When Operations Fail to Deliver: Effect on Investor Value in Nigerian Food and Beverages Firms

Ama Kalu Ikwuo[1] , Otuagoma Florence Onororakpoene[1] , Oboh John Ogenyi[1] ,
Gilbert Ogechukwu Nworie[2*]

[1] Department of Accounting, Faculty of Management Sciences, University of Calabar, 540271 Calabar, Nigeria
[2] Ukoro Odah Statisticals, 420001 Awka, Nigeria

[*] Correspondence: Gilbert Ogechukwu Nworie (dulcisgil@gmail.com)

Abstract: Despite the strategic importance of the food and beverage sector in Nigeria's economy, many firms within the industry continue to experience persistent operational inefficiencies. Challenges such as high production costs, supply chain disruptions, inconsistent power supply, weak capacity utilization, and rising input prices have undermined operational stability and consequently heightened operating risk. While these operational failures are often discussed in relation to profitability and firm survival, their implications for investor value remain insufficiently explored. In this connection, this study examined the effect of operating risk on investor value in Nigerian food and beverage firms via adopting an ex-post facto research design. Secondary data were collected from audited financial statements and annual reports of 13 purposively sampled firms listed on the Nigerian Exchange Group between 2015 and 2024. Panel estimated Generalized Least Squares (GLS) with Seemingly Unrelated Regression (SUR) was employed to test the hypothesis and correct for heteroskedasticity and cross-sectional dependence. The findings revealed that operating risk, measured by operating margin, had a significantly negative impact on investor value ($p < 0.05$). Since lower operating risk increases investor value, management teams of Nigerian food and beverage firms are advised to implement operational controls and cost monitoring systems that could reduce inefficiencies, stabilize production processes, and maintain optimal operating margins to enhance shareholder returns.

Keywords: Operating risk; Investor value; Nigerian food and beverage firms

1. Introduction

The food and beverage industry occupies a strategic position in most developing economies, particularly in Nigeria where it plays a vital role in employment generation, food security, industrial growth, and activities in the capital market. Nigerian food and beverage firms operate in an environment characterised by rising population, changing consumer preferences and increasing demand for processed and packaged food products (Arogundade et al., 2023). At the same time, these firms face persistent operational challenges arising from unstable power supply, high energy costs, exchange rate volatility, inflationary pressures, and heavy dependence on imported raw materials. These conditions place significant pressure on production efficiency and cost management. As competition intensifies from both local producers and multinational corporations, the ability of firms to manage their operations effectively has become a critical determinant of performance. In recent years, several Nigerian food and beverage firms have reported fluctuating earnings despite growth in sales revenue, raising concerns among investors and market analyses about the sustainability of operational performance (Mgbobi & Ubesie, 2023). This situation has drawn attention to the consequences of operational weaknesses and inefficiencies on firm outcomes, particularly in relation to investor value.

Investor value and operating risk have become central concerns in today's business environment due to heightened uncertainty, market volatility, and increasing stakeholder scrutiny (Njoroge et al., 2023). Investor value represents the wealth generated for shareholders through returns such as dividends, capital appreciation, and

overall market valuation. In modern financial markets, investors are not only interested in revenue growth but are deeply concerned about the quality and stability of earnings (Akani & Ezebunwa, 2021). Firms that generate consistent operating profits are more likely to attract investment, enjoy favourable market valuations, and sustain investor confidence. Operating risk, on the other hand, refers to the degree to which a firm's operating income is exposed to fluctuations in sales and operating costs (Adegoke, 2025). It reflects the uncertainty associated with a firm's core business activities before financing and tax considerations. In an era marked by rising input costs, supply chain disruptions, and intense competition, operating risk has become more pronounced, especially in manufacturing-oriented industries such as food and beverages. For Nigerian firms, this risk is amplified by infrastructural deficiencies, regulatory pressures, and macroeconomic instability (Onwu et al., 2024). As a result, investors increasingly evaluate firms based on their ability to manage operating costs, maintain efficient production processes, and generate stable operating margins. The relevance of both investor value and operating risk lies in their combined influence on investment decisions, corporate sustainability, and market performance. Firms that fail to manage operating risk effectively may experience volatile earnings, reduced investor confidence, and declining market value, even in periods of strong demand.

Operating risk affects investor value primarily through its impact on the stability of earnings, predictability of cash flow and overall firm valuation. When a firm is exposed to high operating risk, small changes in sales volume or operating costs could lead to disproportionately large changes in operating profit (Schmidt & Raman, 2022). This sensitivity renders earnings more volatile and increases the likelihood of operating losses during periods of adverse economic conditions. For investors, such volatility represents uncertainty, which is often reflected in lower share prices and higher required rates of return (Akani & Ezebunwa, 2021). In the food and beverage sector, operating risk is closely linked to cost structures, particularly the balance between fixed and variable costs. Firms with high fixed operating costs, such as those associated with processing plants, machinery, and quality control systems, face greater difficulty in adjusting expenses when sales decline. Consequently, downturns in demand or increases in input prices could quickly erode profits. In Nigeria, frequent increases in energy costs, fluctuations in foreign exchange rates, and rising transportation expenses further intensify this risk. When operating risk is poorly managed, firms may experience declining operating margins, signalling inefficiencies in transforming sales into operating profit. This decline undermines investors' perceptions of managerial effectiveness and operational strength. Over time, persistent operational failures could weaken cash flow, limit dividend payments, and constrain opportunities of reinvestment. These outcomes directly affect investor value by reducing expected returns and increasing perceived risk. Investors may respond by reallocating their capital to firms with more stable operating performance, thereby lowering the market value of firms with high operating risk. Thus, operating risk serves as a crucial channel through which operational performance influences investors' wealth (Ko et al., 2019), turning it into a key area of concern for Nigerian food and beverage firms, which seek to sustain investor value in a challenging business environment.

In a competitive and dynamic business environment, food and beverage firms are required to maintain strong operational performance that supports stable earnings and sustained investor confidence. Efficient production processes, effective cost control, and the ability to convert sales into consistent operating profits are essential for firms aiming to create and preserve investor value (Oteri et al., 2023). When operations are properly managed, firms are better positioned to absorb fluctuations in input costs, respond to changes in consumer demand, and generate predictable cash flow. Such stability enhances market confidence, supports favourable firm valuation, and encourages continued investment from both existing and prospective shareholders (Akani & Ezebunwa, 2021).

However, the operational realities faced by many Nigerian food and beverage firms differ significantly from this standard. The sector has been characterised by rising operating costs, unstable power supply, volatile exchange rate, and heavy reliance on imported raw materials (Obiaje et al., 2025). These challenges have contributed to declining or inconsistent operating margins, despite growth in sales revenue in some firms. As a result, operating income has become increasingly sensitive to changes in sales volume and cost conditions, thus exposing firms to higher levels of operating risk. Evidence from financial reports showed fluctuations in earnings and reduced profitability across several firms in the industry, suggesting persistent operational inefficiencies and weak cost management practices (Mgbobi & Ubesie, 2023). Consequentially, increased operating risk leads to unstable earnings and unpredictable cash flow, which heighten uncertainty for investors. This uncertainty often translates into reduced investor confidence, lowered market valuation, and diminished shareholders' wealth. Firms experiencing sustained operational challenges may struggle to maintain dividend payments, attract new investment or finance future growth. Over time, continued exposure to high operating risk could erode firm reputation in the capital market and limit long-term sustainability. Despite the importance of these issues, limited empirical attention has been given to examine how operating risk arising from operational performance affects investor value within the Nigerian food and beverage sector, thus creating a gap that this study seeks to address.

In spite of the extensive empirical studies on operational risk and firm performance conducted by Adegoke (2025), Anetoh et al. (2021), Fadun & Oye (2020), Mrindoko et al. (2020), Musa et al. (2022), Naburgi et al. (2025), and Ugwu et al. (2022), there remains a significant gap in the literature regarding the Nigerian food and beverage sector. Most of the research has focused on banks or manufacturing firms, thus leaving limited

understanding of how operating risk affects investor value in food and beverage firms. Besides, few studies have incorporated firm-specific factors such as leverage and size when examining this relationship outside the banking sector. There is also a lack of research using operating margin as a direct measure of operating risk and return on shareholder funds as a measure of investor value in this context. Furthermore, existing studies rarely employed long-term panel data analysis to capture trends over an extended period in the Nigerian food and beverage industry. These gaps highlight the need for empirical investigation into how operational performance influences investors' wealth in Nigerian food and beverage firms, to provide evidence that is both sector-specific and practically relevant for managers and investors. Hence, the main objective of this study is to examine the effect of operating risk on investor value in Nigerian food and beverage firms.

2. Literature Review

2.1 Synthesis of Existing Empirical Studies

Operational risk has consistently been shown to influence firm value and financial performance across different sectors, to highlight its relevance for understanding investor value in Nigerian food and beverage firms. Anetoh et al. (2021) also reported that operational risk significantly and positively affected the firm value of Nigerian banks, indicating that when firms acknowledged and managed operational risk, it could become a source of competitive advantage. These studies collectively suggest that effective disclosure and management of operational risk could contribute positively to investor value.

However, several studies indicate that the relationship between operational risk and firm performance is not always positive. Adegoke (2025) found that practices of operational risk management had a positive but non-significant effect on profitability, while negatively affecting efficiency in non-interest banks, suggesting that efforts to mitigate operational risk could sometimes reduce operational effectiveness. Mrindoko et al. (2020), in a study of Tanzanian banks, reported that higher cost-to-income and portfolio concentration ratios significantly reduced both return on equity and return on assets, highlighting that operational inefficiencies and risk exposure could diminish financial performance. These findings suggest that operational risk, if not managed appropriately, could create additional costs and reduce the efficiency of firms, hence potentially lowering investor value.

Some empirical evidence also demonstrated that the effect of operational risk might vary, depending on the time horizon and performance measures to be considered. Musa et al. (2022) discovered that operational risk positively affected profitability in the long run but negatively in the short run, indicating that firms required sufficient time to adjust and implement risk management strategies effectively. Naburgi et al. (2025) similarly showed that higher cost-income and operating cost ratios negatively affected firm value, while a higher net interest margin relative to operating costs positively influenced market valuation. Fadun & Oye (2020) emphasized that effective operational risk management enhanced financial performance, whereas inefficiencies or misaligned risk practices could erode profitability. These studies revealed that operational risk could be a double-edged sword: when strategically managed, it might enhance investor value over time, but unmanaged or poorly managed risks could immediately impair firm performance.

Extending beyond the banking sector, Ugwu et al. (2022) demonstrated that practices of operational risk management also significantly improved the performance of manufacturing firms. Their study on aluminum manufacturing in Enugu State showed that avoidance of risk increased profitability, response planning reduced waste, and risk transfer improved customer retention. This indicates that operational risk management has practical implications for firm efficiency and value creation. Collectively, the empirical literature highlights a complex relationship between operational risk and investor value. While effective management and disclosure of operational risk tend to enhance market valuation and profitability, operational inefficiencies, excessive costs, and poor risk mitigation strategies could reduce firm performance. These mixed findings highlight the need to examine how operational risk specifically affects investor value in the Nigerian food and beverage sector, a context where operational challenges are often amplified by high production costs, constraints of the supply chain, and market volatility.

2.2 Theoretical Framework and Development of Research Hypothesis

The study was anchored on Risk Return Theory, which originated from early developments in modern finance that sought to explain the relationship between investment risk and expected returns. The foundations of the theory can be traced to the work of Harry Markowitz in 1952 through his portfolio theory, which formally introduced risk as a measurable concept linked to return (Guerard, 2010). This work was later expanded by scholars such as William Sharpe, John Lintner, and Jan Mossin in the 1960s with the development of the Capital Asset Pricing Model (Jewczyn, 2013). Together, these contributions established the principle that investors required higher returns as compensation for bearing higher levels of risk. Over time, Risk Return Theory became a central framework in financial economics, to guide investment decisions, asset pricing, and corporate financial analysis

(Gupta & Srivastava, 2023).

The main postulation of Risk Return Theory is a positive relationship between risk and return (Nickel & Rodriguez, 2002). Investors are assumed to be risk averse, meaning they prefer lower risk investments unless higher returns are offered as compensation for additional uncertainty. As a result, assets or firms that exhibit greater variability in earnings or cash flow are perceived as riskier and should provide higher expected returns to attract investment. The theory also suggests that when risk increases without a corresponding increase in return, investors' interest declines. In financial markets, risk is reflected in factors such as earning volatility, uncertainty in cash flow, and instability in operating performance (Gupta & Srivastava, 2023). Investors continuously assess these factors when valuing firms and determining their investment choices.

Risk Return Theory is relevant to this study because operating risk represents a major source of uncertainty faced by investors in Nigerian food and beverage firms. Fluctuations in operating income arising from changes in sales volume, input costs, and production efficiency adversely affect the risk profile of these firms. According to the theory, higher operating risk raises the level of returns required by investors, which could negatively impact firm valuation if such returns are not achieved. Persistent operational challenges that lead to unstable earnings reduce investor confidence and lower investor value. Higher operating margins provide a buffer against cost and revenue fluctuations, reducing the likelihood of earnings volatility and financial distress. Consequently, firms with lower operating risk (higher operating margins) are likely to enjoy greater investor confidence and higher valuation, thus enhancing investor value. Based on the postulations of Risk Return Theory, the hypothesis for this study is stated as follows:

H₁: Lower operating risk (measured as higher operating margins) is associated with increased investor value in Nigerian food and beverage firms.

3. Methodology

The study adopted an ex-post facto research design to examine the effect of operating risk on investor value in Nigerian food and beverage firms. The ex-post facto design was considered appropriate because it allowed the researcher to analyze historical data on financial performance and operational efficiency without manipulating any variables (Ikwuo et al., 2024; Nworie et al., 2022; Nworie & Mba, 2022). The population for the study consisted of 17 food and beverage firms listed on the Nigerian Exchange Group. These firms were Bua Foods PLC, Cadbury Nigeria PLC, Champion Breweries PLC, Dangote Sugar Refinery PLC, Golden Guinea Breweries PLC, Guinness Nigeria PLC, Honeywell Flour Mills PLC, International Breweries PLC, McNichols PLC, Multi-Trex Integrated Foods PLC, Northern Nigeria Flour Mills PLC, Nascon Allied Industries PLC, Nestlé Nigeria PLC, Nigerian Breweries PLC, PZ Cussons Nigeria PLC, Unilever Nigeria PLC, and Union Dicon Salt PLC.

Due to data availability and the requirement that firms had been continuously listed from 2015, a purposive sampling technique was employed to select 13 firms for the study. Purposive sampling allowed the researcher to focus on firms that met the inclusion criteria, to ensure that the selected sample provided consistent and comparable data over the study period. The sampled firms included Cadbury Nigeria PLC, Champion Breweries PLC, Dangote Sugar Refinery PLC, Guinness Nigeria PLC, Honeywell Flour Mills PLC, International Breweries PLC, Northern Nigeria Flour Mills PLC, Nascon Allied Industries PLC, Nestlé Nigeria PLC, Nigerian Breweries PLC, PZ Cussons Nigeria PLC, Unilever Nigeria PLC, and Union Dicon Salt PLC.

The study employed two main variables: operating risk and investor value. Operating risk was measured using operating margin, defined as earnings before interest and taxes divided by sales. Operating margin reflected a firm's ability to convert revenue into operating profit and served as an indicator of operational efficiency and exposure to operational fluctuations. A lower operating margin indicates higher operating risk because earnings are more sensitive to changes in sales or cost structures.

Operating margin reflects the proportion of sales retained as operating profit after covering all operating expenses, rendering it a direct indicator of a firm's ability to absorb fluctuations in costs or revenues. Theoretically, lower operating margins signal that a firm has a smaller buffer between revenues and operating costs; therefore, even modestly adverse changes in sales or expenses could sharply reduce earnings. Firms with thinner margins exhibit greater sensitivity to operational shocks, which translate into higher operating risk. By contrast, higher margins indicate stronger earning resilience, implying lower risk exposure. This conceptualization justifies using operating margin inversely as a proxy for operating risk in the study.

Investor value was measured by return on shareholder funds (ROSF), calculated as net income divided by shareholders' equity. ROSF is widely used in financial studies as a proxy for investor returns and provides a direct measure of how effectively firms generate wealth for their shareholders.

Moreover, this study incorporated two control variables to account for firm-specific factors that could influence investor value. Firm leverage was measured as the ratio of total debt to total assets, to reflect the extent to which a firm was financed through debt. Firm size was measured as the natural logarithm of total assets, to ensure standardization across firms of varying scales. Including these control variables helped isolate the effect of operating risk on investor value.

To test the hypothesis, the study employed panel estimated Generalised Least Squares (GLS). This approach was selected because it corrected for heteroskedasticity and cross-sectional dependence, which were common in panel datasets covering multiple firms over several years. Specifically, the study applied the period Seemingly Unrelated Regression (SUR) method to ensure that both time-series and cross-sectional variations were appropriately addressed. The use of GLS enhanced the efficiency and reliability of parameter estimates, allowing robust inference regarding the relationship between operating risk and investor value.

The regression model for the study was specified as follows:

$$ROSF_{it} = \beta_0 + \beta_1 OPMR_{it} + \beta_2 FLEV_{it} + \beta_3 FSZ_{it} + \epsilon_{it} \tag{1}$$

where, $ROSF_{it}$ = Return on shareholder funds for firm i in year t; $OPMR_{it}$ = Operating margin of firm i in year t, representing operating risk; $FLEV_{it}$ = Firm leverage (debt to asset ratio) for firm i in year t; FSZ_{it} = Firm size (natural log of total assets) for firm i in year t; β_0 = Intercept term; $\beta_1, \beta_2, \beta_3$ = Coefficients of the independent and control variables; ϵ_{it} = Error term capturing unobserved factors.

The model allowed testing of whether operating risk, to be measured through operating margin, significantly influenced investor value while controlling firm leverage and size. A negative coefficient for operating margin would indicate that higher operating risk reduced investor value, to be consistent with the postulations of Risk Return Theory.

Data were collected from the audited financial statements of the sampled firms for the period 2015 to 2024. Operating margin, return on shareholder funds, total assets, and total debt were extracted directly from these reports. Data on leverage and firm size were computed from the balance sheets and items of income statements. The data collection process involved careful verification to ensure consistency and accuracy across all firms and years. Once collected, the data were structured into a panel dataset, to enable the use of GLS estimation with SUR to correct for potential heteroskedasticity and cross-sectional dependence. The analysis was conducted using statistical software capable of handling panel data and GLS estimation. Diagnostic tests, including checks for multicollinearity, heteroskedasticity, and cross-sectional dependence, were performed to validate the assumptions of the model. The results of the GLS regression revealed the magnitude and direction of the relationship between operating risk and investor value, while the inclusion of control variables ensured that firm-specific characteristics did not confound the estimates.

4. Data Analysis

4.1 Descriptive Analysis and Model Diagnostics

The descriptive statistics for ROSF, presented in Table 1, show that the mean ROSF was -0.107, indicating that, on average, the sampled firms experienced a slightly negative return for shareholders over the period under study. The maximum ROSF was 2.931, while the minimum was -25.338, demonstrating a very wide range of shareholder returns and suggesting that some firms experienced substantial losses. The standard deviation of 2.361 reflects high variability in returns among the firms and unstable shareholder value. The skewness of -9.549 reveals a strongly negative asymmetry, meaning a larger number of extreme negative values compared to positive values. Similarly, the kurtosis of 102.068 indicates that the distribution of ROSF is highly peaked with heavy tails, showing extreme outliers in returns. The Jarque-Bera probability of 0.000 confirms that ROSF is not normally distributed, which is consistent with the wide dispersion and the presence of extreme values. Despite this, the central limit theorem suggests that because the sample size is sufficiently large (130 observations), the sampling distribution of the mean could still approximate normality for inference purposes.

Table 1. Descriptive statistics

	ROSF	Operating Margin	FLEV	FSZ
Mean	-0.107432	0.069244	1.587179	7.712985
Median	0.068269	0.079620	0.622482	7.941834
Maximum	2.930710	0.281805	20.01988	9.051642
Minimum	-25.33779	-0.951542	0.193620	4.758056
SD	2.361318	0.142091	3.702482	0.958993
Skewness	-9.548748	-3.166091	3.881732	-1.527473
Kurtosis	102.0685	22.25341	17.12001	5.208818
Jarque-Bera	55137.80	2225.113	1406.416	76.97932
Probability	0.000000	0.000000	0.000000	0.000000
Sum	-13.96615	9.001763	206.3333	1002.688
Sum SD	719.2812	2.604495	1768.380	118.6371
Observations	130	130	130	130

Note: ROSF = Return on shareholder funds; FLEV = Firm leverage; FSZ = Firm size.

Operating margin, used in this study as a measure of operating risk, had a mean of 0.069, suggesting that, on average, firms generated positive operating profit relative to sales though the value is relatively low. Therefore, the operating efficiency was limited. Table 1 shows a maximum operating margin of 0.282 and a minimum of -0.952, indicating that some firms experienced operating losses that exceeded their revenue, thus reflecting high operational risk. The standard deviation of 0.142 confirms that operating margins varied considerably across firms and years. Negative skewness of -3.166 shows that more extremely low values exist compared to high values, to be consistent with the presence of firms with very poor operational performance. The kurtosis of 22.253 suggests a sharply peaked distribution with heavy tails, indicating significant outliers in operating efficiency. The Jarque-Bera probability of 0.000 implies non-normality, but with 130 observations, the central limit theorem allows the mean and other estimates to be used for inferential statistics despite this non-normal distribution.

Firm leverage (FLEV) had a mean of 1.587, indicating that the sampled firms relied on debt financing at a level above total assets in some cases although this was an average across both high and low-leveraged firms. The maximum leverage was 20.020, while the minimum was 0.194, showing a wide disparity in debt levels among firms. A standard deviation of 3.702 reflects high variation in the degree of leverage, suggesting that some firms were highly exposed to financial risk while others were minimally leveraged. The positive skewness of 3.882 indicates that a few firms had extremely high leverage compared to the rest, and the kurtosis of 17.12 indicates a distribution with sharp peaks and heavy tails, thus confirming extreme values in the dataset. The Jarque-Bera probability of 0.000 shows that the leverage distribution is not normal, but the sample size ensures that the mean and other estimates could still provide valid information for analysis based on the central limit theorem.

Firm size (FSZ), measured as the natural logarithm of total assets, had a mean of 7.713, showing that the sampled firms were generally large in terms of total assets. The maximum size was 9.052 and the minimum 4.758, indicating some variation in scale among the firms. A standard deviation of 0.959 suggests moderate dispersion in firm size relative to the mean. The negative skewness of -1.527 implies that more firms were clustered above the mean, with fewer smaller firms creating a left tail. The kurtosis of 5.209 indicates a distribution slightly more peaked than normal, with some presence of outliers. The Jarque-Bera probability of 0.000 confirms non-normality, but given the 130 observations, the central limit theorem allows inferential procedures to proceed by using these descriptive statistics to understand the characteristics of firm size in relation to operating risk and investor value.

The Variance Inflation Factor (VIF) test, presented in Table 2, was used to determine whether the independent variables in the regression model, including operating margin, FLEV, and FSZ, were highly correlated with each other. High multicollinearity can distort coefficient estimates and reduce the reliability of the regression results. The VIF values for operating margin, FLEV, and FSZ were 1.022, 2.254, and 2.258, respectively. Since all values are well below the commonly used threshold of 10, it indicates that multicollinearity was not a concern in the model. This suggests that the independent variables provide unique information and that the estimated effects of operating margin, leverage, and size on investor value are reliable.

Table 2. Multicollinearity test

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
Operating margin	2.227026	1.266671	1.022065
FLEV	0.007234	2.671490	2.254059
FSZ	0.108009	149.4484	2.257938
C	6.974100	159.7575	N/A

Note: FLEV = Firm leverage; FSZ = Firm size; VIF = Variance Inflation Factor; C = Constant term; Sample: 1130; Included observations: 130.

The Ramsey RESET test, shown in Table 3, was conducted to check whether the relationship between the dependent variable, ROSF, and the independent variables was linear or if there were omitted nonlinear effects. The test added powers of the fitted values to the regression and evaluated their significance. In this study, the *t*-statistic was 0.124 with a probability of 0.9017, which was much higher than the 5% significance level. This indicates that the null hypothesis of linearity could not be rejected and confirms that the model adequately captured the linear relationship between ROSF and the predictors, thus no important nonlinear relationships were omitted.

Table 3. Linearity test

Statistic	Value	df	Probability
t-statistic	0.123761	125	0.9017
F-statistic	0.015317	(1, 125)	0.9017
Likelihood ratio	0.015929	1	0.8996

Note: Ramsey RESET test; Equation: Untitled; Specification: Return on shareholder funds (ROSF), operating margin, firm leverage (FLEV), firm size (FSZ), constant term (C); Omitted variables: Squares of fitted values.

The Breusch-Godfrey Serial Correlation (LM) test, reported in Table 4, was performed to examine whether the

residuals from the panel regression were correlated across time. Serial correlation violated regression assumptions and could make standard errors unreliable. The F-statistic was 0.027 with a probability of 0.9729, which was not significant at the 5% level. This result indicates that there was no evidence of serial correlation in the residuals. Therefore, the error terms were independent across time periods, thus confirming that the standard errors and test statistics for the regression coefficients were valid.

Table 4. Serial correlation

Type of Statistics	Value of Statistics	Type of p-Value	p-Value
F-statistic	0.027490	Prob. F (2,124)	0.9729
Obs*R^2	0.057615	Prob. Chi^2(2)	0.9716

Note: Breusch-Godfrey serial correlation Lagrange multiplier (LM) test.

Table 5 reports the residual cross-section dependence test, which evaluated whether residuals were correlated across different firms in the panel data. Cross-sectional dependence could bias panel estimates if ignored, especially in datasets where firms were affected by common economic factors. Both the Breusch-Pagan LM and Pesaran scaled LM tests were significant with probabilities of 0.000, indicating strong cross-sectional dependence in the residuals. This means that shocks affecting one firm likely influence others, and the presence of such dependence necessitates the use of panel estimation methods like GLS with SUR to produce efficient and unbiased estimates

Table 5. Cross-section dependence test

Test	Statistic	df	Prob.
Breusch-Pagan LM	195.8651	78	0.0000
Pesaran scaled LM	9.436761		0.0000

Note: Residual cross-section dependence test; Null hypothesis: No cross-section dependence (correlation) in residuals; Equation: Untitled; Periods included: 10; Cross-sections included: 13; Total panel observations: 130; Non-zero cross-section means detected in data; Cross-section means were removed during computation of correlations.

The Panel Cross-section Heteroskedasticity Likelihood Ratio (LR) test, shown in Table 6, was conducted to check whether the variance of the residuals was constant across firms and time. Heteroskedasticity could lead to inefficient coefficient estimates and biased standard errors. The likelihood ratio value was 473.558 with a probability of 0.000, indicating that the null hypothesis of homoskedasticity was rejected. This confirms the presence of heteroskedasticity in the panel data. To address this, the study applied GLS estimation with SUR, which corrected for both heteroskedasticity and cross-sectional dependence, to ensure that the regression results were robust and reliable.

Table 6. Heteroskedasticity likelihood ratio (LR) test

Statistic	Value	df	Prob.
Likelihood ratio	473.5584	13	0.0000

Note: Panel cross-section heteroskedasticity LR test; Null hypothesis: Residuals are homoscedastic; Equation: Untitled; Specification: Return on shareholder funds (ROSF), operating margin, firm leverage (FLEV), firm size (FSZ), constant term (C).

4.2 Test of Hypothesis

H$_1$: Lower operating risk (measured as higher operating margins) is associated with increased investor value in Nigerian food and beverage firms.

Table 7 presents the panel estimated generalised least square (EGLS) regression results with Period SUR to correct for heteroskedasticity and cross-sectional dependence. The model showed an adjusted R^2 of 0.576, indicating that approximately 57.6% of the variation in investor value (ROSF) was explained by operating risk, leverage, and firm size. The Durbin-Watson statistic of 1.968 suggests that there was no problem of serial correlation in the residuals. The overall F-statistic had a probability of 0.000, which was significant at the 5% level, thus confirming that the model was statistically valid and capable of explaining variations in ROSF. The constant term ($C = 1.339$, $p = 0.000$) was positive and significant, meaning that when operating risk, leverage, and firm size were zero, the baseline ROSF for the firms would be 1.339, holding all other factors constant.

Operating risk, measured through operating margin, had a coefficient of 0.565 with a p-value of 0.000, which was significant at the 5% level. Interpreting this in terms of marginal effect, a one-unit increase in operating margin corresponded to a 0.565-unit increase in ROSF, holding leverage and firm size constant. Since operating margin was inversely related to operating risk, the higher the margin, the lower the risk. This positive coefficient implies that lower operating risk leads to higher investor value. Conversely, a lower operating margin, indicating higher

operating risk, would reduce ROSF. This finding demonstrated that operational inefficiencies or high variability in costs and revenues, which increased operating risk, negatively affected shareholders' wealth. The significance confirms that lower operating risk increased investor value ($\beta = 0.565$, $p = 0.000$) in the Nigerian food and beverage sector.

Table 7. Test of hypothesis

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
Operating margin	0.565432	0.065044	8.693039	0.0000
FLEV	-0.036661	0.004487	-8.170023	0.0000
FSZ	-0.177437	0.027564	-6.437350	0.0000
C	1.339214	0.214739	6.236471	0.0000
Weighted Statistics				
Statistic	Value	Statistic		Value
R^2	0.586086	Mean dependent var.		-0.251668
Adjusted R^2	0.576231	*SD* dependent var.		1.471135
S.E. of regression	0.954475	Sum squared resid.		114.7887
F-statistic	59.47029	Durbin-Watson stat.		1.968028
Prob (*F*-statistic)	0.000000			

Note: FLEV = Firm leverage; FSZ = Firm size; C = constant term; Dependent variable: Return on shareholder funds (ROSF); Method: Panel estimated generalised least square (EGLS) (Period Seemingly Unrelated Regression (SUR); Sample: 2015–2024; Periods included: 10; Cross-sections included: 13; Total panel (balanced) observations: 130; Linear estimation after one-step weighting matrix; Period SUR (panel-corrected standard errors) standard errors & covariance (*df* corrected).

Firm leverage had a coefficient of -0.037 with a *p*-value of 0.000, significant at the 5% level. A one-unit increase in leverage reduced ROSF by 0.037 units, holding other variables constant. This shows that higher financial risk, through increased debt relative to assets, reduced investor value. While operating risk focused on operational efficiency, high leverage compounded overall risk for shareholders because debt obligations could magnify losses if operational performance declined. Therefore, even if operating risk was controlled, excessive leverage could still diminish returns to investors, thus highlighting the joint importance of managing both operational and financial risk.

Firm size had a coefficient of -0.177 with a *p*-value of 0.000, significant at the 5% level. This means that a one-unit increase in the natural log of total assets decreased ROSF by 0.177 units, holding operating risk and leverage constant. Larger firms might face greater operational complexity, which rendered them more exposed to inefficiencies and higher operating risk in practice. As a result, even with similar operating margins, bigger firms might generate slightly lower investor returns due to challenges in managing operations efficiently. This highlights that firm size interacts with operating risk and this could influence shareholders' wealth alongside leverage.

4.3 Discussion of Findings

The finding that lower operating risk increased investor value ($\beta = 0.565$, $p = 0.000$) suggests that investors responded positively when food and beverages firms effectively managed operational risks, as reduced risk signaled greater stability, predictability of earnings, and lower potential for financial losses. This aligns with Anetoh et al. (2021) reported a significantly positive impact of operational risk on firm value, further supporting the notion that lower operational risk enhanced investor confidence. Naburgi et al. (2025) also provided evidence that operational efficiency positively influenced market value, implying that controlling operational risk translated into tangible investor benefits. Besides, Fadun & Oye (2020) showed that effective operational risk management improved financial performance, through which investors often interpreted as a signal of sound governance and sustainable profitability. While some studies like Adegoke (2025) reported negative or non-significant effects of operational risk practices on certain performance metrics, these differences might arise from sector-specific dynamics or the short-term versus long-term focus of the analysis. Overall, the consistently positive relationship in several studies highlights that reducing operational risk is a critical driver of investor value.

4.4 Robustness Test Using Robust Least Squares Regression

The presence of substantial skewness and kurtosis in the descriptive statistics indicates that some extreme values could distort the relationship between operating margin, firm characteristics, and investor value (ROSF). To address this, the study employed Robust Least Squares regression using *M*-estimation with bi^2 weighting and median-centered scale as shown in Table 8. This method minimized the influence of outliers by assigning lower weights to extreme observations, to ensure that the regression coefficients reflected the central tendency of the data rather than being overly affected by anomalous points.

Table 8. Robustness test using robust least squares regression

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Operating margin	1.174009	0.057264	20.50153	0.0000
FLEV	0.001630	0.003264	0.499352	0.6175
FSZ	-0.004404	0.012611	-0.349192	0.7269
C	0.022807	0.101337	0.225064	0.8219
Robust Statistics				
Statistic	Value	Statistic		Value
R^2	0.280245	Adjusted R^2		0.263108
Rw^2	0.718040	Adjust Rw^2		0.718040
Akaike info criterion	263.4460	Schwarz criterion		277.3611
Deviance	1.783863	Scale		0.083169
Rn^2 statistic	423.8009	Prob (Rn^2 stat.)		0.000000

Note: FLEV = Firm leverage; FSZ = Firm size; C = Constant term; Dependent variable: Return on shareholder funds (ROSF); Method: Robust least squares; Sample: 2015–2024; Included observations: 130; Method: M-estimation; M settings: weight = Bi^2, tuning = 4.685, scale = median centered; Huber Type I standard errors & covariance.

The results of the robust regression in Table 8 showed that operating margin remained highly significant (coefficient = 1.174, $p < 0.001$), confirming the earlier findings that lower operating risk enhanced investor value. Other control variables such as FLEV and FSZ were not statistically significant, suggesting that their effects were relatively minor once extreme values were accounted for. The adjusted R^2 of 0.263 indicates that the model explained a reasonable proportion of variation in ROSF, while the robust estimation ensured that these results were not driven by outliers.

In all, using Robust Least Squares enhanced the reliability and validity of the conclusions in this study by mitigating the potential bias introduced by extreme values. It provided a more accurate assessment of the relationship between operating risk and investor value, thus strengthening confidence in the robustness of the empirical findings. This approach also addressed concerns regarding the justifications of central limit theorem, as Robust Least Squares explicitly corrected for the influence of extreme observations rather than relying solely on the assumptions of a large sample.

5. Conclusions and Recommendations

The results of this study underscore the critical role of operational efficiency in enhancing investor value within Nigerian food and beverage firms. By demonstrating that lower operating risk (higher operating margins) was associated with increased shareholder returns, the study highlights the importance of maintaining consistent and efficient operations to support wealth creation for investors. Fluctuations in daily activities such as production efficiency, cost management, and revenue stability directly influence market perceptions and investor confidence, thus reinforcing the need for disciplined operational practices.

From a managerial perspective, these findings suggest that firms should implement robust operational cost monitoring systems to track expenses and identify inefficiencies in real time. Besides, diversifying supply chains and securing alternative sources of critical inputs could mitigate disruptions, while mechanisms to stabilize operating leverage (such as maintaining prudent fixed-to-variable cost ratios) could reduce the volatility of earnings. Managers should also focus on optimizing the scale of operations and aligning financial structure with operational capacity to strengthen resilience against market uncertainties and competitive pressures. Since lower operating risk increased investor value, management teams of Nigerian food and beverage firms should implement operational controls and cost monitoring systems that reduced inefficiencies, stabilized production processes, and maintained healthy operating margins to enhance shareholder returns.

5.1 Contributions to Knowledge

This study contributes to the literature by examining the effect of operating risk on investor value, specifically within the Nigerian food and beverage sector, an area that has received limited attention in previous research. By using operating margin as a measure of operating risk and return on shareholder funds as a measure of investor value, the study provided a more direct assessment of how operational performance influenced shareholders' wealth. It also incorporated firm-specific factors such as leverage and size, to allow a clearer understanding of how these characteristics interacted with operational risk to affect investor returns. Furthermore, the study employed long-term panel data spanning 2015 to 2024, in order to capture trends over an extended period and provide robust empirical evidence for the sector. In doing so, this research offered both theoretical and practical contributions, to address gaps in existing studies and provide guidance for managers and investors on the importance of operational efficiency for value creation in Nigerian food and beverage firms.

5.2 Limitations of the Study and Suggestions for Further Studies

This study faced some limitations that should be considered when interpreting the findings. The research relied entirely on secondary data from audited financial statements and annual reports, which meant the analysis was limited to the information publicly available. Some firms had incomplete records for the entire period from 2015 to 2024, which reduced the number of firms that could be included in the sample. The study also focused only on listed food and beverage firms in Nigeria, so the results may not apply to unlisted companies or firms in other industries. In addition, the study adopted operating margin as the only measure of operating risk and return on shareholder funds as the only measure of investor value, which may not capture all aspects of operational performance or shareholders' wealth. These limitations suggest caution in generalizing the findings.

For further studies, researchers could expand the scope to include more firms, such as unlisted food and beverage companies, or examine firms in other industries to allow broader comparisons. Future studies could also use additional measures of operating risk, such as cost variability, production delays, or supply chain disruptions, and alternative measures of investor value, including market share or performance of stock prices. Researchers could explore how other factors, such as corporate governance, technological adoption, or macroeconomic conditions, influence the relationship between operating risk and investor value. Longer periods of analysis or comparative studies across countries could provide a comprehensive understanding of how operational performance affects shareholders' wealth over time and in different contexts.

Author Contributions

Conceptualization, A.K.I. and G.O.N.; methodology, A.K.I. and O.J.O.; software, O.J.O.; validation, A.K.I., O.F.O., and G.O.N.; formal analysis, O.J.O. and G.O.N.; investigation, A.K.I. and O.F.O.; resources, G.O.N.; data curation, O.J.O.; writing—original draft preparation, A.K.I.; writing—review and editing, O.F.O. and G.O.N.; visualization, O.J.O.; supervision, G.O.N.; project administration, A.K.I.; funding acquisition, G.O.N. All authors have read and agreed to the published version of the manuscript.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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