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Operational Risk and Profitability of Nonfinancial Public Limited Companies in Kenya

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A B S T R A C T

The main goal of this research was to establish the effect of operational risk on profitability of nonfinancial listed companies in Kenya. The research was guided by the extreme value theory. The focus population was all the 43 quoted nonfinancial firms. The response rate was 70%. The study used a correlation research design. Pre-existing data was sourced from financial reports at the Nairobi Securities Exchange (NSE) and the Central Bank of Kenya (CBK) database for a period of eleven years starting from 2009 to 2019. Data analysis was done using E-Views-12. Simple regression analysis was done using Panel Vector Error Correction (VEC) Model. The research concluded that, operational risk has a negative and significant impact on profitability of nonfinancial listed companies. The investigation recommends that, nonfinancial companies' strategic management should develop and maintain operational loss databases for external and internal events. This would serve as an early warning signal of an impending and imminent operational risk crisis that can easily cause a great damage to the operations of companies.

Keywords: Operational Risk, Profitability, Nairobi Securities exchange, Nonfinancial Companies, Panel Vector Error Correction Model

1.0 INTRODUCTION

1.1 Background of the Study

Nonfinancial sector public corporations have continued to perform poorly with some persistently reporting huge losses; a worrisome trend compared with their financial sector counterparts with huge posting of billions of profits year in year out (Ishmail, 2024). Musyimi, Gatauwa and Kimutai (2025) and Obong'o, Nasieku and Gekara (2024) claim that, industries in the nonfinancial sectors have been struggling to exist, with some companies in key industries closing operations due poor profitability. Kenya has registered a decline in exports and unfavourable balance of payment due to the fact that profitability in the real sector of the economy is still and remains highly unpredictable (Obong'o *et al.,* 2024). Nonfinancial sector that is unprofitable drives resources away from the real sector to the financial sector where some companies have consistently posted billions of profits (Wanjiku, Mwangi, Nyamute & Kiiru, 2022). The consequences of the shifting in resources from the real sector to the financial sector, puts at risk Kenya's sustainable millennium development goals and the realization of vision 2030 (Kariuki, 2019).

Nonfinancial public limited companies continue to face increasing exposure to financial risk, especially in operational risk in Kenya (Musyimi *et al.,* 2025). In Kenya, financial risk exposure among nonfinancial companies stood at: currency risk 83.8%, interest rate risk 91.9% and commodity risk 73% (Murungi, 2017) and quoted banks reported liquidity risk exposure of 74.03% and systematic risk exposure of 14.81% (Mwaurah, Muturi & Waititu, 2017). Ngunjiri, Matanda and Waga (2025) reported operational risk exposure of 10,164.63 (1,016,463%) in Kenya. Majority of the public limited companies in Kenya are exposed to operational risk (Murungi, 2017; Ngunjiri *et al.,* 2025). Too much exposure to operational risk may threaten company operations and drive them towards material collapse (Lelgo & Obwogi, 2018; Mwakiboko & Mwikamba, 2025).

1.2 Statement of the Problem

Nonfinancial public limited companies have continued to perform poorly with some persistently reporting huge losses; a frightening trend compared with their financial sector counterparts with huge posting of billions of profits year in year out (Musyimi *et al.*, 2025). Nonfinancial companies therefore strain to survive with some of them winding operations year in year out due to increasing volatilities in profitability (Kariuki, 2019). Besides, listed companies including nonfinancial companies at the Nairobi Securities Exchange are increasingly exposed to operational risk more than before (Murungi, 2017). Ngunjiri *et al.* (2025) reported operational risk exposure of 1,016,463% in Kenya. Profitability volatilities and increased exposure to operational risk by nonfinancial companies in Kenya, ignites and sustains the debate on the relationship between operational risk and profitability.

Olalere, Aminul, Yusoff and Shamsuddin (2018) investigated operational risk and performance in Nigeria, Fadun and Oye (2020) and Mrindoko, Macha and Gwahula (2020) explored the impact of operational risk management practices on performance in Nigeria and Tanzania respectively. Some of these prior studies failure to investigate operational risk and profitability nexus, one on one, creating a conceptual and an empirical gap respectively (Olalere *et al.,* 2018) to be filled by the current study in this area. The studies by Fadun and Oye (2020), Mrindoko *et al.* (2020), Muriithi and Muigai (2017) Olalere *et al.* (2018) and Mwakiboko and Mwikamba (2025) are conducted in the financial sectors of the economy, creating an empirical gap in the nonfinancial sector.

Similarly, these group of researchers led by Mwakiboko and Mwikamba (2025), Muriithi and Muigai (2017) and Olalere *et al.* (2018) recommended for further research on operational risk and profitability in the real sector of the economy to help build a consensus. Most of these studies failed to do proper data generation procedures appropriate for time series (Suyanto, Prasilowati, Safitri & Jayadi, 2024). Some prior studies failed to acknowledge that time series data will often times follow a random walk and therefore are non-stationary in nature creating methodological gaps (Suyanto *et al.*, 2024). This study bridges these methodological gaps by carrying out proper data generation procedures by incorporating Granger causality and cointegration tests to inform the choice of models and testing for moderation properly. Therefore, the introduction of superior methodologies in the study of operational risk and profitability in the nonfinancial sectors of the economy in Kenya is properly anchored.

1.3 Research Objective

To determine the influence of operational risk on profitability of nonfinancial public limited companies in Kenya.

Research Hypothesis

H_{01}: Operational risk has no significant impact on profitability of nonfinancial public limited companies in Kenya

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Extreme Value Theory

Aljadani (2024) and Choubar, Yacine and Abdelmounaim (2025) claim that the extreme value theory evolved from the seminal work of Von Bortkiewicz in 1922 and thereafter it was modeled into the asymptotic theory of the distributions of extreme values by Fisher and Tippett in 1928 and later on Boris Gnedenko perfected the theory in 1943. Ngunjiri *et al.* (2025) claim that extreme value theory analyzes the probability and effect of rare extreme events such as financial crisis, security markets crushes and natural disasters. Toroitich (2018) assert that the theory seeks to asses from a given order sample of a given random variable, the probability of events that are more extreme than previously observed (Mwakiboko & Mwikamba, 2025). Extreme value theory provides a statistical foundation for modelling extreme variations in financial data, making it a fundamental tool for risk assessment and economic decision making. Besides the ability of the theory in estimating the probability of extreme fluctuations, extreme value theory enhances the understanding of operational risk exposure (Choubar *et al.,* 2025).

Extreme value theory finds utility in forecasting the extreme values and tail probabilities of financial assets (Mwakiboko & Mwikamba, 2025). In financial risk management, extreme value theory is used for simulating and quantifying extreme risky events, with focus on their peaks through the threshold (Aljadani, 2024). Extreme value theory is widely applied in risk management to model tail risks and safeguard against catastrophic losses. The theory is especially relevant in assessing operational and market risks in volatile environments (Ngunjiri *et al.*, 2025).When operational risk originates from the microenvironment, the firm optimally adopts a less complex investment model in order to minimize the chances of occurrence and the severity of operational losses (Aljadani, 2024). The theory expands the knowledge of operational risk management by emphasizing the securitization of risk and other alternative risk transfer strategies (Okeke, Agonoke & Onuorah, 2018).

Choubar *et al.* (2025) state that, extreme value theory in the recent past, finds increased utility in operational risk and credit risk management as well. The theory offers a set of methodologies, for quantifying the boundaries between different loss classes and provides a scientific language, for translating managerial guidelines on these boundaries into real numbers. Aljadani (2024) identifies fundamental assumptions underlying the extreme value theory: the parameters of the initial universe or the probability distribution remain constant, otherwise if the parameter changes have occurred, then such variations can be adjusted and the price draws or events are random and independent of each other over time. As the sample increases, the range of values for a given event increases and its probability is not expected to be small. For external events, their probability is likely to be high (Ruusunen, 2025).

Aljadani (2024) highlight several benefits of extreme value theory. First, the parametric out of sample value at risk (VaR) calculations are possible for high probability figures. Secondly, the method does not assume a particular model for returns but permits the data to stand on its own to fit the distribution tails. The model risk is considerably contracted as compared to normal or other distributions. Lastly, the extreme value technique puts more weight on the extreme events hence; the risky event is explicitly taken into consideration (Mwakiboko & Mwikamba, 2025).

Extreme value theory is widely applied in financial management and other disciplines (Aljadani, 2024). In insurance, it is used to estimate the loss severity distributions from historical data and this is especially important in the context of reinsurance; where there is need to choose or price a high

excess layer (Choubar *et al.,* 2025). In equity risk, credit risk and operational risk management, extreme value theory is used to estimate the risk capital requirements that can cushion companies against unusual losses, decline in investment-grade status and contingent operational challenges (Okeke *et al.*, 2018). In market risk management, extreme value theory is utilized to determine the value at risk (VaR) for the losses generated on the statement of financial position; as a result of adverse market movement (Aljadani, 2024).

2.2 Conceptual Framework

Ishmail (2024) explains that conceptual framework helps to build and describe relationships between the predictor and the outcome variables; so as to build the literature further and develop the appropriate methodologies for the study. Figure 1 shows operational risk has one level and profitability has one level.

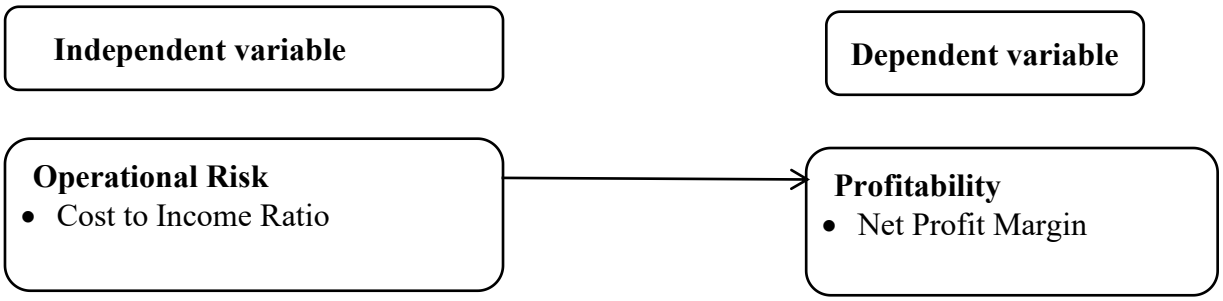

Figure 1: Conceptual Framework

2.2.1 Operational Risk

Simamora and Oswari (2019) assert that, operational risk is the risk caused by failure in internal processes, human errors and system failures or those originating from external events (Ishmail, 2024; Mrindoko *et al.*, 2020). Mirindiko *et al.* (2020) asserts that the events may cause operational losses to companies. Hence operational losses are the cost to the firm that is generated by operational risk (Mrindoko *et al.*, 2020). Yousef, Taha, Muhmad & Abidin (2023) asserts that, it is the risk that operating expenses may exceed operating revenue, resulting in the inability of the company meeting all due obligations.

Yifei (2017) classifies operational risk into fraudulent activities within and without the company, inconsistent hiring practices, work place insecurity, business disruptions, system failures, failed managerial processes and physical damage to assets. Yousef *et al.* (2023) provides the following justifications for operational losses: personnel errors, abuse of power, systems failure, scammer activities and cyber-crimes, poor hardware and software maintenance, communication errors, client mistakes, unreliable supply chain, outdated technologies, human resource issues, processing errors, vendors' opportunism, equipment failure and artificial intelligence driven costs (Al-Tamini, 2025). Operational risk may also arise from external factors such as effects of floods and adverse climatic conditions (Ngunjiri *et al.*, 2025).

Yousef *et al.* (2023) and Yifei (2017) describes four main distinguishing features of operational risk: they tend to be uncorrelated with the general market forces, they depend more on the culture of the business, are mainly pure risk, are unavoidable and exists in every organization regardless of its size. Operational inefficiencies may result in rising costs, damage to organizational reputation, threaten financial stability of the company and contribute to financial crisis in the economy. Operational efficiency emphasizes the efficiency achieved when transactions are conducted with minimum transaction costs (Al-Tamimi, 2025). Operational risk such as, system failure and breakdown, may result into inaccurate execution of financial transactions that can be costly to the company (Ali, 2022). Operational risk ranks as one of the greatest contributing factors to company failure, in the nonfinancial and financial sectors of the economy in African countries (Hudakova, Kardos, Dvorsky, Afful & Kloudova, 2023). Operational risk exposure introduces volatilities in the performance of nonfinancial companies which may cause instabilities (Ishmail, 2024).

The occurrence of operational risk in nonfinancial companies is often times linked to small losses in firm operations that might increasingly become enormous (Olalere *et al.*, 2018). Operational risk indicators include operational efficiency (Al-Tamimi, 2025) measured by cost to income ratio and which is calculated by dividing operating expenses with operating income or gross assets (Muthia, Ghasarma, Andaiyani & Seitiawan, 2019). Operating expenses is the direct costs incurred in the running of the firm operations to generate income and has a significant impact on the balance sheet items (Ishmail, 2024).

Cost to income ratio described as an estimation of a company's efficiency and productivity is calculated using operating expense as a percentage of operating income (Mrindoko *et al.*, 2020). A high cost to income ratio is a revelation of serious weaknesses in managerial efficiency, while a low cost to income ratio indicates increased efficacy in managing assets (Al-Tamimi, 2025). Mrindoko *et al.* (2020) and Wangalwa and Muturi (2018) use operational efficiency, as an indicator of operational risk; this study equally use cost income ratio as an indicator of operational risk and was measured using operating expenses divided by operating income (Al-Tamimi, 2025; Ishmail, 2024).

2.3 Empirical Review

2.3.1 Operational Risk and Profitability

Olalere *et al.*, (2018) interrogated the impact of operational risk on performance of financial sector firms in Nigeria. A sample of 16 banks is studied over a period of 7 years (2009 to 2015). Secondary data is extracted from annual financial reports from Nigerian Bureau of Statistics and World Bank Database. Proxies for operation risk included, cost to income ratio and operating expense to gross asset ratio. Performance was measured by net interest margin. Descriptive and inferential analyses were done to estimate the effect. Olalere *et al.*, (2018) found that operating expenses to gross asset ratio had a positive and significant effect on performance. In the same study, cost to income ratio had a negative and significant influence on company performance.

Olalere *et al.* (2018) observe that firms that put emphasis on the need to control cost end up having a lower operating expenses ratio hence leading to increased earnings. This is normally the case if companies fail to leverage on their fixed costs and accumulation of small losses spread over time (Muriithi & Muigai, 2017). The efficiency and effectiveness of a firm's operational activities are highlighted by its operational risk levels. Firms should undertake projects in which the inherent risks are well understood rather than those whose main aim is to reduce financial risk (Ishmail, 2024; Olalere *et al.,* 2018).

Another study by Fadun and Oye (2020) examined the effect of operational risk management on performance in Nigeria. Published data for the period of 10 years from 2008 to 2017 was sourced from financial reports of 6 banks. The investigation applied repeated-measure design. Descriptive and inferential analysis were performed to test the relationship. Operational risk was indicated by cost to income ratio, while performance was measured by return on asset (ROA). The investigation revealed that, operational risk had a negative and significant effect on profitability. Fadun and Oye (2020) intimate that, firms should give priority to operational risks as they are inherent in all organizational activities and have far reaching consequences on performance, reputation and the desire of companies to remain a going concern (Muriithi & Muigai, 2017). Many companies in developing economies have taken operational risk for granted and assume that it is a residual risk and its impact taken for granted for many years (Fadun & Oye, 2020). Even though operational risks have been institutionalized by some firms, they are not properly managed due to inadequate data on their circumstantial effects (Muriithi & Muigai, 2017).

A study in the financial sector in Tanzania is undertaken by Mrindoko *et al.* (2020). Mrindoko *et al.* (2020) investigate operational risk and performance of 41 banks, for a period of 13 years (2006 to 2019). The research employed longitudinal investigation. Operational risk was measured by cost to income ratio and operating expense ratio while performance is represented by ROA and return on equity (ROE). The study is theoretically anchored on information asymmetry theory. Secondary data is collated from financial reports and descriptive and inferential analyses are done to estimate the effect. Findings from the study indicate that operational risk is negatively and insignificantly related to ROE and has a negative and significant impact on ROA. This means that lower operational risk led to higher profitability. Mrindoko *et al.* (2020) recommends that companies should carry on with their operations appropriately as changes in financial risk may affect their performance and introduce sectorial instability (Fadun & Oye, 2020).

In Kenya, Muriithi and Muigai (2017) scrutinize the relationship between operational risk and profitability in the financial sector. A portion of 43 lending firms were examined from 2005 to 2014. Financial reports from company websites, were examined and time series and cross section research designs are used. Operational risk was estimated by cost to income ratio and profitability by return on equity (ROE). The impact of operational risk on profitability was negative and this is statistically significant. This reveals that operational efficiency is generally low in the banking industry. Muriithi and Muigai (2017) observe that cost reduction measures may include reducing discretionary expenditures such as excess workers, unnecessary audit and marketing, separation of responsibility and authority and application of the most current technology in the production process in order to seal loopholes that would permit operational losses to thrive both in financial and nonfinancial operations.

3.0 RESEARCH METHODOLOGY

A correlation research design was employed to investigate the nonfinancial companies listed at the Nairobi Security Exchange from 2009 to 2019. The study examined 30 companies that had full information for the period. Secondary data was obtained from published financial statements at company website and Nairobi Securities Exchange website using structured data collection sheet. Data was analysed using Econometric Views 12 and Panel Vector Error Correction (VEC) Model was employed to execute the inferential analysis. Diagnostic tests informed the application of Panel Vector Error Correction (VEC) Model.

Regression Equation is shown in equations 1.1

$$\mathbf{NPM_{it}=\beta_0+\beta_1 OPR_{it}+\mu_{it}} \quad \textbf{(1.1)}$$

Taking the natural logarithm (ordinary square root) of the variables to avoid multicollinearity. Log Transformed as in 1.2

$$\mathbf{LnNPM_{it}=\beta_0+\beta_4 LnOPR_{it}+\mu_{it}} \quad \textbf{(1.2)}$$

Where:

$\mathbf{NPM_{it}}$ = Profitability

Ln = Natural logarithm

$\mathbf{B_0}$ = the constant term/the intercept

$\boldsymbol{\beta_1}$ = coefficient of liquidity risk

$\boldsymbol{OPR_{it}}$ = measure of operational risk for company i in time t

t= the period from 2009 to 2019

$\boldsymbol{\mu_{it}}$ = the stochastic error term/the unbiased and equally distributed error term

The coefficients (β_1) are used to estimate the sensitivity of profitability to variations in operational risk.

4.0 FINDINGS AND DISCUSSION

4.1 Descriptive Statistics

Tables 1 and 2 describe the results of the descriptive statistics. The tables presents a report on descriptive for operational risk and profitability. Descriptive statistics used include the minimum, maximum, range, median, mean, standard deviation, skewness and kurtosis.

4.1.1 Descriptive Statistics on Profitability

Profitability was measured by net profit margin as shown table 1 which reveal that all the years reported a negative minimum net profit margin ranging from -10.978 in 2018 to -0.0328 in 2010 casting doubts on the ability of nonfinancial companies to remain profitable. This imply that some companies recorded a negative profitability throughout the study period. The maximum value range from a low of 0.39804 in 2019 to a high of 1.51528 in 2018. The highest average value is 0.131079 in 2010 and the lowest is -0.39238 in 2018. Some companies recorded negative profitability in three consecutive years from 2017 to 2019, which was revealed by negative averages of -0.10842 in 2017, -0.39238 in 2018 and -0.31909 in 2019 and a high standard deviation of 2.090126 (209%) as shown in 2018 and 1.170369 (117%) in 2019 supported by a high range of 0.78135 (78%) to as high as 12.49338 (125%) in 2018. Larger values of dispersion allude to a wide spread in profitability among the nonfinancial public limited companies. Traditionally, net profit margin values of less than 5% (0.05) indicate that profitability is low, 10% (0.1) is a healthy while 20% (0.2) is a high profitability status (Pervetica & Ahmeti, 2023).

The median values reported by the study are below 0.1 throughout the period from 2009 to 2019 ranging from 0.003211 in 2017 to 0.09648 in 2009; with 6 consecutive years that companies reported low net profit margin of 0.044705 in 2014, 0.02097 in 2015, 0.049745 in 2016, 0.003211 in 2017, 0.04174 in 2018 and 0.01621 in 2019 in the median value. This findings show that most nonfinancial public limited companies reported a low profitability from 2014 to 2019 and most companies had reports of profitability values below a healthy status of 0.1 throughout the study period (2009 to 2019). The kurtosis of more than 3 was reported during the entire study period with outliers in 2015 and 2014; with most years companies reported a skewness of 3 and less than 3 which implied the presence of a heavy tail. A negatively skewed data was shown from 2014 to 2019 implying that most of the average values were less than the median values during this period.

The result from the study are consistent with findings from Wanjiku *et al.* (2022) that had a minimum values of less than -39%, an evidence of low profitability among nonfinancial companies. Adebayo, Ifeanyi and Abiodun (2020) reported a minimum value of -0.242, a maximum of 0.106 and average of 0.013 in profitability measured by ROA; Abbas and Ullah, 2024 reported an average of 0.0141, a minimum of -0.1995 and a maximum of 0.8845 in ROA in the financial sector in South Asia; results that are in agreement with the current study. The mixed outcomes shown by positive and negative net profit margins revealed increased volatilities in profitability among the nonfinancial public limited companies.

Table 1 Trend Analysis for Profitability (Net Profit Margin)

Year	N	Min	Max	Med	Mean	SD	Skewness	Kurtosis
2009	30	-0.1283	0.79977	0.09648	0.114769	0.153483	3.109068	13.92589
2010	30	-0.0328	1.05345	0.068795	0.131079	0.204266	3.472867	14.6192
2011	30	-0.5087	1.01369	0.08799	0.118574	0.230351	1.576662	9.09692
2012	30	-0.1140	0.93484	0.056045	0.107112	0.17422	3.851584	18.45561
2013	30	-0.1389	0.6425	0.062475	0.101746	0.13677	2.110315	7.862981
2014	30	-0.4470	0.62569	0.044705	0.037755	0.200219	-0.12943	2.96603
2015	30	-0.8397	0.82827	0.02097	0.069906	0.323802	-0.19175	1.788694
2016	30	-1.5432	1.22198	0.049745	0.021459	0.428384	-1.16079	7.401689

2017	30	-3.2384	0.88392	0.003211	-0.10842	0.736624	-3.12882	11.92445
2018	30	-10.978	1.51528	0.04174	-0.39238	2.090126	-4.80555	24.66262
2019	30	-6.0257	0.39804	0.01621	-0.31909	1.170369	-4.31244	20.74223

Source: Research Data 2024

4.1.2 Descriptive Statistics on Operational Risk

Descriptive statistics on cost income ratio are presented in table 2. The minimum value lie between -58.328 in 2018 and 0.24078 in 2010 which highlights a high operational risk to a low operational risk. Maximum values range from 6.19461 in 2011 to 1,382.65 in 2014 which depicts a high operational risk in the nonfinancial public limited companies in Kenya. Median values lie between 0.6369 in 2015 to 1.819555 in 2017, all which span from low to high operational risk. The mean value span from -0.44928 in 2016 to 4.922395 in 2019, revealing high operational risk. The range lie between 12.71412 in 2011 to a high of 1,421.9518 in 2014; the standard deviation range from 2.342317 (234%) in 2011 to 252.7486 (25,275%) in 2014 indicating a more spread out data set. In some years data is positively skewed while in others it is negatively skewed; in some years the value of skeweness is greater than 3 which indicate a heavy tail while in other periods it lower than 3. Most kurtosis values are more than 8 which indicate a leptokurtic distribution.

This findings are inconsistence with studies by Muriithi and Muigai (2017) which reported a minimum value of 0.045 (4.5%), a maximum of 1.60 (160%), a mean of 0.561 (56%) and a standard deviation of 0.214 (21%) and Mwakiboko and Mwikamba (2025) who reported a minimum of 0.09 (9%), a maximum of 0.10 (10%), a mean of 0.178 (18%) and a standard deviation of 0.099 (10%) in cost income ratio, alluding to a low operational risk in the banking sector in Kenya. A visit to the nonfinancial companies' premises revealed that only 15 out of 43 (35%) target companies maintain operational loss data base. The finance officers from 15 companies were able to provide information on the maintenance of operational loss data base. The rest 28 (65%) finance officers had no evidence of maintenance of records on operational loss database.

Table 2 Trend Analysis for Operational Risk (Cost to Income Ratio)

Year	N	Min	Max	Med	Mean	SD	Skewness	Kurtosis
2009	30	-20.088	10.11871	1.798165	2.009113	4.92467	-2.92066	14.58041
2010	30	0.24078	21.66636	1.72702	3.414016	4.517945	2.77644	9.09315
2011	30	-6.5195	6.19461	1.223265	1.511983	2.342317	-0.82079	4.280656
2012	30	-8.1785	22.49158	1.641355	2.076331	4.926474	2.076356	10.5566
2013	30	-3.4007	16.11928	1.99219	2.866029	3.928149	1.752901	3.899607
2014	30	-39.302	1382.65	1.088795	45.6708	252.7486	5.460816	29.87759
2015	30	-16.944	79.73879	0.6369	4.020477	15.71034	4.077168	19.76003
2016	30	-43.159	12.43568	0.94536	-0.44928	9.125647	-3.7169	17.39052
2017	30	-12.475	27.8492	1.819555	3.584345	8.140973	1.487769	3.444977
2018	30	-58.328	13.59145	1.363915	0.460268	11.7693	-4.50612	23.17335
2019	30	-28.22	92.2105	0.76312	4.922395	18.94812	3.522967	16.3778

Source: Research Data 2024

4.2 Diagnostic Tests

Diagnostic tests were carried out which included normality, autocorrelation, heteroskedasticity, multicollinearity. Normality test in table 3 shows profitability (LNPROFIT) has a skewness of 0.5167 and kurtosis of 0.0000; while operational risk (LNOPR) showed a skewness of 0.0000 and kurtosis of 0.0000, values inferior to the significant value. Hence, the study fails to accept the null hypothesis that the data is normally distributed. Autocorrelation test in table 4 show a p-value of 0.000, which is less than the significant value, providing sufficient evidence to accept the alternative hypothesis that there is serial correlation in the series. Heteroskedasticity test in table 5 report a probability value of 0.0000. Thus, the data is not homoscedastic. Multicollinearity testing output are conveyed in table 6 which report a variance inflation factor of 1.0301 which is within the bench mark value of 5.00 and the tolerance value of less than 1.00. Hence there is no multicollinearity in the series.

Table 3 Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: Residuals are multivariate normal

Date: 12/21/24 Time: 22:08

Sample: 2009 2019

Included observations: 240

Component	Skewness	Chi-sq	Df	Prob.*
LNPROFIT	-0.102535	0.420538	1	0.5167
LNOPR	2.459467	241.9592	1	0.0000
Joint		376.8415	7	0.0000

Component	Kurtosis	Chi-sq	Df	Prob.
LNPROFIT	6.021678	91.30538	1	0.0000
LNOPR	20.68144	3126.331	1	0.0000
Joint		16079.93	7	0.0000

Table 4 Residual Serial Correlation LM Tests

Date: 12/21/24 Time: 22:10

Sample: 2009 2019

Included observations: 240

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	Df	Prob.	Rao F-stat	Df	Prob.
1	99.32927	49	0.0000	2.076187	(49, 1075.6)	0.0000
2	70.23898	49	0.0249	1.448593	(49, 1075.6)	0.0250
3	139.2649	49	0.0000	2.965264	(49, 1075.6)	0.0000

Table 5 Residual Heteroskedasticity Tests (Levels and Squares)

Date: 12/21/24 Time: 22:13

Sample: 2009 2019

Included observations: 240

Joint test:

Chi-sq	Df	Prob.

1329.155	840	0.0000

Table 6 Multicollinearity Diagnostic Criteria

Var	Eigenval	C_Numnber	C_Index	VIF	1/VIF	R2_xi,X
LnOPR	0.7405	2.3417	1.5303	1.0301	0.9707	0.0293

4.3 Panel Unit Root Test for Operational Risk

Panel unit root test is done to find out whether the series on operational risk follows a random walk (Non-stationary). The test null hypothesis states that panels contain a unit root, while the alternative hypothesis states that panels are stationary. The decision rule states that failure of any of the tests applied, then a unit root is present. The results on operational risk (LNOPR) in table 7 show that, Phillips-Peron (PP) statistic has a p-value less than the significant value of 1% (0.01), Levin, Lin and Chu test, Im, Pesaran and Shin and the Augmented Dickey-Fuller (ADF) statistics, have their p-values greater than the significance value of 0.01. Hence, the study concludes that, data on operational risk is non-stationary.

Table 7 Panel unit root test: Operational Risk Summary

Series: LNOPR

Date: 12/18/24 Time: 17:46

Sample: 2009 2019

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.84860	0.0323	30	270
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.17266	0.4315	30	270
ADF - Fisher Chi-square	67.6884	0.2314	30	270
PP - Fisher Chi-square	93.8888	0.0034	30	300

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

4.4 Panel Unit Root Test for Profitability

Panel unit root test is done to investigate whether the profitability series follows a random walk (Non-stationary). The test null hypothesis states that panels contain a unit root, while the alternative hypothesis state that panels are stationary. The test results on profitability in table 8 show that the Levin, Lin and Chu test statistic, Im, Pesaran and Shin, the ADF and PP statistics have their p-values larger than the significant value of 5% (0.05) and 1% (0.01). Hence, there is evidence of unit root in the panels. The null hypothesis is therefore accepted that the data on profitability is non-stationary.

Table 8 Panel unit root test: Profitability Summary

Series: LNPROFITABILITY

Date: 12/18/24 Time: 17:41

Sample: 2009 2019

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.13442	0.4465	30	270
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.57529	0.7175	30	270
ADF - Fisher Chi-square	54.4663	0.6773	30	270
PP - Fisher Chi-square	86.3438	0.0146	30	300

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

4.5 Model Adjustments following Diagnostic Testing

Failure of any of the preliminary diagnostic test implies that the assumptions of the classical linear regression model have been violated and therefore application of the Ordinary Least Square (OLS) models to establish the relationship between independent and dependent variables would give rise to spurious regression output. Hence further testing is required in order to determine the appropriate model to use for analysis.

4.5.1 Pairwise Granger Causality Tests

Pairwise Granger Causality testing was done. The results of the Granger causality test in table 9 show that operational risk (LNOPR) significantly affect profitability (LNProfitability) with a probability value of 0.0474≤0.05, also LNProfitability significantly affect LNOPR with a probability value of 0.0441≤0.05. Hence, a two way causality exists between operational risk and profitability.

Table 9 Pairwise Granger Causality Tests

Date: 12/21/24 Time: 12:40

Sample: 2009 2019

Lags: 2

Null Hypothesis:		Obs	F-Statistic	Prob.
LNOPR does not Granger Cause	LNPROFITABILITY	270	3.08474	0.0474
LNPROFITABILITY does not Granger Cause LNOPR			3.15789	0.0441

4.5.2 Pedroni Residual Cointegration Test

Cointegration test in table 10 indicate that Panel Rho-statistics and ADF tests have probability values of 1.0000 and 0.3150 respectively, hence no evidence of cointegration and further testing required. Panel v-statistics and PP test have probabilities of 0.9993 and 0.0000 which strongly suggest that the series is likely to be cointegrated. Thus the null hypothesis which state that there is no cointegration is rejected for both the panels and the group. Hence, there is evidence of cointegration in the series. Upon discovery of cointegration in the series then the regression can be obtained without false results using VECM model.

Table 10 Pedroni Residual Cointegration Test

Series: LNPROFITABILITY LNLQR LNSVR LNSTR LNFOREX LNOPR LNFS

Date: 12/21/24 Time: 12:46

Sample: 2009 2019

Included observations: 330

Cross-sections included: 30

Null Hypothesis: No cointegration

Trend assumption: No deterministic trend

User-specified lag length: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic
Panel v-Statistic	-3.211565	0.9993	-4.280888
Panel rho-Statistic	6.002429	1.0000	6.734447
Panel PP-Statistic	-13.75934	0.0000	-6.777566
Panel ADF-Statistic	-0.481617	0.3150	-0.247294

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	8.546428	1.0000
Group PP-Statistic	-15.88165	0.0000
Group ADF-Statistic	1.792563	0.9635

4.6 Hausman Test

Random effect assumption state that random effects (Individual and group) are uncorrelated with the other independent variables (Ishmail, 2024). The Hausman specification test was conducted to determine whether to use the random or fixed effect model. The Hausman test results in table 11 indicate that individual variables probability values are greater than the significant value. The panel (group) probability value is equally greater than the significant value of 0.01. Hence, there is no evidence of violation of the random effects assumptions. The decision to use random effect model holds and is justified.

Table 11 Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.442341	6	0.4885

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.

LNOPR	-0.477385	-0.486059	0.000311	0.6227

4.7 Inferential Analysis, Findings and Testing of Hypotheses

Inferential analysis was anchored by correlation and regression tests. Inferential analysis was done. Inferential statistics are reported as in subsequent subsections.

4.7.1 Correlation Analysis

Findings in table 12 show that operational risk has a correlation coefficient of -0.4109 with profitability, which is significant. Reduced exposure to operational risk increases profitability. The correlation highlights the occurrence of a linear relationship between operational risk and profitability of nonfinancial companies listed in Kenya.

Table 12 Correlation Matrix Criterion

	LNPROFITABILITY	**LNLQR**	**LNSVR**	**LNSTR**	**LNFOREX**	**LNOPR**	**LNFS**
LNPROFITABILITY	1	-0.1346	0.0323	0.2779	0.0596	-0.4109	-0.0702

4.7.1 Simple Regression Analysis

Simple regression analysis is used to analyze the relationship between operational risk and profitability. Random effect model is used in determining the relationship. The test results are reported in table 13. Operational risk has no significant effect on profitability of nonfinancial listed companies in Kenya was the test hypothesis. A univariate regression model is mounded to determine this relationship. Table 13 is used to present the output of the regression analysis.

Table 13 Regression for Operational Risk and Profitability

Dependent Variable: LNPROFITABILITY

Method: Panel EGLS (Cross-section random effects)

Date: 12/21/24 Time: 22:59

Sample: 2009 2019

Periods included: 11

Cross-sections included: 30

Total panel (balanced) observations: 330

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.095578	0.160646	-13.04470	0.0000
LNOPR	-0.453514	0.060100	-7.546051	0.0000
	Effects Specification			
			S.D.	Rho
Cross-section random			0.786712	0.3647
Idiosyncratic random			1.038421	0.6353

Weighted Statistics			
R-squared	0.148290	Mean dependent var	-0.896800
Adjusted R-squared	0.145693	S.D. dependent var	1.121862
S.E. of regression	1.036922	Sum squared resid	352.6681
F-statistic	57.10764	Durbin-Watson stat	1.188100
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	0.175033	Mean dependent var	-2.425277
Sum squared resid	543.6165	Durbin-Watson stat	0.770773

The fitted model is presented as in

Profitability=-2.095578-0.453514OPR

From the table 13, the coefficient of determination (R-squared) is 0.148290 with a model probability of 0.000000. The model reveal that 14.829% of the variations in profitability are explained by operational risk and this is statistically significant. This means 14.829% of the changes in profitability are influenced by movement in operational risk. The research findings confirm that, operational risk has a coefficient of -0.453514 with a p-value of 0.0000. The effect of operational risk on profitability is negative and statistically significant. Thus it is known that the null hypothesis is rejected.

This imply that, a one unit increase in operational risk would result in decrease in profitability by 0.453514 units holding other factors constant. In this vein, table 2 report very high average cost-income figures of over 100%. Since cost-income ratio is a reflection of the company's efficiency in its operations. This findings imply that there is enough evidence to claim that increase in operating expenses over operating incomes decreases the profitability position of nonfinancial companies in Kenya. The high values in cost-income alludes to high level of inefficiency in managing operational risk among the listed nonfinancial companies in Kenya. Hence the firms have to grapple with the burden of high operating costs; a situation that is harmful to their quest for generating higher profitability. Mrindoko *et al.* (2020) claim that firms that experience a cost-income ratio of below 50% have efficient operations and likely to report increased profitability.

Yousef *et al.* (2023) in a similar study in the Middle East and North African (MENA) countries reports results which are consistent to this study. The study claim that, cost-income ratio had a negative correlation with ROA and ROE consistently. The panel regression test revealed that, operational risk had a negative and significant effect on profitability. Companies with high operational losses were likely to have a negative market information signal, which erode investors' confidence reducing company valuation and revenues (Mrindoko *et al.*, 2020). Mwakiboko and Mwikambo (2025) investigation found that operational risk measured by cost to income ratio, had a negative and significant effect on profitability which was measured by ROA among the listed lending institutions quoted in Kenya.

These results however, differs with those by Ngujiri *et al.* (2025) who investigated micro-lending institutions in Kenya from 2013 to 2022. Ngujiri *et al.* (2025) found that, operational risk measured by cost to income ratio, had a positive and significant effect on profitability measured by return on investment. The positive effect of operational risk on profitability was caused by judicious financial risk controls and proper diversification of investments in the financial sector (Ngujiri et al., 2025). Yousef *et al.,* (2023) observe that greater dependency on modern technology, increased competition and globalization which have left many companies in developing and middle income economies more vulnerable to operational risk than ever before. Hence, operational risk will remain to be part and parcel of any profit making organization (Mbuya & Tegambwage, 2022).

5.0 CONCLUSIONS

The research objective was to examine the effect of operational risk on profitability of nonfinancial quoted companies in Kenya. Operational risk had a negative and significant impact on profitability. The investigation concluded that, operational risk plays a key role in the determination of profitability of nonfinancial companies. Lower cost to income ratio would raise a company's profitability prospects both in the short and long-run. Increased operational risk implies that nonfinancial companies are inefficient in controlling costs.

Recommendations

Since operational risk is a significant determinant of profitability, the study recommends measures to help improve profitability. Nonfinancial companies should prioritize the implementation of appropriate laws, regulations and procedures to mitigate company losses and facilitate seamless operations leading to enhanced profitability. Appropriate risk management strategies should include proper design, implementation and review of operational risk methodologies to ensure that the risk is well understood and mitigation measures taken to improve profitability. The management

should incorporate operational risk in the corporate strategy of nonfinancial companies. Furthermore, the corporate managers should establish an operational loss monitoring department, develop framework and policies for prompt operational loss reporting, recording and maintenance of operational loss database. It is fundamental that the management create company-wide awareness on operational risk issues, since operational risk constitute a major risk affecting nonfinancial companies' profitability.

Future Research

The current study focuses on the influence of operational risk on profitability. Further study is recommended on the factors influencing operational risk exposure among the nonfinancial companies. For instance, a study on effect of artificial intelligence on operational risk would be appropriate. This will help in understanding the root causes of operational risk and how they can be contained to enhance profitability of companies.

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