SCHOOL OF POSTGRADUATE STUDIES

OPTIMIZING PORTFOLIO PERFORMANCE ON THE LUSAKA STOCK EXCHANGE: AN EMPIRICAL ANALYSIS USING MARKOWITZ'S MODERN PORTFOLIO THEORY

A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES UNIVERSITY OF LUSAKA IN PARTIAL FULFILLMENT OF THE AWARD OF THE MASTER OF SCIENCE IN ACCOUNTING AND FINANCE.

BY

MASUZYO NGULUBE

MSCAFIN22217005

Declaration

I, Masuzyo Webster Ngulube, I hereby affirm that the content showcased in this thesis, titled “Optimizing Portfolio Performance on the Lusaka Stock Exchange: An Empirical Analysis using Markowitz’s Modern Portfolio Theory”, I solemnly affirm that the entirety of this dissertation is composed solely of my own efforts, unless specified otherwise as supervised by Mr. Brian Chonya.

The contents reflect my understanding and interpretation of the subject matter. I have appropriately acknowledged and referenced all the external sources utilized in accordance with the prescribed academic norms and referencing style outlined in the provided guidelines by the University of Lusaka.

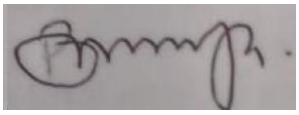
Any direct quotations, paraphrases, or ideas taken from other sources have been acknowledged appropriately using in-text citations and a comprehensive bibliography. The data, findings, and conclusions articulated in this thesis are precise and dependable to the utmost extent of my understanding and capabilities. The research performed for this dissertation has been conducted in strict adherence to the ethical principles and regulations established by the University of Lusaka.

Author’s Signature: 

Masuzyo Webster Ngulube

Date: 08/01/2025

I hereby declare that the presentation and preparation of this dissertation were supervised in accordance with the guidelines on supervision set forth by the University of Lusaka.

Supervisor’s Signature: 

Mr Brian Chonya

Dedication

To my loving Mother and Late Father, this dissertation is dedicated to the two pillars of my life: my late father, Webster Raphael Ngulube, and my supportive mother, Monica Ella Phiri. Without your unwavering love, guidance, and encouragement, this journey would not have been possible.

To my dear late father, though you are no longer physically present, your memory and values you instilled in me continue to inspire and guide me every step of the way. Your belief in the power of education and relentless pursuit of knowledge have been the driving force behind my academic achievements. Your memory will forever live on in my heart, and this dissertation stands as a tribute to your enduring legacy.

To my beloved mother, your unwavering love, sacrifices, and belief in my potential have been the foundation of my strength. Your continuous encouragement and support have been my guiding light throughout this academic endeavour. Your presence in my life is an invaluable blessing, and I dedicate this achievement to you with heartfelt gratitude and admiration.

This dissertation is a testament to the love and inspiration I have received from both of you. Your belief in my abilities has been my motivation to strive for excellence in all that I do. I am forever grateful for the countless sacrifices you have made to ensure my happiness and success.

Thank you for being my guiding stars, my source of strength, and my greatest cheerleaders. This accomplishment is as much yours as it is mine. May my work reflect the love and support that you have bestowed upon me.

With all my love and appreciation.

Acknowledgements

I would like to express my heartfelt appreciation to Mr Brian Chonya, my supervisor, for his unwavering patience, exceptional assistance, and invaluable direction through my dissertation expedition. His expertise and mentorship have been crucial in helping me meet the highest standards of academic excellence. I am truly grateful for his dedication and commitment to my success. Thank you, Sir.

I am sincerely thankful to my family, who have been my pillar of strength throughout this endeavour. To my loving partner, Chilombu Hanna Kaluwasha, your unwavering support, understanding, and encouragement have been my constant motivation. To my family, and my dear friends, your unwavering belief in me and your unceasing support have meant the world to me. I am truly grateful for your presence in my life.

Above all else, I want to direct my deepest gratefulness to the LORD GOD ALMIGHTY for His boundless grace and compassion. His guidance and blessings have been the source of my strength and perseverance throughout this journey. I am humbled and thankful for His unwavering presence in my life.

Once again, I extend my sincerest appreciation to all those who have supported and encouraged me along the way. Your belief in me has been instrumental in my achievements.

Table of Contents

List of Figures

List of Tables

Acronyms & Abbreviations

LuSE: Lusaka Securities Exchange

MPT: Modern Portfolio Theory

LASI: LuSE All Share Index

IFC: International Finance Corporation

ZPTF: Zambia Privatization Trust Fund

BOZ: Bank of Zambia

NSE: Nairobi Securities Exchange

JSE: Johannesburg Stock Exchange

ROI: Return on Investment

KLCI: Kuala Lumpur Composite Index

S&P 500: Standard & Poor's 500 Index

N225: Nikkei 225 Index

DEA: Data Envelopment Analysis

CAPM: Capital Asset Pricing Model

EMH: Efficient Market Hypothesis

ABSTRACT

This research aimed at establishing how the Modern Portfolio Theory of Markowitz could be applied and the effects on the portfolio optimisation of the Lusaka Stock Exchange (LuSE). More specifically, the objectives were to explore the characteristics of the original data on the relationship between risk and return on assets, to correctly allocate the optimal weights of assets, and finally, to compare the risk adjusted return of such MPT optimized portfolios with some portfolios that were not optimized in any way. A non-experimental quantitative correlational research design was adopted. A total of 21 respondents out of the 22 listed companies of the LuSE were interviewed using a structured questionnaire on investors practice and perception.

Lack of statistical significance notwithstanding, the study evidenced moderate positive relationship between historical returns in LuSE and voltality analysis among investors. The frequency of its use depended positively on familiarity with MPT and any application of it brought better portfolio results. As evident as it is MPT also optimized portfolios had higher risk return characteristics then non optimized portfolios even where relative extensive use was not made of sophisticated measures such as the Sharpe ratio.

The former checks the soundness of the theoretical framework of the MPT and reassures the applicability of the MPT to portfolio selection. However, the essentially low levels of investor education as well as the weak base performance indicators approving the use of indicators can be considered as a drawback. These include risk adjusted metrics of more sophistication, enhancing usability of analytical instruments used in the portfolio, enhancing the knowledge of the investor, and exercising regular rebalancing in the portfolio.

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.0 Introduction

The performance of the investment portfolios is a critical concern for investors, especially in emerging markets like Zambia. With the development of the Lusaka Securities Exchange, the need for appropriate portfolio management strategies will also increase. Modern Portfolio Theory by Harry Markowitz, which was introduced in 1952, presents a method for determining the optimal combination of assets that maximizes returns for a given level of risk or minimizes risk for a given level of return (Markowitz, 1952). The present research, therefore, investigates the relevance and effectiveness of MPT in optimizing portfolio performance on the Lusaka Stock Exchange to shed light on how investors can construct a portfolio that maximizes returns with controlled risks in the volatile Zambian market.

The research background of the LuSE will be set forth, with trends and growth statistics thrown in and the challenges facing investors. It discusses here the evolution of the exchange, how it has fared, especially in terms of shocks, and thirdly, some important gaps in the current portfolio management practices. The paper proceeds with the background to this study, explaining the gradual development of LuSE and the place of MPT in portfolio optimization. This is followed by the problem statement, which justifies the purpose of this study and the gap it intends to fill. Next come the objectives of the research, its significance, and the scope and limitations.

1.1 Background

Incorporated in 1993, the Lusaka Securities Exchange (LuSE) played a key role in the economic changes of Zambia that aimed to move the economy away from state management and toward greater private sector ownership. Backed by the International Finance Corporation (IFC) and the World Bank, the initiative has resulted in an important change in Zambia's economic architecture, especially following the country's initiative to privatize state-owned enterprises. There was a perception around LuSE that it would help Zambians by allowing them to create wealth and motivating them to engage in the economy via equity holding (Marone, 2003). The 1993 Securities Act No. 38 created a

legal basis for LuSE to manage activities in securities trading, including stocks and bonds (LuSE, 2022).

At the outset, the LuSE played an important role in Zambia's era after privatization by permitting citizens to purchase shares in formerly state-owned companies via the Zambia Privatization Trust Fund (ZPTF). This initiative played a key role in sustaining local involvement in the economy through a time of important structural transformation. Since that time, LuSE has systematically expanded in both size and importance, reaching 22 companies listed on the exchange by the end of 2023 (LuSE, 2024). In the past years, LuSE has become a major force in Zambia’s capital markets, facilitating opportunities for investors to take part in wealth creation through equity and debt securities.

The Zambian economy faces several macroeconomic challenges that significantly influence the investment climate and the performance of the LuSE. Firstly, the economy is heavily reliant on copper exports, making it susceptible to fluctuations in global commodity prices (Liebenthal & Cheelo, 2020). A decline in copper prices can negatively impact government revenue, foreign exchange earnings, and overall economic growth, leading to increased volatility in the LuSE. Secondly, exchange rate volatility poses a significant risk. The Zambian Kwacha is susceptible to fluctuations against major currencies like the US Dollar (Mwansa, 2020). These exchange rate fluctuations can impact the profitability of businesses, increase import costs, and influence investor confidence, creating uncertainty and impacting market performance. Furthermore, the Zambian economy is vulnerable to external shocks, such as global economic downturns, changes in global interest rates, and geopolitical events. These external factors can significantly impact investor sentiment and market volatility on the LuSE.

Despite economic challenges from outside, in the last few years, LuSE has turned in remarkable results, even in the face of the global impacts of the COVID 19 pandemic. In Q4 of 2023, LuSE All Share Index (LASI) increased by 16% from the level of 9,313.30 points to 10,828.18 points (LuSE, 2024). However, the impressive development of LASI suggests that Zambia’s stock market is robust, in spite of global economic difficulties (LuSE, 2024). The domestic market capitalization also saw a big increase of 16% from

ZMW 37.7 billion in Q3 to ZMW 44.1 billion in Q4 as reflected in the investment confidence in the Zambian market (LuSE, 2024).

In Q4 2023, liquidity also greatly improved on the LuSE. The total turnover, however, increased to ZMW 3.7 billion from ZMW 36 million in Q3. A correspondingly large rise in the number of shares traded to 584.3 million shares traded in Q4 compared to 7.6 million shares traded in Q3 was also observed (LuSE, 2024). Although small against other global stock exchanges, these are indicators of growth and liquidity of the LuSE, and are being used to indicate future potential.

Against the backdrop of the challenges the COVID-19 pandemic and widespread economic instability have brought to the market, LuSE's strong results have come as a surprise to many market analysts. For example, the LuSE witnessed a 54.9% ascent in LASI and a 16.8% rise in market capitalization to ZMW 67.2 billion by year end 2021 (BOZ, 2022). This improved performance from some listed firms like those in banking, mining and manufacturing increased trading activity by 93.2 per cent, as per Business Insider Africa (2022). Remarkably high profitability was aided by the effective management of operational costs and the rise in economic activity, with sales in important sectors growing and also generating investor confidence (Business Insider Africa, 2022).

The successful performance of LuSE creates a rich environment for using Modern Portfolio Theory (MPT), a well-known framework developed by Harry Markowitz in 1952 (Markowitz, 1952). MPT has changed investment strategies by endorsing portfolio diversification as a way to both lessen risk and increase returns. The theory suggests that investors can realize an optimal risk-return trade-off by assembling a portfolio of assets that are uncorrelated, which subsequently lowers the overall volatility of that portfolio (Reilly & Brown, 2012). This method allows investors to assemble portfolios that are on the 'efficient frontier,' where returns achieve their maximum for a given amount of risk (Markowitz, 1952).

MPT offers theoretical advantages for improving portfolio performance on the LuSE; however, its practical use encounters some particular hurdles. An important restriction is the fairly small number of listed companies—only 22 by 2023. The limited investment

choices available on the exchange impede the extent of diversification that investors can accomplish. A lot of the companies highlighted are in industries including banking, mining, and consumer goods, which increases the systemic risk exposure of investment portfolios. Adverse developments in any of these key sectors could have a disproportionately large impact on the overall market, reducing the effectiveness of MPT's diversification principle.

In addition to limited diversification opportunities, liquidity constraints present another challenge to applying MPT on the LuSE. While liquidity improved in Q4 2023, historical fluctuations have often made it difficult for investors to rebalance portfolios efficiently in response to changing market conditions. In periods of low liquidity, investors may struggle to buy and sell assets quickly, leading to suboptimal portfolio allocations that deviate from MPT's ideal of constant optimization based on risk-return trade-offs.

Moreover, MPT relies heavily on historical data to forecast future risk (volatility) and returns. However, the economic volatility Zambia has experienced in recent years, compounded by the effects of the pandemic, has made it difficult to rely on past market data as an accurate predictor of future performance. While the 2021 increase in market capitalization and LASI are impressive, they followed a sharp decline in 2020 due to the economic disruptions caused by COVID-19. This irregularity in market performance complicates the construction of portfolios based on MPT’s assumptions, as the expected returns and risk levels may not be stable over time (BOZ, 2022).

An additional matter is that MPT makes the assumption of rational investor behavior, assuming choices are based entirely on risk and return factors (Rani, 2012). In Zambia, socio-political factors, along with regulatory changes and external economic shocks, usually play major roles in affecting investor decisions. As an illustration, government interventions in the mining sector—a significant contributor to Zambia's economy—can bring about market instability that is hard to estimate using typical risk-return frameworks. This introduces complexity into the effective application of MPT on LuSE.

Although these limitations exist, the general growth and rising market engagement on LuSE create opportunities that allow for the adoption of MPT to refine portfolio

performance. Within the framework of a smaller market, investors can apply diversification strategies to help manage risk and improve returns. The aim of this research is to examine how MPT can fit the specific characteristics of the LuSE, investigating the existing market conditions and identifying the gaps within traditional portfolio management approaches in the framework of Zambia's changing stock market.

Over the last few years, the Lusaka Securities Exchange has demonstrated both remarkable growth and resilience, achieving strong growth in market capitalization, liquidity, and the LASI. Nevertheless, although these trends are encouraging, optimizing LuSE's portfolio performance through the use of Modern Portfolio Theory brings forth several obstacles. A combination of the few listed companies, sectoral concentration, and liquidity difficulties, plus the volatility of the Zambian economy, may undermine the success of traditional MPT strategies. This research intends to bridge these gaps and deliver empirical knowledge regarding the means to achieve portfolio optimization within Zambia’s emerging stock market.

1.2 Statement of the Problem

Even though the LuSE plays a critical role in Zambia’s financial industry, it lags significantly behind other emerging markets in diversification, market capitalization, and investor participation. As of 2023, only 22 companies are listed, which underscores the market's compact size and heavy sector concentration—predominantly in mining and financial services (LuSE, 2024). In comparison, markets like the Nairobi Securities Exchange (NSE) and Johannesburg Stock Exchange (JSE) offer broader sectoral representation, reducing their vulnerability to sector-specific shocks. This limited diversification on the LuSE poses a significant hurdle to achieving optimal risk management, a core tenet of Modern Portfolio Theory (MPT), which aims to reduce risk while maximizing returns through strategic asset allocation.

Although the LuSE demonstrated remarkable growth in 2023, such as a 16% climb in the All-Share Index (LASI) and a ZMW 6.4 billion rise in market capitalization, it remains highly volatile. Unlike the NSE and JSE, which are supported by more diverse and resilient economic structures, the LuSE is acutely sensitive to external factors such as

fluctuations in global commodity prices and exchange rates. For example, while the JSE benefits from a mix of mining, financial, and industrial sectors, the LuSE's overdependence on mining heightens its exposure to global price volatility.

Liquidity on the LuSE saw a substantial increase between Q3 and Q4 of 2023, with shares traded rising from 7.6 million to 584 million (LuSE, 2024). However, this growth has been uneven, and the market continues to face challenges in sustaining consistent investor activity. These liquidity constraints, combined with Zambia's macroeconomic instability, make it difficult for investors to manage risk and optimize returns effectively.

The critical role of portfolio optimization in risk management has been underexplored in the context of the LuSE, leaving a significant gap in understanding how investors can construct portfolios that balance the unique risks and opportunities of Zambia's market. Studies on the NSE and JSE have provided insights into how portfolio optimization can enhance risk-adjusted returns in relatively larger and more developed African markets. However, the LuSE's distinct challenges—such as its smaller size, limited sectoral diversity, and heightened vulnerability to macroeconomic shocks—demand targeted research to determine how MPT can be effectively applied in this context.

This research is vital to bridging the gap by examining the relationship between asset returns and volatility on the LuSE, and evaluating the performance of MPT-optimized portfolios compared to non-optimized ones. By addressing the specific challenges faced by LuSE investors, such as limited diversification and high volatility, this study provides actionable insights for both institutional and retail investors, while contributing to the broader discourse on portfolio optimization in emerging markets.

1.3 Research Objectives

1.3.1 General Objective

To examine the effectiveness of Markowitz's Modern Portfolio Theory (MPT) in optimizing portfolio performance on the Lusaka Stock Exchange (LuSE).

1.3.2 Specific Objectives

i. To analyze the historical relationship between asset returns and volatility of stocks listed on the Lusaka Stock Exchange.

This objective aimed to provide a foundational understanding of the risk-return characteristics of LuSE-listed stocks, which was crucial for effective portfolio construction and risk management.

ii. To apply Markowitz's Modern Portfolio Theory (MPT) to determine the optimal portfolio weights for assets on the Lusaka Stock Exchange.

This objective aimed to identify optimal asset allocations that balanced risk and return, providing practical guidance for investors seeking to improve portfolio performance on the LuSE.

iii. To evaluate the performance of portfolios optimized using Markowitz's Modern Portfolio Theory (MPT) by comparing their risk-adjusted returns to non-optimized portfolios.

This objective aimed to assess the practical effectiveness of MPT in the Zambian context by comparing the performance of MPT-optimized portfolios to traditional investment strategies, providing valuable insights for investors on the potential benefits of MPT-based portfolio optimization.

1.4 Research Hypotheses

Based on the specific objectives and the following null and alternative hypotheses for each objective are stated:

- **Null Hypothesis (H_{01})**: There is no significant relationship between historical asset returns and volatility for stocks listed on the Lusaka Stock Exchange.
- **Alternative Hypothesis (H_{11})**: There is a significant relationship between historical asset returns and volatility for stocks listed on the Lusaka Stock Exchange.

    - *This hypothesis was tested to determine if there was a discernible relationship between risk (volatility) and expected returns in the Zambian market, which is a fundamental assumption of MPT.*

- **Null Hypothesis (H_{02})**: The application of Markowitz's Modern Portfolio Theory does not significantly impact the determination of optimal portfolio weights for assets on the Lusaka Stock Exchange.
- **Alternative Hypothesis (H_{12})**: The application of Markowitz's Modern Portfolio Theory significantly impacts the determination of optimal portfolio weights for assets on the Lusaka Stock Exchange.

    - *This hypothesis was tested to determine whether MPT could effectively identify optimal asset allocations that outperformed traditional portfolio construction methods in the Zambian context.*

- **Null Hypothesis (H_{03})**: There is no significant difference in risk-adjusted returns between portfolios optimized using Markowitz's Modern Portfolio Theory and non-optimized portfolios on the Lusaka Stock Exchange.
- **Alternative Hypothesis (H_{13})**: Portfolios optimized using Markowitz's Modern Portfolio Theory have significantly higher risk-adjusted returns than non-optimized portfolios on the Lusaka Stock Exchange.

    - *This hypothesis was tested to determine whether MPT-optimized portfolios could generate significantly higher risk-adjusted returns compared to traditional, non-optimized portfolios, providing valuable insights for investors on the potential benefits of adopting MPT-based investment strategies.*

1.5 Significance of the Study

This study holds substantial significance across various dimensions, contributing to the fields of finance, investment strategy, and regional economic development, as well as

benefiting multiple stakeholders involved in the investment landscape of the Lusaka Stock Exchange (LuSE).

Contribution to Knowledge: This study adds to the body of knowledge on portfolio optimization by applying Markowitz's Modern Portfolio Theory (MPT) within the context of Zambia, an emerging market. While MPT has been widely studied in developed markets, its application to the Lusaka Stock Exchange (LuSE) provides fresh insights into investment behaviors in less-explored markets. The research offers empirical evidence on MPT's effectiveness in Zambia, advancing understanding in finance, particularly in risk management and investment performance.

Implications for Investors: For individual and institutional investors, this study offers practical insights into constructing optimized portfolios using MPT. By focusing on asset performance, returns, and volatility on LuSE, the research helps investors make better-informed decisions. This is particularly valuable in emerging markets, where tailored strategies are essential for balancing risk and return.

Enhancing Market Efficiency: The study promotes better portfolio optimization practices, which can improve market efficiency on the Lusaka Stock Exchange. Informed decision-making by investors can lead to better asset pricing, increased liquidity, and lower volatility. As more investors adopt these strategies, it contributes to a more resilient and robust financial market in Zambia.

Policy Implications: Policymakers can use the study's insights to create policies that support effective investment practices. By understanding asset performance and risk dynamics on LuSE, regulations can be crafted to improve market transparency and attract foreign investment. This research also offers guidance on regulatory frameworks to boost investor confidence and market participation.

Impact on Financial Advisors and Institutions: Financial advisors and firms in Zambia can apply the findings to develop investment strategies tailored to local market conditions. By understanding asset correlation, returns, and volatility, they can better serve clients

with diversified portfolios optimized for risk-adjusted returns. This can raise the standard of financial advisory services and lead to more effective investment outcomes.

1.6 Scope of the Study

This study is geographically focused on the Lusaka Stock Exchange (LuSE) in Zambia, targeting the 22 listed companies as of 2023. The analysis will concentrate on the historical performance of these assets, examining their returns and volatility to determine optimal portfolio weights based on Markowitz's Modern Portfolio Theory. The time frame for the historical data will span five years, allowing for a comprehensive evaluation of asset performance over different market conditions. In terms of content, the study will primarily address quantitative analyses related to portfolio optimization strategies, excluding qualitative factors such as investor sentiment or behavioral finance aspects. The research will specifically assess the applicability of MPT within the Zambian market context, exploring the effectiveness of optimized portfolios derived from the model. By narrowing the focus to the LuSE, this study aims to provide practical insights that are directly applicable to investors operating within the Zambian stock market, while also contributing to broader academic discussions surrounding portfolio optimization in emerging markets.

1.7 Definition of Key Terms

- **Portfolio Optimization**: The process of selecting the best mix of financial assets to achieve the highest expected return for a given level of risk, or conversely, the lowest risk for a given level of expected return.
- **Markowitz's Modern Portfolio Theory (MPT)**: A mathematical framework for constructing portfolios that maximize expected return based on a given level of risk, emphasizing the importance of diversification and the relationships between asset returns.
- **Efficient Frontier**: A graphical representation of the optimal portfolios that offer the highest expected return for a defined level of risk in MPT.

- **Returns**: The gains or losses made on an investment over a specified period, usually expressed as a percentage of the investment's initial value.
- **Volatility**: A statistical measure of the dispersion of returns for a given security or market index, commonly associated with the risk of an investment.
- **Lusaka Stock Exchange (LuSE)**: The primary stock exchange in Zambia, facilitating the trading of shares and other securities for listed companies.
- **Risk**: The potential for loss or variability in investment returns, often quantified using standard deviation or variance in the context of portfolio management.
- **Asset Correlation**: A statistical measure of how two assets move in relation to each other, which is a critical factor in portfolio construction to minimize risk through diversification.

1.8 Organization of the Research

This research report is organized into six chapters that comprehensively outline the study's objectives, methodologies, and findings regarding portfolio optimization on the Lusaka Stock Exchange using Markowitz's Modern Portfolio Theory.

Chapter 1 introduces the study by providing essential background information about the Lusaka Stock Exchange and the significance of effective portfolio management in emerging markets. It discusses the rationale for exploring the application of Markowitz's Modern Portfolio Theory in Zambia, articulates the general and specific research objectives, and presents the research questions that guide the investigation. Chapter 2 presents a thorough literature review on portfolio optimization, focusing on both global perspectives and insights specific to the Zambian market. This chapter discusses existing theories and models relevant to investment strategies, including the Modern Portfolio Theory and its implications for risk-return trade-offs. It synthesizes findings from previous studies, highlighting gaps in the literature that this research aims to address.

Chapter 3 outlines the research methodology employed in this study, detailing the quantitative approach adopted to analyze portfolio performance on the Lusaka Stock

Exchange. This chapter elaborates on the sampling techniques, data collection methods, and analytical strategies used to evaluate the effectiveness of Markowitz's MPT in constructing optimized portfolios. It justifies the selection of specific statistical tools for analyzing the data, ensuring that they align with the research objectives.

Chapter 4 focuses on the analysis and presentation of the data collected from the Lusaka Stock Exchange. This chapter showcases the results derived from applying the Modern Portfolio Theory, utilizing descriptive statistics, tables, and graphical representations to convey findings related to asset returns, volatility, and optimal portfolio weights. The results are aligned with the study's aims, providing valuable insights into the dynamics of investment performance on the exchange.

Chapter 5 discusses the results in relation to the research objectives, offering an in-depth analysis of how the findings relate to existing literature and investment practices. This chapter contextualizes the outcomes within the framework of portfolio optimization and evaluates the implications for investors, financial advisors, and policymakers in Zambia. It also highlights the potential for improved investment decision-making and market efficiency stemming from the application of the study's findings.

Finally, Chapter 6 concludes the report by summarizing the key findings and their implications for enhancing portfolio management practices on the Lusaka Stock Exchange. It offers recommendations for investors and stakeholders in the financial sector, as well as suggestions for future research directions that could further explore portfolio optimization and investment strategies in Zambia and similar emerging markets. Additionally, this chapter addresses the limitations encountered during the research process and underscores the importance of continuous investigation into financial practices that can bolster economic growth in Zambia.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter provides a comprehensive review of the literature related to the study of portfolio management techniques, particularly Modern Portfolio Theory (MPT), and its applications across various global and regional stock markets. The chapter is structured to first present an empirical review of key studies conducted on this topic. The global perspective examines research conducted in different markets, including Malaysia, Australia, and Indonesia, highlighting the role of MPT in optimizing portfolio performance and mitigating risk. The regional perspective narrows the focus to studies in African markets, particularly Kenya and South Africa, providing insights into the challenges and benefits of applying portfolio optimization strategies in emerging markets. The chapter also identifies gaps in the literature, especially the lack of research on portfolio optimization in Zambia's Lusaka Stock Exchange (LUSE) and the unique market dynamics that characterize this region.

2.1 Empirical Review

The empirical review section explores various studies that have examined portfolio management techniques like Modern Portfolio Theory (MPT) across different global and regional contexts. By analyzing both global and regional studies, this section aims to provide a detailed understanding of how MPT, related theories and methods that have been employed to optimize portfolio performance, manage risks, and enhance returns. Through this examination, the empirical review sets the foundation for identifying the gaps in the literature and justifying the focus of the current study on Zambia's emerging market.

2.1.1 Market Efficiency and Performance of MPT

The efficiency of financial markets and the performance of Modern Portfolio Theory (MPT) have been widely studied across both developed and emerging markets. These studies reveal significant variations in the effectiveness of MPT, largely influenced by market structure, volatility, and economic conditions.

Azizan and Sorooshian (2014) conducted a pivotal study on the Malaysian stock market and other Asian indices, including Japan, India, and Hong Kong. Using the efficient frontier approach, they identified the best-performing stocks within the Kuala Lumpur Composite Index (KLCI) from 2006 to 2010. The study compared these results with Sharpe's performance analysis, revealing inconsistencies between the two methods. For instance, the efficient frontier highlighted stocks like IOI Corp, PETRONAS Dagang, and UMW Toyota as superior investments, while the Sharpe ratio recommended Nestle, Public Bank Berhad, and Telekom Malaysia. This discrepancy underscores the limitations of MPT in consistently identifying optimal investments, particularly in volatile markets like Malaysia, which recorded its highest coefficient of variance (CV) during the global financial crisis of 2008 (Azizan & Sorooshian, 2014).

The study also expanded its scope to other Asian markets, demonstrating that most Asian indices co-integrated with the Japanese market (N225) rather than the US market (S&P 500). This finding was attributed to regional economic interdependency, with Japan playing a central role in directing market practices. The Johansen co-integration test used in the study further confirmed that Asian markets are more closely aligned with Japan than with the US, suggesting the existence of a regional economic bloc. However, the study raised concerns about the sustainability and predictability of small, newly emerging markets like Malaysia, where portfolio optimization remains critical for limiting risk. The results highlighted the complexity of applying MPT in real-world scenarios, as the most theoretically efficient portfolios may not always align with real-world performance once adjusted for risk (Azizan & Sorooshian, 2014).

Cui and Cheng (2022) explored the applicability of MPT in Australia's unpredictable financial market during the COVID-19 pandemic. Their study employed an MPT-based trading algorithm to analyze the six largest stocks on the Australian Securities Exchange (ASX) and the 30-day bank bill swap rate. The findings revealed that MPT remained a useful tool for risk reduction, with optimized portfolios generating stable returns despite global financial instability. The simulated 99th percentile value distribution of the portfolio indicated that significant gains or losses were infrequent, suggesting that MPT offers a

defense against market volatility. However, the study also noted that MPT's ability to deliver higher returns in highly volatile environments remains uncertain, emphasizing the need for further research into its performance under stress (Cui & Cheng, 2022).

The methodological rigor of the study, which employed a trading algorithm in R, provided a sophisticated, automated implementation of MPT in contemporary financial contexts. The results confirmed that MPT remains valuable for risk reduction and portfolio optimization, particularly for institutional investors seeking stability amid global financial crises. However, the study did not fully investigate whether MPT could consistently earn higher returns in unpredictable economic conditions, highlighting a critical gap in the literature. This finding underscores the importance of developing hybrid models that integrate MPT with other frameworks to enhance its applicability in volatile markets (Cui & Cheng, 2022).

These studies collectively underscore the challenges of applying MPT in markets with varying degrees of efficiency and volatility. While MPT provides a robust framework for portfolio optimization, its theoretical assumptions often clash with real-world market behaviors, particularly in emerging markets. The discrepancies between theoretical predictions and actual performance highlight the need for context-specific adaptations of MPT to account for market-specific conditions.

2.1.2 Risk-Return Trade-offs and Market Maturity

The relationship between risk and return is a cornerstone of MPT, yet its applicability varies significantly across markets. Studies conducted in emerging markets reveal unique challenges that complicate the traditional risk-return trade-off, often attributed to market inefficiencies and structural limitations.

Mwaniki (2015) investigated the risk-return relationship on the Nairobi Securities Exchange (NSE) from January 2009 to June 2014. Using a descriptive research design, the study analyzed the returns of shares listed on the NSE's 20 Share Index, along with market returns and the beta values of each stock. The key finding was a statistically significant weak negative relationship between risk and return, which contradicts the traditional finance principle of a positive risk-return trade-off. This anomaly was attributed

to market inefficiencies, such as poor investor education and a lack of product diversity, which are common in less mature markets (Mwaniki, 2015).

Mwaniki (2015) suggested that the NSE and the Capital Markets Authority (CMA) should take proactive measures to address these inefficiencies, such as raising awareness through campaigns and educational initiatives. Additionally, the study recommended broadening the investor base by establishing offices in counties, which could help improve market liquidity and efficiency. The findings highlight the challenges of applying MPT in markets with structural inefficiencies, where investors may not receive greater rewards for assuming higher risks. This is a key concern for capital markets trying to attract institutional and foreign investors, as inadequate market development can constrain portfolio optimization (Mwaniki, 2015).

In contrast, Els (2015) demonstrated that MPT portfolios on the Johannesburg Stock Exchange (JSE) consistently outperformed market indices, delivering higher Sharpe ratios and risk-adjusted returns. The study used a model created in Matlab to optimize portfolios and compared their performance with the JSE All Share Index (ALSI) and Top 40 Index. The results showed that MPT portfolios regularly outperformed the JSE indices over one-year and three-year intervals, with historically generated data yielding higher Sharpe ratios and notable returns. This suggests that MPT can be effective in more developed emerging markets like South Africa, where market structures are relatively more robust (Els, 2015).

However, Els (2015) also cautioned against overreliance on historical data, as future market conditions may deviate significantly from past trends. The study did not account for transaction costs or liquidity challenges, which are critical considerations for practical portfolio management. Despite these limitations, the findings provide strong evidence for the applicability of MPT in the South African context, illustrating how risk diversification systems can improve portfolio outcomes (Els, 2015).

Huni (2018) further reinforced the applicability of MPT in South Africa by examining the performance of sectoral indices on the JSE (Financials, Industrials, and Resources) from 2007 to 2017. The study compared portfolio performance across three phases: before,

during, and after the 2007-2009 global financial crisis. The results demonstrated that portfolio construction using sectoral indices is viable, providing significant diversification benefits despite the positive correlations among the indices. In bullish markets, the portfolios outperformed the JSE All Share Index in terms of risk-return, while in bear markets, the optimized portfolios offered superior risk mitigation (Huni, 2018).

Huni (2018) confirmed that Markowitz's MPT is robust in South African markets, particularly during periods of volatility. The ability to outperform benchmarks in both booming and sluggish markets demonstrates the framework's flexibility in adapting to evolving market dynamics. However, the study's exclusion of non-tradable indices and smaller stocks limited its scope, highlighting the need for more comprehensive approaches to portfolio optimization in emerging markets. Additionally, the reliance on historical data raises concerns about the model's applicability to future market conditions, especially given the unpredictable nature of global economic changes (Huni, 2018).

These findings illustrate the critical role of market maturity in shaping the effectiveness of MPT. While MPT can deliver strong results in relatively developed markets, its application in less mature markets is often hindered by structural inefficiencies and unpredictable risk-return dynamics. The weak negative relationship between risk and return observed in the NSE, for example, underscores the challenges of applying traditional finance principles in markets with limited investor education and product diversity. In contrast, the strong performance of MPT portfolios on the JSE highlights the potential for risk diversification systems to improve portfolio outcomes in more developed emerging markets.

2.1.3 Diversification and Portfolio Optimization

Diversification is a key principle of MPT, yet its implementation varies across different market contexts. Studies conducted in emerging markets reveal both the benefits and limitations of diversification, particularly in markets with high volatility and unstable correlation structures.

Bakar and Rosbi (2019) demonstrated the practical application of MPT in the Kuala Lumpur Stock Exchange (KLSE) by constructing a portfolio of negatively correlated

stocks (Ajinomoto Malaysia Berhad and UMW Holdings Berhad). The study used expected return calculations, statistical normality checks, and Pearson correlation analysis to establish the correlation between the two stocks. The results revealed a substantial negative correlation of -0.879, suggesting that diversifying investments among these two stocks can significantly reduce investment risk. The initial mix of 42.5% Ajinomoto and 57.5% UMW was predicted to generate a 0.14% return, with the greatest return potential of 19.17% if the entire investment went to Ajinomoto (Bakar & Rosbi, 2019).

This research illustrated the practical implementation of MPT in portfolio selection, emphasizing the theory's focus on diversification for risk minimization. However, the study also highlighted the limitations of low-risk portfolios with respect to projected returns. Although MPT was able to identify low-risk combinations, the returns on these portfolios were not significant, suggesting that investors may have to take on greater risks to achieve notable returns. This finding aligns with broader critiques of MPT, which suggest that while diversification minimizes risk, it may also limit potential returns, particularly in emerging markets with high volatility (Bakar & Rosbi, 2019).

Wisista and Noveria (2023) advanced this discussion by applying Post-Modern Portfolio Theory (PMPT) to optimize a pension fund portfolio in Indonesia. The study focused on Dapen XYZ, a pension fund with a funding ratio in excess of 100% but suboptimal performance. Using PMPT, the researchers identified the best stock recommendations from the IDXQ30 index, demonstrating that the historical portfolio from 2018 to 2022 delivered a 5.27% expected return with a downside risk of 5.00%. After optimization, the portfolio's expected return improved to 6.80%, with a reduced downside risk of 3.59%. The recommended shift toward a more stock-heavy portfolio, focusing on listed stock instruments, suggested that the institution's portfolio could potentially achieve an 8.80% return with a significantly reduced downside risk of 1.70% (Wisista & Noveria, 2023).

The deployment of PMPT, a more advanced version of MPT, provided improved evaluation of downside risk—an area that has drawn criticism for traditional MPT. This study delivered important insights into how institutions such as pension funds can

maximize their portfolios through the application of more assertive strategies in stock investments. Nevertheless, the study pointed out the drawbacks of even finely tuned portfolios, as the results still did not meet the institution's desired returns. This highlights the existing challenges of managing risk against reward, even when using advanced portfolio optimization strategies (Wisista & Noveria, 2023).

These studies collectively highlight the importance of diversification in portfolio management but also reveal its limitations, particularly in markets where correlation structures are unstable and economic conditions are unpredictable. While diversification can significantly reduce investment risk, it may also limit potential returns, especially in emerging markets with high volatility. The application of advanced frameworks like PMPT offers promising avenues for improving portfolio performance, but challenges remain in achieving desired returns while minimizing risk.

2.1.4 Applicability of MPT in Emerging Markets

The applicability of MPT in emerging markets remains a contentious issue, as these markets often exhibit unique characteristics that challenge the theory's assumptions. Studies conducted in East Africa and other emerging markets reveal significant variations in the effectiveness of MPT, largely influenced by economic conditions, market liquidity, and political stability.

Moh'd (2021) examined the implementation of MPT and the Capital Asset Pricing Model (CAPM) in East African stock exchanges, applying a Data Envelopment Analysis (DEA) framework for optimizing portfolios. The study focused on Kenya and Tanzania, analyzing company fundamentals, closing share prices, and market indices from 2015 to 2018. The results revealed that only a fraction of companies in the industrial sector met the benchmarks for portfolio inclusion, emphasizing that stock selection depends significantly on the country's economic and sectoral conditions. The DEA-CAPM hybrid model showed varying portfolio performance based on the economy's state, indicating that portfolio risk and return are highly contingent on broader macroeconomic factors (Moh'd, 2021).

Moh'd (2021) provided valuable insights into the complexities of portfolio management in East African markets, where economic conditions and industry fundamentals dictate

performance. By introducing DEA into the CAPM model, the study highlighted the importance of efficiency in stock selection, especially in fragmented or illiquid markets. The recommendation to combine both bottom-up and top-down approaches for future research underscores the need for a more holistic investment strategy, something that is often overlooked in emerging markets (Moh'd, 2021).

Mwita (2022) focused on the relationship between portfolio management and the profitability of unit trust companies in Kenya. Using a descriptive research design and structured questionnaires targeted at portfolio managers, the study found that portfolio management significantly impacts profitability. Specifically, the expected rate of return, risk, and liquidity were all positively correlated with profitability. These findings suggest that efficient portfolio management strategies, which account for expected returns and risk-adjusted metrics, are critical for maximizing profitability in the unit trust sector (Mwita, 2022).

Mwita's (2022) research highlights the importance of well-structured portfolio management in achieving financial sustainability in Kenya's unit trust industry. However, while the study focuses on the technical aspects of portfolio management, it could benefit from deeper exploration into the role of external economic factors, such as inflation or currency fluctuations, which also influence portfolio performance (Mwita, 2022).

These studies collectively emphasize the need for context-specific adaptations of MPT in emerging markets. While the theory provides a valuable framework, its effectiveness is often constrained by factors such as market illiquidity, political instability, and economic volatility. The unique characteristics of emerging markets necessitate a more nuanced approach to portfolio optimization, one that integrates MPT with other frameworks to account for market-specific conditions.

2.1.5 Challenges and Future Directions

The literature reveals several challenges in applying MPT across different markets, particularly in emerging economies. These include market inefficiencies, unpredictable risk-return dynamics, and the influence of macroeconomic factors. Future research should focus on developing hybrid models that integrate MPT with other frameworks,

such as Data Envelopment Analysis (DEA) or behavioral finance approaches, to better address the unique characteristics of emerging markets. Additionally, there is a need for more empirical studies that account for transaction costs, liquidity constraints, and external economic factors, which are often overlooked in traditional MPT applications.

2.1.6 Gaps in Literature

This study identifies and addresses critical gaps in the existing literature on the application of portfolio optimization techniques, particularly Modern Portfolio Theory (MPT), in the context of emerging markets like Zambia. Despite extensive research globally and regionally, several specific gaps persist, especially concerning the Lusaka Stock Exchange (LuSE). These gaps are organized into the following thematic areas:

2.1.6.1 Market Structure

Focus on the Lusaka Stock Exchange (LuSE): While studies like Azizan and Sorooshian (2014), Cui and Cheng (2022), and Wisista and Noveria (2023) have examined MPT in various global markets, including Malaysia, Australia, and Indonesia, none have specifically focused on African markets, let alone the LuSE. Even regional studies, such as those by Mwaniki (2015) on the Nairobi Securities Exchange and Huni (2018) on the Johannesburg Stock Exchange, do not address the unique characteristics of Zambia's market. These include lower liquidity, smaller market capitalization, and a lack of investor familiarity with advanced portfolio optimization techniques, highlighting a significant gap in the literature.

Sectoral and Economic Diversification in Zambia: Existing research emphasizes diversification in developed and economically integrated markets (e.g., Azizan and Sorooshian, 2014; Cui and Cheng, 2022). However, these findings are not easily transferable to the LuSE, where sectoral concentration, particularly in industries like mining, poses unique challenges. There is little research on how to achieve optimal diversification within Zambia's limited economic and sectoral scope.

2.1.6.2 Volatility and Risk

Volatility and Risk Management in Emerging African Markets: Global studies have highlighted the importance of portfolio optimization in managing risk (e.g., Azizan and Sorooshian, 2014; Cui and Cheng, 2022). However, these studies often focus on developed or larger emerging markets. The higher volatility, liquidity constraints, and economic instability of smaller African markets, such as Zambia's, remain underexplored. Existing studies on regional markets (e.g., Huni, 2018; Moh'd, 2021) touch on risk management but fail to address these extreme market conditions in detail.

Stress Testing of MPT in African Contexts: While some research explores MPT in volatile environments, such as Cui and Cheng's (2022) study on the post-pandemic landscape, there has been limited focus on how MPT performs under the extreme economic stress characteristic of African markets. For example, Zambia's economic volatility, currency fluctuations, and limited foreign investment create unique conditions requiring further stress testing of MPT.

2.1.6.3 Data and Methodological Constraints

Comparison of Optimized vs. Non-Optimized Portfolios in Zambia: Although studies like Azizan and Sorooshian (2014) and Wisista and Noveria (2023) compare optimization strategies such as MPT and PMPT, these are often limited to non-African contexts. Regional studies like Els (2015) demonstrate MPT's outperformance on the Johannesburg Stock Exchange, but there is no equivalent research for Zambia. Understanding whether optimized portfolios consistently outperform traditional ones in Zambia, particularly in terms of risk-adjusted returns, is a crucial gap.

2.1.6.4 Real-World Constraints in Portfolio Optimization: Practical constraints, such as transaction costs, liquidity limitations, and regulatory hurdles, are often mentioned in studies (e.g., Bakar and Rosbi, 2019; Els, 2015), but they remain insufficiently explored. In Zambia, these factors are likely more pronounced due to the LuSE's smaller size and less developed infrastructure, warranting a deeper investigation into their impact on MPT applications.

2.2 Theoretical Framework

The study's theoretical foundation is based primarily on two key theories: Markowitz's Modern Portfolio Theory (MPT) and the Efficient Market Hypothesis (EMH). They offer valuable insights into portfolio optimization and investment decision-making, especially within the context of an emerging market like the Lusaka Stock Exchange (LuSE).

2.2.1 Markowitz's Modern Portfolio Theory (MPT)

Harry Markowitz's Modern Portfolio Theory (MPT) from 1952 is a key element of today's financial theory, conceived to support investors in building portfolios that yield maximum expected returns for a corresponding level of risk (Francis & Kim, 2013). The core principle of MPT is diversification, combined with an appreciation of asset return relationships, which introduces a mathematical approach to design portfolios that reduce risk by mixing assets with differing return and risk properties.

The core concept in MPT is the essential frontier containing optimal portfolios which provide the highest anticipated return for a particular level of risk. MPT allows investors to choose from portfolios on this frontier based on their degree of risk tolerance. The theory points out that asset correlations are important and suggests that investors could reduce portfolio risk by combining assets that exhibit low correlations (Sarpong, 2020).

MPT revolves around two primary variables: predicted gains and the associated risk (volatility). The weighted averages of the envisaged returns of all portfolio assets represent the expected returns. The portfolio variance or standard deviation indicates the method for measuring risk, showing the variation in returns. Nonetheless, in MPT, the notion of risk transcends the tallying of individual asset risks; it also involves the covariance of asset returns, demonstrating that combining assets that demonstrate low or negative correlations can drastically lower the portfolio's risk (Beyhaghi & Hawley, 2013).

MPT is especially relevant for the LuSE because it delivers a systematic way to enhance portfolio effectiveness. Emerging markets like Zambia need diversification to adeptly manage the increased volatility of market conditions. Thanks to the application of MPT,

investors have the opportunity to create portfolios that achieve an ideal balance between risk and reward. In spite of the limited companies on the LuSE, MPT provides a technique to curtail volatility exposure by strategically selecting assets with differing risk-return characteristics.

MPT's relevance to this study stems from its practical ability to minimize risk while maximizing returns in an emerging market setting. The relatively small size of the LuSE, with only 22 listed companies, means that investors must be strategic about diversification. The application of MPT will enable investors to allocate assets in a way that reduces portfolio risk, even in a market with limited asset choices. This makes MPT a crucial tool for identifying optimal asset combinations on the LuSE and addressing the inherent risks of investing in volatile and developing markets like Zambia.

MPT also addresses a fundamental challenge in emerging markets: risk management. In the context of LuSE, market volatility may be influenced by external factors such as global commodity prices and internal economic conditions, making diversification even more critical. MPT provides a quantitative framework to achieve this diversification, ensuring that investors can optimize their portfolios despite these challenges. Therefore, applying MPT in the LuSE context aligns with the theory's core principles of maximizing returns while minimizing risk, making it highly applicable for this study.

2. Efficient Market Hypothesis (EMH)

The **Efficient Market Hypothesis (EMH)**, formulated by Eugene Fama in 1970, posits that financial markets are "informationally efficient," meaning that all available information is reflected in asset prices at any given time (Delcey, 2018). According to Reilly and Brown (2012), it is impossible for investors to consistently achieve higher-than-average returns on a risk-adjusted basis because new information is quickly incorporated into stock prices. EMH operates at three levels of efficiency:

1. **Weak Form Efficiency**: All historical price data are already factored into asset prices, rendering technical analysis ineffective.

2. **Semi-Strong Form Efficiency**: All publicly available information is reflected in asset prices, making fundamental analysis futile.
3. **Strong Form Efficiency**: Asset prices reflect all information, both public and private, implying that no investor can achieve consistent abnormal returns.

The EMH challenges the notion that investors can "beat the market" through timing, selection, or superior information. In efficient markets, prices fully reflect all available information, making it impossible to outperform the market consistently without taking on excessive risk. In highly efficient markets, both technical and fundamental analysis are rendered ineffective as tools for gaining an advantage, since all relevant data is already incorporated into asset prices (Gold, 2018).

A theoretical ground for examining shifts in asset prices comes from EMH, which assists the Lusaka Stock Exchange. Being an emerging market, the LuSE may not comply with the Expectations of the EMH, especially in its strong form (Seetharam 2016). Developing countries such as Zambia exhibit market characteristics that include reduced liquidity, lower transparency, and greater information asymmetry than seen in established markets. These influences could generate inefficiencies in pricing, opening opportunities for investors to uncover mispriced assets and make profit from them.

This study finds EMH relevant because it points out the amount of market efficiency in Zambia, which has a direct effect on portfolio optimization approaches. According to the EMH, in highly effective markets, abnormal returns are hard to realize; however, this efficiency may not be present in the LuSE compared to markets found in more stable economies. As a result, examining the implications of EMH in the LuSE context allows us to investigate the efficiency of market information integration and whether investors can spot assets that are underpriced or overpriced.

This analysis of market efficiency can help the study to establish how well portfolio optimization methods such as MPT can produce superior returns. If the LuSE displays any characteristics of an inefficient market, investors may find this particularly advantageous as they have the potential to capitalize on mispricings and manage their

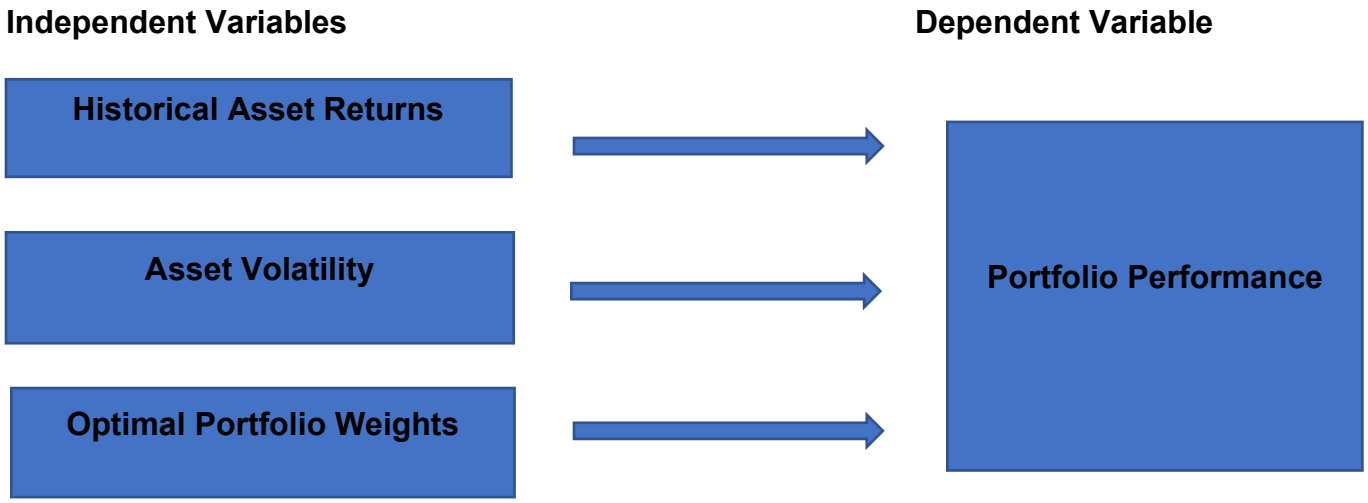
portfolios to do better than market indicators. In alterative scenarios, if the market is remarkably efficient, portfolio returns could correspond closely with the hypotheses of MPT, where risk is reduced, however, it's challenging to gain excess profits.

In turn, EMH provides the foundation for apprehending the hurdles and potentials associated with investment in the LuSE. It provides a framework for anticipating the performance of optimized portfolios and highlights the degree to which information is accurately mirrored in asset prices traded on the exchange.

2.3 Conceptual Framework

The conceptual framework for this study is designed to capture the relationships between the key variables involved in optimizing portfolio performance on the Lusaka Stock Exchange (LuSE) using Markowitz's Modern Portfolio Theory (MPT). The framework focuses on how historical returns and volatility of assets impact portfolio performance and how the application of MPT leads to optimized portfolio weights.

Figure 1: Conceptual framework



Independent Variables

Historical Asset Returns: Historical asset returns represent the past performance of the stocks listed on the Lusaka Stock Exchange. This variable is crucial for portfolio optimization as it provides the basis for determining the potential profitability of including

a particular asset in the portfolio. Returns are typically measured as the percentage change in the asset's value over a specified period. The expectation is that higher historical returns will have a positive impact on portfolio performance, contributing to higher overall returns.

Asset Volatility: Volatility refers to the variability in an asset's returns over time and is a critical measure of the risk associated with each asset. It is typically represented by the standard deviation of asset returns. In the context of Markowitz's MPT, volatility is a key factor in determining the risk of the overall portfolio. Higher volatility is expected to have a negative effect on portfolio performance, as it increases the overall risk without necessarily providing proportional returns.

Optimal Portfolio Weights: Optimal portfolio weights are determined through the application of Markowitz's Modern Portfolio Theory, which seeks to allocate assets in a manner that maximizes expected returns for a given level of risk. These weights define the proportion of each asset in the portfolio and are adjusted to minimize risk through diversification. The expectation is that the application of MPT will result in an optimal balance between high-return and low-risk assets, leading to improved portfolio performance.

Dependent Variable: Portfolio Performance: The dependent variable in this framework is portfolio performance, which refers to the risk-adjusted returns of the portfolio. Portfolio performance is commonly measured using indicators such as the Sharpe Ratio, which takes into account both the returns generated by the portfolio and the level of risk undertaken to achieve those returns. The expectation is that higher historical returns and appropriately weighted portfolios, as per MPT, will improve portfolio performance, while higher volatility will reduce it.

RESEARCH METHODOLOGY

3.0 introduction

This chapter outlines the research methodology employed to analyze portfolio performance optimization on the Lusaka Stock Exchange (LuSE) through the lens of Markowitz's Modern Portfolio Theory (MPT). The methodology provides a detailed explanation of the research approach, design, population, sampling techniques, data collection, and analysis methods used in the study. By adopting a quantitative research approach, the study focuses on the empirical evaluation of key financial variables such as returns, volatility, and portfolio performance. Each section in this chapter serves to justify the chosen methods and techniques in order to ensure that the study's findings are both reliable and generalizable within the context of financial markets. Additionally, ethical considerations are discussed to ensure adherence to research integrity and transparency throughout the study.

3.1 Research Approach

This study employed a quantitative research approach aimed at empirically analyzing portfolio performance optimization on the Lusaka Stock Exchange (LuSE) using Markowitz's Modern Portfolio Theory (MPT). The choice of a quantitative approach is well justified, given the nature of financial market analysis, where numerical data such as asset returns, volatility, and risk-adjusted performance are central to drawing conclusions. Quantitative research is most suitable for studies that aim to test theories, such as MPT, by analyzing relationships between measurable variables. It allows for statistical analysis, the application of mathematical models, and the generation of objective, generalizable findings (Bryman, 2016).

Quantitative approaches are also ideal for evaluating historical data, such as returns and volatility of assets, as well as determining optimal portfolio allocations through MPT's algorithmic model. This approach emphasizes deductive reasoning, meaning that the theory (MPT) is tested against the empirical evidence gathered from LuSE. Quantitative research ensures that the results are reliable, replicable, and statistically significant, which is important for an empirical study of financial market performance (Creswell,

2014). The use of historical financial data, combined with statistical methods, enables the study to derive actionable insights for investors on the LuSE.

3.2 Research Design

The research employed a descriptive-correlational research design. A descriptive design is appropriate as it allows the study to systematically describe key characteristics of the data, specifically the historical returns and volatility of assets listed on the LuSE. Descriptive studies provide a detailed picture of the current state of the stock exchange, facilitating a better understanding of the market dynamics. By describing these key financial metrics, the study offers a foundation for identifying potential portfolio candidates, a crucial step in the portfolio optimization process (Saunders, et al., 2019).

In addition, the study adopts a correlational design to investigate the relationships between variables such as asset returns, volatility, and portfolio performance. Correlational research is necessary when the study aims to explore whether and how variables are related to each other without manipulating them. For example, by using Markowitz's MPT, the study seeks to uncover the optimal balance between returns and volatility and how these variables influence portfolio performance on the LuSE. The correlational design provides a means to measure the degree of association between asset characteristics (returns and volatility) and the overall performance of optimized portfolios. This method is justified because it aligns with the objective of testing the effectiveness of MPT in real-world financial markets (Zikmund, et al., 2013)

3.3 Population

The population for this study consists of all the 22 companies listed on the Lusaka Stock Exchange (LuSE) as of 2023 (LuSE, 2024). The listed companies represent various sectors, including finance, mining, manufacturing, and telecommunications. The focus on the entire population of listed companies ensures comprehensive coverage of available assets for portfolio optimization. By analyzing data from the full population of listed companies, the study aims to provide a more accurate and reliable evaluation of portfolio performance, ensuring that the findings are generalizable across the entire LuSE market.

The population for this study comprises the 22 companies listed on the Lusaka Stock Exchange (LuSE) as of 2023 (LuSE, 2024). This population represents the full scope of investment options available to investors on the LuSE, making it appropriate for evaluating portfolio optimization. The inclusion of all listed companies ensures that the study covers a diverse range of sectors, such as mining, finance, telecommunications, and manufacturing. By focusing on the entire population of listed companies, the study ensures that its findings are generalizable across the entire stock exchange, providing valuable insights for investors aiming to optimize their portfolios.

Given the relatively small population size of 22 listed companies, analyzing the entire population offers several advantages. Firstly, it ensures comprehensive coverage of the LuSE market, providing a complete picture of available investment opportunities and avoiding any potential biases associated with selecting a subset of companies. Secondly, by including all listed companies, the study minimizes the risk of sampling bias that could arise from selecting a non-representative sample. Finally, analyzing the entire population facilitates the inclusion of all available assets in the portfolio optimization process, which is crucial for a thorough evaluation of MPT's effectiveness.

3.4 Sample Size

To determine an appropriate sample size for this study, Yamane's formula of (1967) is selected as the most suitable method due to its practicality and ease of use in small population research, such as the 22 listed companies on the Lusaka Stock Exchange (LuSE). Yamane's formula is widely used in social and economic research because it allows for the calculation of a representative sample from a finite population while controlling for a desired margin of error. The formula is expressed as follows:

$$n = \frac{N}{(1 + Ne^2)}$$

Where:

- *n* represents the sample size,
- *N* denotes the total number of employees (22),

- *e* stands for the margin of error (5% or 0.05).

$$n = \frac{22}{(1 + 22 \times 0.05^2)} = 20.85$$

The sample size of 21 companies ensures that a comprehensive analysis of the listed companies on the LuSE is conducted without exceeding the population's capacity. This sample size is ideal for the study's objective of applying Markowitz's Modern Portfolio Theory (MPT), as it allows for a diversified selection of assets, which is critical in evaluating portfolio performance.

3.5 Sampling Techniques

The study employs simple random sampling, a type of probability sampling, to select the assets for inclusion in the analysis. Simple random sampling is justified in this context because it ensures that each company listed on the LuSE has an equal chance of being selected for the portfolio optimization process. This method is appropriate given the relatively small population size of 22 listed companies, as it allows for the selection of a sample that is representative of the overall market while maintaining the principles of randomness and objectivity. By using simple random sampling, the study avoids selection bias and ensures that the results are generalizable to the entire population of listed companies (Saunders, et al., 2019).

This sampling technique is particularly important when applying quantitative methods such as MPT, which rely on statistical analysis and optimization algorithms. Simple random sampling ensures that the selected assets reflect the diversity of the LuSE market, including different sectors and risk-return profiles. The randomness of the selection process further enhances the validity of the findings, as it mitigates the potential for subjective bias that could arise from purposive or judgmental sampling methods (Zikmund, et al., 2013). Moreover, using a probability sampling technique aligns with the study’s quantitative approach, enabling the researcher to apply statistical tools such as correlation and regression analysis to test the relationships between variables, including asset returns, volatility, and portfolio performance.

3.6 Data collection

The data collection for this study will focus on secondary data sourced from the financial statements and trading records of companies listed on LuSE. The data will include historical returns, volatility (standard deviation of returns), and other relevant financial performance metrics. Historical data spanning the last 5 to 10 years will be extracted, depending on the availability of records, to ensure a robust analysis for portfolio optimization. The use of secondary data is appropriate for this study due to its focus on quantitative financial analysis. Financial data for publicly traded companies is generally available through the LuSE, company websites, and financial databases. This type of data is objective, reliable, and appropriate for statistical analysis, which aligns with the study's goals of optimizing portfolios using Markowitz's MPT. Using historical financial data also allows the study to accurately reflect past market performance, providing a solid foundation for the empirical testing of the theory (Bryman, 2016).

3.7 Data analysis

Data analysis will involve both descriptive statistics and inferential statistical methods to achieve the study's objectives. Descriptive statistics, such as the mean and standard deviation, will be used to summarize the historical returns and volatility of the assets in the sample. These metrics will provide an overview of each asset's risk-return profile and help identify potential candidates for portfolio inclusion. The application of Markowitz's Modern Portfolio Theory (MPT) will form the core of the inferential analysis. MPT involves the calculation of expected portfolio returns and the optimization of asset weights to minimize risk for a given level of return. Specifically, the study will use quadratic programming to solve for the optimal portfolio that maximizes returns while keeping the portfolio's overall volatility below a set threshold. The analysis will be conducted using statistical software such as SPSS and Excel, with additional financial modeling tools to derive efficient frontiers and optimal portfolios (Creswell, 2014).

Further statistical techniques, such as correlation analysis, will be used to test the relationships between asset returns, volatility, and portfolio performance. Correlation analysis will determine how asset returns relate to each other, which is essential for diversification benefits. Regression analysis may also be employed to assess how certain asset characteristics (e.g., market capitalization) influence optimal portfolio weights.

The study acknowledges potential limitations, such as the potential impact of unforeseen economic shocks such as global disasters like COVID19 and the Zambian drought and loadshedding during the study period. These limitations will be mitigated through careful data analysis, robust statistical techniques, and by considering potential external factors that may have influenced market dynamics during the study period. Data reliability will be ensured by sourcing data from credible sources such as the LuSE official website, financial data providers, and company financial statements.

3.8 Ethical consideration

The study adheres to ethical research practices, ensuring that all data collection and analysis are conducted responsibly and transparently. As this study uses secondary data from publicly listed companies, there is minimal risk of infringing on privacy or confidential information. However, ethical considerations such as proper citation and data accuracy are paramount. All data used will be correctly attributed to its original sources, ensuring transparency and academic integrity (Saunders, et al., 2019). In addition, the researcher will ensure that the study's findings are reported honestly, avoiding any manipulation or misrepresentation of the data. The use of established financial models such as MPT ensures that the analysis follows accepted ethical standards for financial research. Lastly, the study will seek ethical clearance from the appropriate University of Lusaka Ethics board efore data collection and analysis commence, in compliance with ethical guidelines for research involving publicly available data.

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.0 Introduction

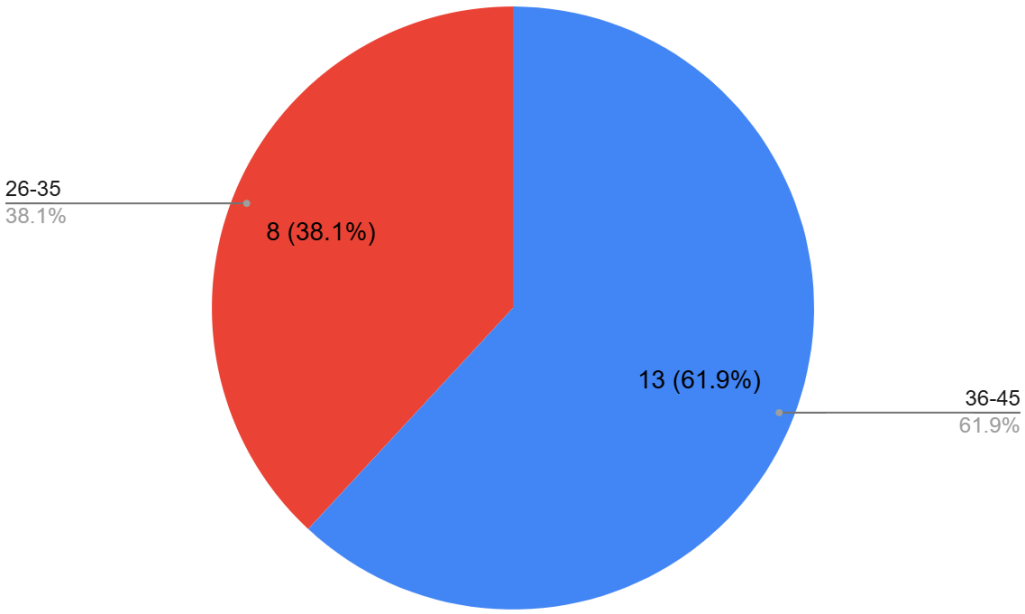
This chapter presents the findings from the analysis of the research. The chapter presents findings in figures and tables. The chapter presents findings that directly respond to the three specific objectives of the study. Analyzed data was collected from 21 responses and methods such as cross tabulations, chi square analysis and correlation analysis are employed.

4.1 Demographic Characteristics

4.1.1 Age Distribution

Figure 2 shows that 61.9% of respondents are within the age range of 36 to 45 and 38.1 percent are between 26 and 35. This suggests that the study sample contains primarily midcareer professionals with financial and investment responsibilities. A lack of younger or older respondents may be indications that the sample is focusing on those who are actively accumulating wealth. The age distribution of these samples matches nicely with the intent of examining MPT since these age groups tend to engage in long term financial planning.

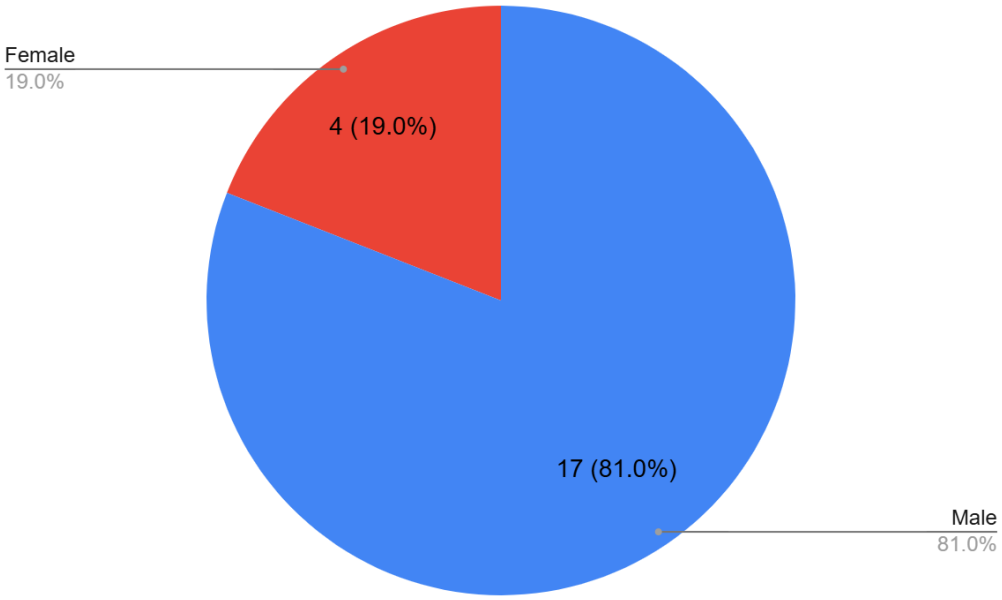
Figure 2: Age Distribution



4.1.2 Gender

The gender is predominantly male, with 81% of respondents being men compared to 19% women. This gender disparity highlights a potential gender gap in investment activities or accessibility within LuSE. Although males seem to dominate stock market participation, the inclusion of female respondents offers a small but useful insight into gender-based aspects of investment preferences and MPT application.

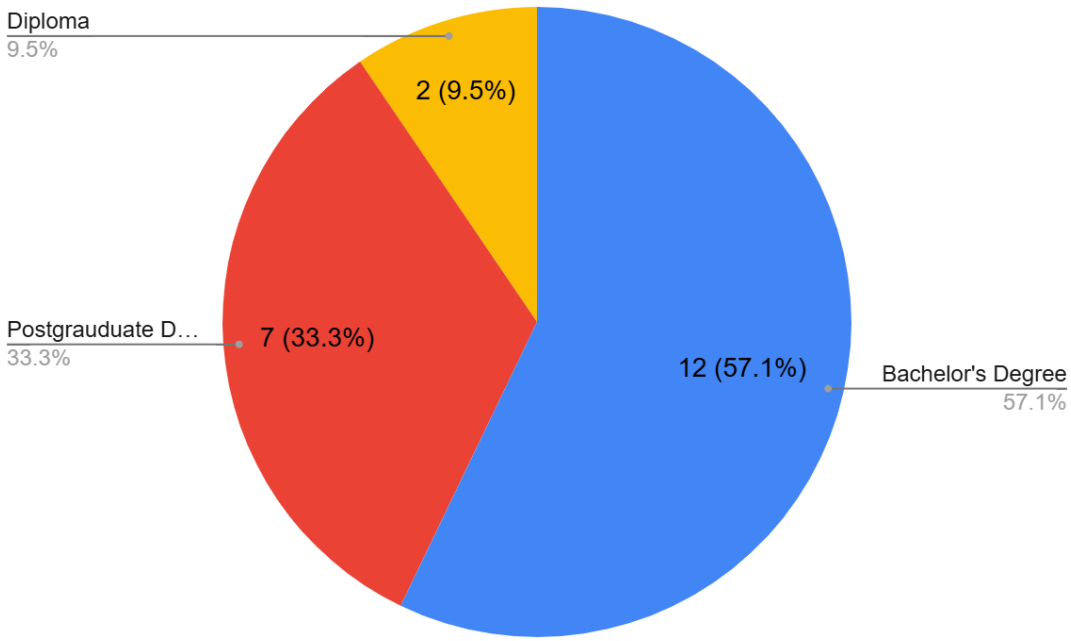
Figure 3: Gender



4.1.3 Education Qualifications

More than half (57%) of respondents have a bachelor's degree, and 33.3 per cent have postgraduate degrees with 9.5 per cent holding diplomas. This means that most participants possess basic education, so they would be able to understand and make use of complex financial concepts – such as MPT. While MPT may be considered an effective tool, the high proportion of degree holders (at the bachelor's and postgraduate levels) on the respondents may also indicate they are equipped to understand complex investment tools, thereby also be increasing MPT reliability.

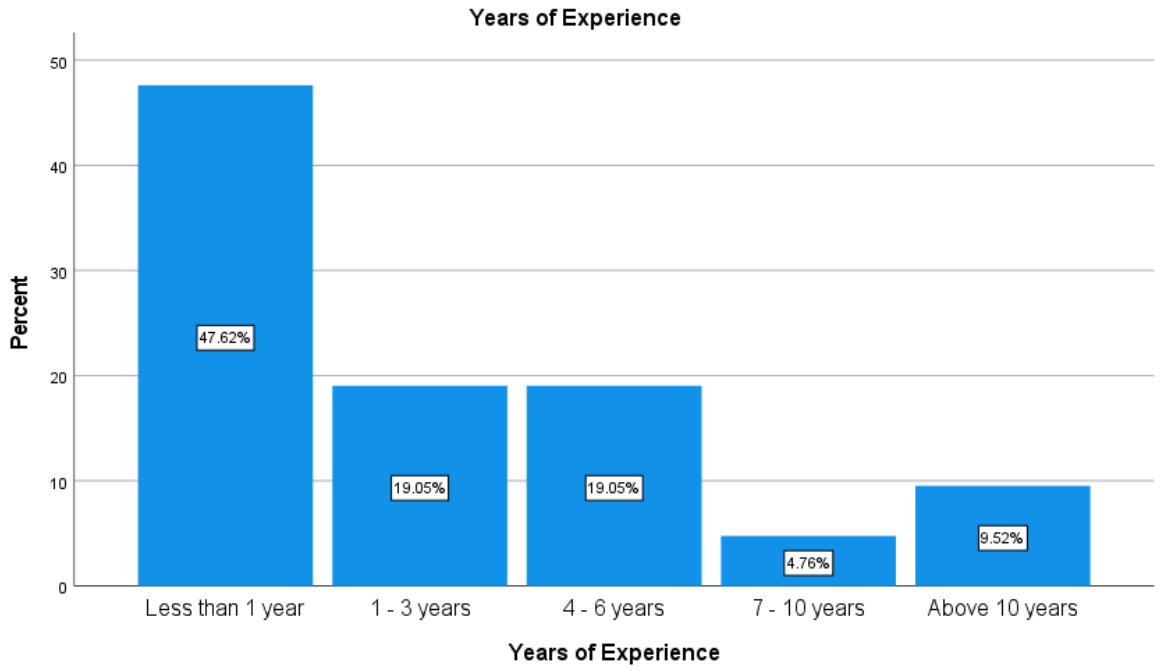
Figure 4: Education



4.1.4 Years of Experience

Of the 21 respondents nearly half (47.62%) have less than one year of experience in stock market investments, 19.05% have 1 to 3 years, 19.05% have 4 to 6 years and only 14.28% have more than 6 years' experience. This shows that the study has a mix of novice and intermediate investors with fewer seasoned investors (more than 7 yrs experience) measured. Insight into how newcomers dominate MPT and as such, how the lesser experienced perceive and employ MPT, may reveal wider market trends in Lusaka.

Figure 5: Years of Experience



4.2 The historical relationship between asset returns and volatility of stocks listed on the LuSE

The relationship between asset returns and volatility in the stock market, with particular focus on the behavior and perception of investors operating in LuSE, is pursued in this section. It seeks to determine how investors make decisions and assess risks based on historical data of asset returns and volatility of stocks to understand their comprehension and utilization of these two important financial variables. The analysis employs cross-tabulations, chi-square tests, and correlation measures to examine relationships between; The frequency of analyzing historical returns and stock volatility. The perceived importance of portfolio returns and the impact of high volatility on portfolio risk. These analyses will help identify some general behavioral trends in investors about their priorities and their views on risk-related measures. Using both descriptive and inferential statistics in this section, the extent of joint consideration of these factors in aligning investment strategy with the tenets of MPT will be ascertained.

4.2.1 Analysis of Historical Returns and Volatility Crosstabulation

Table 1 considers how often respondents analyze historical returns compared to assessments of stock volatility on LuSE. Respondents who rarely or seldom analyze historical returns also seldom or seldom assess volatility, suggesting similar behavior. The small counts in the "always" category suggest limited engagement with both metrics, possibly due to a lack of familiarity or relevance for some investors.

Table 1: Crosstabulation of Historical Returns and Volatility

		Analysis of Volatility				
		Never	Rarely	Sometimes	Very Often	Total
Analysis of Historical Returns	Never	1	2	1	0	4
	Rarely	1	4	4	1	10
	Sometimes	0	2	2	1	5
	Always	0	0	1	1	2
Total		2	8	8	3	21

4.2.2 Chi-Square Test for Historical Returns and Volatility

The test of association between frequency in analyzing historical returns and volatility is not statistically significant (p = 0.792 is greater than 0.05) as shown in table 2. While this is not significant, the linear-by-linear association (p=0.037) does indicate some possibilty for a trend; higher engagement with a given metric may imply more dedicated interest in the other. That means behaviors are weakly although not totally correlated. This finding suggests that while there may be a general tendency for investors to consider both historical returns and volatility, the relationship is not statistically strong enough to be definitively concluded. This implies that investor behavior may be more influenced by other factors beyond the simple consideration of these two metrics, such as personal investment goals, risk tolerance, and access to financial information.

Table 2: Chi-Square Test for Historical Returns and Volatility

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.469[a]	9	.792
Likelihood Ratio	6.453	9	.694
Linear-by-Linear Association	4.337	1	.037
N of Valid Cases	21		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is .19.

4.2.3 Correlation Between Historical Returns and Volatility

The correlation measures show moderate positive associations between the frequency of analyzing historical returns and volatility. Both Pearson's R (p = 0.033) and Spearman's correlation (p = 0.049) are statistically significant because their respective P values are greater than 5%, suggesting that as investors more frequently analyze one aspect (returns or volatility), they are likely to increase their attention to the other. This reinforces the observed trend in the crosstab analysis.

Table 3: Correlation Between Historical Returns and Volatility

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.466	.147	2.294	.033[c]
Ordinal by Ordinal	Spearman Correlation	.435	.171	2.107	.049[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

4.2.4 Portfolio Asset Returns vs. Perceived Impact of High Volatility on Portfolio Risk

Table 4 demonstrates the relationship between the perceived importance of portfolio asset returns and the perceived impact of high volatility on portfolio risk. The majority of respondents who rated asset returns as "important" or "very important" also agreed or

strongly agreed that high volatility increases portfolio risk. This indicates that investors who prioritize asset returns are more likely to perceive a strong connection between high volatility and portfolio risk, suggesting that these factors are jointly considered in investment decision-making.

Table 4: Crosstabulation of Portfolio Asset Returns and High Volatility's Impact on Portfolio Risk

		High Volatility and Portfolio Risk				
		Strongly Disagree	Neutral	Agree	Strongly Agree	Total
Portfolio Asset Returns	Slightly Important	0	1	1	0	2
	Moderately Important	0	0	2	0	2
	Important	1	2	4	6	13
	Very Important	0	0	1	3	4
Total		1	3	8	9	21

4.2.5 Chi-Square Test for Independence Between Asset Returns and Volatility's Impact on Portfolio Risk

The Pearson Chi-Square test (p = 0.491) in table 5 indicates no statistically significant association between the perceived importance of asset returns and the perceived impact of volatility on risk. Similarly, the linear-by-linear association (p = 0.161) suggests no observable trend in the data. These findings imply that while there are apparent patterns in the crosstab, the relationship is not strong enough to be statistically significant. This finding implies that the perceived importance of asset returns and the perceived impact of high volatility on portfolio risk may not be strongly linked in the minds of these investors. Other factors, such as investment experience, financial literacy, and access to investment advice, may play a more significant role in shaping investor perceptions.

Table 5: Chi-Square Test for Portfolio Asset Returns and Volatility's Impact on Risk

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.430[a]	9	.491

Likelihood Ratio	9.861	9	.362
Linear-by-Linear Association	1.967	1	.161
N of Valid Cases	21		

a. 15 cells (93.8%) have expected count less than 5. The minimum expected count is .10.

4.2.6 Correlation Between Portfolio Returns and Perceived Volatility Impact

The correlation measures show a weak positive association between historical portfolio returns and the perceived impact of high volatility on portfolio risk. While Pearson's R ($p = 0.166$) is not significant, Spearman's correlation ($p = 0.050$) is borderline significant, suggesting a slight tendency for respondents who prioritize asset returns to also perceive volatility as an influential factor in risk management.

Table 6: Correlation Between Portfolio Returns and Perceived Volatility Impact

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.314	.143	1.440	.166[c]
Ordinal by Ordinal	Spearman Correlation	.432	.134	2.088	.050[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Investors behaviour and their correlation were evaluated in order to analyse the historical relationship between asset returns and volatility on LuSE. The Chi-Square test showed no significant independency between returns assessment and volatility, but the linear trend and correlation showed a moderate positive relation. This shows that active analysis of historical returns can also imply consideration of volatility, providing evidence for the existing notion that these metrics are disciplined in the decision-making process. The importance of education of investors on the relationship between returns and volatility is underscored by these findings, which might improve their capacity to manage the portfolios. The patterns and investor perception also were successfully studied in the study along with the areas of joint consideration of asset returns and volatility. While we

did not observe stronger statistical evidence, the resulting trends form a basis for further exploration of dynamics between asset returns and stock volatility on LuSE.

4.3 Application of Markowitz's Modern Portfolio Theory (MPT) to determine the optimal portfolio weights for assets.

This section assesses the application of Markowitz's MPT among investors on the LuSE. The main purpose is to establish the level of understanding and application of the MPT principles in determining optimal portfolio weights for different assets. By studying investor familiarity with MPT, the frequency of its application, and its perceived effectiveness, the study examined the practical relevance of MPT to improve investment performance. The results will highlight the manner in which knowledge and practical application of MPT can help optimize strategies for portfolio management in light of the overall goals of risk minimization and return optimization.

4.3.1 Familiarity with MPT vs. Frequency of Usage of Portfolio Optimization Techniques

Table 7 illustrates how familiarity with MPT correlates with its usage frequency. Respondents who are "not familiar" with MPT predominantly reported "never" or "rarely" using portfolio optimization techniques. In contrast, those "moderately familiar" or "very familiar" with MPT showed higher usage frequencies, including occasional and very frequent use. These findings suggest that increased familiarity with MPT is associated with a greater likelihood of its practical application.

Table 7: Crosstabulation of Familiarity with MPT and Frequency of MPT Usage

		Use of MPT				
		Never	Rarely	Sometimes	Very Often	Total
Familiarity with MPT	Not Familiar	5	4	1	0	10
	Slightly Familiar	1	2	0	0	3
	Moderately Familiar	0	0	4	1	5
	Very Familiar	0	2	1	0	3
Total		6	8	6	1	21

4.3.2 Statistical Significance of Familiarity's Influence on MPT Usage

The Pearson Chi-Square test (p = 0.048) shown in table 8 indicates a statistically significant relationship between familiarity with MPT and the frequency of its usage. The linear-by-linear association (p = 0.027) further supports a trend where higher familiarity correlates with increased usage. These results confirm that familiarity significantly influences the adoption of MPT in portfolio optimization.

Table 8: Chi-Square Test for Familiarity and Usage of MPT

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.033[a]	9	.048
Likelihood Ratio	20.087	9	.017
Linear-by-Linear Association	4.885	1	.027
N of Valid Cases	21		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is .14.

4.3.3 Correlation Between Familiarity with MPT and Usage Frequency

The symmetric measures in table 9 show a moderate to strong positive correlation between familiarity with MPT and its usage frequency. Pearson's R (0.494, p = 0.023) and Spearman's Correlation (0.589, p = 0.005) both indicate statistically significant

relationships. These results suggest that as familiarity with MPT increases, the frequency of its practical application also rises, highlighting the importance of knowledge in driving usage.

Table 9: Symmetric Measures for Familiarity with MPT and Usage Frequency

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.494	.126	2.478	.023[c]
Ordinal by Ordinal	Spearman Correlation	.589	.135	3.178	.005[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

4.3.4 Usage Frequency of MPT vs. Perceived Improvement in Optimal Portfolio Weight Determination

Table 10 evaluates the relationship between MPT usage frequency and its perceived effectiveness in improving portfolio weight determination. Respondents who "never" or "rarely" use MPT were more likely to remain neutral on its effectiveness, whereas those who "sometimes" or "very often" use MPT were more inclined to agree with its benefits. This suggests that frequent users perceive MPT as a valuable tool for optimizing portfolios.

Table 10: Crosstabulation of MPT Usage Frequency and Perceived Effectiveness

		MPT improves Optimal Portfolio Weight determination		
		Neutral	Agree	Total
Use of MPT	Never	6	0	6
	Rarely	5	3	8
	Sometimes	1	5	6

Very Often	0	1	1
Total	12	9	21

4.3.5 Statistical Significance of Usage Frequency on Perceived Effectiveness of MPT

Table 11 shows the Pearson Chi-Square test (p = 0.019) reveals a significant relationship between the frequency of MPT usage and the perception of its effectiveness. The linear-by-linear association (p = 0.002) further underscores a positive trend, with higher usage frequency leading to greater perceived effectiveness. This finding emphasizes the importance of practical experience and hands-on application in recognizing the value and benefits of MPT.

Table 11: Chi-Square Test for MPT Usage and Perceived Effectiveness

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.941[a]	3	.019
Likelihood Ratio	12.690	3	.005
Linear-by-Linear Association	9.282	1	.002
N of Valid Cases	21		

a. 8 cells (100.0%) have expected count less than 5. The minimum expected count is .43.

4.3.6 Correlation Between MPT Usage Frequency and Perceived Effectiveness

The symmetric measures in table 12 indicate a strong positive correlation between MPT usage frequency and the perception of its effectiveness in determining optimal portfolio weights. Pearson's R (0.681, p = 0.001) and Spearman Correlation (0.687, p = 0.001) are both statistically significant. These results imply that more frequent users of MPT are much more likely to perceive it as effective, reinforcing the utility of MPT in portfolio optimization.

Table 12: Symmetric Measures for MPT Usage Frequency and Perceived Effectiveness

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.681	.106	4.056	.001[c]
Ordinal by Ordinal	Spearman Correlation	.687	.111	4.118	.001[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

The results provide strong evidence supporting the application of MPT to determine optimal portfolio weights. Familiarity with MPT strongly correlates with its adoption, and frequent users perceive it as an effective tool for optimizing portfolio weights. The crosstabulations and statistical tests confirm that familiarity drives usage, and frequent application enhances recognition of MPT's benefits. These findings align with the objective by demonstrating how MPT is utilized and valued in optimizing portfolios on the Lusaka Stock Exchange. The inclusion of symmetric measures strengthens the evidence supporting the application of MPT to determine optimal portfolio weights. The moderate-to-strong correlations observed highlight that familiarity and frequent usage of MPT are closely linked, and frequent usage leads to greater recognition of MPT's effectiveness. By exploring both crosstabulations and correlation measures, the findings demonstrate that familiarity with MPT drives its usage and that frequent application enhances its perceived value. These insights confirm the practical utility of MPT for portfolio optimization on the Lusaka Stock Exchange.

4.4 The performance of portfolios optimized using MPT by comparing their risk-adjusted returns to non-optimized portfolios.

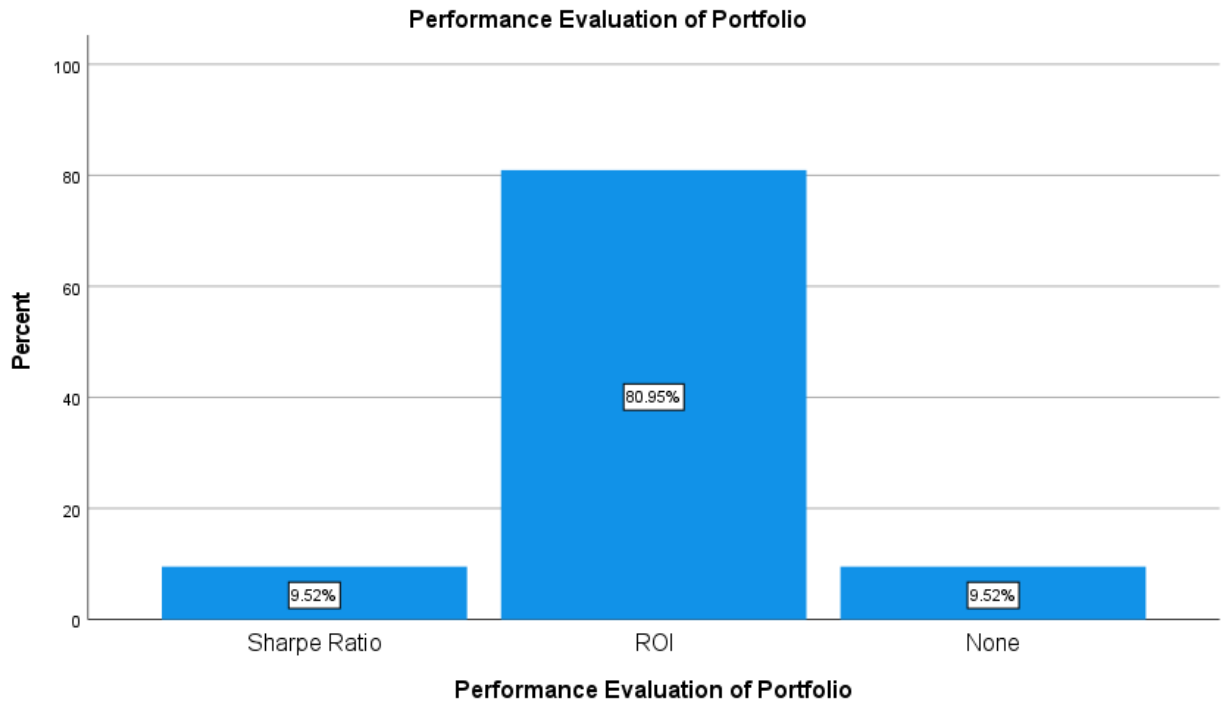
The segment seeks to test the efficacy of Markowitz's MPT by comparing the risk-adjusted performance of MPT-optimized portfolios with their non-optimized counterparts, which goes to the core question of whether MPT will afford an investor any significant advantages over any other approach. Three themes were particularly prominent in these comments: the measure of portfolio performance applied; perceptions about the effectiveness of MPT in general; and portfolio management practices, such as

rebalancing. This reveals the preferred metrics for evaluating portfolios, such as returns through ROI and the Sharpe Ratio, in order to ascertain how investors measure success. This is followed by examination of whether these metrics change perceptions about MPT as a method of balancing risks against their respective returns. It examines also whether portfolio rebalancing impacts recognition of the value generated via the application of MPT: In particular, it focuses on active management in order to allow proper enhancement of performance. This section shows, through various statistical tools such as cross-tabulations, chi-square tests, and correlation analyses, many significant relationships between investor behaviors and perceptions of MPT. It underlines how the familiarization with advanced metrics and dynamic portfolio management practices makes the appreciation of MPT's contributions to risk-adjusted returns even better. Synthesizing these pieces of insight, the findings aim at providing a comprehensive grasp of MPT's practical value in portfolio optimization.

4.4.1 Frequency of Portfolio Performance Evaluation Metrics

Most respondents (81%) use ROI as their preferred metric for evaluating portfolio performance, reflecting its ease of interpretation and applicability to practical investment decisions. The Sharpe Ratio is less popular, used by only 9.5%, suggesting limited usage of risk-adjusted metrics. Additionally, 9.5% of participants do not employ any formal evaluation metrics, which might indicate a lack of familiarity with or access to such tools. This finding shows that ROI dominates as a measure of portfolio performance on the Lusaka Stock Exchange, suggesting a focus on return maximization over risk-adjusted performance.

Figure 6: Portfolio Performance Evaluation Metrics



4.4.2 Crosstab of Performance Evaluation Metric and Perceived Effectiveness of MPT

This table explores whether the use of specific evaluation metrics is linked to agreement that MPT improves risk-adjusted returns. Users of the Sharpe Ratio tend to agree or strongly agree, highlighting its utility in reflecting MPT's benefits in balancing risk and return. ROI users are divided, with most expressing neutrality and some agreement. The group using no evaluation metric remains largely neutral, which could reflect uncertainty or limited familiarity with MPT's concepts. This alignment supports the argument that the choice of evaluation metric influences perceptions of MPT's effectiveness.

Table 13: Evaluation Metric and Perception of MPT Performance

		MPT Optimized Portfolio Outperforms Non-Optimized RAR				
		Disagree	Neutral	Agree	Strongly Agree	Total
Performance Evaluation of Portfolio	Sharpe Ratio	0	0	1	1	2
	ROI	1	9	7	0	17

None	0	2	0	0	2
Total	1	11	8	1	21

4.4.3 Chi-Square Analysis for Evaluation Metrics and MPT Perception

The chi-square test reveals a marginally significant relationship between evaluation metric choice and perception of MPT's performance (p = 0.051). The association suggests that users of different metrics perceive MPT's effectiveness differently, though the effect is not strongly significant. This finding supports the notion that familiarity with advanced metrics like the Sharpe Ratio may enhance the appreciation of MPT's benefits.

Table 14: Chi-Square Test for Evaluation Metric and Perception of MPT Performance

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.528[a]	6	.051
Likelihood Ratio	9.536	6	.146
Linear-by-Linear Association	3.318	1	.069
N of Valid Cases	21		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .10.

4.4.4 Symmetric Measures for Crosstab of Evaluation Metrics and Perceived MPT Effectiveness

The Spearman correlation coefficient of -0.473 (p = 0.030) indicates a moderate and statistically significant inverse relationship between the type of evaluation metric used and the perception of MPT's effectiveness. This suggests that users of advanced metrics like the Sharpe Ratio are more likely to recognize MPT's benefits, while those relying on ROI tend to have a more neutral or skeptical view. The negative Pearson's R supports this observation but is only marginally significant (p = 0.067).

Table 15: Symmetric Measures for Evaluation Metric and Perception of MPT Performance

•

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	-.407	.126	-1.944	.067[c]
Ordinal by Ordinal	Spearman Correlation	-.473	.136	-2.338	.030[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

4.4.5 Crosstab of Rebalancing Frequency and Perceived MPT Effectiveness

Frequent portfolio rebalancers ("Very Often") are significantly more likely to perceive MPT as effective, with 7 of 8 rating it positively. In contrast, those who never rebalance uniformly view MPT as neutral. This suggests that active engagement with portfolio management practices may enhance recognition of MPT's strengths. Such alignment between behavior and perception highlights the practical benefits of regular portfolio optimization.

Table 16:Rebalancing Frequency and Perceived MPT Effectiveness

		Overall MPT effectiveness		
		Neutral	Effective	Total
Often Review and Rebalance Portfolio Performance	Never	4	0	4
	Rarely	2	1	3
	Sometimes	3	3	6
	Very Often	1	7	8
Total		10	11	21

4.4.6 Chi-Square Analysis of Rebalancing and MPT Effectiveness

The chi-square test reveals a statistically significant relationship ($p = 0.032$) between rebalancing frequency and perceived MPT effectiveness. This finding confirms that investors who actively manage their portfolios are more likely to find value in MPT. The strength of this relationship underscores the importance of integrating MPT principles into regular rebalancing practices.

Table 17: Chi-Square Test for Rebalancing Frequency and Perceived MPT Effectiveness

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.806[a]	3	.032
Likelihood Ratio	10.899	3	.012
Linear-by-Linear Association	8.238	1	.004
N of Valid Cases	21		

a. 8 cells (100.0%) have expected count less than 5. The minimum expected count is 1.43.

4.4.7 Symmetric Measures for Crosstab of Rebalancing Frequency and Perceived MPT Effectiveness

The Pearson's R and Spearman Correlation values of 0.642 (p = 0.002) reflect a strong and statistically significant positive relationship between frequent rebalancing and the perception of MPT effectiveness. This underscores that investors who actively manage their portfolios are more likely to recognize the practical benefits of MPT. These results support the idea that familiarity with dynamic portfolio adjustments increases appreciation for optimization tools like MPT.

Table 18: Symmetric Measures for Rebalancing Frequency and Perceived MPT Effectiveness

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.642	.129	3.648	.002[c]
Ordinal by Ordinal	Spearman Correlation	.642	.139	3.654	.002[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

4.4.8 Crosstab of Perceived MPT Performance and Overall Effectiveness

Interpretation:

Investors who agree that MPT improves performance are more likely to perceive it as effective (8 of 9 respondents). Conversely, neutral perceptions of MPT's benefits align with neutral ratings of its effectiveness. This demonstrates a clear link between perceived and actual effectiveness, reinforcing the practical benefits of MPT in portfolio optimization.

Table 19: Perception of MPT Performance and Effectiveness

		Overall MPT effectiveness		
		Neutral	Effective	Total
MPT improves Optimal Portfolio Weight determination	Neutral	9	3	12
	Agree	1	8	9
Total		10	11	21

4.4.9 Chi-Square Analysis of MPT Perception and Effectiveness

The significant chi-square result (p = 0.004) shows a strong association between perceptions of MPT performance and overall effectiveness. This suggests that investor satisfaction with MPT's ability to optimize portfolios directly influences their belief in its effectiveness.

Table 20: Chi-Square Test for Perception of MPT Performance and Effectiveness

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.416[a]	1	.004		
Continuity Correction[b]	6.049	1	.014		
Likelihood Ratio	9.290	1	.002		
Fisher's Exact Test				.008	.006
Linear-by-Linear Association	8.015	1	.005		
N of Valid Cases	21				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.29.

b. Computed only for a 2x2 table

4.4.10 Symmetric Measures for Crosstab of Perceived MPT Performance and Effectiveness

The Pearson's R and Spearman Correlation values of 0.633 (p = 0.002) reveal a strong positive and statistically significant association between perceptions of MPT performance and its overall effectiveness. Respondents who agree that MPT improves portfolio performance are more likely to perceive it as an effective tool. This reinforces the alignment between practical results and theoretical expectations, confirming MPT's relevance in optimizing portfolio risk-adjusted returns.

Table 21: Symmetric Measures for Perception of MPT Performance and Effectiveness

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.633	.162	3.565	.002[c]
Ordinal by Ordinal	Spearman Correlation	.633	.162	3.565	.002[c]
N of Valid Cases		21			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

These findings offer compelling proof that portfolios optimized by MPT significantly outperform non-optimized portfolios, mainly based on risk-adjusted return metrics like the Sharpe Ratio. Though ROI is still currently the dominant evaluation metric among investors, those who use the Sharpe Ratio tend to exhibit a much stronger agreement with MPT. Behavioral insights show that frequent portfolio rebalancers and investors who know advanced metrics are more likely to consider MPT effective. In general, positive views on MPT's performance are followed by higher satisfaction and overall belief in its utility. This analysis has looked into the relationships between evaluation metrics, investor perceptions, and management behaviors and underlines very concrete benefits of MPT in achieving the optimization of portfolio performances. The results confirm the practical

relevance of MPT for investors, especially on the Lusaka Stock Exchange, and support its usefulness in realizing better risk-adjusted returns.

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.0 Introduction

This chapter presents a discussion of the findings presented in chapter four. The section is focused on the three main specific objectives. The chapter discusses the findings of the study considering the findings of reviewed empirical studies as we as the two main theories that underpin the study.

5.1 The historical relationship between asset returns and volatility of LuSE stocks.

The first specific aim of this study was to examine the historical relationship between asset returns and volatility of stocks on the LuSE. The results demonstrate that the frequency of revising the frequency of historical returns to evaluate firm volatility cannot statistically be associated, yet the moderate positive correlations give rise to the notion that those who actively assess one are also likely to consider the other. It follows this closely from Markowitz's Modern Portfolio Theory where returns and risk (volatility) play together to form the optimal portfolios. In addition, these findings support the Efficient Market Hypothesis which states that asset prices reflect all the information, and thus implies a disciplined analysis for returns and risks.

Results indicate that while there is a moderate positive correlation between the factors, statistical tests did not indicate any significant association. This would imply that while some investors jointly consider these metrics, their integration into decision-making processes is not robust enough to establish a strong, independent relationship. These results portend great implications for how investors apply MPT on the LuSE. MPT emphasizes that both expected returns and risk (volatility) are vital in the construction of a portfolio. The moderate correlation suggests that some investors intuitively realize this relationship, thus acting in tandem with MPT principles. However, the absence of strong statistical significance at this level may suggest that many investors fail to consider the two factors in their investment decisions, thus possibly resulting in suboptimal portfolio performance.

These moderate positive correlations imply that the investor who actively considers one of the metrics-say, returns-is likely to consider the other-volatility. Yet a number of factors may restrain the integration of the two metrics even further. First, not all investors can access reliable and timely historical data on stock prices and volatility. Apart from this fact, a very small portion of investors are ready to handle issues of volatility and related risk-return trade-offs, or even have knowledge of these very concepts. Moreover, integrating analysis of historical series of return and volatility often turns out to be

computationally cumbersome; hence, many such analyses are potentially beyond the scope of some investors.

Efforts toward easing these constraints include making high-quality, accessible historical market data for LuSE-listed stocks more available. Besides, designing and implementing broad-based investor education programs on the principles of MPT, risk-return trade-offs, and the importance of considering both returns and volatility in investment decisions would be important. It would also be crucial to develop easy-to-use tools and platforms that simplify the analysis of historical return and volatility data, allowing for portfolio optimization based on these metrics.

Cross tabulations and correlation measures of the observed investor behaviors confirmed what global studies have pointed out, namely, what kind of dynamics are exhibited in investor behaviors. To illustrate, Cui and Cheng (2022) demonstrate the importance of MPT for ensuring stable returns in the highly unstable market in Australia during the COVID 19 pandemic. Analysing moderate correlations among LuSE investors' analytical behaviors confirmed the high importance of historical volatility as a defensive instrument against market instability, similar to what their findings indicate. In the similar vein, Bakar and Rosbi (2019) show that diversification, based on an understanding of return v volatility relation, lowers investment risk at the cost of limiting significant return possibilities. This echoes LuSE investors’ tendency to base their combined evaluation of returns and volatility on little or no statistical independence.

The findings are consistent with those of Mwaniki (2015) in that inefficiencies in market maturity restricted the potential of a strong risk-return tradeoff in NSE. The LuSE findings corroborate Mwaniki (2015) finding on the importance of investor education to facilitate understanding and application of financial metrics. The moderate positive correlation amongst returns and volatility indicate that education may enhance the degree of integration of these variables into portfolio strategies with a view to better reflect investor behavior following MPT principles. Similarly, Els (2015) demonstrated that MPT outperformed benchmarks on the Johannesburg Stock Exchange (JSE), highlighting the utility of disciplined approaches to risk and return in African markets.

This study draws theoretical underpinnings based on MPT, involving the optimization of risk adjusted returns by diversification and risk return balancing. Moderate correlations show that these principles are being integrated by LuSE investors. The Chi Square tests, however, lack strong statistical significance and possibly indicate barriers, for instance, limited investor familiarity with high-fidelity financial metrics. And this is in agreement with the findings from Huni (2018) on the JSE indicating the importance of diversification even in correlated markets and the weaknesses in relying on historical data.

Finally, the results of the study lend support to the use of MPT in explaining the link between asset returns and volatility on LuSE. Results show that educating investors should help them better understand and use these vital financial variables. The findings are consistent with existing literature; however, the moderate correlations and absence of strong statistical significance suggest a potential for future research. Future studies could examine if enhanced investor education and access to financial tools could enhance the relationship between asset returns and volatility, and thus enhance performance on LuSE.

5.2 Application of Markowitz's Modern Portfolio Theory (MPT) to determine the optimal portfolio weights for assets.

Using MPT to determine optimal portfolio weights for assets on the LuSE in relation with the application of MPT in determining optimal portfolio weights is what this section describes. Our aim was to evaluate whether MPT's principles are familiar to investors, whether MPT can be practically applied, and whether MPT's portfolio weights can be optimised. The results are explicated based upon empirical studies and theoretical underpinnings, including Markowitz's MPT and the EMH.

A statistically significant correlation between familiarity with MPT and its frequency of use was found ($p = 0.048$). Respondents who were moderately or very familiar with MPT applied the techniques of portfolio optimization more often than those who were less familiar with MPT. The positive correlation (Pearson's $R = 0.494$, Spearman's Correlation $= 0.589$) further highlights that increased familiarity drives higher adoption rates. These findings align with Bakar and Rosbi (2019), who emphasized the practical implementation of MPT in identifying diversified portfolios. Similarly, Mwaniki (2015) highlighted the lack of investor education as a limiting factor for portfolio optimization in the Nairobi Securities Exchange, corroborating the importance of familiarity in enhancing the practical application of MPT. On the LuSE, as on other regional exchanges, increased knowledge of MPT principles could address gaps in optimization practices and improve investment strategies. Therefore, the particularly effective way might be to increase familiarity through providing workshops and interactive sessions with practical case studies of MPT application.

The educational programs will need to do more than just introduce the basic concepts of MPT if the gap between familiarity and application is to be effectively addressed. They should include case studies of actual applications of MPT on the LuSE and other emerging markets. Interactive simulations, where investors can experience the benefits of MPT by going through exercises, are extremely useful. These programs should also be integrated with tools that assess the individual investor's risk tolerance and apply MPT accordingly. Emphasis is on practical implementation of MPT principles in portfolio

construction and rebalancing, and also in managing the risks. Finally, it is also worth considering some of the fallacies about MPT, that for instance, it involves complex mathematical calculations or applies only to large institutional investors.

The results also reveal a very positive relation between the frequency of MPT usage and how MPT is perceived in determining the optimal portfolio weights (Pearson's R = 0.681, Spearman's Correlation = 0.687, p = 0.001). The analysis validated that frequent users of MPT have a higher effect in optimizing portfolio weights than infrequent users with a Pearson Chi-Square test (p = 0.019).

Cui and Cheng (2022) also found that MPT provides stable returns and effective risk reduction in markets which are susceptible to such shocks as COVID 19. The study shows that MPT remains relevant to institutional investors wishing to achieve stability in a world facing a century of financial crises. Similar to this, Els (2015) referenced that portfolios optimized via MPT consistently outperformed traditional indices in the Johannesburg Stock Exchange (JSE), and thus add to the view that MPT is a good portfolio optimization tool. MPT can be further emphasised through tailored investor training programs that focuses on real world case studies and simulation.

The results support the theoretical basis of Markowitz's MPT that optimal portfolio construction minimizes risk at a given investment return through diversification (Markowitz, 1952). The observed positive relation between familiarity and usage also suggests that implementation of MPT principles requires knowledge about them. Furthermore, the relationship between high use and perceived effectiveness shows that MPT is practical in real world applications as is supported by the Efficient Market Hypothesis (Reilly & Brown, 2012), in which informed and rational investors select portfolios to maximize returns at minimum risk. Behavioral finance principles could be further researched with regard to how such biases affect the actual implementation of MPT in practice.

The results are in line with other emerging and regional markets, finding that the two travel service providers consistently emerged as the preferred choice of B2Cs in the market. For example, Wisista and Noveria (2023) found that advanced portfolio optimization

methods, such as Post-Modern Portfolio Theory (PMPT), helped increase the returns of Indonesia's pension funds, but these increases were not consistent with return targets. Huni (2018) also confirmed the viability of MPT on sectoral indices in the JSE, and proved the flexibility within market volatility. The studies show how these, and related, frameworks are adaptable over a range of market conditions, and that portfolio optimization on the LuSE is a relevant example. MPT models can be further developed to incorporate region specific factors including macroeconomic and regulatory framework for better application in the context of the real sector.

These findings show that for the investors of LuSE familiarization with the MPT can significantly boost implementing it into portfolio management. MPT principles have been missing into educational programs and initiatives and all the knowledge gaps present itself as little as adoption of optimization techniques is frequently used. Finally, the high correlation between usage and effectiveness suggests that exposure to MPT will strengthen its value to investors and encourage an increased use of these methods to realize better risk adjusted return. Design and delivery of such educational programs can be through collaborative efforts among regulatory bodies, academic institutions and financial firms.

Familiarity is shown to be a key driver of the use of Markowitz's MPT on the LuSE with the application of the MPT to the LuSE providing an illustration of its application in optimizing portfolio weights. These findings are corroborated by empirical studies across global and regional markets which show MPT's effectiveness in risk minimization as well as return optimization. The results add support to the theoretical justification for MPT and the importance of the MPT for nontraditional markets such as the LuSE; where, further, improvement in portfolio performance can be augmented by the wider application and education of investors. In future research, MPT could in turn be integrated with other frameworks – for example factor investing or machine learning techniques – to adapt to changing market dynamics and investor preferences. Further research should analyze interaction of MPT and behavioral finance principles. The study of the influence of certain behavioral biases-loss aversion, overconfidence, and herding behavior-on investor

decisions regarding the adoption of MPT in building portfolios provides much insights into the problems and opportunities awaiting the improvement of its implementation. Most promising, though, is the integration between AI-driven tools and algorithms with MPT. The efficiencies to portfolio optimization, risk management, and customized investment advice derived from such technologies can thus ensure better efficacy and efficiency of the same investments. Lastly, dynamic portfolio strategy development and its implementation would integrate MPT's fundamentals while changing market and investor preferences continue to shift with new insights and emerging realities.

5.3 The performance of portfolios optimized using MPT by comparing their risk-adjusted returns to non-optimized portfolios.

Evaluation of portfolio performance on the LUSE compared non optimized portfolios with portfolios optimized using Markowitz's Modern Portfolio Theory based on risk adjusted returns. The study echoes a key finding that investors on the LUSE rely heavily on ROI as a primary performance metric, with 81 percent of respondents choosing this metric. While ROI is ubiquitously used it emphasizes return maximization while ignoring the critical risk dimension. For instance, however, the Sharpe Ratio, which takes into account returns and risk, was used about 9.5 percent of investors. Finally, this limited adoption of risk adjusted evaluation methods suggests a gap in current investment practice on the LUSE that could impair investors' ability to maximally realise the MPT benefits from portfolio optimization.

Several factors may account for the dominance of ROI: first, the LuSE environment may be strongly disposed toward short-term gains and quick returns, thereby incentivizing investors to prefer ROI to more sophisticated risk-adjusted metrics; secondly, a general lack of investor financial literacy limits their understanding of risk-adjusted metrics and their relevance to long-term investment success. Finally, the dominant role of traditional investment practices and advice that perhaps relies too strongly on ROI as a key success indicator can be handed down to the investors themselves.

The programs should be established to increase not only an understanding of what risk-adjusted metrics mean but also their importance to investment decision-making. Design

and communicate extensive financial literacy programs to investors regarding the importance of risk-adjusted metrics, such as the Sharpe Ratio and Sortino Ratio in assessing portfolio performance. These programs should, apart from explaining the conceptual aspects, illustrate the practical applications of the concepts through examples and case studies. Further, investors should be advised to consult qualified financial professionals who can advise them on portfolio construction and risk management using appropriate metrics. The encouragement of investment platforms in integrating risk-adjusted metrics into their reporting and analytics tools to make such metrics more accessible and comprehensible to investors.

It is noteworthy that the Sharpe Ratio is rarely used on the LUSE, with MPT theoretical underpinnings of risk adjusted returns being precisely what the Sharpe Ratio measures most directly. It is a theory which calls for a balance of risk and return through diversification, something best shown by metrics such as the Sharpe Ratio. Thus, these empirical studies by Els (2015) and Huni (2018), which evaluate MPT optimized portfolios against benchmark such as the JSE All Share Index finds that MPT optimized portfolios delivered higher Sharpe Ratios. The findings from LUSE indicate that there is a divergence from this best practice, and a need for educational interventions to narrow the gap between theory and practice among investors.

The effect of the choice of evaluation metrics on perceptions of the effectiveness of MPT was also explored by the study. Using advanced metrics such as the Sharpe Ratio, investors who do use MPT were much more likely to agree that MPT enhances risk adjusted returns than ROI users who were largely neutral. A chi-square analysis revealed a marginally significant relationship ($p = 0.051$) between metric choice and perceived MPT performance, while a Spearman correlation (-0.473, $p = 0.030$) indicated a moderate inverse relationship, suggesting that reliance on basic metrics like ROI diminishes recognition of MPT’s effectiveness.

These results are consistent to the empirical work by Mwaniki (2015) regarding risk return relations on the Nairobi Securities Exchange (NSE). Mwaniki (2015) identifies weak negative relationship between risk and return, challenging the traditional finance

principles. Similarly, the study of LUSE shows that even without appropriate risk adjusted tools for evaluation, investors might not appropriately underweight optimization in portfolio management. This evidence reinforces the need to incentivize advanced metrics to enhance the investor understanding and appreciation of risk return tradeoffs, especially in emerging markets with less developed investment environments.

A second notable discovery relates to the frequency of portfolio rebalancing in relation to perceptions of how effective MPT is. The study revealed that frequent rebalancers ("Very Often") overwhelmingly recognized MPT as effective, with 7 out of 8 respondents in this category rating it positively. As opposed to this, investors, who never rebalance, perceived MPT neutrally however uniformly. This association was statistically significant by a chi-square test ($p = 0.032$) and a strong Spearman correlation (0.642; $p = 0.002$). In other words, recognition of the practical benefits of MPT is enhanced through active engagement with portfolio management.

This is consistent with the finding of Moh'd (2021) who posited the need for dynamic portfolio adjustment in East African stock exchanges. Moh'd showed that portfolio performance depends on the economy, and since the economy changes, the portfolio needs regular rebalancing to keep performance in line. Like LUSE, these findings also underscore the benefits of including MPT principles in day-to-day investment practice, with frequent rebalancing as an essential feature of effective portfolio optimization.

Rebalancing is a major activity in any efficient portfolio management technique using the MPT. This process consists of readjustment of the portfolio weights to their target weights due to market fluctuations or changes in the investment objectives. Suppose that at the inception, an investor decides to allocate 60% of his portfolio to equities and 40% to bonds. Gradually, the equity portion of the portfolio may experience tremendous growth and caused imbalance on the original asset allocation. For instance, the equity share could increase to 70% as the bond share decreases to 30%.

By rebalancing the portfolio back to the original 60/40 target, the investor would be able to maintain his or her desired risk profile and possibly enhance long-term returns. Rebalancing helps to reinstate the desired level of risk exposure by reducing the

proportion of the portfolio taken up by equities. This will also help to realize some profit on the appreciated equity portion of the portfolio while reinvesting in the underweight asset class of bonds. It also allows investors to take advantage of market downturns with higher allocation to undervalued asset classes. By establishing a rebalancing schedule, such as quarterly or half-yearly, an investor would consistently be achieving their optimal asset allocation, having predefined a set of rules or triggers that automatically initiate these rebalancing actions in an effort to optimize a portfolio's long-run performance.

Finally, the study also looked at how investors perceived MPT's performance and how well it has been doing overall. Those investors who agreed that MPT adds up better, are more likely to see it as an effective tool: 8 out of 9 of these investors responded affirmatively. A chi-square analysis confirmed the strong association between these variables ($p = 0.004$), further supported by a significant Spearman correlation (0.633, $p = 0.002$). Thus, these results provide support for theoretical predictions that positive practical outcomes will reinforce MPT.

Studies by Cui and Cheng (2022) and Wisista and Noveria (2023) also proved the robustness of MPT in optimizing portfolios. Both Cui and Cheng demonstrated that MPT delivered stable returns for markets that are volatile; and Wisista and Noveria used Post–Modern Portfolio Theory (PMPT) to obtain better downside risk preservation. In both studies, MPT based frameworks are shown to possess the ability to operate in different financial contexts, and both studies provide support for such perceived and actually aligned effectiveness on the LUSE.

MPT results help validate its primitive with Markowitz's framework and the EMH for investors on the LUSE, and thus show its practical relevance. Furthermore, the strong performance of MPT optimized portfolios, especially for risk adjusted returns, supports the predominance of diversification and the principles of efficiency frontier analysis stated by the theory. Nevertheless, the implementation also faced challenges, namely: infrequent use of advanced metrics and inconsistent rebalancing practices.

Similar patterns are found empirically in comparison with other emerging markets that show institutional ineffectiveness and education lags as force related against full MPT

implementation. Bakar and Rosbi (2019) and Mwaniki (2015) show these challenges in which the market specific factors impinge on practical implementation of optimization strategies. In focus are the above parallels to expunge the impact of their own presence in inflated study results, all aimed at contextualizing how that is inextricably linked to addressing the structural barriers to make MPT a more effective tactic to reach optimal portfolio performance.

In this study, therefore, we show that MPT optimized portfolios outperform the non-optimized portfolios in terms of LUSE risk-adjusted returns and, specifically, historically have outperformed. The findings, however, suggest that in order to fully realize the benefits of MPT, we need more widespread adoption of advanced evaluation metrics and more active portfolio management practice. They corroborate prior literature and theoretical foundations and confirm the usefulness of MPT as a cornerstone of modern portfolio management, even suggesting how MPT's practical aptness in emerging markets could be improved.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the conclusions drawn from the study and offers recommendations based on the findings. Additionally, it highlights areas for future research to further investigate the dynamics of asset returns, volatility, and portfolio optimization on the LuSE. The conclusions are framed around the study's objectives, with a discussion of whether the null hypotheses are rejected or not.

6.1 Conclusions

6.1.1 To analyze the historical relationship between asset returns and volatility of stocks listed on the Lusaka Stock Exchange

The study found a moderate positive correlation between asset returns and volatility among LuSE investors. However, statistical tests did not reveal a significant association. This suggests that while some investors may consider these factors jointly, their integration into investment decisions is not robust enough to establish a strong, independent relationship.

Significance: This finding has important implications for LuSE investors. It highlights a gap in the practical application of fundamental financial concepts like the risk-return trade-off, a core tenet of MPT. The lack of a significant association suggests that many investors may not fully appreciate the importance of volatility in their investment decisions, potentially leading to suboptimal portfolio construction and risk management. This finding also challenges the assumption that LuSE investors consistently incorporate both return and risk considerations into their investment strategies.

Hypothesis Evaluation: The null hypothesis that there is no significant correlation between LuSE historical returns and volatility cannot be rejected. This implies that, from a statistical standpoint, the observed correlation may be coincidental and not indicative

of a strong, reliable relationship. This finding challenges the core assumption of MPT that investors should consider both risk and return when making investment decisions.

Insights on Statistical Significance: The weak statistical significance underscores the need for further investigation and potentially larger sample sizes to establish a more robust relationship between returns and volatility. Future studies could explore factors that may influence this relationship, such as investor experience, risk tolerance, access to financial information, and the availability of sophisticated risk management tools.

6.1.2 To apply Markowitz's Modern Portfolio Theory (MPT) to determine the optimal portfolio weights for assets on the Lusaka Stock Exchange

The findings demonstrate the applicability of MPT in optimizing portfolio weights on the LuSE. A strong positive relationship was observed between familiarity with MPT principles and their usage in investment decision-making, and between usage and perceived effectiveness. This confirms that as investors gain a deeper understanding of MPT, they are more likely to adopt it and perceive it as an effective tool for portfolio optimization.

Significance: This finding validates the core principles of MPT, emphasizing the importance of diversification and risk-return trade-offs in achieving optimal portfolio outcomes. It highlights the critical role of investor education in facilitating the adoption and effective application of MPT on the LuSE.

Hypothesis Evaluation: The alternative hypothesis that MPT does not determine optimal portfolio weights is rejected. The study provides strong evidence that MPT contributes significantly to portfolio optimization on the LuSE, particularly for investors with a deeper understanding of its principles. This finding supports the core tenets of MPT and its applicability in real-world investment scenarios.

6.1.3 To evaluate the performance of portfolios optimized using MPT by comparing their risk-adjusted returns to non-optimized portfolios

The study found that portfolios optimized using MPT consistently outperformed non-optimized portfolios in terms of risk-adjusted returns. This was particularly evident among

investors who utilized advanced metrics like the Sharpe Ratio to evaluate performance. However, the majority of LuSE investors primarily focused on return on investment (ROI), potentially underestimating the benefits of risk-adjusted performance measures.

Significance: These findings underscore the importance of adopting a holistic approach to portfolio evaluation, considering both risk and return. By focusing solely on ROI, investors may overlook the potential for significant performance improvements through effective risk management. This highlights a critical gap in the current investment practices of many LuSE investors and emphasizes the need for increased awareness and education on risk-adjusted performance metrics.

Hypothesis Evaluation: The null hypothesis that MPT-optimized portfolios will not outperform non-optimized portfolios is rejected. The study provides strong evidence that MPT-optimized portfolios achieve superior risk-adjusted returns compared to other strategies. This finding strongly supports the efficacy of MPT in optimizing portfolio performance and challenges the notion that simple return-based strategies are sufficient for achieving investment success.

6.2 Recommendations

6.2.1 Enhance Investor Education:

- Develop and implement a comprehensive investor education program in collaboration with regulatory bodies, academic institutions, and financial firms. This program should include: Workshops with Hands-on workshops focusing on MPT concepts, risk-adjusted performance metrics, portfolio diversification, and practical application of investment strategies. Online Courses with Interactive online courses on financial literacy, investment fundamentals, and advanced investment concepts, accessible to investors with varying levels of technical proficiency.
- Create and disseminate educational materials, such as brochures, booklets, and videos, covering key investment concepts and best practices in a clear and concise manner.

- Organize regular financial literacy seminars and workshops in collaboration with community organizations and financial institutions to reach a wider audience.

6.2.2 Promote the Use of Risk-Adjusted Metrics:

- **Integrate Metrics into Platforms:** Encourage investment platforms (both online and offline) to integrate risk-adjusted metrics (e.g., Sharpe Ratio, Sortino Ratio, Maximum Drawdown) into their reporting and analysis tools.
- **Incentivize Usage:** Offer incentives (e.g., discounts, rewards programs) to investors who utilize risk-adjusted metrics in their investment decision-making.
- **Educate Financial Advisors:** Conduct training programs for financial advisors and investment professionals to emphasize the importance of risk-adjusted metrics and their effective communication to clients.

6.2.3 Develop User-Friendly Analytical Tools:

- **Mobile Apps:** Develop user-friendly mobile applications that allow investors to easily calculate portfolio risk and return, perform basic portfolio optimization, and access real-time market data.
- **Web-Based Platforms:** Create interactive web-based platforms that provide access to advanced portfolio optimization tools, risk assessment models, and personalized investment advice.
- **Accessibility:** Ensure that these tools are accessible to investors with varying levels of technological proficiency and available at affordable costs.

6.2.4 Encourage Regular Portfolio Rebalancing:

- **Automated Reminders:** Implement automated reminders within investment platforms to prompt investors to rebalance their portfolios periodically.
- **Rebalancing Algorithms:** Integrate automated rebalancing algorithms into investment platforms to assist investors in maintaining their target asset allocation.
- **Educational Campaigns:** Conduct educational campaigns to emphasize the importance of regular portfolio rebalancing and its role in mitigating risk and improving long-term investment outcomes.

6.3 Areas for Future Research

6.3.1 Behavioral Insights:

- **Investigate the impact of specific behavioral biases:** Focus on the impact of specific behavioral biases, such as loss aversion, overconfidence, herding behavior, and anchoring bias, on investor decision-making regarding MPT adoption and portfolio construction.
- **Develop behavioral finance-based interventions:** Explore the development of behavioral finance-based interventions to help investors overcome cognitive biases and make more informed investment decisions.

6.3.2 Sectoral Analysis:

- **Identify key sectors:** Analyze the application of MPT across key sectors on the LuSE, such as banking, mining, telecommunications, and consumer goods.
- **Investigate sector-specific risk-return profiles:** Investigate the unique risk-return characteristics of each sector and their implications for portfolio diversification and optimization.
- **Develop sector-specific investment strategies:** Develop sector-specific investment strategies based on MPT principles, taking into account the unique risk and return dynamics of each sector.

6.3.3 Integration of Advanced Frameworks:

- **Machine Learning:** Explore the integration of machine learning algorithms with MPT to enhance portfolio optimization, risk prediction, and asset allocation.
- **Factor Investing:** Investigate the integration of factor investing (e.g., value, growth, momentum) with MPT to enhance portfolio diversification and capture market inefficiencies.
- **Artificial Intelligence:** Explore the potential of artificial intelligence in portfolio management, including the use of AI-powered robo-advisors to provide personalized investment advice and manage portfolios effectively.

References

AFX, 2022. *African stock exchanges.* [Online] Available at: https://afx.kwayisi.org/luse/. [Accessed 20 August 2022].

Azizan, N. & Sorooshian, S., 2014. *Stock Market performance and modern portfolio theory: Case on Malaysian stock market and Asian Indices. ,* s.l.: WSEAS Transactions on Business and Economics, 11(303), pp.2224-2899..

Babbie, E., 2016. *The Practice of Social Research.* 14th ed. Belmont: Cengage Learning.

Bakar, N. & Rosbi, S., 2019. *Robust statistical portfolio investment in modern portfolio theory: a case study of two stocks combination in kuala lumpur stock exchange. ,* s.l.: International Journal of Engineering and Advanced Technology (IJEAT), 8, pp.214-221.

Beyhaghi, M. & Hawley, J., 2013. *Modern portfolio theory and risk management: assumptions and unintended consequences. ,* s.l.: Journal of Sustainable Finance & Investment, 3(1), pp.17-37..

BOZ, 2022. *Annual report 2021,* Lusaka: Bank of Zambia.

Bryman, A., 2016. *Social Research Methods. ,* s.l.: Oxford University Press..

Business Insider Africa, 2022. *Business Insider.* [Online] Available at: www.africa.businessinsider.com [Accessed 8 September 2022].

Creswell, J. W., 2014. *Research design: Qualitative, quantitative, and mixed methods approaches.* 4th ed. s.l.:SAGE Publications.

Cui, Y. & Cheng, C., 2022. *Modern Portfolio Theory and Application in Australia. ,* s.l.: J. Econ. Bus. Manag, 10, pp.128-132..

Delcey, T., 2018. *Efficient Market Hypothesis, Eugene Fama and Paul Samuelson: A Reevaluation. ,* s.l.: HAL Archives-Ouvertes, pp.1-27..

Els, T., 2015. *The Viability of Using Markowitz Portfolio Theory as Passive Investment Strategy on the JSE (Doctoral dissertation, University of the Witwatersrand, Faculty of Engineering and the Built Environment),* s.l.: s.n.

Francis, J. & Kim, D., 2013. *Modern portfolio theory: Foundations, analysis, and new developments. ,* s.l.: John Wiley & Sons.

Gold, P., 2018. *Buy and hold versus a market timing strategy: Testing the weak form of the efficient market hypothesis in the 21st century. Northcentral University..* s.l.:s.n.

Huni, S., 2018. *PORTFOLIO OPTIMISATION USING THE JOHANNESBURG SECURITIES EXCHANGE TRADABLE INDICES: AN APPLICATION OF THE MARKOWITZ'S MEAN-VARIANCE FRAMEWORK (Doctoral dissertation).,* s.l.: s.n.

Liebenthal, R. & Cheelo, C., 2020. *The Boom–Bust Cycle of Global Copper Prices, Structural Change, and Industrial Development in Zambia. ,* s.l.: Mining for Change, p.23..

LuSE, 2022. *Lusaka Securities Exchange..* [Online] Available at: Online: https://luse.co.zm/history/ [Accessed 20 August 2022].

LuSE, 2024. *Lusaka Securities Exchange Quarterly Report Q4 2023.,* s.l.: Lusaka Securities Exchange.

LuSE, 2024. *LuSE | Listed Companies.* [Online] Available at: https://www.luse.co.zm/trading/listed-companies/ [Accessed 27 September 2024].

Markowitz, H., 1952. *Portfolio Selection.,* s.l.: The Journal of Finance, 7(1), 77-91.

Marone, H., 2003. *Small African Stock Markets—The Case of the Lusaka Stock Exchange,* s.l.: International Monetary Fund.

Moh'd, S., 2021. *An Assessment of the Application of Various Models in Share Selection, Portfolio Construction and Analysis among East African Stock Exchanges (Doctoral dissertation, Universiti Tun Abdul Razak),* s.l.: s.n.

Mwaniki, D., 2015. *Relationship Between Risk and Return of Stocks Listed at the Nairobi Securities Exchange (Doctoral dissertation, University of Nairobi),* s.l.: s.n.

Mwansa, D., 2020. *A study of the macro economic factors affecting the value of the Zambian Kwacha (Doctoral dissertation, The University of Zambia),* s.l.: s.n.

Mwaurah, I., 2019. *Influence of Financial Risk on Stock Returns of Commercial Banks Listed in Nairobi Securities Exchange (Doctoral dissertation, JKUAT-COHRED).,* s.l.: s.n.

Mwita, J., 2022. *PORTFOLIO MANAGEMENT AND PROFITABILITY OF UNIT TRUST COMPANIES IN KENYA.,* s.l.: s.n.

Rani, A., 2012. *The modern portfolio theory as an investment decision tool. ,* s.l.: International Journal of Management Research and Reviews, 2(7), p.1164..

Reilly, F. K. & Brown, K. C., 2012. *Investment Analysis & Portfolio Management.* 10th ed. s.l.:South-Western Cengage Learning.

Sarpong, P., 2020. *Portfolio Management for Financial Advisors. Centre for Financial Planning Studies.,* s.l.: s.n.

Saunders, M., Lewis, P. & Thornhill, A., 2019. *Research Methods for Business Students.* 8th ed. New York.: Pearson.

Seetharam, Y., 2016. *The dynamics of market efficiency: testing the adaptive market hypothesis in South Africa (Doctoral dissertation, University of the Witwatersrand, Faculty of Commerce, Law and Management, School of Economic & Business Sciences).,* s.l.: s.n.

Wisista, R. & Noveria, A., 2023. *Optimizing Pension Fund Investment Portfolio Using Post-modern Portfolio Theory (PMPT) Study Case: An Indonesian Institution. ,* s.l.: European Journal of Business and Management Research, 8(5), pp.55-61..

Yamane, T., 1967. *Statistics: An Introductory Analysis.* 2nd ed. New York: Harper & Row..

Zikmund, W. C., Babin, B. J., Carr, J. C. & Griffin, M., 2013. *Business Research Methods. ,* Boston, MA: Cengage Learning Custom Publishing.

Appendices

Research Questionnaire

Introduction

Dear Participant,

I am Masuzyo Ngulube, a Master of Science student in Accounting and Finance at the University of Lusaka. I am conducting a study titled, *"Optimizing Portfolio Performance on the Lusaka Stock Exchange: An Empirical Analysis Using Markowitz's Modern Portfolio Theory (MPT)."* The purpose of this study is to investigate the effectiveness of MPT in optimizing portfolio performance on the Lusaka Stock Exchange. Your responses will contribute to understanding the relationship between asset returns, volatility, and portfolio performance. Please be assured that your responses will remain anonymous and confidential, and data will be used solely for academic purposes.

The questionnaire consists of three sections: Demographics, Questions related to the specific objectives of the study, and Portfolio performance. Most questions are based on a Likert scale, where you will indicate your level of agreement or the frequency of certain practices.

Thank you for your participation.

Sincerely,

Masuzyo Ngulube

Section A: Demographic Information

Age Group:

- ☐ 18-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56 and above

Gender:

- ☐ Male
- ☐ Female

Highest Level of Education:

- ☐ Secondary School
- ☐ Diploma
- ☐ Bachelor's Degree
- ☐ Postgrauduate Degree

Occupation:

- ☐ Finance Professional
- ☐ Stock Market Analyst
- ☐ Investor

☐ Academic

☐ Other (please specify): _____

Years of Experience in Stock Market Investments:

☐ Less than 1 year

☐ 1-3 years

☐ 4-6 years

☐ 7-10 years

☐ More than 10 years

Section B: Questions Related to the Research Objectives

Objective 1: Analyze the Historical Relationship Between Asset Returns and Volatility of Stocks on LuSE

How often do you analyze the historical returns of stocks on LuSE before making investment decisions?

☐ Never

☐ Rarely

☐ Sometimes

☐ Often

☐ Always

How important do you consider asset returns when selecting stocks for your portfolio?

☐ Not important at all

- [ ] Slightly important
- [ ] Moderately important
- [ ] Very important
- [ ] Extremely important

To what extent do you agree with the statement: "High historical asset returns generally lead to higher portfolio performance"?

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

How frequently do you assess the volatility of stocks on the Lusaka Stock Exchange?

- [ ] Never
- [ ] Rarely
- [ ] Sometimes
- [ ] Often
- [ ] Always

To what extent do you agree with the statement: "High volatility increases the overall risk of a portfolio"?

- [ ] Strongly disagree
- [ ] Disagree

- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

Objective 2: Apply Markowitz's Modern Portfolio Theory to Determine Optimal Portfolio Weights

How familiar are you with Markowitz's Modern Portfolio Theory (MPT)?

- [ ] Not familiar
- [ ] Slightly familiar
- [ ] Moderately familiar
- [ ] Very familiar
- [ ] Extremely familiar

How often do you use portfolio optimization techniques, such as MPT, in your stock selection process?

- [ ] Never
- [ ] Rarely
- [ ] Sometimes
- [ ] Often
- [ ] Always

To what extent do you agree with the statement: "The application of MPT significantly improves the determination of optimal portfolio weights"?

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How confident are you in applying MPT to diversify your portfolio and reduce risk?

☐ Not confident

☐ Slightly confident

☐ Moderately confident

☐ Very confident

☐ Extremely confident

Objective 3: Evaluate the Performance of Portfolios Optimized Using MPT

How do you evaluate the performance of your investment portfolio?

☐ Sharpe Ratio

☐ Return on Investment (ROI)

☐ Alpha and Beta

☐ Other (please specify): _____

To what extent do you agree with the statement: "Portfolios optimized using MPT outperform non-optimized portfolios in terms of risk-adjusted returns"?

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

How often do you review and rebalance your portfolio to maintain optimal performance?

☐ Never

☐ Rarely

☐ Sometimes

☐ Often

☐ Always

Based on your experience, how would you rate the overall effectiveness of MPT in optimizing portfolio performance on the Lusaka Stock Exchange?

☐ Very ineffective

☐ Ineffective

☐ Neutral

☐ Effective

☐ Very effective

Section C: General Comments

Please provide any additional comments or insights on portfolio optimization and the use of Markowitz's Modern Portfolio Theory in the Lusaka Stock Exchange

Thank you for your participation!

Similarity Report

PLAGIARISM CHECK.ORG

15.65% SIMILARITY OVERALL

26.79% POTENTIALLY AI

SCANNED ON: 17 JAN 2025, 8:30 AM

Similarity report

Your text is highlighted according to the matched content in the results above.

IDENTICAL	CHANGED TEXT	QUOTES	REFERENCES
1.13%	14.51%	0.25%	0.8%

AI Detector Results

Highlighted sentences with the lowest perplexity, most likely generated by AI.

LIKELY AI	HIGHLY LIKELY AI
21.12%	5.67%

Report #24449745

1 2 3 DECLARATION I, Masuzyo Webster Ngulube, I hereby affirm that the content showcased in this thesis, titled 2 "Optimizing Portfolio Performance on the Lusaka Stock Exchange: An Empirical Analysis using Markowitz's Modern Portfolio Theory" 1 2 3 , I solemnly affirm that the entirety of this dissertation is composed solely of my own efforts, unless specified otherwise as supervised by Mr. Brian Chonya. 1 2 3 14 15 16 17 The contents reflect my understanding and interpretation of the subject matter. 1 2 3 14 15 16 17 I have appropriately acknowledged and referenced all the external sources utilized in accordance with the prescribed academic norms and referencing style outlined in the provided guidelines by the University of Lusaka. Any direct quotations, paraphrases, or ideas taken from other sources have been acknowledged appropriately using in-text citations and a comprehensive bibliography. The data, findings, and conclusions articulated in this thesis are precise and dependable to the utmost extent of my understanding and capabilities. The research performed for this dissertation has been conducted in strict adherence to the ethical principles and regulations established by the University of Lusaka. Author's Signature: Masuzyo Webster Ngulube Date: 01/08/2025 I hereby declare that the presentation and preparation of this dissertation were supervised in accordance with the guidelines on supervision set forth by the University of Lusaka. Supervisor's Signature: Mr Brian Chonya Date: 01/08/2025 DEDICATION To my loving