynamics experienced by manufacturing firms, leading to inaccurate asset valuations and misinformed portfolio decisions. This empirical gap not only affects investors but also reduces the effectiveness of market regulation and policy formulation aimed at supporting the sector.

If this gap continues to be overlooked, the consequences may be detrimental to both capital market efficiency and economic development. Investors may remain exposed to pricing distortions and return anomalies, while firms may struggle to attract the equity capital required for expansion and innovation. Furthermore, the absence of disaggregated empirical evidence undermines policymaking and weakens the feedback loop between market behavior and regulatory intervention. Therefore, there is a compelling need to conduct a focused empirical investigation into the risk-return characteristics of listed manufacturing firms in Nigeria, using sector-specific data and robust methodologies to uncover insights that can improve investment decision-making and policy direction.

### 1.3 Research Objectives

The main objective of this study is to empirically investigate the relationship between various dimensions of risk and stock returns of listed manufacturing firms in Nigeria. Specifically, the study seeks to:

1. Examine the impact of systematic risk (beta) on the stock returns of listed manufacturing firms in Nigeria.
2. Evaluate the effect of firm-specific risk (volatility) on the stock returns of listed manufacturing firms in Nigeria.
3. Investigate the relationship between financial risk factors (such as leverage, liquidity, and firm size) and the stock returns of listed manufacturing firms in Nigeria

## 2.0 Literature Review

### 2.1 Theoretical Framework

This study is underpinned by three key theories: the Capital Asset Pricing Model (CAPM), Modern Portfolio Theory (MPT), and the Trade-Off Theory of Capital Structure.

#### 2.1.1 Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) was independently developed by Sharpe (1964), Lintner (1965), and Mossin (1966) as an extension of Markowitz's portfolio theory. It represents a significant advancement in modern financial theory by providing a systematic framework for understanding how risk influences expected return. CAPM introduced a method for pricing individual securities in relation to market risk, captured by the beta coefficient (β), which measures the sensitivity of an asset's returns to market movements. As one of the most widely adopted models in finance, CAPM serves as a cornerstone for evaluating the trade-off between risk and return, portfolio diversification, and cost of capital estimation in both academic and professional financial analysis.

The model posits that the expected return on a security is a function of the risk-free rate plus a premium for bearing systematic risk. Mathematically, this is expressed as:

$$\mathbf{E(Ri) = Rf + \beta i(E(Rm) - Rf)},$$

where $E(Ri)$ is the expected return of the asset, $Rf$ is the risk-free rate, $\beta i$ is the asset's beta, and $(E(Rm) - Rf)$ is the market risk premium.

According to the CAPM framework, only market-related (systematic) risk is priced, while firm-specific (unsystematic) risk is irrelevant since it can be eliminated through portfolio diversification. The model assumes efficient markets, rational investors, and frictionless trading. While these assumptions often hold in developed economies, their validity in emerging markets, such as Nigeria has been the subject of empirical debate.

The Capital Asset Pricing Model (CAPM) remains pertinent to this study as it offers a theoretical foundation for evaluating the risk-return characteristics of listed manufacturing firms in Nigeria. Although the model has known limitations in frontier markets, its focus on systematic risk,

measured through beta, provides a valuable framework for assessing whether increased risk is compensated by higher returns. Empirical findings from the Nigerian context, such as those by Osamwonyi and Asein (2012) and Amah (2024), reveal mixed results, often attributed to market inefficiencies and volatility. Nevertheless, the CAPM's conceptual simplicity, broad applicability, and continued relevance in asset pricing justify its inclusion in the present analysis.

### 2.1.2 Modern Portfolio Theory (MPT)

Harry Markowitz introduced the Modern Portfolio Theory (MPT) in 1952 as a foundational framework to analyze investment risks while evaluating returns. MPT established the fundamental principles of portfolio management through its focus on portfolio diversification for maximizing risk-adjusted returns. Markowitz revolutionized investor portfolio strategies by directing attention from single assets towards complete portfolios and from absolute return measures towards risk and return balance.

According to MPT, investors achieve risk reduction through the combination of assets that show varying correlation patterns. The theory posits that systematic risk, known as market risk, exists independently from unsystematic risk, which stems from firm-specific factors, while diversification strategies minimize these firm-specific risks. The efficient frontier stands as a core MPT concept that shows all portfolios that maximize expected returns at particular risk levels. MPT dictates that rational investors should opt for portfolios that exist on this frontier to reach their best possible outcomes. Full portfolio diversification remains challenging in Nigeria's emerging markets because of market segmentation alongside restricted investment instruments, limited market liquidity, and restricted information availability.

The relevance of MPT to this study lies in its application to stock return volatility within the Nigerian manufacturing sector. Given the inherent volatility of the Nigerian stock market, often driven by macroeconomic instability, currency fluctuations, and political uncertainty, understanding how firms can mitigate risk through diversification is crucial. Standard deviation, as a proxy for volatility, is used in this study to measure return dispersion and assess specific risk exposures. Prior studies, such as Kawu et al. (2018), highlighted that Nigerian manufacturing firms are particularly sensitive to market shocks. Also, findings from Irawan et al. (2025) and Patil and

Saware (2024) suggest that volatility, rather than beta alone, provides a more accurate predictor of returns in emerging and volatile markets. Therefore, MPT offers a valuable theoretical lens for examining how Nigerian manufacturing firms respond to firm-level and market-wide risk through portfolio behavior.

### 2.1.3 Trade-Off Theory of Capital Structure

The Trade-Off Theory of Capital Structure, established by Kraus and Litzenberger (1973), elucidates how corporations reconcile the advantages and disadvantages of debt financing. According to the idea, firms strive to attain an optimal capital structure by balancing the tax benefits of debt with the possible costs of financial hardship. Although debt offers a tax shield that augments business worth, overdependence on debt heightens the likelihood of insolvency and financial instability, therefore diminishing anticipated returns for investors.

The theory asserts that firms make financing decisions by comparing the marginal benefits and marginal costs of additional debt. At the optimal point, the value of the tax shield equals the expected costs of distress. Larger firms with steady cash flows and asset bases are more likely to benefit from debt financing, while smaller or less liquid firms may be more vulnerable to financial shocks. Thus, capital structure decisions are not a one-size-fits-all approach because it must reflect firm-specific characteristics such as size, asset tangibility, and earnings volatility. In emerging markets, these factors become even more critical due to limited access to external financing and heightened macroeconomic risk.

In the context of this study, the Trade-Off Theory is relevant in analyzing how financial risk indicators such as leverage, liquidity, and firm size, affect stock returns of manufacturing firms listed on the Nigeria Exchange Group (NGX). Empirical evidence by Ogbeiwi and Okoughenu (2020) supports the role of leverage as a key determinant of firm performance, while Adoke and Abdulaziz (2021) highlight how financing decisions directly influence return outcomes among consumer goods firms. Nigerian manufacturing firms, often constrained by limited funding sources, tend to rely heavily on debt, making them more exposed to financial risk. By applying the Trade-Off Theory, this study evaluates how internal financial decisions impact market valuation

and return volatility, offering insight into the broader dynamics of risk management and capital structure within the Nigeria's industrial sector.

### 2.2 Empirical Review

Rui et al. (2018) examined the validity of the Capital Asset Pricing Model (CAPM) in the Malaysian stock market using ordinary least squares (OLS) regression. By analyzing multiple sectors, they calculated beta coefficients from the relationship between stock returns and market returns. Their results supported the CAPM framework, showing a positive correlation between beta and expected returns, particularly during stable market conditions. However, the model's predictive strength weakened in times of macroeconomic instability, highlighting the influence of external factors on the risk-return relationship.

Osamwonyi and Asein (2012) tested CAPM applicability in the Nigerian capital market through time-series econometric techniques. Using five years of firm-level returns data, they estimated beta values via regressions against market returns. Their findings indicated that while CAPM holds some relevance, beta exhibited weak explanatory power in the Nigerian context due to inefficiencies, illiquidity, and inconsistent market behavior. Similarly, Gbadebo and Oyedeko (2021) applied quantile regression to examine how macroeconomic risks, such as inflation and exchange rate, affect stock returns under different market conditions. They found stronger risk-return impacts during positive market sentiment, suggesting asymmetry in return sensitivity depending on market direction.

Focusing specifically on the manufacturing sector, Kawu et al. (2018) employed panel data regression to analyze how systematic and unsystematic risks affect the performance of listed Nigerian manufacturing firms. Their findings revealed that stock return volatility was significantly influenced by firm-level operational risks and industry-wide challenges such as unstable electricity supply and rising input costs. This highlights the sensitivity of manufacturing stocks to both internal inefficiencies and sector-specific constraints.

Patil and Saware (2024) investigated risk-return dynamics in Indian equities by analyzing ten companies over five years using regression and correlation techniques. Their results showed that

higher price volatility was associated with higher returns, although some low-volatility stocks also performed well due to stable fundamentals and earnings. This suggests that qualitative factors can also influence return behavior. Similarly, Irawan et al. (2025) studied Indonesian banking stocks and found that firms with larger asset bases and consistent growth exhibited lower beta values, implying reduced exposure to systematic risk. Their findings demonstrate that firm-specific variables such as asset growth can significantly shape risk perceptions.

Bukar et al. (2020) analyzed beta stability in the Nigerian stock market using rolling-window estimation techniques. They discovered that beta values varied substantially over time, largely due to macroeconomic instability and unpredictable market conditions. This supports the argument that static beta estimates may not be reliable in emerging markets. Complementing this, Ogbeiwi and Okoughenu (2020) used panel data to evaluate how market risk and financial indicators such as leverage, and liquidity affect stock returns among Nigerian listed firms. Their findings emphasized that firms with high financial leverage experienced greater return volatility, aligning with the Trade-Off Theory, and suggesting that financial structure plays a more significant role than market risk alone in determining returns behavior.

In a related study, Nilapornkul et al. (2016) applied OLS regression to examine the risk-return relationship in Thai listed finance and securities firms. Their analysis confirmed a strong positive relationship between beta and returns, supporting the CAPM. However, they noted that this relationship varied significantly across subsectors, reinforcing the importance of sector-specific evaluations when analyzing risk-return dynamics in developing markets.

## 3.0 Methodology

The study employs an ex post facto research design, which is appropriate given its reliance on historical data to examine the impact of various forms of risk on stock returns. This design is well-suited for financial and econometric research, where variables of interest such as stock returns, risk indicators, and financial ratios, are derived from past events and documented in publicly available financial statements. As these variables are not subject to manipulation, the approach enables the researcher to draw objective, data-driven inferences about potential cause-effect relationships based on observed patterns within the existing dataset.

### 3.1 Population, Sample Size, and Sources of Data

The population of the study consists of all listed manufacturing firms on the Nigerian Exchange Group (NGX) as of December 31, 2023. Purposive sampling technique was employed to select 35 firms based on data availability and consistency in listing throughout the study period. The sample comprises firms across diverse manufacturing sub-sectors such as food and beverages, industrial goods, consumer products, and chemicals. The study covered twelve years from 2012 to 2023 allowing for adequate longitudinal analysis and robustness in trend identification and risk estimation. Secondary data extracted from the audited annual reports and financial statements of the selected firms as well data from the Nigeria Exchange Group (NGX) were used for this study. The use of audited financial records ensures the reliability and authenticity of the data, consistent with best practices in empirical finance research.

### 3.2 Model Specification

Following the empirical models employed by Rui et al. (2018) and Ogbeiwi and Okoughenu (2020), this study adopts and modifies their frameworks to suit the Nigerian manufacturing context.

R= (SRISK, TRISK, LEV, SIZE, LIQ, ROA, EXR)

The adapted panel regression model is specified as follows:

$$Rit= \beta_0+\beta_1 SRISK_{it}+\beta_2 TRISK_{it}+\beta_3 LEV_{it}+\beta_4 SIZE_{it}+\beta_5 LIQ_{it}+\beta_6 ROA_{it} +\beta_7 EXR_{it} +\mu i+\epsilon it$$

Where:

Rit: Return of firm *i* at time *t*

SRISKit: Systematic risk (beta) of firm *i*

TRISKit: Total risk (volatility) of firm *i*

LEVit: Leverage of firm *i*

SIZEit: Firm size

LIQit: Liquidity of firm *i*

ROAit: Return on assets of firm *i*

EXRit: Exchange rate

μi: Unobserved firm-specific effect

ϵit: Stochastic error term

### 3.3 Variable Description and Measurement

| Variable | Type | Description | Measurement | Expected Sign |
|---|---|---|---|---|
| Rit | Dependent (DV) | Stock return of firm *i* at time *t* | Tobin's Q | |
| Bit | Independent (IV) | Systematic risk (market-related risk) | Cov(Ri,Rm)/Var(Rm) | + |
| Σit | Independent (IV) | Firm-specific volatility (total risk) | Standard deviation of annual returns w | + |
| LEVit | Independent (IV) | Financial leverage of the firm | Total Debt / Equity | ± |
| SIZEit | Independent (IV) | Size of the firm | Natural logarithm of total assets | + |
| LIQit | Independent (IV) | Liquidity (short-term solvency) | Current Ratio or Quick Ratio | + |
| ROAit | Independent (IV) | Return on Assets (profitability) | Net Income / Total Assets | + |

### 3.4 Estimation Technique

This research utilized both descriptive and inferential statistical methods to analyze the correlation between several risk dimensions and the stock returns of publicly traded manufacturing companies in Nigeria. Descriptive statistics, encompassing metrics such as the mean, standard deviation, minimum, and maximum values, were employed to encapsulate the data and furnish preliminary insights into the distribution and volatility of the principal variables. Additionally, correlation analysis was conducted to evaluate the strength and direction of linear relationships among the independent and dependent variables, offering a preliminary understanding of potential associations prior to regression estimation.

For inferential analysis, panel regression techniques were adopted, reflecting the cross-sectional and time-series nature of the dataset. The analysis commenced with a Pooled Ordinary Least Squares (OLS) model, serving as a baseline estimator under the assumption of homogeneity across firms and time. To account for unobserved heterogeneity and firm-level characteristics, Fixed Effects (FE) and Random Effects (RE) models were subsequently estimated. The Hausman specification test was employed to determine the more appropriate model, with the fixed effects model preferred where significant correlation existed between the regressors and the individual effects. Furthermore, the Pesaran CD test was applied to detect cross-sectional dependence among firms. Where such dependence was identified, robust standard errors were used to correct for

potential inefficiencies in the coefficient estimates. These methodological procedures ensured the accuracy, reliability, and robustness of the empirical findings derived from the regression models.

## 4.0 Analysis and Results

### 4.1 Descriptive Statistics

Table 2 presents the summary statistics for all variables used in this study.

**Table 2: Summary of Descriptive Statistics**

| | Mean | Median | Minimum | Maximum | Standard Deviation | Skewness | Kurtosis | Obs |
|---|---|---|---|---|---|---|---|---|
| TOBINSQ | 1.602 | 1.090 | 0.028 | 9.522 | 2.226 | 4.843 | 11.290 | 420 |
| SRISK | -0.030 | 0.511 | -7.920 | 1.574 | 1.474 | -3.093 | 13.857 | 420 |
| TRISK | 6.384 | 0.827 | 0.000 | 299.918 | 23.415 | 8.152 | 83.711 | 420 |
| LEV | 0.874 | 0.576 | 0.002 | 7.482 | 1.127 | 3.704 | 18.642 | 420 |
| LIQ | 133.126 | 121.000 | 7.000 | 361.000 | 62.295 | 1.066 | 4.465 | 420 |
| SIZE | 10.333 | 10.202 | 8.418 | 12.595 | 0.889 | 0.150 | 2.222 | 420 |
| ROA | 2.569 | 2.921 | -71.357 | 176.267 | 14.310 | 3.559 | 57.430 | 420 |
| EXR | 305.829 | 305.937 | 157.312 | 645.919 | 136.587 | 1.009 | 3.679 | 420 |

The dependent variable, Tobin's Q (TOBINSQ), a proxy for stock return and market valuation, has a mean value of 1.602 and a median of 1.090. This suggests that, on average, listed manufacturing firms in Nigeria were moderately valued relative to their asset base. However, the substantial range, spanning from a minimum of 0.028 to a maximum of 9.522, indicates considerable variation in how the market perceives the future growth prospects of individual firms. The relatively high standard deviation of 2.226, skewness of 4.843, and kurtosis of 11.290 implies the presence of firms with extreme valuations, likely influenced by investor sentiments, firm fundamentals, or macroeconomic shocks.

In examining systematic risk (SRISK), which captures firm sensitivity to market-wide movements, the mean value is slightly negative at -0.030, while the median is positive at 0.511. This points to significant dispersion in how Nigerian manufacturing firms respond to overall market risks. Some firms appear to move counter-market trends, possibly due to sector-specific hedging, operational insulation, or mispricing. The minimum value of -7.920, combined with high negative skewness of -3.093 and extremely high kurtosis of 13.857, reveals the presence of outlier firms that exhibit

atypical risk behavior relative to the broader market. This supports the study's objective of empirically testing whether systematic risk is a valid predictor of stock return within this sector.

Total risk (TRISK), measured through stock returns volatility, further illustrates risk heterogeneity. The mean volatility is 6.384, but with a staggering maximum of 299.918 and a standard deviation of 23.415, there is evidence of highly unstable risk patterns among some manufacturing firms. The extremely high positive skewness of 8.152 and kurtosis of 83.711 highlights the influence of a few highly volatile firms, possibly affected by erratic cash flows, unstable supply chains, or poor governance. These results are directly relevant to the second objective of this study, which evaluates the effect of firm-specific risk on stock return.

With respect to financial risk factors, the mean leverage (LEV) ratio of 0.874 reflects a moderately high debt burden, although some firms reported leverage ratios as high as 7.482. The standard deviation of 1.127, skewness of 3.704, and kurtosis of 18.642, imply that while most firms maintain conventional debt-equity balances, a few are excessively leveraged, increasing their exposure to financial distress and market shocks. This variation may influence the stock returns of these firms and aligns with the third objective, which assesses how financial structure influences returns performance.

Liquidity (LIQ) also varies significantly, with a mean of 133.126 and a standard deviation of 62.295. This indicates that while some manufacturing firms in Nigeria hold substantial current assets, others are close to having liquidity constraints. Firms with higher liquidity may be perceived as more stable and less risky by investors, potentially affecting their market valuation.
The average firm size (SIZE), represented as the natural logarithm of total assets, is 10.333, with minimal dispersion and standard deviation of 0.889, suggesting relative homogeneity in scale across the sampled firms. Nonetheless, size differences may still influence investor perception, operational risk, and ultimately stock returns.

Return on assets (ROA), a measure of profitability, has a mean of 2.569, but exhibits extreme outliers with values ranging from -71.357 to 176.267. The large standard deviation of 14.310 and high kurtosis of 57.430 imply that profitability among manufacturing firms is not only diverse but

often unstable. This volatility could reflect sector-wide challenges such as high production costs, energy inefficiencies, or policy disruptions.

Exchange rate (EXR) volatility, a macroeconomic variable affecting input cost and export competitiveness, shows wide fluctuations with mean of 305.829 and max of 645.919. The standard deviation of 136.587 and skewness of 1.009 confirm the exchange rate shocks during the study period, especially due to multiple devaluations and inconsistent foreign exchange policies in Nigeria. These shocks may indirectly increase both systematic and firm-specific risks, thus influencing returns.

### 4.2 Correlation Matrix

Table 3 presents the Pearson correlation coefficients between Tobin's Q (used as a proxy for firm value and stock return) and the explanatory variables related to risk and firm characteristics.

**Table 3: Correlation Matrix**

| | TOBINSQ | SRISK | TRISK | LEV | LIQ | SIZE | ROA | EXR |
|---|---|---|---|---|---|---|---|---|
| TOBINSQ | 1 | | | | | | | |
| SRISK | -0.369 | 1 | | | | | | |
| TRISK | 0.558 | -0.558 | 1 | | | | | |
| LEV | 0.302 | -0.247 | 0.565 | 1 | | | | |
| LIQ | -0.117 | 0.117 | -0.126 | -0.116 | 1 | | | |
| SIZE | 0.138 | -0.138 | 0.283 | 0.080 | -0.433 | 1 | | |
| ROA | 0.203 | -0.217 | -0.201 | 0.053 | 0.075 | -0.172 | 1 | |
| EXR | -0.177 | 0.177 | 0.289 | -0.275 | 0.017 | 0.156 | 0.022 | 1 |

The results reveal that systematic risk (SRISK) is negatively correlated with Tobin's Q (r = -0.369), suggesting that firms with higher exposure to market-wide risk tend to have lower market valuation. This inverse relationship aligns with the theoretical expectation in emerging markets like Nigeria, where higher systemic uncertainty may deter investors and lower firm value. Conversely, total risk (TRISK) shows a strong positive correlation with Tobin's Q (r = 0.558), implying that firms exhibiting higher return volatility are also associated with higher market

valuation. This counterintuitive result may reflect the perception of high-return potential in volatile stocks or the presence of speculative trading in Nigeria's manufacturing sector.

Furthermore, leverage (LEV) has a moderate positive correlation with Tobin's Q ($r = 0.302$), indicating that more highly leveraged firms are also valued more by the market. This could be due to the signaling effect of debt as a commitment to future performance or the tax benefits associated with debt financing. However, liquidity (LIQ) is negatively correlated with firm value ($r = -0.117$), suggesting that excessive liquidity may not be positively perceived by investors, possibly because it indicates under-utilized capital or conservative risk-averse management. Other firm-level variables such as firm size (SIZE) and return on assets (ROA) show weak to moderate positive correlations with Tobin's Q ($r = 0.138$ and $r = 0.203$ respectively), implying that larger and more profitable firms tend to enjoy slightly better valuation. Exchange rate (EXR) has a weak negative correlation with firm value ($r = -0.177$), indicating that the depreciation of Nigeria's currency (Naira) may be detrimental to manufacturing firms' market performance, likely due to increased input costs and macroeconomic instability.

### 4.3 Panel Regression

$$Rit = \beta_0 + \beta_1 SRISK_{it} + \beta_2 TRISK_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \beta_5 LIQ_{it} + \beta_6 ROA_{it} + \beta_7 EXR_{it} + \mu i + \epsilon it$$

The panel regression analysis estimates the effect of systematic risk, total risk, and selected firm-level financial indicators on stock returns. Two model specifications were tested: the Fixed Effects (FE) and the Random Effects (RE) models. The Hausman test result (Chi-Sq. = 7.89; $p = 0.453$) indicates that the random effects model is more appropriate, suggesting that firm-specific heterogeneity is uncorrelated with the explanatory variables. In addition, the Pesaran CD test confirms the absence of cross-sectional dependence (CD = 24.93; $p = 0.245$), validating the assumption of independent panel units and the robustness of the random effects estimator.

Under the preferred random effects specification, systematic risk (SRISK) has a statistically significant and negative effect on stock return ($\beta = -1.206$, $p < 0.05$). This implies that higher exposure to market-wide fluctuations reduces firm value, supporting the risk-averse behavior of investors in Nigeria's manufacturing sector and validating one of the central hypotheses of this

study. In contrast, total risk (TRISK) shows a positive and significant relationship with Tobin's Q ($\beta = 2.878$, $p < 0.05$), suggesting that investors may associate higher firm-specific volatility with potential for abnormal returns, possibly due to speculative behavior or expectations of recovery and growth in volatile firms.

**Table 4: Panel Regression Results**

| Variable | Fixed Effects | Random Effects |
|---|---|---|
| **C** | 0.665<br>(2.13)<br>[0.000] *** | 0.861<br>(2.79)<br>[0.000] *** |
| **SRISK** | -0.682<br>(-2.34)<br>[0.000] *** | -1.206<br>(-2.29)<br>[0.028] ** |
| **TRISK** | -0.263<br>(-2.46)<br>[0.014] ** | 2.878<br>(2.19)<br>[0.031] ** |
| **LEV** | 0.485<br>(1.37)<br>[0.173] | -2.866<br>(-2.09)<br>[0.044] ** |
| **LIQ** | 0.372<br>(1.32)<br>[0.189] | -0.810<br>(-2.20)<br>[0.028] ** |
| **SIZE** | 0.353<br>(2.99)<br>[0.000] *** | -2.403<br>(-3.57)<br>[0.000] *** |
| **ROA** | 0.051<br>(0.25)<br>[0.801] | -0.190<br>(-0.44)<br>[0.662] |
| **EXR** | -0.454<br>(-3.04)<br>[0.000] *** | -1.287<br>(-2.03)<br>[0.042] ** |
| **R-squared** | 0.626 | 0.707 |
| **Adjusted $R^2$** | 0.584 | 0.683 |
| **F-statistic** | 7.97 [0.000] *** | 7.98 [0.000] *** |
| **Durbin-Watson** | 1.90 | 1.94 |
| **Hausman Test** | Chi-Sq. = 7.89 [0.453] | → RE preferred |
| **Cross-Section Dependence Test** | CD = 24.93 [0.245] | No cross-sectional dependence detected |

**( )** Standard errors, **[ ]** p-values ***** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Among the financial indicator variables, leverage (LEV) exhibits a significant negative influence on stock return ($\beta = -2.866$, $p < 0.05$), indicating that excessive debt undermines market valuation,

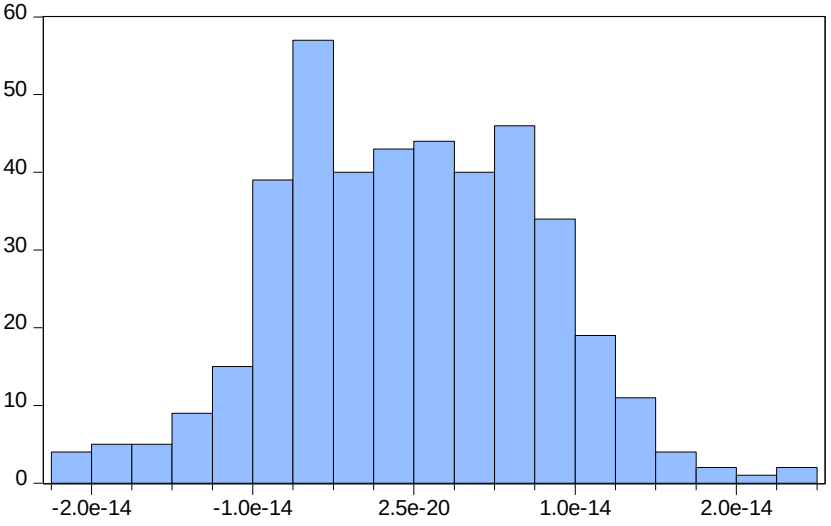
likely due to concerns over financial fragility or default risk. Liquidity (LIQ) also shows a negative and statistically significant coefficient ($\beta = -0.810$, $p < 0.05$), which may reflect investors preference for firms that actively deploy resources into productive investments rather than maintaining idle assets. Interestingly, firm size (SIZE) is negatively associated with Tobin's Q ($\beta = -2.403$, $p < 0.01$), suggesting that smaller firms may be perceived as more agile and capable of achieving higher growth, while larger firms may face structural inefficiencies or saturation effects. On the other hand, return on assets (ROA) does not significantly influence stock return in either model ($p > 0.10$), implying that accounting profitability may not be a strong determinant of market-based valuation in this sector, possibly due to inconsistent earnings or weak investor confidence in reported figures. Exchange rate (EXR), however, has a negative and statistically significant relationship with firm value ($\beta = -1.287$, $p < 0.05$), indicating that currency depreciation erodes market confidence in manufacturing firms, likely due to increased input costs and external exposure.

Overall, the random effects model reports a respectable R-squared of 0.707, indicating that approximately 71% of the variation in stock return is explained by the combined effects of risk metrics and firm-specific financial indicators. The model is statistically significant as reflected in the F-statistic (7.98, $p < 0.01$), and the Durbin-Watson statistic of 1.94 confirms the absence of serious autocorrelation. These results reinforce the conclusion that both systematic and firm-specific risks, along with key financial fundamentals, significantly affect the market valuation of manufacturing firms in Nigeria**.**

### 4.4 Normality test

The normality test of the standardized residuals, based on 420 observations from 2012 to 2023, confirms that the residuals from the panel regression model are normally distributed. The Jarque-Bera statistic is 0.414870 with a p-value of 0.812666, indicating that the null hypothesis of normality cannot be rejected at any conventional significance level. Additionally, the skewness of 0.016279 is close to zero, and the kurtosis of 2.849512 which approximates the normal distribution benchmark of 3, further supports the normality assumption. The histogram also visually confirms a symmetric, bell-shaped distribution. These results validate the reliability of the regression

estimators and supports the statistical soundness of the inferences drawn regarding the risk-return relationship of listed manufacturing firms in Nigeria.




| Series: Standardized Residuals | |
|---|---|
| Sample 2012 2023 | |
| Observations 420 | |
| Mean | -3.24e-16 |
| Median | -4.44e-16 |
| Maximum | 2.46e-14 |
| Minimum | -2.18e-14 |
| Std. Dev. | 8.02e-15 |
| Skewness | 0.016279 |
| Kurtosis | 2.849512 |
| Jarque-Bera | 0.414870 |
| Probability | 0.812666 |

**4.5 Discussion of Findings**

The regression results reveal a statistically significant and negative effect of systematic risk (SRISK) on stock returns in the Nigerian manufacturing sector, which underscores the risk-averse behavior of investors operating in an emerging market environment. This finding misaligns with the Capital Asset Pricing Model (CAPM) as proposed by Sharpe (1964) and Lintner (1965), which suggests that higher exposures to systematic risk and market-wide volatility that cannot be diversified away, should be compensated for by higher expected returns. The negative coefficient observed here indicates that investors penalize firms with higher systematic risk, likely due to persistent market inefficiencies, regulatory instability, and macroeconomic volatility in the Nigerian capital market, as similarly noted by Osamwonyi and Asein (2012) and Amah (2024). This deviation from the CAPM's theoretical expectation reinforces the argument that beta may not always serve as a reliable predictor of return in developing economies.

Conversely, Total risk (TRISK) has a positive significant relationship with Tobin's Q because investors view firm-specific volatility as an indicator of potential high returns which could stem from speculative behavior or the expectation of turnaround initiatives. The research of Patil and Saware (2024) supports this finding by demonstrating that high volatility stocks in the Indian equity market typically captured investor attention because investors expect superior returns.

Modern Portfolio Theory (Markowitz, 1952) identifies systematic and unsystematic risks as separate entities because systematic risk impacts all firms but unsystematic volatility creates opportunities for knowledgeable investors to diversify their portfolios.

The negative connection between leverage (LEV) and firm value matches the Trade-Off Theory of Capital Structure (Kraus & Litzenberger, 1973) since excessive debt increases financial distress costs. Ogbeiwi and Okoughenu (2020) discovered that Nigerian firms with elevated leverage experienced greater return volatility and diminished performance according to their research findings. Stock market investors seem to prefer businesses that use capital for reinvestment rather than cash accumulation as shown by the negative relationship between liquidity and share value. Irawan et al. (2025) suggest that small firms in emerging markets tend to have higher valuation levels because of their growth potential.

Furthermore, the negative impact of exchange rate depreciation on firm value aligns with studies such as Kawu et al. (2018), which highlights how macroeconomic shocks, particularly currency instability, exert downward pressure on manufacturing performance. The insignificance of ROA may reflect investor skepticism toward accounting earnings as reliable indicators of firm value, especially in opaque reporting environments. Collectively, the model's robustness, with an R-squared of 0.707 and absence of autocorrelation, underscores the significant influence of both risk dimensions and financial fundamentals on stock valuation in Nigeria's manufacturing sector.

## 5. Conclusion

This study examined the relationship between various dimensions of risk and the stock returns of listed manufacturing firms in Nigeria over the period of 2012 to 2023. Utilizing the panel data regression framework, the analysis explored the effects of systematic risk, total risk, and firm-specific financial indicators on firm value, as proxied by Tobin's Q. The findings indicate that systematic risk has a statistically significant and negative influence on firm valuation, reinforcing the view that investors in Nigeria's manufacturing sector are highly sensitive to macroeconomic volatility and market-wide shocks. Conversely, firm-specific risk, measured by return volatility, exhibited a positive relationship with stock valuation, which may reflect speculative behavior or investors' optimism about potential turnaround opportunities in volatile firms.

Additionally, financial fundamentals such as leverage, liquidity, and exchange rate volatility were found to have detrimental effects on firm value. These outcomes suggest heightened investor sensitivity to financial fragility, inefficient capital utilization, and external exposure. Notably, firm size was inversely related to stock performance, implying that smaller firms may be perceived as more agile or growth-oriented, contrary to conventional expectations. The insignificant impact of return on assets (ROA) further suggests that accounting profitability does not play a central role in determining stock price behavior in this context, likely due to transparency issues or limited investor reliance on reported earnings. The research adds to the empirical literature on emerging markets by offering firm-level insights from Nigeria and provides actionable implications for investors, corporate managers, and policy stakeholders.

### 5.1 Recommendations

Based on the empirical evidence presented, it is recommended that manufacturing firms should adopt risk mitigation strategies, including revenue diversification and financial hedging, to reduce exposure to systemic shocks. In addition, given the limited role of ROA in market valuation, improving the credibility and transparency of financial statements may enable investors to better assess firm performance.

Also, firms should avoid overreliance on debt financing and pursue a balanced capital mix to reduce financial distress and enhance investor trust. It is recommended as well that high liquidity levels should be channeled into productive investments, as idle funds were associated with diminished market valuation. In an emerging market like Nigeria, it is imperative that policymakers should promote access to financing and business support for smaller manufacturing firms, which were found to be more favorably valued by investors. Firms should adopt currency risk management strategies, such as forward contracts, currency swaps, or increased local sourcing, to cushion the negative impact of exchange rate volatility on firm value.

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