

DIVIDEND PAYOUT, LEVERAGE AND EQUITY MARKET VOLATILITY AMONG FIRMS LISTED AT THE NAIROBI SECURITIES EXCHANGE, KENYA

Justin Orang'i Ombui^{1*}, Gordon Opuodho², Isaac Linus Ochieng³
^{1,2,3}Jomo Kenyatta University of Agriculture and Technology, Kenya

*Corresponding Author:

justinorangiombui@gmail.com

Abstract

This study investigates the effect of dividend payout on equity market volatility among firms listed on the Nairobi Securities Exchange, considering leverage as a moderating variable. Applying panel regression techniques alongside comprehensive diagnostic testing, the study finds that dividend payout significantly reduces volatility, confirming the stabilizing role of dividends in emerging markets. The inclusion of firm size strengthens the model, showing that larger firms experience lower volatility, while leverage increases volatility but also enhances the stabilizing effect of dividends. These findings support dividend signalling and bird-in-hand theories by demonstrating that stable and predictable payouts help to calm investor uncertainty. The study contributes to the theoretical debate by clarifying the dual role of dividend payout as both a stabilizing mechanism and a signalling tool, while practically recommending stronger dividend disclosure practices and prudent leverage management to mitigate volatility in frontier markets.

Keywords: Dividend Payout, Equity Market Volatility, Leverage, Firm Size, Nairobi Securities Exchange

1. Introduction

Equity market volatility, characterized by significant fluctuations in stock prices, presents a fundamental challenge to investors and policymakers in emerging markets. These price swings create uncertainty, affect investment decisions, and threaten the stability of capital markets (Morina, Sylva, & Alija, 2024). Nowhere is this more apparent than in the context of African exchanges, which are often characterized by higher average returns, less stringent regulation, and greater volatility compared to their developed counterparts (Mwanje, 2019). The Nairobi Securities Exchange (NSE) exemplifies this trend, having experienced pronounced volatility and unpredictability amid its rapid growth, with fluctuations directly impacting Kenya's capital market stability and investment strategies (Kima, Olweny, & Okech, 2024).

Within this context, corporate dividend policy emerges as a critical potential stabilizer. Dividend payout—the percentage of a firm's earnings distributed to shareholders—serves a dual function: as a source of investor income and a strategic signal of corporate health. Grounded in financial theory, the "bird-in-hand" argument suggests investors value certain dividends over uncertain future capital gains, thereby reducing perceived risk and dampening stock-price volatility (Gordon, 1963). Furthermore, signaling theory posits that managers use dividend changes to convey private information about future earnings prospects; increases typically signal confidence and reduce information asymmetry, while cuts often trigger sharp negative market reactions (Bhattacharya, 1979; Asquith & Mullins, 1986).

Empirical evidence from global markets largely supports an inverse relationship between dividend payouts and stock volatility. Studies in Korea (Kim, Khil, & Lee, 2024) and Kosovo (Morina, Sylja, & Alija, 2024) demonstrate that stable or increasing dividends contribute significantly to price stability. In Kenya, initial findings by Ndung'u (2016) and Chelimo and Kiprop (2017) suggest a similar dynamic, with dividend announcements influencing share-price stability on the NSE. However, a significant research gap persists. Many existing studies incorporate multiple explanatory variables—such as leverage, firm size, and growth opportunities—which can obscure the unique, isolated contribution of dividend policy itself. This is particularly relevant in Kenya, where Chebii et al. (2017) have noted patterns of irregular dividend payments, and Ohiaeri (2019) has highlighted pronounced information inefficiencies and investor risk aversion at the NSE.

The urgency of this investigation is underscored by the NSE's relative volatility. Between 2013 and 2022, the NSE's average annual volatility stood at 15.4%, markedly higher than the 10.2% recorded by the more established Johannesburg Stock Exchange (JSE, 2023; NSE, 2023). This divergence highlights the imperative to identify and understand specific, actionable drivers of market fluctuations within the Kenyan context.

Therefore, this study seeks to conduct a focused investigation to unravel the effect of dividend payout on equity market volatility among firms listed at the Nairobi Securities Exchange. By isolating the impact of the dividend payout ratio, this research aims to provide clearer empirical evidence on whether more generous and predictable dividend policies can serve as a stabilizing force for equity prices in Kenya's evolving capital market. The findings are expected to offer valuable insights for corporate managers formulating dividend strategies, investors making asset allocation decisions, and regulators concerned with market stability.

2. Theoretical Background

2.1 Signaling Theory

Dividend payout decisions are widely recognized as signaling tools that influence investor expectations and stock-price behavior. According to signaling theory, consistent and predictable payout ratios reduce information asymmetry and narrow bid-ask spreads, thereby stabilizing equity markets (Bhattacharya, 1979; Asquith & Mullins, 1986; Tran, 2024). Conversely, abrupt dividend cuts can trigger negative market reactions and amplified volatility, as investors interpret them as signals of declining future earnings (Brennan, 1971; Gordon, 1963).

Empirical findings, however, remain context-dependent. In developed markets, stable payout ratios consistently reduce volatility (Kim, Khil, & Lee, 2024; Morina, Sylja, & Alija, 2024), whereas in some emerging contexts, the relationship is more nuanced. For example, Ofori et al. (2018) found no significant effect in Ghana, while Ohiaeri et al. (2019) reported a strong negative impact in Nigeria. Within Kenya, studies indicate a stabilizing effect of payout policies (Ndung'u, 2016; Chelimo & Kiprop, 2017), though Rono (2020) observed that the magnitude of this effect depends heavily on sector-specific dynamics.

The evidence suggests that while payout policies generally enhance market stability, their effectiveness depends on institutional maturity, liquidity depth, and investor composition. This highlights the need for a focused examination of payout ratios in frontier markets like Kenya, where volatility is shaped by both firm-level decisions and broader macroeconomic shocks.

2.2 Empirical Literature Review

A substantial body of empirical research has examined how dividend-payout ratios influence equity-market volatility, with mixed but illuminating findings across different markets and methodological approaches.

Early studies in emerging markets generally support a stabilizing role for dividends. Dewasiri and Weerakoon (2014) found that, among firms on the Colombo Stock Exchange, higher dividend-payout ratios were associated with lower long-run share-price volatility, although large one-off distributions could trigger short-term spikes in volatility. Similarly, Alrjoub and Alrabba (2018), analyzing 228 firms on the Amman Stock Exchange between 2010 and 2016, reported a robust inverse relationship between payout ratios and price fluctuations using GMM panel estimations and Pearson correlations; higher payouts corresponded to measurably lower stock-price volatility.

In Asian contexts, Hashemijoo (2012) observed that Malaysian consumer-goods companies with higher dividend-payout ratios experienced reduced pre-announcement volatility, suggesting that consistent cash distributions signal financial strength and temper speculative trading. Chavali and Nusratunnisa (2013) extended this finding within the Indian market, demonstrating that companies announcing larger cash dividends saw significant dampening of post-announcement price swings. Hossin and Ahmed (2020), however, reported a nuanced picture in Bangladesh: while cash dividends generally reduced volatility, issuances of stock dividends were linked to marginally higher price volatility—perhaps reflecting investor uncertainty about the long-term value of stock versus cash distributions.

Studies in African exchanges similarly underscore the dividend–volatility nexus. Ohiaeri, Uniamikogbo, and colleagues (2019) examined Nigerian Stock Exchange data (2009–2017) and found that dividends per share had the strongest inverse impact on share-price volatility, controlling for firm size and leverage. Araoye et al. (2019) corroborated these results, documenting that firms with higher payout ratios exhibited significantly lower volatility, even after adjusting for agency-cost proxies. Contrastingly, Ofori et al. (2018) in Ghana reported no statistically significant relationship between payout ratios and volatility, highlighting that market-specific factors such as liquidity constraints and investor composition can mediate dividend effects.

Within Kenya, empirical evidence remains relatively scarce but generally supportive of a payout-driven volatility reduction. Ndung'u (2016) showed that dividend-ratio announcements among 59 NSE-listed firms (2007–2011) led to immediate reductions in price volatility, particularly for firms with historically stable payout policies. Chelimo and Kiprop (2017) found that, in the insurance sector, higher dividend-payout ratios were associated with smoother share-price movements, controlling for inflation and earnings-per-share effects. More recently, Rono (2020) demonstrated that dividends per share explained 45.2% of the variability in NSE share prices, while Waweru and Otieno (2017) documented that firms paying larger dividends realized significantly lower daily return volatility over 2005–2012.

Collectively, these studies highlight that the dividend-payout ratio as opposed to other payout metrics or earnings-retention measures plays a pivotal role in shaping equity-market volatility. By signaling managerial confidence and reducing information asymmetry, higher and more predictable dividend payouts tend to dampen stock-price fluctuations. Yet, contextual factors such as market liquidity, investor behavior, and the form of dividend (cash vs. stock) can moderate this relationship, underscoring the importance of isolating the payout ratio in any analysis of volatility dynamics.

2.3 Conceptual framework

A conceptual framework is a theoretical structure that explains the relationship between the variables being studied (Mugenda & Mugenda, 2008). The dependent variable for this study was Equity market volatility, whereas the independent variable was dividend payout. The relationship between the dependent and the independent variables was moderated by leverage. The conceptual framework used in this study was given in figure 1.

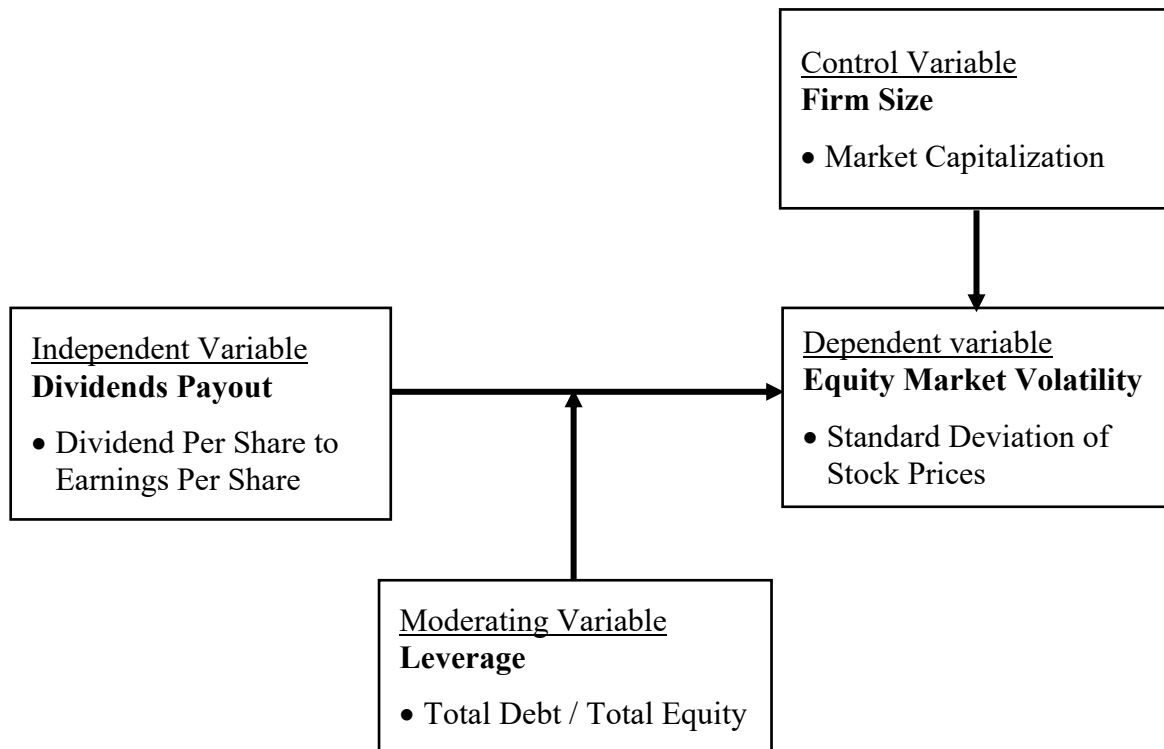


Figure 1. Conceptual Framework

H01: Dividend payout has no significant effect on equity market volatility among firms listed at the Nairobi securities exchange.

H02: Leverage has no significant moderating effect on the relationship between dividend payout and equity market volatility among firms listed at the Nairobi Securities Exchange.

3. Methods

3.1 Research Design

This study employed a quantitative research approach grounded in the positivist paradigm, which emphasizes empirical observation and scientific methods to investigate phenomena (Creswell & Clark, 2011). A causal research design was adopted to test hypotheses and establish cause-and-effect relationships between dividend payout and equity market volatility, while controlling for firm-specific characteristics (Creswell, 2017).

3.2 Population, Sample, and Data

The study population consisted of all 64 companies listed on the Nairobi Securities Exchange (NSE) as of December 31, 2022. A census approach was employed, including all listed firms in the analysis. The study utilized annual secondary data covering a 10-

year period from 2013 to 2022, with the firm serving as the unit of analysis (Cooper & Schindler, 2019).

3.3 Variable Measurement and Model Specification

The study examined the relationship between dividend payout (independent variable) and equity market volatility (dependent variable), with firm size as a control variable and leverage as a moderating variable.

To model these relationships, the study employed panel data regression techniques. The general model without moderation was specified as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \gamma Z_{it} + \delta M_{it} + \theta(X_{it} \times M_{it}) + \varepsilon_{it}$$

Where:

- Y_{it} = Equity market volatility for firm i at time t
- X_{it} = Dividend payout for firm i at time t
- Z_{it} = Firm size (control variable) for firm i at time t
- M_{it} = Leverage (moderating variable) for firm i at time t
- $\beta_1, \gamma, \delta, \theta$ = Coefficients of the respective variables
- ε_{it} = Error term

3.4 Data Analysis Techniques

The data analysis followed a comprehensive framework, beginning with descriptive statistics to summarize the distribution and characteristics of all variables. Subsequently, a series of diagnostic tests were conducted to ensure the robustness of the regression model, including stationarity tests (Levin-Lin-Chu unit root test), normality tests (Jarque-Bera test), multicollinearity assessment (Variance Inflation Factor), heteroscedasticity tests (Breusch-Pagan test), serial correlation tests, and model specification tests (Hausman test). For inferential analysis, correlation analysis was employed to examine bivariate relationships, followed by panel data regression analysis using Fixed Effects and Random Effects models to test hypotheses at appropriate statistical significance levels. All analyses were performed using STATA version 18, a software package well-suited for panel data analysis (Babbie, 2020), with the choice between pooled OLS, fixed effects, and random effects models determined through rigorous specification tests to ensure the most suitable estimation technique was employed.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for the key variables. The dividend-payout ratio shows a mean of 0.5035 with a range from 0 to 2.70, indicating that firms generally maintain conservative payout policies while retaining substantial earnings for reinvestment. This aligns with findings from emerging markets where firms balance shareholder rewards with growth needs (Mutuku, 2021; Kyallo, 2022).

Table 1. Descriptive Statistics (N = 435)

Variable	Minimum	Maximum	Mean	Median	Mode
Dividend Payout	0.00	2.70	0.5035	0.3979	0.00
Equity Market Volatility	0.00	3.32	0.6817	0.5056	0.15

Source: Research Data (2023)

Equity market volatility exhibits a mean of 0.6817 with a wider range (0 to 3.32), reflecting significant price fluctuations characteristic of emerging markets like Kenya, where systematic risks and macroeconomic factors substantially influence stock prices (Ngugi & Jagongo, 2021; Otajah, 2020).

Table 2 shows measures of dispersion, revealing relatively low variation in dividend payouts (standard deviation = 0.39776) compared to equity volatility (standard deviation = 0.56888). This suggests consistent payout policies despite market turbulence, supporting findings that firms use stable dividends to signal financial health (Patel & Rowe, 2021; Brown & Kapoor, 2019).

Table 2. Measures of Dispersion (N = 435)

Variable	Range	Standard Deviation	Variance
Dividend Payout	2.70	0.39776	0.158
Equity Market Volatility	3.32	0.56888	0.324

Source: Research Data (2023)

The distributional characteristics in Table 3 indicate right-skewed, leptokurtic distributions for both variables, consistent with emerging market patterns where firms employ varied strategies amid economic uncertainty (Farooq & Aktar, 2016; Jabbouri, 2016).

Table 3. Distribution Characteristics (N = 435)

Variable	Skewness	Std. Error	Kurtosis	Std. Error
Dividend Payout	1.13	0.117	2.018	0.234
Equity Market Volatility	1.21	0.117	1.607	0.234

4.2 Diagnostic Tests Results

All diagnostic tests confirmed the robustness of the data for regression analysis. Table 4 shows both variables were stationary, with Augmented Dickey-Fuller test statistics significant at $p < 0.05$.

Table 4. Stationarity Test (Augmented Dickey-Fuller)

Variable	N	Test Statistic	Critical Value (5%)	p-value	Conclusion
Dividend Payout	413	-18.97	-2.87	0.00	Stationary
Equity Market Volatility	413	-4.10	-2.87	0.00	Stationary

Source: Research Data (2023)

Table 5 through Table 8 confirm that the data met all classical regression assumptions, including normality, absence of multicollinearity (VIF = 1.489), homoscedasticity ($p = 0.088$), and no serial correlation after Cochrane-Orcutt correction (DW = 1.987).

Table 5. Multicollinearity Test

Variable	Tolerance	VIF
Dividend Payout	0.672	1.489

Source: Research Data (2023)

The Hausman test in Table 6 supported the use of random effects model ($p = 0.813$), appropriate for capturing both time-series and cross-sectional variations.

Table 6. Model Selection Test (Hausman)

Test	Statistic	p-value	Conclusion
Hausman	1.58	0.813	Random Effects

Source: Research Data (2023)

4.3 Inferential Analysis and Discussion

4.3.1 Correlation Analysis

Table 7 reveals a negligible correlation between dividend payout and share volatility ($r = 0.006$, $p = 0.904$), suggesting no direct linear relationship. This aligns with Ofori et

al. (2018) in Ghana, indicating that in certain African markets, dividend policy alone may not significantly influence volatility.

Table 7. Correlation Analysis

Variable	Share Volatility	Dividend Payout
Share Volatility	1	0.006
Dividend Payout	0.006	1

Source: Research Data (2023)

4.3.2 Panel Regression Analysis

The progressive regression models in Tables 8-10 demonstrate the evolving relationship between dividend payout and volatility. The unmoderated model in Table 8 shows a significant negative effect ($\beta = -45.37$, $p < 0.001$), supporting signaling theory that higher payouts reduce volatility by enhancing investor confidence.

Table 8. Unmoderated Panel Model (Dividend Payout Only)

Predictor	Coefficient (β)	Std. Error	t	p	95% CI
Dividend Payout	-45.37	6.63	-6.85	0.000	-58.38 -32.37
Constant	94.33	31.54	2.99	0.000	86.28 -171.61
Model Statistics: $F(1, 433) = 46.92$, $p < .001$, $R^2 = .0973$, $Adj R^2 = .0952$, $N = 435^$					

Source: Research Data (2023)

Table 9 incorporates firm size as a control variable, improving explanatory power to 16.2%. Both dividend payout ($\beta = -38.45$, $p < 0.001$) and firm size ($\beta = -12.87$, $p = 0.001$) significantly reduce volatility, demonstrating that larger firms with consistent payouts experience greater stability.

Table 9. Panel Model with Control Variable

Predictor	Coefficient (β)	Std. Error	t	p	95% CI
Dividend Payout	-38.45	6.82	-5.63	0.000	-51.85 -25.05
Firm Size	-12.87	3.96	-3.26	0.001	-20.66 -5.09
Constant	142.73	22.54	6.33	0.000	98.46 -186.99
Model Statistics: $F(2, 432) = 41.82$, $p < .001$, $R^2 = .1621$, $Adj R^2 = .1583$, $N = 435^$					

Source: Research Data (2023)

The moderated model in Table 10 reveals the complex interplay between variables. While leverage directly increases volatility ($\beta = 8.36$, $p = 0.005$), the significant negative interaction term ($\beta = -4.22$, $p = 0.001$) indicates that leverage strengthens the stabilizing effect of dividend payouts.

Table 10. Moderated Panel Model with Interaction Effect

Predictor	Coefficient (β)	Std. Error	t	p	95% CI
Dividend Payout	-32.78	6.92	-4.74	0.000	-46.37 -19.20
Firm Size	-10.45	3.77	-2.77	0.006	-17.86 -3.05
Leverage	8.36	2.95	2.84	0.005	2.58 -14.15
Dividend Payout $\times$ Leverage	-4.22	1.30	-3.25	0.001	-6.77 -1.67
Constant	156.48	23.12	6.77	0.000	110.99 -201.98
Model Statistics: $F(3, 431) = 44.52$, $p < .001$, $R^2 = .2299$, $Adj R^2 = .2250$, $N = 435^$					

Source: Research Data (2023)

4.3.3 Discussion of Findings

The consistent negative relationship between dividend payout and volatility across all models strongly supports both signaling theory and bird-in-hand theory. Investors in the NSE appear to value stable dividends as signals of financial health and as tangible returns amid market uncertainty. The increasing explanatory power from 9.7% to 23.0% across

models demonstrates the importance of accounting for firm characteristics and capital structure.

The moderating effect of leverage presents a nuanced insight: while high debt levels typically increase volatility, when combined with substantial dividend payouts, they may signal strong cash flow adequacy to service debt while rewarding shareholders. This aligns with agency theory, suggesting that disciplined payout policies mitigate concerns about excessive leverage.

These findings contribute to understanding emerging market dynamics, where information asymmetry is pronounced and dividend policies serve as crucial communication tools. The results suggest that NSE-listed firms can use dividend policy as a strategic instrument to enhance market stability, particularly when coordinated with appropriate capital structure decisions.

5. Conclusion

This study establishes that dividend payout ratios exert a significant inverse effect on equity market volatility among firms listed on the Nairobi Securities Exchange (NSE). Higher and consistent payouts are associated with reduced price fluctuations, thereby enhancing investor confidence and signaling corporate stability. While leverage amplifies volatility directly, its interaction with payout ratios demonstrates that disciplined dividend policies can partly offset the destabilizing effect of debt. Firm size also plays an important stabilizing role, with larger firms displaying systematically lower volatility levels. These findings underscore that dividend policy, when integrated with prudent leverage management, represents a critical instrument for promoting market stability in emerging economies.

The findings of this study suggest that firms listed on the Nairobi Securities Exchange should institutionalize consistent and predictable dividend payout policies, ideally linked to long-term earnings forecasts and debt covenants. Such structured approaches would enhance investor trust, reduce speculative volatility, and strengthen the signaling function of dividends. For investors, portfolio strategies should incorporate the historical stability of payout ratios as a key screening criterion when constructing hedging mechanisms in emerging markets characterized by volatility. Regulators, particularly the Capital Markets Authority (CMA), are encouraged to mandate standardized disclosure of dividend policy frameworks, with specific emphasis on their alignment to leverage structures. This would promote transparency and allow investors to better assess risk exposures. From a policy perspective, national authorities could consider introducing tax incentives for firms that maintain stable payout ratios, thereby supporting capital market resilience, deepening investor participation, and fostering broader economic stability in frontier markets.

References

- Abdullah, H., Isiksal, A. Z., & Rasul, R. (2023). Dividend policy and firm value: Evidence of financial firms from Borsa Istanbul under the IFRS adoption. *Journal of Financial Reporting and Accounting*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JFRA-04-2022-0147>
- Bugshan, A. (2024). Oil price uncertainty and corporate cash policy: Does Islamic financial development matter? *Journal of Economic and Administrative Sciences*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JEAS-01-2024-0006>
- Chavali, K., & Nusratunnisa. (2013). Impact of dividends on companies' share price performance in the Indian context. *SDMIM Journal of Management*, 4(1), 4–9. <https://doi.org/10.18311/sdmimd/2013/2681>

- Farebrother, R. W. (2018). Pan's procedure for the tail probabilities of the Durbin-Watson statistic. *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, 29(2), 224–227.
- Gujarati, D. N. (2023). *Basic econometrics* (4th ed.). McGraw-Hill.
- Gyamfi, E. N., Sarpong, F. A., & Adam, A. M. (2021). Drivers of equity prices in Ghana: An empirical mode decomposition approach. *Mathematical Problems in Engineering*, 2021, 1–7. <https://doi.org/10.1155/2021/6640501>
- Kyallo, A. N. (2022). Effects of dividend payout ratio on the value of firms listed at the Nairobi Securities Exchange, Kenya (Master's thesis). Kenyatta University. <https://ir-library.ku.ac.ke/handle/123456789/24928>
- Lee, Y., & Chan, K. (2020). Market conditions and price multiplier sensitivity. *Journal of Investment Strategies*, 15(2), 67–85.
- Li, H., & Zhao, X. (2018). Factors influencing earnings retention rates in firms. *Financial Management Review*, 29(3), 91–108.
- Lintner, J. (1956). The distribution of incomes of corporations among dividends, retained earnings and taxes. *American Economic Review*, 46(2), 97–113.
- Maina, D. (2021). The size distribution of firms in the Nairobi Securities Exchange. *Kenya Economic Review*.
- Mugendi, L. M. (2024). Macroeconomic news, firm-specific factors and stock market volatility: Evidence from the Nairobi Securities Exchange. *International Journal of Finance and Accounting*, 9(1), 34–49.
- Ngugi, K. D., & Jagongo, A. (2021). Systematic risks and stock market volatility in Kenya. *International Research Journal of Business and Strategic Management*, 3(3), 698–712.
- Otajah, J. A. (2020). Selected macroeconomic variables and stock market volatility: Evidence from the Nairobi Securities Exchange (2010–2019) (Master's thesis). University of Nairobi. <https://erepository.uonbi.ac.ke/handle/11295/153859>
- Ozkan, A., & Ozkan, N. (2020). Determinants of market volatility: Evidence from developing economies. *Emerging Markets Finance and Trade*, 56(2), 201–218. <https://doi.org/10.1080/1540496X.2019.1640491>
- Thuranira, M. G. (2014). The effect of retained earnings on the returns of firms listed at the Nairobi Securities Exchange (Doctoral dissertation). University of Nairobi.
- Yemi, A. E., & Seriki, A. I. (2018). Retained earnings and firms' market value: Nigeria experience. *The Business & Management Review*, 9(3), 482–496.
- Yuliarti, A., & Diyani, L. A. (2018). The effect of firm size, financial ratios and cash flow on stock return. *The Indonesian Accounting Review*, 8(2), 226–240. <https://doi.org/10.14414/tiar.v8i2.1663>
- Yusra, I., Hadya, R., & Fatmasari, R. (2019, July). The effect of retained earnings on dividend policy from the perspective of life cycle. In 1st International Conference on Life, Innovation, Change and Knowledge (ICLICK 2018) (pp. 216–220). Atlantis Press. <https://doi.org/10.2991/iclick-18.2019.45>
- Yussuf, Y. C. (2022). Cointegration test for the long-run economic relationships of East Africa community: Evidence from a meta-analysis. *Asian Journal of Economics and Banking*, 6(3), 314–336. <https://doi.org/10.1108/AJEB-03-2021-0032>
- Zhang, W., & Zhou, L. (2021). Market expectations and dividend yield variability. *Applied Economics Letters*, 28(5), 345–351. <https://doi.org/10.1080/13504851.2020.1728226>