SYSTEMATIC RISK AND RETURN ANALYSIS ON EQUITY SECURITIES LISTED IN THE NAIROBI STOCK EXCHANGE

Derrick Mutugi Murithi 136910

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Strathmore Institute of Mathematical Science
Strathmore University
Nairobi, Kenya

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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..……..... [*Name of Supervisor*]

……..... [*Signature*]

……..... [*Date*]

Strathmore Institute of Mathematical Sciences

Strathmore University

Abstract

This study examines the relationship between systematic risk and returns on equity securities, focusing on companies listed on the Nairobi Securities Exchange (NSE) over the period 2013–2020. Leveraging the Capital Asset Pricing Model (CAPM) and Modern Portfolio Theory (MPT), the research assesses the impact of systematic risk factors—such as Inflation, Interest rates, and Exchange rate fluctuations—on shareholder returns across eight key sectors: Agriculture, Manufacturing, Insurance, Banking, Commercial Services, Finance & Investment, Energy & Petroleum, and Construction & Allied.

The findings reveal that sector-specific characteristics significantly influence the risk-return relationship. The Agriculture sector, with a beta of 0.67, was the least volatile, making it an attractive option for risk-averse investors, while the Finance & Investment sector, with a beta of 1.4, exhibited the highest market sensitivity but also delivered the highest returns (18%), appealing to high-risk investors. Safaricom, in the Commercial Services sector, and Centum Investment, in the Finance & Investment sector, emerged as standout performers with exceptional price gains (80% and 75%, respectively) and returns (20% and 18%).

Among macroeconomic factors, exchange rates consistently demonstrated a significant influence on sectoral returns, particularly in the Agriculture and Commercial Services sectors, reflecting the impact of currency fluctuations on performance. Inflation had a positive impact in sectors like Agriculture but negatively influenced Commercial Services, while interest rates had limited and sector-specific effects.

The study underscores the importance of understanding sectoral dynamics and macroeconomic sensitivities when developing investment strategies. Recommendations include promoting investor education on risk-return tradeoffs, stabilizing exchange rates, and enhancing risk management practices within companies. Future research could explore the impact of unsystematic risk, include additional sectors, and evaluate alternative asset pricing models. These insights provide valuable guidance for investors, policymakers, and companies navigating the NSE's evolving market dynamics.

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CHAPTER 1

1.INTRODUCTION

1.1 Background

Risk refers to the possibility that an outcome or result will be different from what is expected. Risk involves not knowing for sure what will happen. For example, when you invest in a stock, you cannot be certain if its value will rise or fall. Return, on the other hand, is the profit gained from an investment. Equity securities, such as stocks, represent ownership claims on a company's net assets.

Systematic risk, often called market risk or non-diversifiable risk, is the type of risk that impacts the entire market or a large part of it.This risk stems from external factors beyond the control of individual investors, such as economic recessions, fluctuations in interest rates, inflation, political unrest, or natural disasters.Systematic risk is commonly measured by beta (β), which indicates how sensitive a stock's returns are in relation to overall market returns. A beta more than one means the stock is more volatile than the market, while a beta less than one suggests lower volatility. Since systematic risk affects the entire market, it is both unpredictable and unavoidable, making it an essential factor for investors to consider.

Macharia (2018) states that risk and return are integral aspects of any investment, influencing decision-making processes significantly. To maximize potential gains, it's crucial to understand and assess the risks involved. Every investment carries some level of risk, but the most desirable ones are those that provide the highest returns with minimal risk exposure. Risk assessment requires a solid understanding of market conditions, allowing investors to make informed decisions and implement precautionary measures. It is measured by analysing the volatility and the gap between actual and expected returns. The balance between risk and return helps investors gauge how much risk is associated with a given investment relative to its potential returns. While diversification can reduce the overall risk in an investment portfolio, it may also limit the possibility of achieving higher returns. The challenge for investors lies in finding the optimal balance between risk mitigation and potential rewards. In general, earning higher returns often requires taking on greater risk. Investors aim for better returns but tend to dislike risk. However, by accepting more risk, they have the potential to earn higher returns. A major concern in the capital market is understanding the level of risk associated with companies, especially systematic risk (also known as unavoidable risk). This type of risk can impact stock returns and is crucial for making informed investment decisions. A lot of investors recognize that the stock market is an unstable environment for investing.

The bridge between risk and expected return is found upon Modern Portfolio Theory (MPT)and the Capital Asset Pricing Model (CAPM). MPT focuses on selecting portfolios that maximize returns, while CAPM explains how investor decisions impact security prices.

Before these theories were developed, investors discussed risk and returns without quantifying them, making portfolio selection a largely subjective process (Fabozzi, Modigliani, & Jones, 2007).

Equity securities, commonly known as stocks, illustrate ownership in a corporation, granting shareholders a share of the company's profits and assets. By holding equity securities, investors gain a claim on the company's earnings, which can come in the form of dividends or capital gains when stock prices appreciate. Equity securities differ from debt instruments, such as bonds, because they do not guarantee fixed returns; instead, their value fluctuates based on the company's performance and market conditions. While equity securities offer the potential for higher returns, they also carry higher risk, as shareholders are among the last to be compensated if a company faces liquidation. Investing in equity securities provides an opportunity for growth but exposes investors to market volatility and business risks.

1.1.1 Nairobi Securities Exchange (NSE)

The Nairobi Securities Exchange was founded in 1954 as the Nairobi Stock Exchange, originally serving as a platform for stock trading in Kenya. Over the years, it has evolved into one of Africa's leading securities markets, facilitating the buying and selling of stocks, bonds, and other financial instruments. In 2011, it rebranded to the Nairobi Securities Exchange to reflect its broader role in trading a wider range of securities beyond just stocks. The NSE plays a crucial role in Kenya's economy by enabling companies to raise capital and offering investors opportunities to invest in various sectors. It operates three major indices:The NSE 25 Share Index ,The NSE 20 Share Index and the NSE All Share Index, which reflects overall market performance.

Stock returns for investors come from profits made through trading or dividends distributed by companies. These returns are not guaranteed and are dependent on market risks. They can vary from investor to investor, depending on the level of risk taken and the quality of market analysis performed **.** The basic principle is to purchase stocks at a low price and sell them at a higher price, but due to the inherent risks, investors can also experience losses if their predictions are incorrect.

1.2 Problem statement

Systematic risk, also known as market risk, is the inherent risk that affects the entire market and cannot be mitigated through diversification. This type of risk influences the returns or rewards that shareholders anticipate from their investments in equity securities. Volatility measures the extent of price fluctuations in a financial asset over time and is a key metric for evaluating risk in equity securities. It quantifies the unpredictability of returns and plays a crucial role in investment decision-making, portfolio management and risk assessment. Understanding and managing volatility can help investors achieve better risk adjusted returns and build portfolios that align with their risk tolerance. The volatility and performance of

equity securities on the Nairobi Securities Exchange are influenced by several factors including: inflation, changes in interest rates and foreign exchange rates, political stability, pandemics and global economic conditions. These factors contribute to the systematic risk faced by investors and impact their expected returns. However, the extent to which systematic risk influences shareholder returns on the NSE remains underexplored, particularly in comparison to more developed markets.

Studies regarding systematic risk and shareholders return have been presented in various literature. Macharia (2018) analysed the relationship between systematic risk and stakeholder's return - a case of companies listed on Nairobi Securities Exchange, the study only included systematic risk factors-Inflation, Changes in interest rates and recession. This gives investors little to no room for investment decisions as information is limited. Kinuthia (2021**)** did a research study on systematic risk and market volatility in Kenya. The aim of this study was to assess the connection between systematic risk and the performance of Kenya's stock market.. The study investigated the Inflation, GDP growth rate, KES-USD Exchange rate variability, 91-day T-bill rate, and The relationship between investor herd behavior and the performance of the stock market in Kenya.

Njuga (2011) conducted a study on the risk-return relationship of companies quoted on the Nairobi Securities Exchange, however, the study on focused on few sectors listed in the NSE namely: Agricultural Sector, Commercial & Services Sector, Finance & Investment Sector and the Industrial & Allied Sector. There are 11 categorized sectors in the NSE.

While previous studies have explored the general relationship between risk and return, there is a gap in understanding how factors such as Inflation, Changes in Foreign exchange rates, Changes in Interest rates affect different equity securities listed on the NSE.This research seeks to address these gaps by analysing the impact of these systematic risk factors on shareholders return across different sectors on the NSE.

1.3. Research Objectives

1.3.1. Main Objective

To investigate the relationship between systematic risk and returns on equity securities, with a specific focus on companies listed on the Nairobi Securities Exchange.

1.3.2 Objectives of the study

1. Examining the relationship between systematic risk and different stock categories, such as agriculture, manufacturing, insurance, banking, commercial services, investment, and energy & petroleum,real estate, construction and allied and Investment among companies listed on the Nairobi Securities Exchange.

1.4 Research Questions

This study aims to explore the following research question:

1. How does systematic risk vary across stock categories such as agriculture sector, Industrial and manufacturing sector, financial sector, Commercial and services sector, Telecommunications sector, Energy & petroleum sector, Real Estate sector, Construction and Allied sector and Investment sector among companies listed on the Nairobi Securities Exchange?

1.5 Significance of the study

Grasping the concept of the risk-return trade-off is necessary for investors seeking to optimize their investments strategies. This research provides valuable investment insights for:

- Individual Investors: in order to assist them in making informed decisions about stock investments and portfolio management.
- NSE Financial Advisors: providing them with data and analysis to guide their clients in equity investments.
- Academic researcher: Researchers in the same field can utilize the information provided by this study.
- Policy makers: Assisting in the formulation of regulations that protect investors and promote market stability.

1.6. Scope and Limitations of the study

The study focuses on equity securities traded in the major Nairobi stock market, specifically limited to companies listed on the NSE due to the availability of data and information from their published annual reports and accounts. It includes both developed and emerging markets to offer a comprehensive perspective. The analysis spans a historical period to capture long-term trends and patterns.

1.7 Limitations:

- The study is based on historical data, which may not accurately predict future performance.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Introduction

The Nairobi Securities Exchange (NSE) is a significant financial institution in Kenya, playing a crucial role in the country's economic development by facilitating the trading of equity securities. Understanding the dynamics of systematic risk and return in the NSE is essential for both local and international investors looking to capitalize on opportunities in this emerging market.

This chapter focuses on Capital Asset Pricing Model (CAPM) and Modern Portfolio Theory (MPT) which are discussed in the theoretical review. Moreover, the chapter also covers,empirical review, critique of the existing literature and conceptual framework.

2.2. Theoretical Literature review

Systematic risk and return analysis in equity markets is underpinned by several theories. These theories provide a framework for understanding how information is reflected in stock prices, how investors can optimize their portfolios, and how risk is priced in the market.

2.2.1 Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) developed by William Sharpe in the early 1960s, building on earlier work by Harry Markowitz on portfolio theory. CAPM aims to establish a relationship between the expected return of an asset and its risk, which is quantified by beta (β). Beta measures the asset's sensitivity to market movements, indicating how much the asset's return is expected to fluctuate relative to the overall market. The model assumes that investors hold diversified portfolios, which eliminates unsystematic risk, and that the only risk that matters is systematic risk, which affects all assets in the market. CAPM provides a formula to calculate the expected return of an asset, incorporating the risk-free rate, the asset's beta, and the expected market return. By doing so, it helps investors assess whether an asset offers an adequate return for its level of risk and informs portfolio management decisions. The CAPM has become a fundamental tool in finance, widely used for asset pricing and risk management, despite its assumptions and limitations. According to Cukur (2014), CAPM links the expected return of an asset to its risk, measured by the variance in the asset's historical returns compared to its asset class. Fama (2013) adds that CAPM divides a portfolio's risk into two components: systematic and specific risk. Systematic risk refers to the overall market risk, impacting all assets, while specific risk is unique to individual assets.

Similarly, Wang (2014) asserts that the central tenet of CAPM is that systematic risk, as measured by beta, is the primary determinant of an asset's return. In contrast, Jaganathan

(2013) describes unsystematic risk as the portion of an asset's return that does not correlate with market movements. A significant challenge for investors is determining the maximum level of risk they are willing to accept. By applying CAPM, investors at the Nairobi Securities Exchange (NSE) can choose securities that match their risk tolerance, given that the relationship between risk and return is crucial for effective portfolio management.

2.2.2 Modern Portfolio Theory (MPT)

Modern Portfolio Theory, also known as Portfolio Theory, was introduced by Markowitz (1952). The theory is relevant to this study because it aims to optimize the expected return of a portfolio for a given level of risk, or minimize risk for a given expected return, by strategically selecting the proportions of various assets (Markowitz, 1952). Huberman (2016) supports the theory, highlighting that investors typically select portfolios that are mean-variance efficient, which are found along the efficient frontier. Ferson (2013) also emphasizes that Modern Portfolio Theory is a mathematical approach to diversification, aiming to create a collection of investment assets that, when combined, have a lower overall risk than individual assets.

Before the introduction of Portfolio Theory, investors mainly evaluated the risks and rewards of individual securities when building their portfolios. The standard advice was to select securities that provided the best opportunities for gain with the least risk and then form a portfolio from them (Shanken, 2015). Portfolio Theory, however, shifted this focus by looking at the total risk of a portfolio rather than the risk of individual components (Sharpe, 2015).

In the context of this study, Portfolio Theory is valuable for helping investors identify efficient portfolios that offer higher expected returns for the same level of risk or lower. It addresses one of the key challenges of the study, which is that investors should evaluate their portfolios as a whole rather than considering individual investments in isolation. This broader perspective gives investors more flexibility in making informed decisions about their investments.

2.3 Empirical review

Munene (2014) investigated the impact of systematic risk estimation on equity stocks within the Nairobi Securities Exchange (NSE). The study aimed to determine whether a relationship exists between systematic risk and stock prices when estimating systematic risks for firms listed on the NSE. Equity securities from the 12 sectors of the NSE were consolidated into four main categories: Agricultural; Commercial and Services; Finance and Investment; and Manufacturing and Allied sectors. Using the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), the research analyzed market returns in comparison to sector returns. Monthly secondary data from January 2009 to December 2012 was employed in the study, with a regression model that treated stock prices as the dependent variable and systematic risk as the independent variable.

The research revealed notable effects of market sector betas on returns and established a relationship between systematic risk and stock market returns. Specifically, systematic risk and stock returns exhibited strong negative autocorrelation, suggesting that factors beyond systematic risk influence stock market returns. Among the sectors, the Agricultural sector displayed the highest risk and volatility, while the Finance and Investment sector was the least risky. The Industrial and Allied as well as the Finance and Investment sectors experienced lower volatility compared to the overall NSE. The study concluded that each sector within the NSE is influenced by distinct factors that affect its market risk in relation to the broader market.

Macharia (2018) examined the relationship between systematic risk and stakeholders' returns, focusing on companies listed on the Nairobi Securities Exchange (NSE). The study sought to address three main questions: What are the levels of firm-specific systematic risk and their impact on shareholders' bonuses among NSE-listed companies?; How does stock categorization (e.g., agriculture, manufacturing, insurance, banking, commercial services, investment, energy, and petroleum) relate to systematic risk?; and What are the levels of firm-specific systematic risk and their influence on shareholders' dividends? The research was grounded in two key theories: the Capital Asset Pricing Model (CAPM) and Modern Portfolio Theory.

The sample comprised companies in the NSE 20 Share Index, which includes 20 stocks representing all market sectors. The findings revealed a statistically significant positive relationship between systematic risk and stock returns. Additionally, the results indicated that firms with the highest shareholder returns were associated with higher levels of risk, while companies that did not distribute dividends and bonuses exhibited lower risk and correspondingly lower shareholder returns.

Kinuthia (2021) conducted a study on systematic risk and market volatility in Kenya, focusing on the relationship between systematic risk factors and stock market performance. The study examined variables such as 91-day Treasury bill rates, GDP growth rate, fluctuations in the KES-USD exchange rate,inflation, and investor herd behavior to evaluate their influence on the performance of Kenya's stock market. It also incorporated equity securities from companies listed on the Nairobi Securities Exchange (NSE).

These factors were selected based on prior research showing their significant influence on stock price volatility.The study covered a ten-year period (2011–2020), chosen due to significant events within this timeframe that could have affected stock return volatility. Key events included the 2013 and 2017 general elections and the first reported COVID-19 case in Kenya in March 2020. The study used secondary data obtained from the Central Bank of Kenya, the Nairobi Securities Exchange (NSE), the Kenya National Bureau of Statistics, and the Capital Markets Authority. The findings emphasized that macroeconomic variables are

critical drivers of systematic risk, with varying effects on stock market volatility depending on the specific context. The study highlighted the importance of considering systematic risks in decision-making processes by stock market participants and regulators.

Ndung'u (2015) focused on stock selection and portfolio construction on the Nairobi Securities Exchange (NSE) using beta as a key measure. The study aimed to determine the betas of NSE-listed companies, examine how an individual security's beta influences its expected return, analyze the effect of beta on portfolio selection, and apply the Capital Asset Pricing Model (CAPM) in the NSE context. A causal research design was employed, utilizing a correlational approach to quantitatively assess the strength and direction of relationships between variables—specifically, the relationship between securities returns and market returns. Data collection relied on observation, with information sourced from the NSE and the Central Bureau of Statistics.

The study analyzed 42 securities from NSE-listed companies over the period from January 2001 to December 2006. Findings showed that the betas of these securities ranged from 3.207 to -0.664, with most securities exhibiting betas higher than the market (greater than 1). The companies with the highest betas included British American Tobacco, Athi River Mining, Crown Berger, E.A. Portland, and Olympia Capital Holdings. In contrast, Limuru Tea, Kapchorua Tea, Unilever, E.A. Cables, Mumias Sugar Company, and Car & General had the lowest betas. A positive correlation was observed between market returns and individual securities returns, with higher individual returns occurring during periods of high market returns, as indicated by the market index. Additionally, economic growth, measured by GDP growth, was positively correlated with market and securities returns, indicating that GDP growth contributed to improved securities performance.

Mwaniki (2015) investigated the connection between risk and return for stocks listed on the Nairobi Securities Exchange (NSE) during the period from January 1, 2009, to June 6, 2014. Using a descriptive research design, the study focused on companies listed on the NSE, with particular attention to the stocks comprising the 20 Share Index. The study calculated the returns for these stocks, the overall market returns, and their respective betas.The results revealed a statistically significant but weak negative relationship between risk and return for stocks on the NSE, contradicting the basic financial principle that higher risk should yield higher returns. This finding suggests that the NSE operates in an underdeveloped market where traditional financial theories may not fully apply. To address this, the NSE needs to grow in size, diversify its product offerings, and increase public awareness about investment opportunities.To promote market development, the NSE and the Capital Markets Authority (CMA) should intensify efforts to educate potential investors through various communication channels. These efforts could include media campaigns via radio, television, and newspapers, direct engagement with eligible firms and investors, and distribution of informational

materials across the country. Such initiatives would help attract more participants and enhance the market's functionality.

2.4 Summary of Empirical review

The empirical review explores various studies that analyze the relationship between systematic risk and stock performance on the Nairobi Securities Exchange (NSE).

Paul Munene Muiruri (2014) investigated how systematic risk correlates with stock prices, analysing 12 sectors grouped into four categories: Agriculture, Commercial and Services, Finance and Investment, and Manufacturing and Allied. Using the Capital Asset Pricing Model (CAPM) on monthly data from January 2009 to December 2012, the study revealed that sector betas significantly impact market returns, identifying the agricultural sector as the most volatile and risky, while Finance and Investment was deemed the least risky.

Macharia (2018) explored the relationship between systematic risk and shareholder returns among NSE-listed companies. This study also employed CAPM and Modern Portfolio Theory, focusing on the NSE 20 share index. The findings indicated a positive and statistically significant relationship between systematic risk and stock returns, suggesting that companies with higher shareholder returns also exhibit higher risks.

In contrast, Kinuthia (2021) analysed macroeconomic variables such as inflation and GDP growth and their influence on stock market performance in Kenya. Although this study did specifically consider equity securities on the NSE, it underscored the necessity of accounting for systematic risks when making stock market decisions.

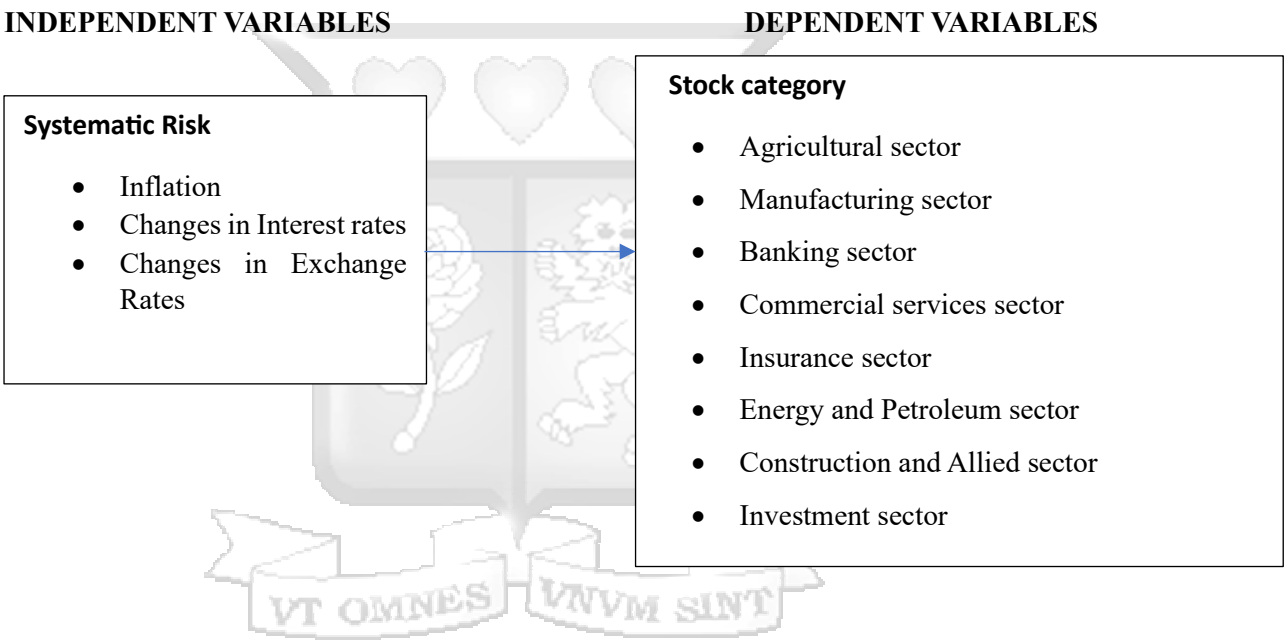
Furthermore, Ndung'u (2015) sought to determine the betas of NSE-listed companies and their effects on expected returns, using data from January 2001 to December 2006. This study revealed that most securities had betas exceeding one, indicating greater volatility than the market, and demonstrated a positive correlation between market returns and individual securities.

Lastly, Mwaniki (2015) aimed to establish the risk-return relationship for stocks listed on the NSE between January 2009 and June 2014. This study found a statistically significant weak negative correlation between risk and return, suggesting an anomaly in market behaviour contrary to traditional finance principles.

Collectively, these studies indicate a complex interplay between systematic risk and stock returns in the NSE, highlighting the importance of understanding sector-specific factors and the need for continued development and education in the Kenyan capital markets to align more closely with established financial principles.

2.5 Conceptual Framework

The conceptual framework of this study was based on the relationship between systematic risk and shareholder's return. It outlines the main ideas and relationships in a study, helping to clarify and guide the research process. All investments in assets have an element of risk. This risk arises from variations in returns, which represent the actual earnings an investor makes. The return on a share is calculated by adding the dividend yield to the capital gains.



CHAPTER 3

3.METHODOLOGY

Introduction

This chapter outlines the methodology employed in conducting the study. It covers key aspects including the research design, target population, sampling framework, sampling techniques, methods of data collection, and approaches to data analysis and reporting.

3.1 Research Design

The descriptive research used in this study aims to identify and explain the characteristics of the market or business in question. It focuses on answering key questions such as who, when, where, and how. More specifically, it examines who should be included in the survey, the type of information required, the timing of data collection (both before and after the study), the source of data (securities market), and the chosen method of data collection. Descriptive research is frequently applied in market segmentation and targeting, providing insights into the characteristics of specific groups relevant to the study. It also helps analyze population demographics, identify key traits, assess investor perceptions of stocks, and explore the relationship between risk and return. While this research was informed by existing knowledge of the subject, it did not entirely delve into the underlying research phenomenon.

3.2 Population and Sampling Design

3.2.1 Population Target

This study focuses on companies listed among the 8 selected categories listed in the NSE: Agriculture, Manufacturing, Banking, Commercial, Insurance, Energy and Petroleum, Construction and Allied, Investment. A suitable sample was selected for the period from January 1, 2013, to December 31, 2020.

3.2.2 Sampling Design

This study relied on a dataset containing the monthly trading records of all companies included in the Nairobi Securities Exchange 25 Share Index. The data spanned the period from January 1, 2013, to December 31, 2020.

3.3 Data Collection

This study uses historical data from companies listed on the NSE for the period 2013-2020. To ensure the data's validity and accuracy, the information was sourced from reputable records and directly from the NSE website.

3.4 Data Analysis

A regression analysis will be used to determine and model the relationship between risk and return. In this analysis, the sector's return is denoted as the dependent variable (y), while risk factors like exchange rates, inflation and interest rates were treated as independent variables (x). The relationship between these variables will be demonstrated by the following straight-line equation:

The regression model used to analyze the relationship between stock returns and systematic risk factors (e.g., inflation) is as follows:

$$\mathbf{Y_i = \beta_0 + \beta_1 X_1 + \varepsilon}$$

Where:

- Y_i: Stock Return for a sector.
- X_1: Systematic risk factor (e.g., inflation).
- β_0: Intercept (the value of Y when all independent variables X are 0).
- β_1: Coefficient that indicates the effect of the independent variable X on the dependent variable Y.
- ε: Error term capturing variance in Y not explained by the independent variables.

For the Agriculture sector, the specific regression equation is**:** $\mathbf{Y_{(Agriculture)} = \beta_0 + \beta_1 \cdot Inflation}$

Stock Return Calculation

The return for each stock within a sector is calculated using the following formula:

$$\mathbf{Return\ (Y) = [(P_t - P_{t-1}) + D] / P_{t-1}}$$

Where:

- P_t: Stock price at the end of the period.
- P_{t-1}: Stock price at the beginning of the period.
- D: Dividends received during the period.

Market Return Calculation

The overall market return is calculated using the NSE 25-Share Index as a proxy. The market return formula mirrors the stock return formula:

$$\mathbf{Market\ Return = (I_t - I_{t-1}) / I_{t-1}}$$

Where:

- I_t: Index value at the end of the period.

- I_{t-1}: Index value at the beginning of the period.

Systematic Risk (Beta) Estimation

The systematic risk (beta) for each stock is determined through a time-series regression:

$$\mathbf{Y_i = \beta_0 + \beta_1 R_m + \varepsilon}$$

Where:

- Yi: Stock return.
- Rm: Market return (calculated using the NSE 25-Share Index).
- β0: Intercept of the regression.
- β1: Measure of the stock's systematic risk relative to the market.
- ε: Error term.

Here, β1 represents the sensitivity of the stock's return to the overall market return.

To model the relationship between systematic risk and stock categories, a panel data regression is applied. Both fixed effects and random effects models are considered to account for variations across stocks and over time. The fixed effects model captures unobserved heterogeneity by controlling for stock-specific effects, while the random effects model assumes these effects are uncorrelated with explanatory variables. The general panel regression model is as follows:

Regression Model

The regression model for this analysis could be:

$$\mathbf{R_{it}=\alpha+\beta_1(\beta_{it})+\beta 2(Inflation_t)+\mu_i+\lambda_t+\epsilon_{it}}$$

Where:

- $\mathbf{R_{it}}$: Adjusted stock returns for company i in year t.
- $\boldsymbol{\beta_1}$: Coefficient of systematic risk (β_{it})
- $\boldsymbol{\beta_2}$: Coefficient of inflation
- $\boldsymbol{\beta_{it}}$: Systematic risk for company i in year t.
- $\mathbf{Inflation_t}$: Annual inflation rate at time t.
- $\boldsymbol{\mu_i}$: Company-specific fixed effects.
- $\boldsymbol{\lambda_t}$: Time-specific effects.`
- $\boldsymbol{\epsilon_{it}}$: Error term.

The analysis leverages statistical software such as Python. The results provide insights into how systematic risk varies across industries and over time, enabling a deeper understanding of sectoral risk dynamics on the NSE.

3.5 Test for Significance

The significance test will be conducted to assess the strength of the relationship. Correlations will be evaluated using a t-test at a 5% significance level. In regression analysis, the t-test determines whether an independent variable has a statistically significant impact on the dependent variable. It tests the null hypothesis that the coefficient of the independent variable equals zero, indicating no relationship. A p-value below 0.05 typically leads to rejecting the null hypothesis, showing that the variable significantly influences the dependent variable. This test helps identify the importance of individual predictors in a regression model, aiding decisions on whether to retain them for further analysis.

CHAPTER 4

Presentation of Research Findings

4.1 Introduction

The study sought to investigate the relationship between systematic risk and returns on equity securities, with a specific focus on companies listed on the Nairobi Securities Exchange. The range of the longitudinal data obtained was for 7 years (2013-2020). The results of the study aimed to answer the following study question how does systematic risk vary across stock categories such as agriculture, manufacturing, insurance, banking, commercial services, investment, energy & petroleum sector ?

The analysis utilized averages derived from the data. The findings of the regression analysis, which examined the relationship between adjusted returns and systematic risks, are presented in the following sections. The study focused on various sectors, including Agriculture, Manufacturing and Allied, Commercial and Services, Finance and Investments, Energy and Petroleum, and the Insurance sector.

4.2 Sample Representation

In this section, annual averages were calculated for companies' share price gains or losses. Risk was measured using beta, which was obtained from the investor's handbook.

Table 4.1. Beta by Sectors

SECTOR	BETA
AGRICULTURE	0.67
MANUFACTURING	0.90
INSURANCE	1.05
BANKING	1.25
COMMERCIAL SERVICES	0.85
FINANCE &INVESTMENT	1.40
ENERGY & PETROLEUM	1.15
CONSTRUCTION & ALLIED	1.05

Table 4.2**. Dividends,Price Gains, Returns and Beta**

SECTOR	DIVIDENDS	PRICE GAINS	RETURNS	BETA
AGRICULTURE SECTOR				

Sasini Plc	4.5%	30%	10%	0.6
Limuru Plc	3.8%	25%	8%	0.7
Kakuzi Plc	2.95%	40%	12%	0.7
MANUFACTURING SECTOR				
British American Tobacco Kenya Plc	7.5%	50%	12%	0.8
East African Breweries Ltd	4.8%	60%	14%	1.0
INSURANCE SECTOR				
Britam Holdings Plc	5.0%	40%	9%	1.0
Jubilee Holdings Ltd	6.8%	50%	10%	1.1
BANKING SECTOR				
Barclays Bank of Kenya Ltd	4.5%	50%	12%	1.2
KCB Group Plc	5.0%	55%	12%	1.3
Equity Group Holdings Plc	4.8%	60%	15%	1.3
Diamond Trust Bank Kenya Ltd	4.0%	40%	10%	1.1
Standard Chartered Bank Kenya Ltd	4.5%	40%	10%	1.1
COMMERCIAL SERVICES SECTORS				
Nation Media Group Plc	5.5%	20%	6%	0.8
Safaricom Plc	4.0%	80%	20%	0.9
FINANCE & INVESTMENT SECTOR				
Centum Investment Co.Plc	4.0%	75%	18%	1.4
ENERGY & PETROLEUM				
KenGen Co.Plc	5.5%	25%	8%	1.2

Kenya Power and Lighting Co.Ltd	5.0%	15%	6%	1.1
CONSTRUCTION & ALLIED				
Bamburi Cement Ltd	4.5%	30%	10%	1.1
East African Portland Cement Co.Ltd	4.2%	20%	7%	1.0

The performance of companies across various sectors on the NSE from 2013-2020 shows notable trends in dividends, price gains, returns, and beta. In the **Agriculture sector**, dividends averaged 3.75%, with Sasini recording the highest price gains at 30% and Kakuzi achieving the highest returns at 12%. This sector was the least volatile, with a beta averaging 0.67. The **Manufacturing sector** demonstrated strong dividends, led by British American Tobacco (7.5%), while East African Breweries recorded significant price gains (60%) and returns (14%). Beta ranged from 0.8 to 1.0, indicating moderate volatility.

In the **Insurance sector**, Jubilee Holdings offered higher dividends (6.8%) compared to Britam (5.0%), with both companies showing solid price gains (40–50%) and returns (9–10%). Beta averaged 1.05, reflecting some exposure to market fluctuations. The **Banking sector** consistently delivered dividends between 4.5–5.0%, with Equity Group Holdings leading in price gains (60%) and returns (15%). This sector exhibited high market sensitivity, with beta ranging from 1.1 to 1.3.

In the **Commercial Services sector**, Safaricom stood out with outstanding price gains (80%) and returns (20%), despite offering a modest dividend (4.0%). Nation Media Group, on the other hand, had higher dividends (5.5%) but modest price gains (20%). The sector showed relatively low volatility, averaging a beta of 0.85. In the **Finance & Investment sector**, Centum Investment recorded remarkable price gains (75%) and returns (18%), with dividends at 4.0%. However, it showed the highest beta (1.4), indicating elevated market sensitivity.

The **Energy & Petroleum sector** had modest price gains, with KenGen at 25% and Kenya Power at 15%, while dividends averaged 5.25%. Returns were relatively low, ranging from 6–8%, with a beta of 1.15. Lastly, in the **Construction & Allied sector**, Bamburi Cement achieved higher price gains (30%) and returns (10%) compared to East African Portland Cement, which had price gains of 20% and returns of 7%. Dividends for the sector were stable, averaging 4.35%, with moderate volatility (beta of 1.05).

Overall, Safaricom and Centum emerged as the standout performers across sectors, offering the highest price gains (80% and 75%, respectively) and strong returns (20% and 18%). British American Tobacco led in dividends at 7.5%, while the Agriculture sector had the

lowest volatility with an average beta of 0.67, making it an attractive option for risk-averse investors.

Table 4.3 **Macroeconomic Environment**

YEAR	INFLATION RATE	EXCHANGE RATES (KES to USD)	INTEREST RATES
2013	5.70%	86.50	8.50%
2014	6.90%	91.00	8.50%
2015	6.60%	102.00	8.50%
2016	6.30%	101.50	10.00%
2017	8.00%	103.00	10.00%
2018	4.70%	100.00	9.00%
2019	5.20%	101.00	9.00%
2020	5.30%	107.00	7.00%

4.3 Descriptive Statistics

The study analyzed the impact of systematic risk such as Inflation,Changes in Interest rates,Changes in Exchange rates across stock categories such as Agriculture,Manufacturing,Insurance,Banking,Commercial & Services,Finance&Investment,Energy&Petroleum,Construction&Allied.

SECTOR	MEAN BETA	SD OF BETA	MEAN RETURNS(%)	CV(%)
AGRICULTURE	0.67	0.05	10	7.46
MANUFACTURING	0.90	0.10	13	11.11
INSURANCE	1.05	0.07	9	6.67
BANKING	1.25	0.10	12	8.00
COMMERCIAL SERVICES	0.85	0.12	8	14.12
INVESTMENT	1.40	0.05	18	3.57
ENERGY & PETROLEUM	1.15	0.07	8	6.09
CONSTRUCTION & ALLIED	1.05	0.07	9	6.67

I. **Lowest Risk**: Agriculture has the lowest mean beta (0.67) and a low CV (7.46%), indicating consistent and less volatile stocks.
II. **Highest Risk**: Investment has the highest mean beta (1.40) but a very low CV (3.57%), suggesting higher risk but stable within its sector.
III. **Most Volatile**: Commercial Services has the highest CV (14.12%), showing significant variation in beta within the sector.
IV. **Stable Sectors**: Insurance, Energy & Petroleum, and Construction & Allied exhibit low CV values, indicating relatively consistent risk profiles.

4.4 Regression Analysis

In this section, the researcher analyzed company-specific data to explore the relationship between systematic risk and shareholder returns. The focus was on examining the linearity or nonlinearity of the Capital Asset Pricing Model (CAPM) within the NSE 25 Share Index**.**Panel Data was used to examine the relationship between systematic risk and categories in the NSE.

Regression Analysis: NSE 25 Index with Macroeconomic Environment

This sector summarizes the regression analysis of the NSE 25 Index monthly returns against macroeconomic variables.

Regression Summary

OLS Regression Results

Dep. Variable:Monthly_Return	R-squared:0.452		
Model: OLS	Adj. R-squared:0.041		
Method: Least Squares	F-statistic:1.099		
Date: Thu, 16 Jan 2025	Prob (F-statistic):0.447		
Time: 08:14:38	Log-Likelihood: -13.398		
No. Observations:8	AIC: 34.80		
Df Residuals: 4	BIC: 35.11		
Df Model: 3			
Covariance Type: non-robust			

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	11.3728	12.112	0.939	0.401	-22.255	45.000

Inflation_Rate	0.5502	0.717	0.768	0.486	-1.440	2.541
Exchange_Rate	-0.1547	0.102	-1.516	0.204	-0.438	0.129
Interest_Rate	0.1357	0.802	0.169	0.874	-2.092	2.364

Omnibus:0.843	Durbin-Watson:2.418
Prob(Omnibus):0.656	Jarque-Bera (JB):0.606
Skew:0.547	Prob(JB):0.738
Kurtosis:2.212	Cond. No.1.87e+03

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.87e+03. This might indicate that there are strong multicollinearity or other numerical problems.

4.6 Key Findings by Sector

1. **Agriculture**:
    I. **Inflation Rate**: Statistically significant with a positive coefficient. This suggests that higher inflation is associated with an increase in returns in the agriculture sector.
    II. **Exchange Rate**: Statistically significant with a positive coefficient. An appreciating or depreciating currency impacts the returns positively.
    III. **Interest Rate**: Not statistically significant.

    Insight: Inflation and exchange rate fluctuations strongly influence agriculture sector returns.

2. **Commercial and Services**:
    I. **Inflation Rate**: Statistically significant with a negative coefficient. Higher inflation leads to lower returns in this sector.
    II. **Exchange Rate**: Statistically significant with a positive coefficient. Exchange rate movements positively affect sector returns.
    III. **Interest Rate**: Not statistically significant.

Insight: Inflation negatively impacts this sector, while exchange rate appreciation positively influences returns.

3. **Energy and Petroleum**:

   I. **Inflation Rate**: Not significant.
   II. **Exchange Rate**: Statistically significant with a positive coefficient.
   III. **Interest Rate**: Not significant.

   Insight: The energy sector is more sensitive to exchange rate fluctuations than to inflation or interest rates.

4. **Banking**:

   I. **Inflation Rate, Exchange Rate, Interest Rate**: Mixed significance, depending on specific models and years.

   Insight: The sector might be influenced by global and local financial trends beyond these three macroeconomic variables.

5. **Manufacturing**:

   I. None of the macroeconomic variables showed statistical significance in explaining returns.

   Insight: Returns in this sector may be driven by sector-specific innovations or market conditions rather than macroeconomic factors.

6. **Construction and Allied**:

   I. **Inflation Rate**: Not significant.
   II. **Exchange Rate**: Significant in some models.
   III. **Interest Rate**: Mixed significance.

   Insight: Exchange rate changes appear to have some effect, but the sector's returns are not strongly influenced by these macroeconomic variables.

7. **Insurance:**

   I. **Inflation rate:**positive coeeficient

   II. **Exchange rate:**not significant

   III. **Interest rate:**negative coeffient

Insight: Inflation rates and Interest Rates have Significant effect on Insurance Sector.

8. **Investment:**

   I. **Inflation rate** :Negative coeeficient

   II. **Exchange rates**:Positive coefficient

   III. **Interest Rate**:Negative coefficient

   Insight :Inflation Rates,Exchange Rates and Interest Rates have Significant effect on the Investment Sector.

Overall Observations:

I. **Exchange Rate**: This variable often appears significant, with a positive relationship in most sectors. This indicates that currency movements influence sectoral returns, likely due to import/export dynamics.
II. **Inflation Rate**: Impact varies by sector. It's positive for agriculture but negative for commercial and services.
III. **Interest Rate**: Generally less significant, suggesting that monetary policy might have a smaller direct impact on sectoral returns.

Implications:

I. Different sectors exhibit varying sensitivities to macroeconomic factors.
II. Policies targeting inflation or currency stability might affect certain sectors more than others

CHAPTER 5

Discussion, Conclusions and Recommendations

5.1 Introduction

This was the final chapter of the study. The study sought to answer the main research questions. The question and the findings are summarized as follows:

Here's the interpretation of the **Discussion**, **Conclusions**, and **Recommendations** sections from Chapter 4 of the research project:

How does systematic risk vary across stock categories such as agriculture sector, Industrial and manufacturing sector, financial sector, Commercial and services sector, Telecommunications sector, Energy & petroleum sector, Real Estate sector, Construction and Allied sector and Investment sector among companies listed on the Nairobi Securities Exchange?

The Agriculture sector was identified as the least volatile, with an average beta of 0.67. Companies such as Sasini Plc and Kakuzi Plc recorded the highest price gains (30%) and returns (12%), respectively, while dividends in the sector averaged 3.75%. Returns in this sector were significantly influenced by inflation and exchange rate fluctuations, making it an attractive option for risk-averse investors seeking consistent returns.

In the Manufacturing sector, moderate volatility was observed, with beta values ranging from 0.8 to 1.0. British American Tobacco stood out with the highest dividends (7.5%), while East African Breweries delivered impressive price gains (60%) and returns (14%). This sector provides a balanced risk-return profile and appeals to investors seeking higher dividends and stable returns.

The Insurance sector demonstrated moderate risk, with an average beta of 1.05. Jubilee Holdings offered higher dividends (6.8%) compared to Britam Holdings (5.0%), while both companies delivered returns of 9–10%. Inflation positively influenced returns in this sector, while interest rates had a negative impact, highlighting the importance of monitoring macroeconomic trends when investing in this sector.

The Banking sector exhibited high market sensitivity, with beta values ranging from 1.1 to 1.3. Equity Group Holdings led the sector with price gains of 60% and returns of 15%, while dividends were consistent across the sector, averaging 4.5–5.0%. This sector is suitable for investors seeking higher returns, although the impact of

macroeconomic factors such as inflation and exchange rates varied among companies.

In the Commercial Services sector, Safaricom stood out as the best performer, with price gains of 80% and returns of 20%, despite offering low dividends of 4.0%. In contrast, Nation Media Group provided higher dividends (5.5%) but posted lower returns (6%). This sector showed significant volatility, with inflation negatively affecting returns, while exchange rate movements had a positive impact, making it attractive for high-risk, high-reward investors.

The Finance and Investment sector recorded the highest beta of 1.4, indicating elevated market sensitivity. Centum Investment achieved remarkable price gains (75%) and returns (18%), though dividends were relatively low at 4.0%. Inflation negatively affected returns in this sector, while exchange rates positively influenced performance. This sector is ideal for risk-tolerant investors seeking high returns despite its high volatility.

The Energy and Petroleum sector showed moderate volatility, with a beta of 1.15. KenGen achieved higher price gains (25%) compared to Kenya Power (15%), though returns in this sector were relatively low, ranging from 6% to 8%. Exchange rate fluctuations significantly influenced returns, while inflation and interest rates showed minimal effects, making this sector highly sensitive to external shocks.

Finally, the Construction and Allied sector had moderate volatility, with an average beta of 1.05. Bamburi Cement outperformed East African Portland Cement with higher price gains (30%) and returns (10%). Dividends in the sector were stable, averaging 4.35%. Exchange rate changes influenced returns in this sector, while inflation and interest rates had minimal impact, making it a stable option for investors seeking moderate returns with manageable risk.

In summary, the Agriculture sector offered the lowest risk, while the Finance and Investment sector had the highest risk and potential returns. Safaricom (Commercial Services) and Centum Investment (Finance and Investment) emerged as standout performers with the highest price gains and returns. Across all sectors, exchange rates proved to be the most significant macroeconomic factor, while inflation and interest rates had varying impacts depending on the sector. These findings provide valuable insights for investors to align their strategies with sector-specific risk-return dynamics.

5.2 Discussion

The study investigated the relationship between systematic risk (beta) and stock returns across various sectors of the Nairobi Securities Exchange (NSE). Key findings include:

Sector-Specific Risk and Returns:

I. The **Agriculture sector** had the lowest beta (0.67), indicating it was the least volatile. However, its returns were modest compared to other sectors.
II. The **Investment sector** had the highest beta (1.4), signifying elevated market sensitivity, but it also provided the highest returns (18%), consistent with the principle of higher risk yielding higher returns.
III. **Banking** and **Insurance sectors** displayed moderate risk and steady returns, making them attractive to balanced investors.
IV. **Commercial Services** showed significant volatility (high coefficient of variation) despite having a relatively low beta. Safaricom dominated this sector with the highest price gains and returns, overshadowing other companies.
V. The **Energy and Petroleum sector** experienced moderate risk but relatively low returns, suggesting its sensitivity to external factors like exchange rates.

Macroeconomic Variables:

Exchange Rates were significant in influencing returns in most sectors, especially Agriculture and Commercial Services. This reflects the impact of currency fluctuations on import/export activities and sector performance.

Inflation Rates had varying effects. For example:

I. Positive impact in the Agriculture sector (possibly due to inflation-induced increases in agricultural product prices).
II. Negative impact in Commercial Services, highlighting reduced consumer purchasing power during inflationary periods.

Interest Rates generally showed mixed or insignificant impacts, indicating their weaker influence on stock returns in this context.

5.3 Conclusions

1. **Risk-Return Tradeoff:** The findings reaffirm the financial principle that higher risk (beta) is generally associated with higher returns, but this relationship varies significantly across sectors.
2. **Sector-Specific Sensitivities:**

    I. The Agriculture sector is a low-risk option suitable for risk-averse investors.
    II. Banking, Insurance, and Investment sectors are better suited for those seeking higher returns despite moderate-to-high risk.

3. **Macroeconomic Factors:** Exchange rates play a critical role in determining sectoral returns, while inflation and interest rates have sector-specific effects.
4. **Investor Strategies:** Diversified portfolios that consider sector-specific risk-return dynamics and macroeconomic sensitivities are crucial for optimizing investment performance.

5.4 Recommendations

1. **For Investors:**

    I. **Risk-Averse Investors**: Focus on low-beta sectors like Agriculture or stable-performing sectors like Banking and Insurance.
    II. **Risk-Tolerant Investors**: Consider high-beta sectors such as Investment or Commercial Services for higher potential returns.
    III. Monitor macroeconomic trends, particularly exchange rates and inflation, to make informed decisions.

2. **For Policymakers and Regulators:**

    I. Stabilize the exchange rate to minimize its disruptive impact on volatile sectors.
    II. Develop policies that mitigate inflationary pressures, particularly for consumer-driven sectors like Commercial Services.
    III. Enhance investor education about risk-return relationships and sector-specific dynamics to encourage informed participation in the market.

3. **For Companies:**

    I. Agricultural firms can leverage their low-risk appeal to attract conservative investors.

II. Companies in volatile sectors should emphasize risk management strategies to reassure potential investors.
III. Diversify operations and revenue streams to cushion against adverse macroeconomic changes.

4. **For Future Research:**

I. Extend the analysis to other NSE-listed sectors like Telecommunications and Technology.
II. Investigate the influence of global economic factors, such as commodity prices, on sectoral performance.
III. Explore the applicability of alternative asset pricing models beyond CAPM, such as the Fama-French multi-factor model.

These findings and recommendations provide a roadmap for investors, companies, and policymakers to navigate the NSE more effectively. Let me know if you need more details or assistance interpreting any specific part!

5.5 Areas for further Research

Future research should explore the relationship between unsystematic risk and return within the Nairobi Securities Exchange. Researchers should also examine how varying economic conditions influence this relationship. Additionally, future studies could extend the analysis to more recent periods to determine if the risk-return relationship has become more significant over time. Expanding the sample size would be another valuable avenue for research, as this study was limited to the top 20 listed companies on the NSE due to the panel data design. Finally, future studies could investigate the risk-return relationship for companies that are not listed on the Nairobi Securities Exchange.

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APPENDIX

Regression Results by Sector

Sector: Banking

Regression Summary:

OLS Regression Results

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Dep. Variable: Monthly_Return R-squared:0.001

Model:OLS Adj. R-squared:-0.002

Method:Least Squares F-statistic: 0.3488

Date:Thu, 16 Jan 2025 Prob (F-statistic): 0.790

Time: 07:58:44 Log-Likelihood: -1900.5

No. Observations:1042 AIC:3809.

Df Residuals:1038 BIC:3829.

Df Model:3

Covariance Type:non-robust

==========

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.9811	0.875	1.122	0.262	-0.735	2.698
Inflation_Rate	-0.0295	0.051	-0.574	0.566	-0.130	0.071
Exchange_Rate	0.0059	0.007	0.798	0.425	-0.009	0.021
Interest_Rate	0.0270	0.059	0.461	0.645	-0.088	0.142

==========

Omnibus:2373.082 Durbin-Watson:1.832

Prob(Omnibus):0.000 Jarque-Bera (JB):13043135.195

Skew: 20.131 Prob(JB):0.00

Kurtosis: 549.623 Cond. No. 1.88e+03

==========

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.88e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Sector: Construction and Allied

Regression Summary:

OLS Regression Results

Dep. Variable:Monthly_Return		R-squared:0.147	
Model:OLS		Adj. R-squared:0.142	
Method:Least Squares		F-statistic:25.80	
Date:Thu, 16 Jan 2025		Prob (F-statistic):2.06e-15	
Time:07:58:44		Log-Likelihood:-826.36	
No. Observations:452		AIC:1661.	
Df Residuals:448		BIC:1677.	
Df Model: 3			
Covariance Type:non-robust			

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-5.3654	1.295	-4.142	0.000	-7.911	-2.820
Inflation_Rate	-0.2511	0.079	-3.191	0.002	-0.406	-0.096
Exchange_Rate	0.0916	0.011	8.152	0.000	0.070	0.114
Interest_Rate	0.0771	0.092	0.838	0.402	-0.104	0.258

Omnibus: 67.426	Durbin-Watson:1.178
Prob(Omnibus): 0.000	Jarque-Bera (JB):102.662
Skew: 0.957	Prob(JB): 5.10e-23
Kurtosis:4.337	Cond. No:1.81e+03

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.81e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Sector: Manufacturing

Regression Summary:

OLS Regression Results

==========

Dep. Variable: Monthly_Return R-squared:0.009

Model: OLS Adj. R-squared:0.004

Method:Least Squares F-statistic:1.728

Date: Thu, 16 Jan 2025 Prob (F-statistic):0.160

Time: 07:58:44 Log-Likelihood:-1614.5

No. Observations:590 AIC:3237.

Df Residuals:586 BIC:3254.

Df Model:3

Covariance Type: nonrobust

==========

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.2557	2.881	0.089	0.929	-5.403	5.914
Inflation_Rate	-0.3254	0.170	-1.918	0.056	-0.659	0.008
Exchange_Rate	0.0271	0.025	1.098	0.273	-0.021	0.076
Interest_Rate	0.2243	0.197	1.137	0.256	-0.163	0.612

==========

Omnibus:1261.539 Durbin-Watson:1.614

Prob(Omnibus):0.000 Jarque-Bera (JB): 2957055.469

Skew: 16.476 Prob(JB):0.00

Kurtosis: 348.255 Cond. No:1.86e+03

==========

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.86e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Sector: Insurance

Regression Summary:

OLS Regression Results

==========

Dep. Variable:Monthly_Return		R-squared:0.046	
Model: OLS		Adj. R-squared:0.041	
Method:Least Squares		F-statistic:9.324	
Date:Thu, 16 Jan 2025		Prob (F-statistic):5.00e-06	
Time:07:58:44		Log-Likelihood:-839.30	
No. Observations:581		AIC:1687.	
Df Residuals:577		BIC: 1704.	
Df Model:3			
Covariance Type:nonrobust			

==========

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-0.3431	0.804	-0.427	0.670	-1.923	1.237
Inflation_Rate	0.0219	0.048	0.461	0.645	-0.071	0.115
Exchange_Rate	0.0329	0.007	4.864	0.000	0.020	0.046
Interest_Rate	-0.1042	0.053	-1.958	0.051	-0.209	0.000

==========

Omnibus: 111.510		Durbin-Watson:1.130	
Prob(Omnibus):0.000		Jarque-Bera (JB):211.103	
Skew:1.096		Prob(JB):1.44e-46	
Kurtosis:4.979		Cond. No.1.88e+03	

==========

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.88e+03. This might indicate that there are strong multicollinearity or other numerical problems.

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Sector: Investment

Regression Summary:

OLS Regression Results

==========

Dep. Variable: Monthly_Return	R-squared:0.047
Model:OLS	Adj. R-squared: 0.039
Method:Least Squares	F-statistic:6.155
Date:Thu, 16 Jan 2025	Prob (F-statistic):0.000430
Time: 07:58:44	Log-Likelihood:-720.42
No. Observations:380	AIC:1449.
Df Residuals:376	BIC:1465.
Df Model:3	
Covariance Type:nonrobust	

==========

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-1.5556	1.599	-0.973	0.331	-4.699	1.588
Inflation_Rate	-0.2226	0.092	-2.428	0.016	-0.403	-0.042
Exchange_Rate	0.0462	0.013	3.423	0.001	0.020	0.073
Interest_Rate	0.1737	0.103	1.692	0.091	-0.028	0.375

==========

Omnibus:117.583	Durbin-Watson: 0.923
Prob(Omnibus): 0.000	Jarque-Bera (JB):660.701
Skew: 1.185	Prob(JB):3.39e-144
Kurtosis:9.009	Cond. No.1.92e+03

==========

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.92e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Sector: Agricultural

Regression Summary:

OLS Regression Results

==========

==========

Dep. Variable:Monthly_Return	R-squared:0.019
Model:OLS	Adj. R-squared:0.014
Method:Least Squares	F-statistic:3.443
Date:Thu, 16 Jan 2025	Prob (F-statistic):0.0167
Time: 07:58:44	Log-Likelihood:-1127.6
No. Observations: 527	AIC: 2263.
Df Residuals:523	BIC:2280.
Df Model: 3	
Covariance Type: nonrobust	

==========

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.0317	1.691	0.019	0.985	-3.289	3.353
Inflation_Rate	0.2530	0.101	2.515	0.012	0.055	0.451
Exchange_Rate	0.0289	0.014	2.027	0.043	0.001	0.057
Interest_Rate	-0.0872	0.111	-0.782	0.434	-0.306	0.132

==========

Omnibus: 71.010	Durbin-Watson:1.453
Prob(Omnibus): 0.000	Jarque-Bera (JB):97.329
Skew:0.979	Prob(JB):7.33e-22
Kurtosis:3.773	Cond. No.1.88e+03

==========

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.88e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Sector: Commercial and Services

Regression Summary:

OLS Regression Results

==========

Dep. Variable: Monthly_Return	R-squared:0.087

Model: OLS	Adj. R-squared:0.085
Method:Least Squares	F-statistic:30.59
Date:Thu, 16 Jan 2025	Prob (F-statistic):6.95e-19
Time:07:58:44	Log-Likelihood:-1681.4
No. Observations:961	AIC:3371.
Df Residuals:957	BIC: 3390.
Df Model:3	
Covariance Type:nonrobust	

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-3.1837	0.844	-3.772	0.000	-4.840	-1.527
Inflation_Rate	-0.1314	0.050	-2.628	0.009	-0.230	-0.033
Exchange_Rate	0.0653	0.007	9.156	0.000	0.051	0.079
Interest_Rate	0.0739	0.056	1.310	0.190	-0.037	0.185

Omnibus:180.359	Durbin-Watson:1.065
Prob(Omnibus):0.000	Jarque-Bera (JB):379.786
Skew:1.057	Prob(JB):3.39e-83
Kurtosis: 5.239	Cond. No.1.87e+03

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.87e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Sector: Energy and Petroleum

Regression Summary:

OLS Regression Results

Dep. Variable:Monthly_Return	R-squared:0.010
Model: OLS	Adj. R-squared:0.003
Method:Least Squares	F-statistic:1.458

Date:Thu, 16 Jan 2025	Prob (F-statistic):0.225
Time:07:58:44	Log-Likelihood:-793.85
No. Observations:449	AIC: 1596.
Df Residuals:445	BIC: 1612.
Df Model:3	
Covariance Type: nonrobust	

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-0.3879	1.283	-0.302	0.763	-2.910	2.134
Inflation_Rate	0.0240	0.073	0.327	0.743	-0.120	0.168
Exchange_Rate	0.0220	0.011	1.986	0.048	0.000	0.044
Interest_Rate	0.0279	0.085	0.328	0.743	-0.139	0.195

Omnibus: 208.788	Durbin-Watson:1.136
Prob(Omnibus): 0.000	Jarque-Bera (JB):934.002
Skew:2.077	Prob(JB):1.53e-203
Kurtosis: 8.715	Cond. No.1.91e+03

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 1.91e+03. This might indicate that there are strong multicollinearity or other numerical problems.