Drivers of financial sustainability of individual pension schemes in Kenya

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ABSTRACT

This study sought to determine the drivers of the financial sustainability of individual pension schemes in Kenya. It, therefore, looked at the schemes through market timing, security selection, portfolio rebalancing, asset allocation, and market sentiments. The study applied the institutional theory, modern portfolio theory, and the capital market efficiency theory. Subsequently, this study adopted a pragmatic research philosophy and used a sequential explanatory mixed-methods design. The population of the study was 49 individual pension schemes registered by the RBA. This study used a census approach. A quantitative analysis was performed. Subsequently, data collection was done from 27th November to 27th December 2024. The Statistical Package for the Social Sciences (SPSS) Version 27 was utilised for statistical analysis. This study adopted a binary logit regression model. The findings of the study show that security selection, asset allocation, market timing strategies, portfolio rebalancing and market sentiment all had a significant and positive effect on the financial sustainability of individual pension schemes registered with the RBA. Security selection had a statistically significant positive effect on the financial sustainability of individual pension schemes in Kenya ($\beta = 0.620$, $p = 0.000$), indicating that a one-unit increase in security selection increases the log odds of financial sustainability by 0.620. Similarly, asset allocation showed a significant positive effect ($\beta = 0.430$, $p = 0.002$), with a one-unit increase associated with a 0.430 rise in log odds. Market timing also had a significant positive influence ($\beta = 0.360$, $p = 0.006$), implying a 0.360 increase in log odds per unit increase. Portfolio rebalancing demonstrated a significant positive effect as well ($\beta = 0.282$, $p = 0.004$), corresponding to a 0.282 increase in log odds. Lastly, market sentiment exhibited a strong significant positive effect ($\beta = 0.561$, $p = 0.000$), with each unit increase leading to a 0.561 rise in the log odds of financial sustainability. The model was significant ($p < 0.05$), with Nagelkerke R^2 values between 0.082 and 0.180, signifying moderate explanatory capacity. The findings emphasise the necessity of incorporating diverse investing methods to improve pension sustainability. Policy recommendations emphasise adopting effective security selection strategies, supported by training for fund managers. Market sentiment should be integrated into portfolio and risk models, while practice should focus on capacity building, market-timing tools, and sentiment analysis.

Keywords: Asset Allocation, Financial Sustainability, Market Sentiments, Market Timing, Portfolio Rebalancing, Pension Schemes, Security Selection

I. INTRODUCTION

Kenya's pension system is currently grappling with a severe crisis, underscored by significant gaps in contributions and payments (Ambani, 2024). The Retirement Benefits Authority (RBA) has raised concerns about the sustainability of the country's pension schemes, highlighting that only about 20% of Kenyans are covered by any form of pension, leaving the majority financially vulnerable in retirement. Despite transitioning from a defined benefit to a defined contribution model, several state-owned enterprises, such as Posta Kenya, continue to struggle to meet their pension obligations (Mathenge, 2023). By the end of the last financial year, outstanding employer contributions for pensions amounted to KSh 42.06 billion, with unremitted contributions alone totalling KSh 40.8 billion, excluding penalties (Retirement Benefits Authority [RBA], 2023). This growing deficit poses a direct threat to the financial sustainability of individual pension schemes, risking that some retirees may receive no pensions at all. Further, the Financial Sector Deepening (FSD) Kenya annual report has pointed to systemic inefficiencies and weak enforcement mechanisms as major contributors to the crisis. The situation is exacerbated by the National Treasury’s recent inability to remit pensions for civil servants during the first half of the 2023/24 financial year, leaving arrears of KSh 4.59 billion from May and June 2023. (Financial Sector Deepening [FSD], 2024)

This crisis coincides with projections from the National Treasury, estimating that approximately 85,400 public service workers will retire between 2024 and June 2026. Of these, about 30,155 were expected to leave in the financial year ending June 2024, with numbers gradually decreasing in subsequent years. The pension schemes are also contending with high volatility in the stock market and rising interest rates, which have negatively affected pension investments (National Treasury, 2024). According to the Central Bank of Kenya [CBK] report, the sector's exposure to market fluctuations has worsened due to instability in equity and bond prices. Major declines in capital markets were reported, with quoted equities dropping by 32.6 per cent and corporate bonds by 15.4 per cent. Capital markets were characterized by declines in equity and bond prices, with significant scale-downs by foreign investors and inactive corporate bond markets. This negatively impacted the returns on investment for the pension sector (CBK, 2024).

Several research gaps are evident in the existing literature. First, a contextual research gap exists where there is a growing body of work on global pension crises, research has not sufficiently explored the specific impact of liquidity constraints on Kenya's pension schemes, mainly how such constraints influence fund sustainability during large-scale retirements. Secondly, conceptual research gaps exist where studies; Atandi and Bosire (2023) and Mathenge (2023) have examined investment strategies, they do not sufficiently address the efficacy of current investment strategies regarding their financial returns for individual pension schemes in Kenya. Thirdly, a methodological research gap exists where many studies (Yakubu et al., 2023) rely on short-term or cross-sectional data, but there has been little to no longitudinal analysis of pension reforms or management practices. Lastly, knowledge research gaps exist where there is limited research on the systemic causes of large outstanding balances and unpaid contributions and the stability of contribution rates relative to liabilities (Arslan et al., 2020; Danso 2019; Waweru, 2022; Temba, 2025).

This study, therefore, addressed these research gaps by exploring the drivers of the financial sustainability of individual pension schemes in Kenya. The study addressed the theoretical and empirical literature gaps, by providing actionable insights to policymakers and fund managers seeking to stabilize pension contributions and improve long-term financial outcomes. The rest of the paper is organized as follows. Section 2 presents the literature review, covering theoretical foundations, empirical perspectives, and research questions development. Section 3 outlines the research methodology. Section 4 presents and discusses the empirical findings. Section 5 provides the conclusions, recommendations, and contributions of the study.

1.1 Research Objectives

The main objective of this study was to determine the drivers of the financial sustainability of individual pension schemes in Kenya.

The study was structured around the following specific objectives:

i. To assess the effect of market timing on the financial sustainability of individual pension schemes in Kenya.
ii. To examine the effect of security selection on the financial sustainability of individual pension schemes in Kenya.
iii. To investigate the effect of portfolio rebalancing on the financial sustainability of individual pension schemes in Kenya.
iv. To assess the effect of asset allocation on the financial sustainability of individual pension schemes in Kenya.
v. To examine the effect of market sentiment on the financial sustainability of individual pension schemes in Kenya.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Modern Portfolio Theory (MPT)

Modern Portfolio Theory was created by Harry Markowitz in 1952. The theory holds that investors behave as they attempt to avoid risk but, at the same time, endeavor to earn the highest possible return on their investment (Blay, 2024). MPT directly applies to the specific objectives of the study, particularly in understanding the effect of asset allocation and portfolio rebalancing on the financial sustainability of individual pension schemes in Kenya (Jones & Trevillion, 2022).

2.1.2 Institutional Theory

Institutional theory was developed by John Meyer and Brian Rowan (1977) and later expanded by Richard Scott (1995). This theory suggests that organizational behavior is shaped not only by efficiency and performance imperatives but also by the need to conform to societal and institutional expectations to gain legitimacy (Meyer & Höllerer, 2014). Institutional theory explains how financial sustainability and market sentiments are influenced by regulatory frameworks, cultural norms, and market dynamics (Lawrence & Shadnam, 2008).

2.1.3 Capital Market Efficiency Theory

Capital Market Efficiency (CME) Theory developed by Eugene Fama in 1970. This theory postulates that financial markets are “efficient” in incorporating all available information in the prices of financial assets (Erdem, 2020). CME theory offers a framework through which it is possible to analyse pension fund managers' and investors’ decisions regarding investment choices, entry and exit timings and portfolio management, in the light of prevailing market conditions (Soares, 2020).

2.2 Empirical Review

2.2.1 Effect of market timing on the financial sustainability of individual pension schemes

Empirical evidence on market timing presents mixed findings regarding its influence on pension scheme sustainability. Sievänen et al. (2017) find that market timing can improve short-term performance but requires active portfolio rebalancing to sustain benefits. Similarly, Parker and Sun (2025) report that market timing is effective under stable conditions but loses significance during financial volatility, though their findings lack applicability to Kenya. Oloruntoba and Ihiovi (2022) report a negative but statistically insignificant effect, highlighting methodological limitations in measuring market timing. In Uganda, Okech and Ogola (2023) show that market timing yields positive results during low inflation but negative outcomes during high inflation, emphasizing the importance of macroeconomic conditions, although this was not fully explored. In Kenya, Ondieki (2022) finds that market timing has minimal impact compared to asset allocation, though the study overlooked short-term market dynamics. Overall, the reviewed studies suggests that market timing has limited or context-dependent effects, with stronger outcomes when combined with portfolio rebalancing strategies. Based on the foregoing review and theoretical foundations, the following research question was formulated:

What is the effect of market timing on the financial sustainability of individual pension schemes in Kenya?

2.2.2 Effect of asset allocation on the financial sustainability of individual pension schemes

The literature consistently identifies asset allocation as a key determinant of pension fund sustainability, particularly through diversification strategies. Zhao and Sutcliffe (2021) find that multi-asset diversification enhances resilience during economic downturns in the UK, while Umar and Olson (2022) emphasize optimal long-term allocation strategies in South Africa, though without addressing external shocks. In Kenya, Ondieki (2022) shows that asset allocation accounts for a significant proportion (58%) of pension fund performance, but does not consider external economic influences. Atandi and Bosire (2023) extend this by incorporating liquidity and fund size as additional determinants of sustainability. Mwangi (2021) highlight the benefits of combining government securities, real estate, and equities, though they neglect global market effects. Similarly, Zaimovic et al. (2021) emphasize diversification across traditional and alternative assets, as well as regional cooperation, but do not examine global trends. Overall, while there is consensus on the centrality of asset allocation, studies differ in scope, with most overlooking external and global market dynamics, except for limited attention to regional interdependencies. Based on the foregoing review and theoretical foundations, the following research question was formulated:

What is the effect of asset allocation on the financial sustainability of individual pension schemes in Kenya?

2.2.3 Effect of security selection on the financial sustainability of individual pension schemes

The literature generally supports a positive relationship between security selection and pension scheme sustainability. Wang (2024) finds that active security selection enhances long-term sustainability in Chinese pension schemes, though findings are context-specific. Makochekanwa et al. (2024) report improved performance in Zimbabwe during economic recovery periods but do not account for external shocks. Oloruntoba and Ihiovi, (2022) identify security selection as a key predictor of sustainability in Nigeria, though with limited analytical depth. In Kenya, Waweru (2022) confirms that effective security selection improves returns, while LinLin (2024) highlight the role of ethical and diversified investments, albeit without considering macroeconomic influences. Despite contextual and methodological gaps, most studies agree that careful security selection enhances returns and reduces risk. However, contrasting views exist, with some scholars emphasizing active selection (Wang, 2024) and others highlighting diversification within passive strategies (Mwangi, 2021), while Makochekanwa et al. (2024) stress its varying importance across economic cycles. Based on the foregoing review and theoretical foundations, the following research questions was formulated:

What is the effect of security selection on the financial sustainability of individual pension schemes in Kenya?

2.2.4 Effect of portfolio rebalancing on the financial sustainability of individual pension schemes

Existing literature underscores the importance of portfolio rebalancing in enhancing pension scheme sustainability, though with notable contextual and conceptual gaps. Bikker et al. (2018) show that rebalancing behavior varies with market performance, with limited rebalancing during short-term equity gains leading to allocation shifts and increased risk exposure, particularly among larger funds; however, their findings are limited to Dutch schemes. Pan (2023) demonstrates that integrating portfolio rebalancing with market sentiment analysis improves decision-making and performance in South Africa, though the study lacks relevance to Kenyan contexts. In Kenya, Ondieki (2022) emphasizes asset allocation but does not explicitly address rebalancing, creating a conceptual gap on how periodic adjustments influence sustainability. Okoth (2024) highlight the need for continuous portfolio review and rebalancing to optimize returns and manage risk, although they overlook external shocks such as economic crises. Overall, the reviewed studies agree that rebalancing supports financial sustainability, with variations in focus on market asymmetry, strategic alignment, and the integration of sentiment analysis. Based on the foregoing review and theoretical foundations, the following research question was formulated:

What is the effect of portfolio rebalancing on the financial sustainability of individual pension schemes in Kenya?

2.2.4 Effect of market sentiment on the drivers of financial sustainability of individual pension schemes

The literature highlights market sentiment as an important determinant of pension fund sustainability, primarily through its influence on investment decisions and risk behavior. Yakubu et al., (2023) found that positive market sentiment enhances investor confidence and improves pension fund performance in Nigeria, though their findings are not directly applicable to Kenya due to regulatory differences. Dautaj (2023) shows that in European markets, positive sentiment encourages investment in higher-risk assets, while negative sentiment prompts shifts toward safer instruments. Similarly, Osina (2019) demonstrates that sentiment significantly shapes investment behavior during financial crises, though the global scope limits contextual relevance to Kenya. In the Kenyan context, Temba (2025) finds that market sentiment significantly affects property investment returns and valuations but does not examine its interaction with other key investment strategies, creating a conceptual gap. Makau (2021) confirm a strong relationship between market sentiment and investment performance in Kenyan pension schemes; however, their reliance on primary data limits analysis of long-term trends, presenting a methodological gap. Overall, the reviewed studies agree that market sentiment influences pension fund sustainability through its effect on risk-taking and asset allocation decisions, though gaps remain in long-term analysis and integration with other investment factors. Based on the foregoing review and theoretical foundations, the following research question was formulated:

What is the effect of market sentiment on the drivers of financial sustainability of individual pension schemes in Kenya?

III. METHODOLOGY

3.1 Research Design

This study employed a sequential explanatory mixed methods design. By employing this design, the study aims to determine the degree and direction of association between various strategies used by pension fund managers and the financial sustainability of individual pension schemes in Kenya. This approach is carefully chosen to align with the study's objectives.

3.2 Study Area

This study was carried out in Nairobi, Kenya. Nairobi was selected as the study area due to its central role in Kenya's financial and pension sectors. It hosts key institutions such as regulators, pension fund managers, and administrators, providing easy access to relevant data and stakeholders. As the country's main financial hub, Nairobi offers a dynamic environment where investment strategies like market timing, security selection, portfolio rebalancing, asset allocation, and market sentiment are actively applied, making it suitable for achieving the study objectives.

3.3 Target Population

The target population comprised 49 Individual retirement benefit schemes registered in Kenya as of December 2024 (RBA, 2024). This study adopted a census approach, so there was no sampling since the study's population was small (unit of analysis). Thus, five respondents were targeted per Individual pension scheme, comprising a Pension Manager, a Deputy Pension Manager, and three senior pension officers. Thus, the study's sample size was 245 respondents (unit of observation).

3.4 Sampling Procedure and Sample Size

This study adopted a census approach, so there was no sampling since the study's population was small. As per the RBA website, there are 49 Individual pension schemes in Kenya (unit of analysis). Thus, five respondents were targeted per Individual pension scheme, comprising a Pension Manager, a Deputy Pension Manager, and three senior pension officers. Thus, the study's sample size was 245 respondents (unit of observation).

3.5 Data Collection Instruments and Procedure

This study used both primary and secondary data. The primary data was collected through questionnaires distributed to pension fund managers in Kenya. The structured format, with predominantly closed-ended questions, was designed to accumulate quantitative data, which can be analysed using statistical tools to identify correlations between strategies and financial sustainability outcomes. The few open-ended questions were analysed qualitatively to provide additional insights and context, complementing the quantitative findings. The study also used secondary data to determine if retirement benefit schemes are financially sustainable or not. Financial statements were used to compute the asset/liability ratio (the higher, the better), which was used as a measure so that for each retirement pension scheme, the researcher first computed this ratio and also established the growth rate of the scheme to establish whether it was financially sustainable or not, by doing this the researcher converted the dependent variable (continuous data) that was derived from secondary sources over periods of 3years ranging from 2020 to 2023 frequencies so that it can be combined with other variables in the study, i.e. independent variable (categorical data) measured using Likert / ordinal scale, the dependent variable must be also in categories of whether a pension scheme was financially sustainable or not. This was recorded in a data collection sheet. Questionnaires were distributed and collected using a drop-and-pick method. The official financial statements were accessed from the individual retirement pension scheme head offices in Nairobi. Data collection was done from 27th November to 27th December 2024.

3.6 Data Analysis

This study employed a quantitative approach to analysing the collected data, which ensured a comprehensive understanding of the variables under study (Mulisa, 2022). The data underwent meticulous cleaning to facilitate comprehensive analysis and was organised within an MS Excel spreadsheet. Subsequently, Statistical Package for Social Science (SPSS) Version 27 was utilised for statistical analysis. Descriptive statistics, including the mean and median, were calculated to summarise the data. Additionally, inferential analysis which included correlation analysis and binary logit regression analysis were computed. Results were presented using tables, graphs, and charts. This study adopted a binary logit regression model as follows:

$$LN (P / 1 - P) = B0 + B1SS + B2AL + B3PR + B4MT + B5MS + e \quad \text{(i)}$$

P = probability that a pension scheme was financially sustainable, and 1-P = probability that a pension scheme was not financially sustainable (depending on the computation)
B0= Constant
B1= Coefficient for security selection
SS= Security Selection
B2=Coefficient for Asset Allocation
AL=Asset Allocation
B3=Coefficient for Portfolio Rebalancing
PR= Portfolio Rebalancing
B4=Coefficient for Market Timing
MT=Market Timing
B5=Coefficient for Market Sentiment
MS= Market Sentiment
e =Error Term

3.7 Ethical Consideration

The researcher remained keen on ethical considerations such as confidentiality, anonymity, privacy, and informed consent in carrying out this study. Permission from the participants was sought before involving them in the study, in this manner informing them of the rise of the study, what the study was all about, the processes to be undertaken, and freedom to withdraw at the participant's wish. Further, the conduct of the study was guided by the Strathmore University Institutional Scientific Ethics Review Committee. Permission to carry out the research, code of ethics approval and NACOSTI permit were obtained before the commencement of the study. Lastly, published, and unpublished materials used in the study were fully acknowledged by referencing to avoid chances of plagiarism.

IV. FINDINGS & DISCUSSION

4.1 Descriptive Statistics

Descriptive statistics highlighted that strategies like security selection (value investing and income investing), asset allocation (integrated and insured allocation), and market timing (buy low, sell high) were rated as highly effective by respondents. These strategies showed significant potential for optimizing financial sustainability by enhancing returns and managing risks effectively.

4.2 Regression Analysis

A binary logistic regression model was estimated to examine the effect of market timing, security selection, portfolio rebalancing, asset allocation, and market sentiment on the financial sustainability of individual pension schemes in Kenya. Financial sustainability was operationalized as a binary outcome based on firm growth and the asset-to-liability ratio. The goodness-of-fit tests were used to confirm the model's goodness of fit presented in Table 1.

Table 1
Model Fitness Test

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
439.812a	0.156	0.493

The overall model was statistically significant, as indicated by the likelihood ratio chi-square test ($p < 0.05$), suggesting that the set of explanatory variables jointly predicts the probability of financial sustainability. The researcher applied the Pearson and Deviance Chi-square tests presented in Table 2.

Table *2*
Pearson and Deviance Chi-square tests of Independence

Factor	Pearsons $\chi 2$ Value	df	P Value
Security Selection * Financial Sustainability	216.902	111	0.000
Asset Allocation * Financial Sustainability	104.561	61	0.000
Market Timing Strategies* Financial Sustainability	110.104	17	0.000
Portfolio Rebalancing* Financial Sustainability	161.302	53	0.000
Market Sentiments* Financial Sustainability	192.923	52	0.000

The findings in Table 2 showed that financial sustainability was dependent on all four factors of security selection, asset allocation, market timing, portfolio rebalancing and market sentiment tested at 5% significance levels. Further, the determination measures were established using the NagelKerke Pseudo-R Square, presented in Table 3.

Table 3
Measures of Determination

Model	NagelKerke R^2	Cox and Snell R^2	McFadden R^2
Security Selection * Financial Sustainability	0.180	0.129	0.084
Asset Allocation * Financial Sustainability	0.162	0.139	0.118
Market Timing Strategies* Financial Sustainability	0.104	0.093	0.049
Portfolio Rebalancing* Financial Sustainability	0.082	0.053	0.026
Market Sentiment* Financial Sustainability	0.135	0.063	0.031

The pseudo-R^2 statistics (Nagelkerke, Cox and Snell, and McFadden) indicate moderate explanatory power, which is acceptable in logistic regression models where values are typically lower than those observed in linear regression. The Nagelkerke R^2 values suggest that investment strategy variables contribute meaningfully to explaining variations in the likelihood of financial sustainability, though other institutional and macroeconomic factors not captured in the model may also play a role. Importantly, the pseudo-R^2 values are interpreted as measures of model improvement rather than proportions of variance explained. Table 4 presents the regression coefficients.

Table 4
Binary Logit Regression using Parameter Estimates

Step 1[a]	Estimate	Std. Error	Wald	df	Sig	95%CI Lower	Upper
Constant	0.211	0.051	27.190	1	0.590	0.394	0.804
Security Selection	0.620	0.081	20.520	1	0.000	0.670	1.390
Asset Allocation	0.430	0.290	87.012	1	0.002	1.630	2.402
Market Timing Strategies	0.360	0.216	4.590	1	0.006	0.406	1.205
Portfolio Rebalancing	0.282	0.203	3.910	1	0.004	0.324	1.126
Market Sentiment	0.561	0.208	2.390	1	0.000	1.602	2.091

Substituted coefficient estimates in the equation:
$LN (P / 1 - P) = 0.211 + 0.620SS + 0.430AL + 0.282PR + 0.360MT + 0.561MS + e$ ………....................................... (i)

From the results in Table 4, security selection driver had a coefficient of 0.620 which lies within the lower bound 0.670 and upper bound of 1.390. This implied that security selection had a significant positive effect on the financial sustainability of individual pension schemes in Kenya (p-value = 0.000). Further, for every unit increase in security selection, there was a predicted increase of 0.620 in the log odds of financial sustainability of individual pension schemes in Kenya. This aligns with the empirical findings of Bessembinder (2018) emphasize that effective security selection reduces idiosyncratic risk and enhances portfolio returns. Theoretical backing comes from Agency Theory, which posits that well-informed decision-making mitigates principal-agent conflicts, ensuring that fund managers' actions align with investors' interests. Similarly, Modern Portfolio Theory supports security selection to optimize risk-adjusted returns through carefully evaluating securities. (Aslan, 2023). The study corroborates findings from Waweru (2022), who established a significant positive link between security selection and financial performance, However, fundamental analysis was rated the least effective method, highlighting a gap in its practical application within Kenya's pension schemes. This underscores the importance of customized approaches, like active and qualitative analysis, which respondents rated highly.

Asset allocation driver had a coefficient of 0.430 which lies within the lower bound 1.630 and upper bound 2.402. This implied that asset allocation had a significant positive effect on financial sustainability of individual pension schemes in Kenya (p-value = 0.002). Further, for every unit increase in asset allocation, there was a predicted increase of 0.430 in the log odds of financial sustainability of individual pension schemes in Kenya. The findings are consistent with prior studies, such as Al-Aradi and Jaimungal (2018), which argue that asset allocation accounts for most long-term portfolio performance. This empirical evidence reinforces the role of diversification, a cornerstone of Modern Portfolio Theory, in managing systemic risk while maximizing returns. Furthermore, Capital Market Efficiency Theory underlines the need for effective asset allocation to navigate efficiently priced markets, ensuring that resources are distributed optimally across asset classes. (Jensen & Meckling, 1976). Capital Market Efficiency Theory (CME) reinforces the importance of asset allocation by suggesting that efficiently priced markets require optimal resource distribution across asset categories to achieve financial sustainability (Erdem, 2020). The findings are consistent with Irfan and Lau (2024), who demonstrated a positive relationship between asset allocation and pension fund performance. However, the low use of Dynamic and Insured Asset Allocation indicates a preference for financial sustainability over reactive strategies, which might reflect behavioral biases or limited technical capacity to implement such strategies effectively.

Market timing driver had a coefficient of 0.360 which lies within the lower bound 0.406 and upper bound of 1.205. This implied that market timing had a significant positive effect on the financial sustainability of individual pension schemes in Kenya (p-value = 0.006). Further, for every unit increase in market timing, there was a predicted increase of 0.360 in the log odds of financial sustainability of individual pension schemes in Kenya. The findings are consistent with prior research by Hidayat (2024), which established that while market timing can enhance short-term performance, it is challenging to execute consistently due to informational inefficiencies and behavioral biases. Capital Market Efficiency Theory critiques the feasibility of market timing by suggesting that markets already reflect all available information, reducing the potential gains from timing strategies. (Jones & Trevillion, 2022). The findings also highlight the influence of behavioral finance, which intersects with agency dynamics, by emphasizing how market participants' sentiment and psychology affect timing effectiveness. This finding supports Muhanguzi (2021), who demonstrated a statistically significant relationship between market timing and pension performance. However, it contradicts Oloruntoba and Ihiovi (2022), who found market timing had an insignificant negative effect in Nigeria. These disparities highlight the influence of local economic contexts and market dynamics on the strategy's effectiveness.

Portfolio rebalancing driver had a coefficient of 0.282 which lies within the lower bound 0.324 and upper bound of 1.126. This implied that portfolio rebalancing had a significant positive effect on the financial sustainability of individual pension schemes in Kenya (p-value = 0.004). Further, for every unit increase in portfolio rebalancing, there was a predicted increase of 0.282 in the log odds of financial sustainability of individual pension schemes in Kenya. This result aligns with studies such as Şerban (2025), which argue that rebalancing mitigates portfolio drift and aligns investments with long-term goals, particularly during market volatility. Modern Portfolio Theory supports rebalancing as essential for maintaining the desired risk-return profile by reallocating assets in response to changing market conditions. (Jones & Trevillion, 2022). The findings align with Ondieki (2022), who attributed 58% of pension firm performance to rebalancing strategies. However, Calendar and Constant Proportion Rebalancing were rated less effective, possibly due to challenges in execution or lack of adaptability to volatile markets.

Market sentiment had a coefficient of 0.561 which lies within the lower bound of 1.602 and upper bound of 2.091. This implied that market sentiment had a significant positive effect on the financial sustainability of individual pension schemes in Kenya (p-value = 0.000). Further, for every unit increase in market sentiment, there was a predicted increase of 0.561 in the log odds of the financial sustainability of individual pension schemes in Kenya. This finding corroborates research of Thomas and Kumar (2025), which underscore the pivotal role of sentiment in influencing investment decisions, especially during periods of market turbulence. Although Capital Market Efficiency Theory suggests that prices already incorporate collective sentiment, Modern Portfolio Theory also supports the findings (Aslan, 2023). This study advances the conversation by emphasizing the behavioral dynamics of market sentiment in influencing financial outcomes. These findings further concur with the findings of Atandi and Bosire (2023) examined the financial sustainability of individual pension schemes in Kenya, finding that portfolio mix and fund size had a significant impact on sustainability. They also noted a positive correlation between liquidity, operating costs, and financial sustainability. Similarly, these findings concur with the findings of Nduruhu (2019) that pension fund management practices such as financing, investment management, and financial control significantly impact performance. Conversely, these findings do not concur with the findings of Makau (2021) found no significant relationship between capital structure and pension firm performance, suggesting that financial sustainability does not necessarily correlate with pension firm growth and performance.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study concludes that security selection, asset allocation, portfolio rebalancing, and market timing have a positive and significant effect on financial sustainability of individual pension schemes in Kenya.

5.2 Recommendations

The study recommends that regulatory bodies, particularly the Retirement Benefits Authority (RBA) and the Government of Kenya, strengthen policy enforcement to enhance the financial sustainability of individual pension schemes. Special emphasis should be placed on ensuring the timely and full remittance of pension contributions by both private and public employers, as well as self-employed individuals, through stricter monitoring and penalties for non-compliance. Addressing the prevalent issue of underfunding, the government and regulators should introduce and enforce minimum funding ratios, ensuring that pension schemes maintain adequate reserves to meet future obligations even during economic downturns. Furthermore, regulatory frameworks should be continuously reviewed and updated to account for evolving market conditions, allowing pension schemes greater flexibility in investment options. Encouraging diversified investment across equities, property, government securities, and alternative assets, along with the adoption of advanced investment strategies, will help mitigate risks associated with market volatility, inflation, and other economic uncertainties.

From a theoretical perspective, the study finds that Modern Portfolio Theory (MPT) and Institutional Theory provide a useful foundation for understanding the determinants of pension scheme sustainability. However, these frameworks require adaptation to better reflect the unique dynamics of pension fund management in emerging economies like Kenya. For example, incorporating dynamic investment strategies such as market timing and portfolio rebalancing would improve MPT's practical relevance in turbulent markets. Additionally, both theories need to account for local market inefficiencies, regulatory challenges, and external economic shocks, which are more pronounced in Kenya compared to developed economies. Contextualizing these theories ensures that they are more applicable to local decision-making and better capture the challenges faced by pension schemes in developing countries.

In practice, individual pension scheme managers should embrace technology and predictive analytics platforms to enhance investment decision-making and improve fund performance. Tools such as Bloomberg Terminal, Refinitiv, and sentiment analysis software can provide real-time insights into market trends and investor behavior, enabling managers to optimize market timing and make informed buying or selling decisions. Strengthening security selection through active management, income-focused, and value-based investment strategies is also critical to achieving long-term financial sustainability. Managers should implement disciplined portfolio rebalancing techniques to realign asset allocation with market changes and maintain an optimal balance between risk and return. Incorporating strategic and integrated asset allocation frameworks can further improve fund resilience and growth, ensuring that investment decisions align with the scheme's objectives and risk appetite.

The study also emphasizes the need for further research to evaluate the long-term effects of investment strategies on pension fund sustainability across different economic cycles. Future studies should explore how macroeconomic factors such as inflation, interest rates, and geopolitical events influence the effectiveness of strategies like market timing, security selection, portfolio rebalancing, and asset allocation. Such research would provide a more comprehensive understanding of how external economic conditions interact with investment decisions to shape the financial sustainability of pension schemes, particularly in emerging markets. By addressing these gaps, future studies can contribute to more effective policies, theoretical models, and practical strategies tailored to the specific challenges faced by pension schemes in Kenya.

REFERENCES

Al-Aradi, A., & Jaimungal, S. (2018). Outperformance and tracking: Dynamic asset allocation for active and passive portfolio management. *Applied Mathematical Finance, 25*(3), 268–294. https://doi.org/10.1080/1350486X.2018.1507751

Ambani, B. (2024, April 8). State defaults on pension remittance for six months. *Business Daily.* https://www.businessdailyafrica.com/bd/economy/state-defaults-on-pension-remittance-for-six-months--4582196#google_vignette

Arslan, A., Qayyum, A., & Niazi, M. (2020). Determinants of financial sustainability and growth: An analysis of Turkish pension schemes. *International Journal of Management, 11*(10), 857–875. https://www.academia.edu/download/65212905/IJM*11*10_080.pdf

Aslan, R. G. (2023). Agency problems in the private pension system of Turkey: Pension sector employee perspectives. *Qualitative Research in Financial Markets, 15*(1), 142–159. https://www.emerald.com/insight/content/doi/10.1108/QRFM-07-2021-0120/full/html

Atandi, D. M., & Bosire, J. (2023). Firm-specific factors and financial sustainability of pension schemes in Kenya. *International Academic Journal of Economics and Finance, 3*(9), 79–120. http://iajournals.org/articles/iajef*v3*i9*79*120.pdf

Bessembinder, H. (2018). Do stocks outperform treasury bills? *Journal of Financial Economics, 129*(3), 440–457. https://doi.org/10.1016/j.jfineco.2018.06.004

Bikker, J. A., Broeders, D., & de Dreu, D. (2018). Stock market performance and pension fund investment policy: Rebalancing, free float, or market timing. *International Journal of Central Banking.* https://dspace.library.uu.nl/handle/1874/31455

Blay, K. A. (2024). From portfolio selection to portfolio choice: Remembering Harry Markowitz. *Journal of Portfolio Management, 50*(8), 45. https://doi.org/10.3905/jpm.2024.50.8.045

CBK. (2024). *2024 FinAccess Household Survey.* Central Bank of Kenya. https://www.centralbank.go.ke/wp-content/uploads/2024/12/2024-FINACCESS-HOUSEHOLD-SURVEY-MAIN-REPORT.pdf

Danso, A. L.-A. (2019). Market sentiment and firm investment decision-making. *International Review of Financial Analysis, 66*, 101369. https://www.sciencedirect.com/science/article/pii/S105752191830766X

Dautaj, E. (2023). Exploring the relationship between corporate social responsibility and firm value: The role of market volatility and investor sentiment. SSRN. https://ssrn.com/abstract=4508723 or http://dx.doi.org/10.2139/ssrn.4508723

Erdem, O. (2020). After the crash: Understanding the social, economic and technological consequences of the 2008 crisis. In *Springer Nature.* https://doi.org/10.1007/978-3-030-43343-7_1

FSD. (2024). *Annual report: Financial Sector Deepening Kenya.* https://www.fsdkenya.org/annual-reports/2024-annual-report/

Hidayat, M. (2024). Assessing market efficiency and behavioral anomalies in financial markets. *Economics and Digital Business Review, 5*(2), 237–246. https://ojs.stieamkop.ac.id/index.php/ecotal/article/view/3369

Irfan, M., & Lau, W. (2024). Asset allocation and performance of Malaysian civil service pension fund. *Australasian Accounting, Business and Finance Journal, 18*(1), 86–107. https://doi.org/10.14453/aabfj.v18i1.06

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360. https://www.taylorfrancis.com/chapters/edit/10.4324/9781315191157-9/theory-firm-managerial-behavior-agency-costs-ownership-structure-michael-jensen-william-meckling

Jones, C., & Trevillion, E. (2022). Portfolio theory and property in a multi-asset portfolio. In *Real Estate Investment: Theory and Practice*. Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-031-00968-6_7

Lawrence, T. B., & Shadnam, M. (2008). Institutional theory. In W. Donsbach (Ed.), *The International Encyclopedia of Communication*. https://doi.org/10.1002/9781405186407.wbieci035

LinLin, L. (2024). Examining macroeconomic policies and their impact on corporate finance: A comparative assessment of developed and emerging economies. *International Journal of Economics and Finance Studies, 16*(3), 365–388. https://orcid.org/0009-0001-7999-0910

Makau, M. M. (2021). Macro risk factors, investor sentiments and performance of equity market at Nairobi Securities Exchange, Kenya [Doctoral dissertation, Kenyatta University]. https://ir-library.ku.ac.ke/bitstream/123456789/22733/1/Macro%20Risk%20Factors.....pdf

Makochekanwa, A., Cheure, C., Chundu, M., & Mavodyo, E. (2024). Informal sector self-employed workers' old age pension scheme in retail sector in Zimbabwe. *Journal of Social Development Studies, 5*(1), 31–42. https://doi.org/10.22146/jsds.12026

Mathenge, E. (2023). Challenges for responsible investment in the retirement benefits sector of Kenya [Doctoral dissertation, University of Wellington]. https://openaccess.wgtn.ac.nz/articles/thesis/Challenges*for*Responsible*Investment*in*the*retirement*benefits*sector*of*Kenya_/14343437

Meyer, R. E., & Höllerer, M. A. (2014). Does institutional theory need redirecting? *Journal of Management Studies, 51*(7), 1221–1233. https://onlinelibrary.wiley.com/doi/abs/10.1111/joms.12089

Muhanguzi, K. B. (2021). Pensions and timing of retirement: The case of the public service pension scheme in Uganda. SSRN. https://ssrn.com/abstract=3874784

Mulisa, F. (2022). When does a researcher choose a quantitative, qualitative, or mixed research approach? *Interchange, 53*(1), 113–131. https://link.springer.com/article/10.1007/s10780-021-09447-z

Mwangi, A. W. (2021). Effect of credit management on asset quality of microfinance institutions in Nairobi Metropolitan [Doctoral dissertation, KCA University]. https://scholar.google.com/scholar?hl=en&as*sdt=0%2C5&as*ylo=2017&as_yhi=2025&q=Mwangi%2C+A.+W.+%282021%29.

National Treasury. (2024, July 10). Pensions – The National Treasury. https://www.treasury.go.ke/sites/default/files/Circulars/Treasury-Circular-No.-9-of-2024-on-public-sector-schemes-10.7.2024-updated.pdf

Nduruhu, D. K. (2019). Influence of financial management practices on sustainability of pension funds administrative institutions in Kenya [Doctoral dissertation, JKUAT-COHRED]. http://hdl.handle.net/123456789/5032

Okech, B. B., & Ogola, N. D. (2023). Public financial management in Africa. In *Handbook of Public Management in Africa* (pp. 131–150). Edward Elgar Publishing. https://doi.org/10.4337/9781803929392.00021

Okoth, D. O. (2024). Influence of resource allocation management strategies on performance of county governments in Kenya: A study of Migori County [Doctoral dissertation, Kisii University]. http://repository.kisiiuniversity.ac.ke:8080/xmlui/handle/123456789/9980

Oloruntoba, A. D., & Ihiovi, J. O. (2022). Financial sustainability and pension fund performance in Nigeria: The effects of inflation rates. *UMYU Journal of Accounting and Finance Research, 2*(2), 54–67. https://doi.org/10.61143/umyu-jafr.2(2)2021.004

Ondieki, N. W. N. (2022). Retirement fund characteristics and financial performance of pension schemes in Kenya [Master's thesis, Kenyatta University]. https://ir-library.ku.ac.ke/server/api/core/bitstreams/7cd75ddd-6f1b-48c6-91e5-78e7d08f6545/content

Osina, N. (2019). Global liquidity, market sentiment, and financial stability indices. *Journal of Multinational Financial Management, 52–53*, 100606. https://doi.org/10.1016/j.mulfin.2019.100606

Pan, A. J. (2023). Optimal asset allocation model for South African life insurance companies [Doctoral dissertation, University of Johannesburg]. https://www.proquest.com/openview/f93f75bc87a13e37fe0cc13b40f2b46f/1?pq-origsite=gscholar&cbl=2026366&diss=y

Parker, J. A., & Sun, Y. (2025). Target date funds as asset market stabilizers: Evidence from the pandemic. *Journal of Pension Economics and Finance, 24*(1), 183–208. https://doi.org/10.1017/S1474747223000197

RBA. (2024). *Annual report 2023–2024.* https://www.rba.go.ke/download/annual-report-2023-2024/

Şerban, F. (2025). Sustainable portfolio rebalancing under uncertainty: A multi-objective framework with interval analysis and behavioral strategies. *Sustainability, 17*(13), 5886. https://doi.org/10.3390/su17135886

Sievänen, R., Rita, H., & Scholtens, B. (2017). European pension funds and sustainable development: Trade-offs between finance and responsibility. *Business Strategy and the Environment, 26*(7), 912–926. https://doi.org/10.1002/bse.1954

Soares, D. B. (2020). How to do the nature and the structure of information affect the optimal pricing algorithm to guarantee market efficiency and minimize fundamental prices volatility? [Doctoral dissertation, Normandie Université]. https://theses.hal.science/tel-03361803/

Temba, G. I. (2025). Government securities trading and liquidity dynamics of commercial banks in Tanzania. *The Accountancy and Business Review, 17*(1), 11–24. https://doi.org/10.59645/abr.v17i1.570

Thomas, K. V., & Kumar, K. S. (2025). Investor sentiment and stock market volatility: A behavioral finance perspective. *GS WOW: Wisdom of Worthy Research Journal, 4*(1), 37–50. https://orcid.org/0009-0003-6601-5838

Umar, Z., & Olson, D. (2022). Strategic asset allocation and the demand for real estate: International evidence. *Empirical Economics, 62*(5), 2461–2513. https://doi.org/10.1007/s00181-021-02090-8

Wang, Y. (2024). Government accountability and pension fund financial sustainability: Evidence from China's local institutions. SSRN. https://ssrn.com/abstract=5071587 or http://dx.doi.org/10.2139/ssrn.5071587

Waweru, M. M. (2022). Effect of service provider costs on financial performance of defined contribution pension schemes in Kenya [Doctoral dissertation, University of Nairobi]. http://erepository.uonbi.ac.ke/handle/11295/162501

Yakubu, S., Muritala, T. A., Abubakar, H. L., Bakare, A. A., Yusuf, W. A., & Afolabi, H. O. (2023). How does pension funds impact stock market development? An empirical analysis from Nigeria using ARDL technique. *Open Journal of Social Sciences, 11*(9), 575–600. https://www.academia.edu/download/111070794/Pension*fund*and*stock*market.pdf

Zaimovic, A., Omanovic, A., & Arnaut-Berilo, A. (2021). How many stocks are sufficient for equity portfolio diversification? A review of the literature. *Journal of Risk and Financial Management, 14*(11), 551. https://doi.org/10.3390/jrfm14110551

Zhao, Z., & Sutcliffe, C. (2021). What determines the asset allocation of defined benefit pension funds? *Applied Economics, 53*(36), 4178–4191. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5071587