2022

Evaluating the Performance of Sector Mutual Funds

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EVALUATING THE PERFORMANCE OF SECTOR MUTUAL FUNDS

by

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Dissertation submitted to

THOMAS JEFFERSON UNIVERSITY

in partial fulfillment of

the requirements for the degree of

DOCTOR OF MANAGEMENT

in

STRATEGIC LEADERSHIP

2022

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DEDICATION

Knowledge is wisdom, I dedicate this dissertaion to my spiritual leader Imam-Mehdi (AJTF) who is the streem of knowledge.I have always been a explorer of knowledge, and that has led me to pursue a doctoral degree. This program was the most challenging and rewarding in terms of learning. I dedicate this pursuit to my parents, Maj® Syed Dawar Raza Kazmi (Pakistan Army, Ex. CEO Alhaqani Securities and Investments), and Syeda Rabab Kazmi (Renowned scholar and first women interpreter of the Holy Quran). I cannot express enough how grateful I am for all the support I have gotten from my family, especially from my wife, Rajah Karrar, and my in-laws, Eng.Masroor Karrar and Shama Karrar to complete this program. I want to thank my brothers, Syed Faizyab Kazmi, Syed Shees Ali Kazmi, and Muneel Karrar for their moral support. Here I must mention my two sweet kids Syed Hasan Raza Kazmi and Syeda Fatima Kazmi who were instrumental towards my doctoral degree.

I also dedicate this disseratation to my both (maternal and paternal) grandfathers, Late. Syed Moosi Raza Kazmi (Principale® Deaf, Dum and Blind School) and Late. Syed Muhammad Mehdi Kazmi (Chairman® Sindh Board of Technical Education).

Jefferson's DSL program has widened my knowledge horizon so that I can use the learned skillsets throughout my career. My overall experience with this program has been phenomenal. I could progress in my career and grow my business with the help of the knowledge acquired through various theories, models, and concepts. Indeed, Jefferson's DSL program is a step toward academic and organizational success for me. The skills and knowledge I have gained from this program will be invaluable as I continue my journey.

Thank you for everything.

ACKNOWLEDGEMENTS

I have worked with many excellent professors at Thomas Jefferson University, whose teachings have opened up unexplored areas to me. It is a pleasure to express my gratitude to them in my humble acknowledgment. I am incredibly grateful to those who have served on my doctoral committee and want to thank my committee members, Dr. Larry Starr, Dr. D K Malhotra, and Dr. John Pourdehnad, for their time, advice, and contribution during the entire process. Their advice and encouraging comments were instrumental in finalizing this dissertation.

An advisor is a beacon of light without whom a candidate could not be inspired; I take this opportunity to mention my beacon of light and inspiration, Dr. John Pourdehnad, who always guided and shared his experience, knowledge, and advice. I find him to be a devoted and humble guide to me, and he has led me to believe that humility is the essence of success.

Lastly, I want to record my overwhelming gratitude to Dr. D K Malhotra. I am grateful for his encouragement, knowledge, and wisdom that guided me to completion. He provided many opportunities to apply my learning from the classroom to real-world scenarios. I could not have asked for a more supportive or effective mentor. Without these individuals' help, this dissertation would not have been possible.

Thank you all from the bottom of my heart.

ABSTRACT

The growth in the US mutual fund industry has remained slow, despite the recent upside blow in the overall market attributed to the global pandemic. The mutual fund industry is still observing a fee crisis and slower yearly growth, but the compression occurs short-term with more drastic results. Mutual funds that would serve these “new normal” requirements need to be future-fit. In this dissertation, I focus on the following questions: Do sector mutual funds add value to investors` portfolios by contributing a better risk-adjusted rate of return? Is there evidence of performance consistency? Do portfolio managers require different skills in portfolio management mutual funds? Should mutual fund portfolio managers opt for interactive planning as compared to predictive modeling for managing the mutual fund?

The study found that the benchmarked index outperformed the sector mutual fund and provided a better risk-adjusted return. This suggests that investors would be better off using a benchmarked index rather than a sector mutual fund. Additionally, the manager's experience does not seem to impact the return from a sector mutual fund, indicating that investors do not need to worry about who is managing their mutual fund. Finally, collective aspects of sector mutual funds (e.g., portfolio returns and performance) are two different scenarios, so investors should be careful when comparing these metrics.

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CHAPTER 1

INTRODUCTION

The spring of 2020 is remembered for the awareness by most of the presence of the global COVID-19 pandemic. Within a few weeks, the world's leading economies shut down, creating uncertainty in the global capital markets. The result was a period of historical market volatility including steep drops in domestic and global markets. Policymakers in the United States and began to consider how to bolster the financial sector's resilience to future shocks.

The financial turmoil that seized the markets in March 2020 originated from market shareholders' immediate necessity for liquidity to protect against the uncertainty created by the coronavirus pandemic and economic closedown. Despite the explicit uncertainty and losses, Treasuries have been secure for market participants during previous market stress. Various factors have contributed to this unexpected behavior, ranging from market participants rebalancing positions to account for changing market circumstances to imposed regulatory capital standards for banks.

However, in 2020, the situation was more severe and strains in the Treasury markets ultimately spilled over into both short and long-term credit markets, including the markets for municipal debt securities, bank certificates of deposit, and corporate bonds. In light of uncertainty about the outbreak and its impact on the economy, investors became distinctly risk-averse and attempted to preserve or sustain their cash positions. As a result, sellers of short- and long-term credit securities surpassed the number of buyers. These market dynamics affected all market stakeholders, including money market and bond mutual funds.

The Security Exchange Commission (SEC) recently announced that it has resolved to approve new rules establishing the latest regulatory framework for fund valuation practices (United States Securities and Exchange Commission, 2020). The investment Company Act of 1940 is how fund boards fulfill their valuation obligations in the light of market trends, such as the increasing diversity of asset classes held by funds and the increasing range and type of data used to make valuation decisions. The SEC comprehensively addressed valuation practices under the Investment Company Act of 1940 in two publications over 80 years ago. Since then, market and fund investment practices have evolved significantly. Many funds now use third-party pricing information providers to provide pricing information for particularly low-trading and more complex assets. Furthermore, significant regulatory developments have modified how boards, investment advisers, and other market participants manage valuation under the federal securities laws. The new rule 2a-5 recognizes and reflects these changes, including the vital role that fund managers play and the expertise they provide (Vanessa A. Countryman, 2020).

The new rule establishes prerequisites for satisfying a fund board`s responsibility to determine fair value in good faith for purposes of the Investment Company Act (ICA). The new rule 2a-5 requires a board or its valuation designee to assess and manage risks associated with fair value determinations, select, apply and test appropriate valuation methodologies, and oversee and evaluate any pricing services used. This rule recognizes that most fund directors do not play a recurring role in pricing fund investments and allows directors to delegate fair value decisions to specific parties. This designation is subject to detailed conditions and monitoring requirements, including regular and prompt thorough reporting by the evaluator, accurate definition of responsibilities, and proper separation of duties between evaluator staff. This rule clarifies that effective board oversight must be positive for this process. In addition, specific policies and

procedures related to the law must be adopted and implemented. Finally, the Commission has adopted relevant record-keeping requirements that require the Fund or its advisors to retain certain documents related to fair value determinations.

A mutual fund is an open-end investment organization registered with the SEC that connects funds from various investors and invests in multiple financial instruments such as stocks, bonds, short-term money-market instruments, or hybrid investments. The consolidated securities and assets owned by the mutual fund are its portfolio, which an SEC-registered investment adviser manages. Each mutual fund share signifies an investor's ownership proportionate to the amount invested by him to the total investment of the mutual fund's portfolio and the income the portfolio generates. Mutual fund shares are typically purchased from them directly or through investment professionals such as a broker. Mutual funds are required by Investment Company Act of 1940 (The Act) to assess their shares' prices each business day, typically after the major U.S. exchanges close. The per-share price of the mutual fund's assets withholding liabilities —is known as net asset value (NAV). Mutual funds must transact their shares at the NAV, calculated once the investor puts a buy or sell order. This means, when an investor places a purchase order for mutual fund shares, the purchase price will not be confirmed until the next NAV is calculated.

Mutual funds always issue a disclaimer that past performance does not indicate future performance, which is marketed every time there has been an investment in mutual funds. It means that one cannot expect guaranteed returns from these mutual funds or from any open financial investment. Therefore, it is necessary to look beyond the preceding years' returns to evaluate a mutual fund. Primarily, investments should be monitored to make informed decisions that can drive higher returns. It is known that the capital market keeps fluctuating with changes in the overall economic conditions, and such a change affects the portfolio's asset allocation.

It is essential to identify the performance of mutual funds in US markets to ensure that investors get what they expect from their investment. Additionally, this information can help managers make better decisions about how to run their funds and what strategies to employ to improve performance. Several factors must be considered when investing in a mutual fund to ensure that investors get the best possible return on investment. One of the most important factors is the performance of the fund itself. There are several different ways to measure the performance of a mutual fund, but one of the most common is the use of the Sharpe ratio. This ratio measures the risk-adjusted return an investment has generated over time. In other words, it takes into account both the ups and downs of the market to give an accurate picture of how well a particular fund has performed. Another essential factor to consider when assessing mutual fund performance is the expense ratio.

This is the amount of money one will be charged in fees for investing in a particular fund. The higher the expense ratio, the fewer money investors will have to invest in the actual fund. Therefore, finding a fund with a low expense ratio is vital to maximize return on investment. Risk exposure is also essential to consider regarding mutual fund performance. This refers to the risk one takes by investing in a particular fund. The more risk an investor is willing to take on, the higher potential return could be seen from investment. However, it is essential to remember that with high risk comes the potential for high losses. Therefore, balancing risk and return is vital when investing in mutual funds. One way to mitigate risk when investing in mutual funds is to diversify portfolios. This means investors should not put all their eggs in one basket. Instead, investors should invest in various funds to spread their risk. This will help to ensure that investors do not lose everything if one particular fund happens to underperform.

Another way to manage risk in mutual fund investing is through stop-loss orders. This order helps limit losses if the market turns for the worse. By using stop-loss orders, an investor can help to protect themself from incurring too much loss on their investment. When it comes to mutual fund investing, there are several strategies that one can employ to improve their chances of success. However, it is essential to remember that no investment is ever guaranteed; therefore, it is vital to research any investments before putting hard-earned money at risk carefully. Additionally, it is essential to consult with a financial advisor to get the most accurate information and advice possible. With careful planning and research, one can significantly improve their chances of success with mutual fund investments.

When investing in a mutual fund, many factors must be considered to ensure that investors get the best possible investment return. One of the most important factors is the performance of the fund itself. There are several different ways to measure the performance of a mutual fund, but one of the most common is the use of the Sharpe ratio. This ratio measures the risk-adjusted return an investment has generated over time. In other words, it takes into account both the ups and downs of the market to give investors an accurate picture of how well a particular fund has performed. Another essential factor to consider when assessing mutual fund performance is the expense ratio. This is the amount of money that will be charged in fees for investing in a particular fund. The higher the expense ratio, the less money one will have to invest in the fund.

Therefore, finding a fund with a low expense ratio is vital to maximize return on investment. Risk exposure is also essential to consider regarding mutual fund performance. This refers to the risk investors take by investing in a particular fund. The more risk one is willing to take on, the higher potential return could see from investment. However, it is essential to remember

that with high risk comes the potential for high losses. Therefore, finding a balance between risk and return when investing in mutual funds is essential.

One way to mitigate risk when investing in mutual funds is to diversify portfolios. This means investor should not put all their eggs in one basket. Instead, they should invest in a variety of different types of funds to spread out their risk. This will help to ensure that investors do not lose everything if one fund happens to underperform. Another way to manage risk in mutual fund investing is through stop-loss orders. This type of order helps limit their losses if the market turns for the worse.

By using stop-loss orders, Investors can help protect themselves from incurring too much loss on their investment. Regarding mutual fund investing, there are different strategies investors can employ to improve their chances of success. With careful planning and research, they can significantly improve their chances of success with mutual fund investments. When investing in a mutual fund, many factors must be considered to ensure that investors get the best possible investment return. One of the most important factors is the performance of the fund itself. There are several different ways to measure the performance of a mutual fund, but one of the most common is the use of the Sharpe ratio.

This ratio measures the risk-adjusted return an investment has generated over time. In other words, it considers both the ups and downs of the market to give investors an accurate picture of how well a particular fund has performed. Another essential factor to consider when assessing mutual fund performance is the expense ratio. This is the amount of money that will be charged in fees for investing in a particular fund. The higher the expense ratio, the less money will be available to invest in the actual fund. Therefore, finding a fund with a low expense ratio is essential to maximize return on investment. Risk exposure is also an important factor to consider when it

comes to mutual fund performance. This refers to the risk taken by investing in a particular fund. The more risk are willing to take on, the higher potential return could see from investment. However, it is essential to remember that with high risk comes the potential for high losses. Therefore, finding a balance between risk and return is crucial when investing in mutual funds.

Too often, investors tend to look at investments only for producing maximum returns for the cash they invest. With this point of view, they are not attentive to hardly look at their risk profile and the investment risk before making a choice. Nearly all investments have a certain degree of risk. If the return on these investments is not commensurate with its risk, then making these investments may not be fruitful. A successful mutual fund provides better yields in its category given the same risk. While returns can be readily tracked accurately assessing the risk associated with mutual funds becomes important. A mutual fund's performance is understood by an assessment of the risk-return tradeoff which is the relationship between the level of risk and level of potential return on investment. Metrics used in this assessment are the Sortino ratio, Omega ratio, and Alpha or Sharpe ratio.

The Sortino ratio estimates the risk-adjusted return of an investment portfolio. It is an adaption of the Sharpe ratio but counterstrikes only those returns falling below a predefined specified target or required rate of return, while the Sharpe ratio determines both upside and downside volatility equally. Though both ratios measure an investment's risk-adjusted return, they do so in significantly different ways that will frequently lead to differing conclusions about the true nature of the investment's return-generating efficiency.

The Omega ratio is a risk to return performance measure of an investment strategy. It was developed by Con Keating and William F. Shadwick in 2002 and is defined as the probability-

weighted ratio of profits versus losses for some targeted return. The ratio is a substitute for the widely used Sharpe ratio and is established on the Sharpe ratio discards information.

The Alpha ratio represents the intercept in a regression equation of the fund's excess return on one or more yielding benchmarks. The Sharpe ratio is the fund's expected excess income divided by the standard deviation of the fund's return. These measures are estimated with historical returns on the assets that describe them. This means the Alpha is determined using excess income on the fund and the benchmarks, whereas the Sharpe ratio is measured using the excess returns.

Dissertation Purpose, General Problem and Research Questions

The purpose of this dissertation is to evaluate the performance of US based mutual funds by analyzing, returns, operating cost, risk exposure and risk mitigation strategies. The study research is important because COVID-19 and its socio-economic disruptions have given new urgency to the challenges facing mutual funds. In 2019, it was forecast (U.S. bureau of labor statistics, 2019) that from 2019 to 2025 trends such as slower growth, shrinking fees, strategic positioning, product innovation, unemployment rate, and technological transformation would decline. These trends have accelerated, however, and mutual fund managers need to move even faster to maintain and improve their positions. The current coronavirus pandemic has pushed many US based mutual fund managers to re-evaluate how they operate.

This dissertation seeks to provide insights into the strategies that these managers are using to adapt to the new landscape brought about by COVID-19. Specifically, this research will focus on how mutual fund managers are using data and technology to drive small business investment decisions during and after the pandemic. Additionally, this dissertation will attempt to answer the question of whether or not US based mutual fund managers are taking advantage of opportunities presented by the current market conditions. Ultimately, this research will provide valuable insights

into how mutual fund managers can best position themselves for success in an increasingly uncertain world.

With the pandemic in mind, managers and investors may now be rethinking their forecasts and expectations for the near- and mid-term future. Organic growth in the US mutual fund industry has remained slow, despite the upside blow in the overall market. The long-term outlook is also challenging due to downward pressure on fees, reduced profit margins, and changing investor preferences. Adding the pandemic deepens the challenge for asset managers trying to remain competitive.

There is a need for this research in order to provide insights about how US based mutual fund managers can survive and thrive during and after COVID-19. The specific research questions that this study will answer are:

1. To what degree do sector mutual funds add value to investors' portfolios by contributing a better risk-adjusted rate of return?
2. What is the evidence of performance constancy in the case of sector mutual funds?
3. What management skills enable improved mutual fund portfolio outcomes?
4. How does linear analytic predictive modeling compare with non-linear systems-informed interactive planning for managing mutual funds?

Audience:

This dissertation is directed to the following audiences. First, institutional investors such as large corporations specialize in closed-end mutual fund investment through sector mutual fund portfolios, allowing them to approach the market through these mutual funds by paying hefty fees. The 2nd audience would be the individual investors who are basing the there investment on the

experience and consistency of fund managers' investment, which relates to the purpose of investment. The 3rd aspect of the audience is that this dissertation aims to address the research questions related to mutual fund performance and risk tolerances. The dissertation will focus on understanding the interactive planning approach through identifying ideal benchmarks and how it would impact the security selection model for the fund managers and investors.

The dissertation will provide an understanding of how the mutual funds are utilizing the invested amount and which strategy and combination of experience of the fund manager would justify the risk appetite. Furthermore, it focuses on exploring new investment strategy venues based on inputs shared throughout the organizational goal. Additionally, this research will provide valuable insights for investors, fund managers, and other stakeholders such as the state in understanding how interactive planning can impact security selection models and lead to improved investment outcomes.

The sector mutual fund portfolio allows investors to gain exposure to a specific sector of the economy while diversifying their overall portfolio. This can provide potential benefits such as higher returns during periods of economic growth in that sector while allowing investors to participate in other sectors that may be performing well. Additionally, a sector mutual fund portfolio can help mitigate some risks associated with investing in a single industry. For example, if the healthcare sector is experiencing a downturn, investors in this portfolio would still have exposure to other sectors that may be doing well.

However, it is important to note that sector mutual fund portfolios come with their own set of risks:

- Because these portfolios are typically more volatile than traditional diversified portfolios, they may not be suitable for all investors.
- There is the risk that the sector investors have invested in will underperform the rest of the market.
- While sector mutual funds can offer diversification benefits, they should not be used as a substitution for a diversified portfolio.

When choosing a sector mutual fund portfolio, it is essential to consider the investment objectives and risk tolerance. Additionally, it is important to research the sector mutual funds performance as considering investing in and the specific funds that make up the portfolio. This will help an investor understand the risks and rewards associated with this type of investment.

Sector mutual fund portfolios can be a great way to gain exposure to a specific economic sector. However, it is vital to understand this type of investment's risks and potential rewards before making any decisions. If one is considering investing in a sector mutual fund portfolio, research the sector thoroughly and consult with a financial advisor to ensure it is suitable for investors.

Dissertation Format:

This dissertation is organized as follows: Chapter 1 provides The motivation and significance of the study. This chapter aims to provide an understanding of the extant research on individual investors and their decision-making and related decision-making in organizations concerning investment decisions. Additionally, this review will help to identify gaps in the literature that this study seeks to address. Chapter 2 presents a Literature Review, the purpose of which is to provide an understanding of the extant research on individual investors and their decision-making, as well as related decision-making in organizations concerning investment

decisions. Additionally, this review will help to identify gaps in the literature that this study seeks to address. Chapter 3 presents the Methodology I used to examine the research questions, based on the quantitative study and adequate risk analysis returns such as Sharpe and alpha ratio. Chapter 4 presents the Results of the examination of the research questions and empirical analysis, and Chapter 5 presents the Discussion and Conclusions of this research.

CHAPTER 2

LITERATURE REVIEW

The general problem addressed in this dissertation is the complex context of COVID-19 has generated gaps between the prevailing methods applied by managers of mutual fund investments and the information needed by investors to meet their purposes and interests. I argue that responses to a set of four research questions can close the gap between these states and offer a pathway to navigate mutual fund activity and growth with improved outcomes for managers and investors. This chapter reviews the academic and practice literature that addresses the general problem and the research questions.

Prevailing Analytic Approach to Understand and Manage Mutual Funds

1960s to 1999

There have been several studies on the performance and growth of mutual funds around the globe. Treynor (1965) shows a method of viewing performance results. He incorporated multiple theories and developed Treynor index, which rate the performance of mutual funds graphically. The higher the slope of the line, the higher the systematic risk or volatility a fund needs to mitigate.

Sharpe (1966) explained that the expected return on an efficient portfolio and its associated risk are correlated. He developed an index that rates the performance based on the optimal portfolio with the risky portfolio by combining various concepts known as the Sharpe index. he shared that the unsystematic risk is associated with particular security due to inefficient management. A risk-free asset is the one with the most excellent and most secure investment. Whereas Jenson, Michal C. (1967) indicates the fund's past performance, predicts the future demand of the fund, and investors attract to invest in Mutual.

Daniel, Grinblatt, Titman, and Wermers (1997) apply new portfolio performance measures that use a benchmarking model based on the characteristics of stocks included in the portfolios that are evaluated. The benchmarking models were developed from the returns of 125 passive portfolios compared with stocks held in the evaluated portfolio based on those stocks' market capitalization, book-to-market, and prior-year return characteristics. Based on their benchmarks, "Characteristic Timing" and "Characteristic Selectivity" measures are developed to detect whether portfolio managers successfully time their portfolio weightings on these characteristics and whether managers can select stocks that outperform the average stock with the same characteristics. They also apply these measures to a new database of mutual fund holdings covering over 2500 equity funds from 1975 to 1994, which resulted in mutual funds, particularly aggressive-growth funds, exhibiting some selectivity, but those funds exhibit no characteristic timing ability.

Fama (1972) developed methods to distinguish past returns due to the talent to choose the steadiest securities at a given level of risk from forecasted price movements in the market. He introduced a multiperiod model enabling evaluation on different intervals of times and on a whole study period. He proposed that return on a portfolio constitutes return from security selection and return for carrying risk. His contributions combined modern theories of portfolio selection and capital market equilibrium with more universal concepts of good portfolio management.

Gilbertson and Vermaak (1985) shared that they analyzed the performance of eleven South African mutual funds over the eight years 1974 to 1981 and found that the returns produced by the funds ranged are generally lower than those achieved by three stock market indexes. They further shared that the mutual funds generally outperformed the three indexes when risk-adjusted performance measures were used. They also shared some evidence that at least one mutual fund consistently and significantly outperformed the indexes and the other funds.

Grinblatt and Titman (1989) proposed employing the 1975-84 quarterly holdings of a sample of mutual funds to formulate an estimation of their total returns. They shared that their model was not subject to survivorship bias. It was used in conjunction with a sample that includes the net returns of the mutual funds, which allowed them to measure the inclination in measured performance due to the survival requirement and to estimate total transaction costs. Their tests indicate that the risk-risk mitigated gross returns of some funds were significantly positive. Furthermore In 1992 they analyze how mutual fund performance relates to past performance. They created the tests based on multiple portfolio benchmarks built on security properties. They shared that evidence has been found that performance differences between funds persist over time, and this consistency is consistent with the ability of fund managers to generate anomalous returns.

Robert E. Cumby and Jack D. Glen (1990) shared that based on the performance of a sample of fifteen U.S.-based internationally diversified mutual funds between 1982 and 1988, they found no evidence that the funds, either independently or, provide investors with performance that exceeds that of a broad, international equity index over this sample period. They shared that the two performance measures used in their study were the Jensen measure and the positive period weighting measure proposed by Grinblatt and Titman.

Geranmayeh and Bartol (1990) explored the role of top management concerning the diversified operations of a company and the purpose of "strategic planning" for these entities. They summarily examined two general strategies for generating growth: conglomeration (portfolio management) and synergistic growth. They argued that the second is better by challenging the globally popular notion that growth is the appropriate purpose for a business entity. They also proposed the concept of "development" as a more suitable alternative by offering the case of Armco's Latin American Division (known as ALAD) to illustrate the kind of reasoning that

emerges when development is taken as the corporate goal and present a five-phase strategy that combines the notions of synergistic growth and corporate development in a systemic framework.

Barua and Varma (1991) estimated share performance (1987-1991) using the CAPM method from big investors, small investors, and fund management. The study applied ET Index as a substitute for market behavior. The risk-adjusted performance was measured by using Sharpe, Jensen, and Treynor measures. They used the capital market line to study the risk-return relationship of the fund from the perspective of large investors and the security market line for small investors. They concluded that the fund performed better than the market for small investors and fund management, but the fund did not do well as opposed to CML.

Grinblatt and Titman (1992) analyzed how mutual fund performance relates to past performance. Their tests are based on multiple portfolio benchmarks built on security properties, which show that performance differences between funds persist over time. This consistency is consistent with the ability of fund managers to generate abnormal returns.

Shome (1994), based on growth schemes, reviewed the performance of the mutual fund industry from April 1993 to March 1994 with BSE SENSEX as a market proxy. Their study showed that, in the case of 10 schemes, the average rate of return on mutual funds was marginally lower than the market return.

At the same time, the standard Gupta Ramesh (1989) circumscribed fund performance in India, analyzing the returns gained by schemes of relative risk and comparable constraints; as a result, a direct risk-return relationship was developed to compare funds with various risk levels. His study disintegrated total return into the return from investors' risk, managers' risk, and target risk. Mutual funds return due to selectivity was characterized as a return due to the choice of

securities and timing of investment in a distinct class of securities. However, Carhart, Mark M. (1997), shared that the fund performance is determined, identified risk, and measured fund return. The paper demonstrates how to identify the scheme and diversification of the portfolio. The portfolio needs to adjust its risk.

Volkman and Wohar (1996) examine the relative strength of trust performance by analyzing the profitability of 20 trading strategies based on different valuation and investment periods using three other empirical methods. Specifically, they tested the positive consistency of fund performance by focusing on the optimal weighting of historical performance information. They further shared that there is a decline in performance sustainability after a year; instead, an unusual fund returns over a one-year to three-year investment period, based on a three-year to four-year valuation period. In addition, they further discussed that the relative strength of a fund's performance is directly related to the sustainability of a high-performance fund, not the sustainability of a poor-performance fund.

Droms and David (1996) Used pooled cross-section/time series analysis to assess risk-adjusted equity fund performance and long-term relationships between asset size, cost ratios, portfolio turnover, and charge / idle conditions. Their database consists of investment results from 151 equity funds continuously managed for 20 years from 1971 to 1990. Use a variation of the cross-section/time series model to explore the interaction between fund type (load or idle) and asset size and cost ratio. They also argued that Investment performance does not depend on asset size, turnover, or charge / idle status; hence increased spending leads to a higher return.

Gupta and Sehgal (1998) evaluated the performance of 80 mutual fund schemes over four years (1992-96). Their study tested the mutual fund diversification, consistency of performance,

parameters, and risk-return relationship. They also noticed the existence of inadequate portfolio diversification and consistency in performance among the sample schemes.

2000 - Present

Rajeswari Moorthy (2001) have expressed that mutual fund are a retail product created to target small investors, salaried people, and others who are not overawed by the strangeness of the stock market but like to receive the profits from stock market investing. At the retail level, investors are novel and are a highly diversified group. Therefore, their fund selection also widely differs.

Bliss and Potter (2002) assess whether gender affects the performance and behavior of fund managers. They provide theoretical evidence of the differences between men and women in risk aversion and overconfidence, and then hypotheses link these differences to fund performance. Furthermore, according to them, female fund managers are expected to be less risk-averse and less confident than male managers. They further shared that contrary to expectations, domestic and international female fund managers have been shown to hold slightly higher risk portfolios than men, depending on the risk measure used. They also confirmed that there was no statistical difference between the two groups regarding the turnover rate of domestic fund managers based on Pipe return measurements, which are consistent with popular magazine articles, showing that female fund managers are superior to male fund managers; however, after adjusting for risks and other potential impacts, there was no significant difference in the performance of domestic funds.

Berkowitza and Kotowitzb (2002) discussed the relationship between the fees charged by mutual fund and their performance. They distinguished between high-quality and low-quality funds and further shed light on the growing controversy over the role of independent directors as supervisors of fee-setting practices within funds. They shared a positive relationship between top-quality manager fees and performance; In contrast, for poor-quality managers, there is a negative

relationship between fees and performance. They further shared that the association reflects the incentive for poor managers to take advantage of investors in the short term, as poorly performing managers are unlikely to survive. Furthermore, these results are consistent with the idea that independent directors responsible for protecting shareholders' interests may not be effective in doing so.

Chang, (2004) shared that maximum capital gains and growth funds are below growth and income funds, active managers are below passive investment strategies, low-risk funds are above high-risk funds, and no-load funds are above load funds. He also mentioned that low beta, small asset funds are functioning efficiently.

Timmermann et al. (2006) shared the idea of a new bootstrap statistical technique to analyze the U.S mutual fund industry's performance from 1975 to 2002. They suggested a bootstrap approach is necessary because the cross-section of mutual fund alphas has a complex nonnormal distribution due to heterogeneous risk-taking by funds and nonnormality in individual fund alpha distributions. They also argued that their bootstrap approach uncovers findings that differ from past studies and that a sizable minority of managers pick stocks well enough to cover their costs.

Busse and Irvine (2006) used daily returns to compare the performance predictability of Bayesian inference of mutual fund performance with standard frequency-based measurements. They shared that if anyone wants to correlate non-benchmark passive investment returns with fund holdings, incorporating a history of those returns would give out performance metrics that are more predictive of future performance than standard metrics. They Further shared that Bayesian alpha based on the Capital Asset Pricing Model (CAPM) is beneficial for predicting future standard CAPM alpha; during their sample period, biases consistent with moderate to widespread beliefs

about management capabilities dominated more skeptical biases, with results consistent with investor cash flow.

Sing (2007) argued that trust performance determinants affect expected return or transaction costs as factors influencing expected return include benchmark return on asset allocation and systematic risk. He shared that the transaction costs include explicit and implicit costs that can be measured by cost ratio and fund size. Furthermore, he shared that The importance of transaction cost determinants can be attributed to asset allocation in determining returns allowing him to examine the cost ratio, performance, and size characteristics of domestic equity funds subject to various fiduciary standards under Singapore's Central Provident Fund investment scheme because these funds are subject to the same standards for managing social security savings.

Pollet and Wilson (2008) shared that an actively managed mutual fund is suffering from diminishing returns in size; the fund will need to change its investment behavior as assets under management grow. They said that asset growth has little effect on the behavior of a typical fund. However, large and small funds diversify their portfolios as they grow: Increasing diversified investment, especially in small-cap funds, will improve performance. They also argued that the growth of the fund family is related to the launch of new funds that hold different shares than their existing siblings: Funds with many siblings slow down diversification as they grow, suggesting that the fund family can influence its portfolio strategy.

Karoui and Meier (2009) shared the portfolio characteristics of 828 newly launched US equity mutual funds over 1991-2005 based on their performance. These funds initially earn, on average, higher excess returns and higher abnormal returns, whereas their risk-adjusted performance is also better than existing funds. Furthermore, they provided evidence for short-term constancy among top-performing funds—however, an ample fraction of funds losses their position

drastically over two subsequent periods. Analyzing portfolio characteristics, they also found that returns of funds exhibit higher ratios of unsystematic to absolutei risk. Furthermore, they also shared that new fund portfolios are typically less diversified in terms of the number of stocks and industry concentration and are invested in smaller and less liquid stocks.

Sørensen (2009) shared that by using the newly constructed survivor-free dataset, this study examines the performance and durability of all Norwegian equity funds listed on the Oslo Stock Exchange between 1982 and 2008 and evenly mutually. It was found that funds provide statistically significant evidence of risk-adjusted anomalous performance in weighted portfolios. This study also discovered that the bootstrap method, which separates skill and luck, finds little evidence of skill at the right end of the alpha cross-section distribution. However, at the left end, there are some inferior fund products, and the performance of the winner or loser is inconsistent.

DellaVigna and Gentzkow (2010) shared a selective survey of empirical evidence on persuasive communication's effects and the drivers. They organize their review around factors such as persuasive communication, the persuaders' incentives, and their limited ability to distort communications. They also evaluated how persuasion affects equilibrium outcomes in economics and politics.

Mahmud and Mirza (2011) explored Pakistan Mutual Funds 2006-10 industry performance when both bull and bear markets are the characteristic market. they shared that Fund-type analysis shows that Islamic funds are performing Growth strongly despite poor performance compared to traditional funds whereas Income funds seem to suffer due to underdevelopment Bond markets and very high T-bill interest rates resulted in negative excess returns. furthermore thay also suggested that for Equity-Funds, market index and size are essential factors shows the manager's preference for large-cap stocks.

Otten and Thevissen (2011) revisited the performance of European mutual funds using a more recent and extensive survivorship bias-free database of 16,055 equity funds over the 1992-2006 period. They shared four significant aspects: 1st, European mutual funds have offered a significantly negative four-factor Carhartt Alpha in this recent period. The expansion of the European investment trust industry today makes it more difficult for managers to add value: 2nd, Passive funds perform even worse than active funds, leaving us a puzzle. It might be that passive funds are not pure index trackers but active funds in disguise: 3rd, Adding back TERs and loads make most alphas insignificantly different from zero. European fund managers can follow the market but charge investors too much: 4th, They fund strong persistence in performance in all investigated countries over six and 12-month holding periods.

Benos and Jochec (2011)shared that existing bibliographic patterns will only appear if the fund is ranked by overall performance, such as stock selection, market timing, fees, etc. When it comes to overall performance, there is consistency only between the funds with the lowest performance and the funds with the highest performance. In addition, they shared that the profitability of the winning strategy depends on the frequency of rebalancing and, in some cases, the size of the investment. Private investors cannot make a profit, but wholesale investors can take advantage of the Class A-share fee structure and rebalance their portfolios each year to get extraordinary positive returns.

Bhuva and Bantwa (2012) argued that academic research often focuses on fund returns. They said that their study intends to examine the performance of selected Large-cap and Mid-cap mutual fund schemes of the Indian Mutual fund industry during the study period 2007 to 2011. They shared that the performance of selected mutual funds was assessed in terms of average returns, systematic risk, and unsystematic risk using different measures like Sharpe, Jenson,

Treynor, and FAMA. After detailed analysis, it was found that except for two, all the sampled schemes have performed better than the market, supporting the established relationship of high risk - high return, better performing schemes are exposed to higher risk. They also revealed that the majority of the mutual fund schemes were adequately diversified, and around 60% of the schemes were able to outperform the market with the help of better stock selection by the fund managers.

Csaszar (2012) shared that mutual funds offer an ideal and rare setting to test the theoretical model of how organizational structure impacts organizational performance since there are detailed records on the projects they encounter, the decisions they make, and the results of these decisions. He explained that the independent variable, organizational structure, is coded based on fund management descriptions made by Morningstar (a mutual fund rating firm). The findings suggest that organizational structure has relevant and anticipated effects on an extensive range of organizations; applications include designing organizations that achieve a given mix of exploration and exploitation and predicting the consequences of centralization and decentralization. (Sah and Stiglitz 1986)

JavierVidal-García (2013) examines the performance and performance consistency of style-consistent European equity funds from 1988 to 2010. Garcia used a large, unbiased sample of survivors from six European countries to document strong evidence of benchmark-adjusted return consistency. The study found that statistically and economically significant performance persistence is seen for periods up to 36 months, but persistence is much more pronounced for top and bottom performers. Hence according to this study, the historical performance of European mutual funds can predict future performance, and historical performance data can provide valuable clues to investors.

Yu (2014) examined the performance of socially responsible mutual funds from 1999 to 2009. they shared that to minimize benchmarking errors; they apply a propensity score matching method to identify the most comparable traditional funds for each socially responsible fund based on some key characteristics. Furthermore, they argued before using the propensity score matching method and found that socially responsible investment funds had lower returns than traditional funds. However, socially responsible mutual funds show excellent average and risk-adjusted returns compared to propensity score-adjusted funds. They also suggested that good returns for funds with a propensity score consistent with socially responsible funds exist only in funds that meet social and governance screening criteria.

Steffen and Ibikunle (2015) performed the first comparative analysis of European green, black (fossil energy and natural resources) financial performance, and traditional investment funds. Their dataset of 175 greens, 259 blacks, and 976 traditional mutual funds compares three different investment-oriented financial performances from 1991 to 2014. They found that Green mutual funds perform significantly lower than traditional funds over the entire sample period. However, significant risk-adjusted performance differences between green and black mutual funds during the same period did not exist. They also found that green investment vehicles have significant exposure to small caps and growth stocks, while black funds are more invested in value stocks. According to them, the risk-adjusted return profile of a green fund will gradually improve over time until there is no discernible difference in performance between the green and traditional classes. Furthermore, they also suggested that green funds have begun to significantly outperform Blackpia, especially during the 2012-2014 investment period.

Edwin and Elton, (2015) suggests that Mutual fund attrition can create problems for a researcher because funds that disappear tend to do so due to poor performance. They estimate the

size of the bias by tracking all funds that existed at the end of 1976 and calculating the return, taking into account the merger terms. This allowed them to have a precise estimate of survivorship bias. In addition, they examine the characteristics of mutual funds that merge and their partner funds while Estimating survivorship bias over different horizons and using different models to evaluate performance. They also argue that Interactive Planning in a mutual fund is essential to avoid such bias and ensure good performance of the fund. In addition, it is also essential to monitor the fund regularly to ensure that it is still performing well and has not been adversely affected by any recent changes.

Agarwal, Mullally, Tang, and Yang (2015) explored the impact of mutual funds' compulsory portfolio disclosure on stock liquidity and fund performance. They developed an informed trading model with disclosures and tested their forecasts against the SEC's May 2004 rules, which require more frequent disclosures. They found that Stocks with many funds, especially stocks held by well-informed funds and stocks with a large amount of information asymmetry, will have significantly increased liquidity due to changes in regulations. They also established the relationship between Information-rich funds, especially those that hold stocks with high information asymmetry and would experience significant performance degradation due to regulatory changes.

Kiymaz and Koray (2017) shared that by adopting the Morningstar classification of mutual funds and using the Lipper US Mutual Fund Database by FactSet to collect monthly returns and multiple metrics for equity and bond mutual funds from January 2000 to May 2017. They shared several descriptive statistics for these funds are reported as well as various risk-adjusted performance measures, and their results show that diversified emerging market funds generate significant alphas for their investors during the study period. On the other hand, emerging market

funds do not render any significant positive alphas; mostly, alphas are negative. Their analysis of sub-period performance proposes that these funds do not consistently produce excess returns, showing significant shifts from one period to another. They further argued that the emerging market funds present US investors with alternative sources of exposure. Their study also contributes to the scarce literature on these types of funds and provides a broad performance assessment against various benchmarks during a period that incorporates significant bear and bull markets across the world.

Clare (2018) evaluate the performance of the US bond mutual fund industry using a broad sample of bond funds over a period from January 1998 to February 2017. Their study evaluates bond funds relative to their self-declared benchmarks and in terms of both gross fee returns and net fee returns. They further document many irregular performances between funds; to the fund (gross returns) and the investor (net returns). They argued that Bond fund performance is much better in the post-financial crisis period; however, past outstanding performance cannot be relied upon to prognosticate future performance. They also found a predominance of unfavorable market timing among US bond mutual funds.

Alvi and Rehan (2020) shared that their findings revealed no difference between the modified Sharpe and VIS Credit Rating Company Model by both way results exhibited the same mutual fund star rankings. Furthermore, both methods have a different way of calculating final scores with the same results. They also shared that the modified Sharpe ratio is quite well when excess return is negative, but when there is a mix of negative and positive, it is better to use the VIS model and positive excess returns. They also identify that their research paper could not calibrate other models developed by rating companies (Pakistan Credit Rating Company) which is a future research gap.

Herlambang (2020) shared that he aims to see a hint of difference in the performance of traditional and Islamic mutual funds in Indonesia with the Sharpe Index, Treynor Index, and Jensen Index. Based on the sample selection criteria, 20 mutual funds for conventional category stocks and 13 mutual funds for Islamic stocks are working and publishing their monthly NAB during the research period. His analysis compares the returns, risks, and performance of conventional and Islamic mutual funds. Based on his Independent Sample Test results, there is a notable difference between the performance of Islamic equity funds and conventional equity funds exercising the Sharpe Index, Treynor Index, and the Jensen Index.

Damani and Vaidya (2021) attempted to examine and correlate global actively managed equity mutual funds' performance over intervals of time to assess and verify how predicting future performance can be made significant for investors analyzing historical data based on monthly net asset values (NAVs). Their study evaluated 180 actively managed funds summing up to roughly USD 5 trillion of the fund assets as of March 31, 2021. They also identified a research gap that the paper aims to fill under one umbrella: prediction analysis using performance measures, downside risk measures, style factor analysis, and market timing models. Various performance ratios (Sharpe and Omega) and style attributes were computed and compared for their relative performance across periods for sampled equity funds. They further shared that relative performance was stable across periods and, hence, predictable, which shows that a portfolio of funds construc ted optimally using historical performance would be exceptional in the subsequent period. However, They also shared that it would be appropriate for investors to use the relative past performance of the funds and their analysis for the future allocation of investible surplus over these funds.

Samarbakhsh and Shah (2021) argued to look at the performance of the bond mutual fund industry, focusing on Canadian fixed income funds before, during, and after the 2008 global

financial crisis. After investigating the excess returns and dollar fund flows of Canadian fixed income funds and adjusting the characteristics and macroeconomic factors of the funds, it shows that the funds are well below the fixed income market throughout the investigation period. Consistent with previous research, this slump was even more pronounced during market downturns. These results suggest a spiral relationship, suggesting that institutional investors' performance declines during the financial crisis. They also observed the volatility pattern of dollar fund flows. Inflows are also positively correlated with the time of the problem, suggesting that dollar fund inflows into bond funds recorded positive numbers during the recession, indicating inflows.

CHAPTER 3

METHODOLOGY

This chapter proposes the use of methods and tools to generate primary and second data to respond to the dissertation's general problem and four research questions. The general problem concerns gaps between the prevailing methods applied by managers of mutual fund investments and the information needed by investors to meet their purposes and interests. The four research questions are: (1) To what degree do sector mutual funds add value to investors' portfolios by contributing better risk-adjusted rate of return? (2) What is the evidence of performance constancy in the case of sector mutual funds? (3) What management skills enable improved mutual fund portfolio outcomes? (4) How does linear analytic predictive modeling compare with non-linear systems-informed interactive planning for managing mutual funds?

Prevailing Research Methodology

Performance analysis for mutual funds include average monthly return, an average monthly standard deviation of return, the Sharpe ratio, and Jensen's alpha ratio. Downside risk would be evaluated using the Omega ratio and Sortino ratio.

Sharpe Ratio

William F. Sharpe has developed the Sharpe Ratio to help investors understand the rate of return and risk. This ratio is the average rate of return obtained at the risk-free rate per unit of volatility or absolute risk. Volatility is a measure of price fluctuations in an asset or portfolio. By subtracting the risk-free rate from the median rate of return, investors can better isolate the profits associated with risky behavior. A risk-free rate of return is the rate of return that an investor can expect from taking no risk. The higher the Sharpe ratio, the more attractive the risk-adjusted returns.

Modern Portfolio Theory (MPT) states that adding assets to an uncorrelated diversified portfolio can mitigate portfolio risk without sacrificing returns. Adding diversification should increase the Sharpe ratio compared to similar portfolios with lower levels of diversification. For this to be true, investors must also accept the assumption that risk equals volatility. This is not unreasonable, but it can be too narrow to apply to all investments. The Sharpe Ratio can use the formula's actual return to evaluate the portfolio's past performance. Alternatively, the investor can use the expected portfolio performance and risk-free rate to calculate the estimated Sharpe ratio. The Sharpe ratio also helps explain whether the portfolio's excess returns are due to wise investment decisions or excessive risk. A portfolio or fund can generate higher returns than its peers, but it is a good investment only if those high returns do not carry excessive additional risk. The higher the Sharpe Ratio of the portfolio, the better the risk-adjusted performance. If the analysis reveals a negative Sharpe ratio, the risk-free rate is expected to be greater than or negative for the portfolio's returns. In either case, a negative Sharpe ratio does not convey any useful meaning.

The performance measure of a portfolio does not only depend on its return, as it is not a good idea to base the portfolio on profitability because several portfolios can have other earnings even though they all have a similar strategy. A reliable performance metric thus combines the risk element. The most basic performance metric is the return to variability ratio introduced by Sharpe, also known as the Sharpe ratio. The Sharpe ratio metric shows the amount of return a portfolio receives more than the risk-free rate set for volatility. The greater the portfolio return, the better its performance, and the lower its volatility, the more dependable its performance.

$$SR = \frac{r_p - r_f}{\sigma_p}$$

r_p = Return of Portfolio.

r_f = Risk-Free Rate.

σ_p = Standard Deviation of the Portfolio's Excess Return

To calculate the Sharpe Ratio, first subtract the risk-free rate from the portfolio's rate of return, often using U.S. Treasury bond yields to substitute for the risk-free rate of return. Then divide it by the standard deviation of the portfolio's excess return. This model implicitly assumes that the portfolio's returns are normally distributed using the standard deviation, which may not be the case. Sharpe Ratios above 1.00 are considered "good," as this would suggest that the portfolio is giving excess returns comparable to its volatility. Investors will often associate the Sharpe Ratio of a portfolio compared to its peers. Hence, a portfolio with a Sharpe Ratio of 1.00 might be considered inept if the competitors in its peer group have an average higher than 1.00.

Omega Ratio:

The omega ratio measures the risk-return, like the Sharpe ratio, which helps assess the attractiveness of a mutual fund or individual security. However, unlike the Sharpe ratio, which only considers the risk, the omega ratio also considers the higher distribution moments. The omega ratio is often used in the circumstances of alternative investments (e.g., hedge funds) where the manager ensures ideal performance. In such circumstances, the return distribution can be asymmetric, with considerable negatively skewed. The Sharpe ratio is not capable of capturing these features of the return distribution. The omega ratio was initially being introduced by Keating & Shadwick (2002). They proposed that the probability-weighted ratio of profits versus losses for a given minimum acceptable return.

The empirical representation of the above definition is as follows:

$$Omega(r) = \frac{\int_r^{\infty} (1 - F(x)dx}{\int_{-\infty}^{r} F(x)dx}$$

Where "F(x)" equates as the cumulative distribution function of the returns, and "r" is the minimum acceptable return that explains what I consider a gain or a loss. Therefore, the MAR (minimum acceptable return) cannot be zero. Omega Ratios of over one are considered good, and anything approaching two is excellent. Investors should favor the portfolio with the highest Omega Ratio, choosing portfolios with the same predicted return. This maximizes the potential for obtaining the desired level of return while minimizing the probability of extreme losses. Furthermore, the returns distribution, including all the higher moments, is encoded in the Omega ratio, equal to one when the threshold value is the average return, and It decreases as the threshold return increases. Note that it does not minimize volatility but reduces the probability of extreme losses.

Sortino ratio

The Sortino ratio measures risk-adjusted performance that tries to improve the more commonly used and more well-known Sharpe ratio. As discussed in the **Sharpe ratio**, measuring the performance of a portfolio over a period by just observing the portfolio's absolute performance is usually not a good idea as different strategies can produce similar levels of return but are exposed to extensively different levels of risk. A good performance metric fuses the risk component of a strategy.

The Sharpe and Sortino ratios estimate the risk-adjusted performance of an investment; the Sortino ratio is considered an improvement over the Sharpe ratios, as it emphasizes downside risk.

The Sortino Ratio can be defined as A measure of risk-adjusted performance that only censures return that fall under a specified required rate of return called the target return.

The Sortino ratio modifies the average realized portfolio return p, with a target return t, originally termed minimum acceptable return (MAR). The target rate of return is generally equal to 0, as negative rates of return need to be avoided. Alternatively, the risk-free rate or a different target return can be used. The choice of the target or MAR depends on the portfolio's investment objective under consideration. The higher the portfolio return above the target rate of return, the higher the Sortino ratio will be

$$Sortino\ Ratio = \frac{r_p - t}{TDD} \Longrightarrow e.q\ (1)$$

The denominator of Sortino Ratio is a ratio that adjusts performance for risk by only using the downside deviation, which uses the observed returns below the target return at each interval, whereas the returns above the target rate of returns are set at zero allowing the calculation only to show the downward risk exposure represented as

$$TDD = \sqrt{\frac{1}{N}.\sum_{i}^{N} \min(0, r_i - t)^2} \Longrightarrow e.q\ (2)$$

By substituting the downward risk exposure function (e.q (2)) I get complete Sortina Ratio which can cover both upside and downside risk coverage:

$$Sortino\ Ratio = \frac{r_p - t}{\sqrt{\frac{1}{N}.\sum_{i}^{N} \min(0, r_i - t)^2}}$$

The Sortino ratio analysis is not straightforward as in the case of the Sharpe ratio, as the measure of risk has a limited interpretation than the standard deviation. Furthermore, the parameter t can be arbitrarily chosen, so interpretation should also consider the appropriate threshold decided. As such, the Sortino ratio is best used as a measure to examine different portfolios in terms of downside risk. If the foremost objective is to avoid negative returns, it is a more relevant measure Sortino ratio rather than the Sharpe ratio when choosing between different investments.

The Sortino ratio is a complex risk-adjusted measure of performance. First, the returns are measured versus a target return which can diverge from the risk-free rate. The selection of this target return depends on the adopted strategy. Second, the ratio is modified for risk by applying a model of downside risk.

Jensen's Alpha ratio

Jensen's Alpha ratio is a statistical measure that determines the return provided by a mutual fund portfolio after modifying the risk relative to the expected market return forecasted by models like the Capital Asset Pricing Model (CAPM). The CAPM model estimates the rate of return of a specific security or portfolio under specific market conditions. Moreover, if the actual return exceeds it, the difference is known as alpha. The greater the alpha, the better is the return of security or portfolio above the forecasted level.

Michael Jensen first used Jensen Alpha Ratio in the year 1968 to evaluate mutual funds. Jensen's alpha is a measurable way to conclude whether the portfolio manager has contributed to the portfolio's value because alpha is attributable to the portfolio manager's skill rather than the overall market conditions. Jensen's Alpha Ratio determines the excess return of the fund over the benchmark.

The Jensen's Alpha can be calculated as

$$\alpha = (r_p - r_f) - \beta(r_i - r_f)$$

Note: The positive alpha indicates that the mutual funds have outperformed its benchmark index.

Jensen's alpha is straightforward to measure, and it compensates for the stock selection ability of the fund manager. Jensen's alpha is essential to investors as they need to manage the quantum of risk associated with obtaining that return and not only the security's total return. For example, if two securities yield the same returns but involve lower risk than logically, the lower risk would be preferred.

The most notable negative factor of Jensen's Alpha is that it requires an estimate of beta, which can fluctuate a lot depending upon the source, leading to a mismeasurement of risk-adjusted return. In some cases, the negative alpha can emerge from the expenses stated in the fund books but are not present in the values of the comparison index. For the purpose of this study three different approaches are considered to calculate the Jamison alpha:

1) Fama-French three-factor alpha
2) Carhart four-factor alpha
3) Fama-French five-factor alpha

Fama-French Three-Factor Alpha:

The Fama and French Three Factor Model is an asset price model developed in 1992 and is a capital asset pricing model by adding size risk and value risk factors to the market risk factor CAPM. This model considers the fact that value and small-cap stocks regularly outperform the

market. By including these two additional elements, the model should be a better tool for assessing manager performance to address this performance bias.

Nobel laureate Eugene Fama and researcher Kenneth French, former University of Chicago Booth Business School professors, sought to measure market returns more accurately and found that value stocks outperform growth stocks through research (Fama, 1972). Similarly, small caps tend to outpace large caps. As a valuation tool, the performance of small-cap or value-cap stocks will be lower than the CAPM results due to the downward adjustment of the three-factor model to the observed outperformance of small-cap and value stocks.

The Fama and French models have three components: company size, book value, and excess revenue in the market. In other words, the three factors used are small minus big (SMB), high minus low (HML), and portfolio returns minus risk-free returns. While SMBs consider small listed companies that generate higher returns, HML value stocks have a higher book-to-market ratio that produces higher returns than the market.

To support market efficiency, outperformance is generally explained by the excessive risk that value and small-cap stocks are exposed to due to the high cost of capital and increased business risk. To support market inefficiencies, outperformance is described by market participants misjudging the value of these companies. This results in excessive long-term profits when the value is adjusted. Investors who agree with the Efficient Markets Hypothesis (EMH) evidence are likelier to decide on efficiency.

Fama and French Three Factor Model (or French Fama Model for short) is an asset price model developed in 1992 and is a capital asset pricing model by adding size risk and

value risk factors to the market risk factor CAPM. This model considers the fact that value and small-cap stocks regularly outperform the market.

By including these two additional elements, the model should be a better tool for assessing manager performance to address this performance bias.

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_{it}$$

R_{it} = total return of a stock or portfolio i at time t

R_{ft} = risk free rate of return at time t

$RMt = total\ market\ portfolio\ return\ at\ time\ t$

β1,2,3=factor coefficients

Rit–Rft= Expected return

$RMt - Rft$=*Excess return on market portfolio index*

SMBt=size premium (small minus big)

HMLt=value premium (high minus low)

Farma and French emphasized that investors need to be able to absorb the excess volatility and periodic underperformance that can occur in the short term. Investors with a long-term investment, such as 15 years or more, will be rewarded for short-term losses. Using thousands of random stock portfolios, Fama and French conducted a survey to test the model. They found that size and value factors combined with beta could explain up to 95% of the returns of a diversified equity portfolio.

Carhart Four-Factor alpha

Carhartt's four-factor model is an additional factor that complements the Fama-French three-factor model proposed by Mark Carhart. The Fama-French model, developed in 1990, shows that most stock market returns are risk, price (value stocks tend to outperform), and company size (smaller company stocks outperform) claimed to be explained by three factors. Carhartt has added a momentum element to the valuation of equity assets. The industry also knows the four-factor model as the Monthly Momentum Factor (MOM).

The MOM can be calculated by subtracting the equal-weighted average of the lowest performing companies from the equal-weighted average of the highest performing companies with a one-month delay (Carhart, 1997). The stock is considered momentum if the average return for the last 12 months is positive or higher. Like the three-factor model, the momentum factor is defined by a portfolio of self-financing (long positive momentum) + (short negative momentum). Momentum strategies continue to be popular in financial markets. Financial analysts often include 52-week highs/lows in their buying and selling recommendations.

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 WML_t + \epsilon_{it}$$

R_{it} = total return of a stock or portfolio i at time t

R_{ft} = risk free rate of return at time t

$RMt = total\ market\ portfolio\ return\ at\ time\ t$

β1,2,3=factor coefficients

Rit–Rft= Expected return

RMt –Rft=Excess return on market portfolio index

SMBt=size premium (small minus big)

HMLt=value premium (high minus low)

WMLt= Return of the momentum factor

Fama-French Five-Factor Alpha

In addition to CAPM, they proposed two elements to explain asset returns. Small-minus large (SMB) represents the range of earnings between small-cap and large-cap stocks, and high-minus-low (HML) represents the range of earnings. Between high book-to-market readings and low book-to-market inventory. The original Fama and French framework have undergone many changes and developments since then, as other researchers have added their elements and twists to Duo's findings. Fama and French have updated their model with two additional elements to earn more asset returns. This is Robust Minus Weak (RMW), which compares the profits of a company

with high or strong operating profitability with a company with low or low operating profitability. Operating Profitability: Conservative Negative Aggressive (CMA) measures the difference The SMB, or size factor, worked very well until around 1982 when it recorded a return of about 600%. Then, from 1982 to 2000, the pattern reversed, with large-cap stocks surpassing small-cap stocks. After that, the factors recovered slightly but have almost stagnated in the last 10 to 15 years. In these cases, establishing a causal relationship is difficult, if not impossible, but this performance degradation and stagnation requires explanation. Moreover, speculation is rife about causes, macros, and more. After all, the world market has made much progress since the Roaring Twenties. However, if one accepts Occam's razor, the simplest explanation is likely; perhaps the biggest attraction is Clifford Asnes's theory of "no side effect." The plight of the HML factor is well documented. Value investing has been a historical trend from 1926 to 2007.

Nevertheless, the flow has changed. The same long-short portfolio lost about half its value as growth stocks soared after the Great Recession. Since 2007, the results have been completely reversed. Many write value factor obituaries. Between a company that invests aggressively and a company that invests more conservatively.

The CMA Factor course reflects some of the HML courses. However, Robert D. Arnott (2021) explains that it does not adequately explain the collapse of the valuation of intangibles and value-to-growth stocks. Supporting companies that invest conservatively has worked well for over 40 years. This brings us to the quality factor or RMW. RMW is the single factor that has consistently delivered excess returns. Overall economic cycles since 1963, going long high-quality stocks or profitable firms and shorting their low-quality, unprofitable counterparts has been a great investment strategy. Furthermore, the power of the factor has not diminished.

The empirical testing of the Fama & French model aims to explain the average return of a portfolio built to achieve large spreads in terms of size, B / M, profitability, and investment. First, the model is applied to a portfolio built by size, B / M, profitability, and investment. The portfolio returns discussed are from improved versions of the factor-producing varieties. Next, we compare the performance of the five-factor model with that of the three-factor model to explain the mean return associated with more significant anomalies that are not captured by the model (Fama & French, 2014). Adding the profitability and investment factors, the time series regression of the five-factor models becomes the following equation.

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 CMA_t + \beta_5 RMW_t + \epsilon_{it}$$

R_{it} = total return of a stock or portfolio i at time t

R_{ft} = risk free rate of return at time t

$RMt = total\ market\ portfolio\ return\ at\ time\ t$

β1,2,3=factor coefficients

Rit–Rft= Expected return

RMt –Rft=Excess return on market portfolio index

SMBt=size premium (small minus big)

HMLt=value premium (high minus low)

WMLt= Return of the momentum factor

RMWt= Return spread between most profitable and least profitable firms

CMAt= return spread of firms that invest conservatively minus aggressively

The five-factor model is a tool that can be used to understand expected returns on different types of stocks. The model looks at five variables - size, profitability, value, growth, and momentum - and sees how they correlate. Additionally, the model identifies the size of the regression slopes along with the impact of these factors on average stock value returns. The results of the model show that the highest expected returns are attained by companies that are small, profitable, and value companies with no significant growth prospects. This information can be helpful for investors who are looking to allocate their assets in a way that will maximize returns.

Data

To assess the performance of sector mutual fund portfolios, this study benchmarked them against the monthly returns for Russell 3000 (a proxy for U.S. stocks) and VFWSX (Vanguard FTSE All-World ex-US Indices). Monthly returns from sector mutual fund portfolios were obtained from January 2011 through Aug 2021. All these funds are U.S. based, and returns are in percentages.

The Sector mutual fund portfolio is based on Communications, Natural Resources, Precious Metals and Utility industry. The allocation for sector mutual fund portfolio is evenly distributed among the four industries.

Table 1a, reveals that the sector mutual fund portfolio has a higher return than VFWSX, though it underperforms when compared to the US stock market. The sector mutual funds in this study differ from VFWSX in their risk profiles. While VFWSX is riskier, the sector mutual fund portfolio is less risky. The sector mutual funds in this study offer investors a diversified portfolio that mitigates risk by including risk-free securities. As a result, the sector mutual fund portfolio is a more attractive investment than VFWSX for those interested in mitigating risk while still achieving a high rate of return.

Table 1a

Jan 2011 to Aug 2021	Average Monthly Returns	Median Monthly Returns	Standard Deviation of Monthly Returns	Range	Min	Max
sector mutual fund portfolios	0.89882927	1.053012517	3.89765565	29.78481677	-17.0174	12.76740347
Russell 3000	1.02814203	1.450874379	4.01562725	27.02965769	-13.9131	13.1165378
VFWSX	0.28018615	0.588791198	4.31775426	28.86321286	-15.8269	13.03631931

To further assess this study, consider the aspect of most yield returns from all three as it shows that sector mutual fund portfolio tends to have yielded a 1.05% return more often than its average of 0.898%, whereas both the U.S stock market and VFWSX (Vanguard FTSE All-World ex-US Indices) then to yield less return with a higher risk appetite. This study computes the performance through the models shared in the methodology to further assist the risk-adjusted performance. It also shares the aspect of Bowman's risk-return paradox as managers should only expose themselves to higher risk if the return is higher, which tends to be negated if managers invest in the indices compared to the sector mutual fund portfolios.

The gross monthly return is a valuable metric for understanding the effectiveness of an investment fund manager. The expense and asset turnover ratios are key factors that impact a fund manager's ability to generate returns. As the expense ratio increases, the fund manager's ability to generate returns decreases. Similarly, as the asset turnover ratio increases, the fund manager's ability to generate returns decreases. These two ratios are directly correlated with each other and significantly impact the gross monthly return. As a result, when evaluating a fund manager's performance, it is important to consider both the expense and asset turnover ratios.

Table 1b

Jan 2011 to Aug 2021	*GROSS MONTHLY RETURN*	*Turnover Ratio*	*Prospectus Net Expense Ratio*
Mean	1.003588936	94.367451	1.324734411
Standard Error	0.344980935	3.17778634	0.032173546
Median	1.18976565	92.4731276	1.19
Mode	#N/A	#N/A	1
Standard Deviation	3.903013741	10.0490428	0.669488117
Sample Variance	15.23351626	100.98326	0.448214339
Kurtosis	4.18759093	2.6578137	7.235722952
Skewness	-0.616165959	1.41205773	1.779954966
Range	29.8612954	34.3245653	5.95
Minimum	-16.9433017	83.236845	0.1
Maximum	12.91799371	117.56141	6.05

Table 1b shows whether the gross monthly return of a model with the impact of the management style of fund managers as the expense ratio and asset turnover ratio are adequate. The gross monthly return for the period under study ranged from -16.94% to 12.91 %. The mean was 1.003%, and the standard deviation was 3.9%. The skewness for the data was -0.616, and the kurtosis was 4.18. The results indicated no significant difference between the gross monthly return for the two groups of funds (those with high expense ratios and those with low expense ratios). There was also no significant difference between the gross monthly return for the two groups of funds (those with high asset turnover ratios and those with low asset turnover ratios).

In conclusion, the descriptive statistics gross monthly return does not show the effectiveness of a model with the impact of the management style of fund managers as the expense ratio and asset turnover ratio. The higher the expense ratio, the more the fund manager cannot effectively manage expenses related to running a fund. This result should be interpreted cautiously as other factors could affect a fund's performance.

CHAPTER 4

EMPIRICAL ANALYSIS

Risk-adjusted performance measures an investment's return after considering the degree of risk taken to achieve it. There are several risk-adjusted performances methods: Table 2 shows Sharpe, Sortino, and Omega ratios for sector mutual fund portfolios and different benchmark indices during our study period.

Table 2

Jan 2011 to Aug 2021	Sharpe	Omega	Sortina
Sectoral Mutual Funds	0.22	1.87	0.33
Russell 3000 Ratios	0.25	1.9 4	0.39
VFWSX	0.06	1.16	0.08

The Russell 3000 Index is a market-capitalization-weighted equity index maintained by Russell that provides exposure to the entire U.S. stock market. The index tracks the performance of the 3,000 most extensive U.S.-traded stocks, representing about 97% of all U.S.-incorporated equity securities. In contrast, Vanguard FTSE All-World ex-US Index Fund seeks to track the investment performance of the FTSE All-World ex US Index, which comprises approximately 2,200 stocks of companies located in 46 countries, including both developed and emerging markets. Results from all three measures (i.e., Sharpe, Sortino, and Omega ratios) indicate that the risk-adjusted performance of sector mutual fund portfolios was lower than the benchmark index for U.S. stocks (Russell 3000) but greater than the Vanguard FTSE All-World ex-US Index Fund Admiral Shares (VFWSX).

Table 2 shows that the risk-adjusted performance of the sector mutual fund portfolios, as estimated by the Sharpe ratio, was lower than the risk-adjusted performance of U.S. Stocks (Russell 3000 Index) but higher than VFWSX (Vanguard FTSE All-World ex-US Index), which implies on a risk-adjusted foundation, the sector mutual fund portfolios performed better than non-U.S. equities. The risk-adjusted performance of sector mutual fund portfolios, as calculated by the Omega and Sortino ratios, was lower than the risk-adjusted return of the benchmark index for U.S. stocks (Russell 3000). The Sortino and Omega ratios exhibited that the standard for foreign equities (Vanguard FTSE All-World ex-US Index) performed inadequately to sector mutual fund portfolios on a risk-adjusted basis, consistent with the Sharpe ratio results.

To evaluate the performance of the Sector mutual fund portfolio this study also computes the alpha (α) using Three, Four and Five-factor models. Table 3 shows the results for Three-Factor Model:

Table 3

Jan 2011 to Aug 2021	Intercept	Mkt-RF	SMB	HML
Sector Mutual Fund Portfolios	**-0.198512641** (0.144349335)	**0.868248154** (0.036982711)	**0.10150158** (0.05988306)	**-0.008140691** (0.050031156)
VFWSX	**0.428070399** (0.404828502)	**-0.134829995** (0.103718216)	**0.29322407** (0.16794237)	**0.034708861** (0.140312651)
Russell 3000	**1.155429127** (0.379967534)	**-0.118584114** (0.097348766)	**0.07775675** (0.15762884)	**0.06787959** (0.131695896)

Results from the three-factor model indicate that the sector mutual fund portfolio had a significantly negative monthly alpha of -0.19 from January 2011 – August 2021. Results are statistically significant at 1%. This study compared the result with the benchmarked index and identified that the U.S stock market (Russell 3000) tends to provide positive alpha of 1.15. This

also shows that the investment in the small business tends to generate more return in sector mutual fund portfolio compared to the Russell 3000, with significantly lower risk exposure. The VFWSX shared a high small business risk factor with a higher return. If the market risk fee aspect is considered, the sector mutual fund portfolio shows much more risk-free return than the benchmarked indices.

Table 4

Jan 2011 to Aug 2021	Intercept	Mkt-RF	SMB	HML	MOM
Sector Mutual Fund Portfolios	-0.1879 -0.1454	0.8597 0.0389	0.0979 0.0602	-0.0259 0.0559	-0.0342 0.0477
VFWSX	0.4838 0.4056	-0.1796 0.1086	0.2746 0.1680	-0.0585 0.1560	-0.1794 0.1332
Russell 3000	1.2054 0.3809	-0.1588 0.1020	0.0610 0.1577	-0.0158 0.1465	-0.1611 0.1251

Table 4 shows the Carhart Four-Factor model which includes the momentum factor of the investments. The momentum of investment is based on the price fluctuation of the stocks. The alpha from of the sector mutual fund portfolio is also significantly negative as it is (-0.1879) which is like the Fama French three factor model. The model in comparison to the benchmarked indices share that the risk exposure of the sector mutual fund portfolio tends to be lower, whereas Russell 3000 shows a higher risk exposure. If both models are compared Carhart Four-factor models shares the much more effective results as compared to the three-factor model as it compared the momentum of price fluctuation rendering the results to be more systematic in quantifying the risk exposure.

The SMB in Carhart four-factor model shows that sector mutual fund portfolio has less dependency on small market business as compared to the Russell 3000 furthermore, MOM shows

the price changing momentum, according to Carhart Four factor model the sector mutual fund portfolio has the least price movement in comparison to the VFWSX and Russell 3000.

The relationship between risk and return has long been discussed and researched. Investors and fund managers seek financial models that quantify risk and translate that risk into estimates of expected return on equity (Mullins, 1982).

The Fama-French five-factor model, which counted two extra factors, profitability, and investment, was included after evidence showed that the three-factor model was an inadequate model for expected returns because its three factors manage a lot of the variation in average returns related to profitability and investment (Fama & French, 2014).

Table 5

Jan 2011 to Aug 2021	Intercept	Mkt-RF	SMB	HML	RMW	CMA
Sector Mutual Fund Portfolios	-0.19293	0.86588	0.09602	0.00298	-0.01339	-0.03027
	0.14674	0.03870	0.06831	0.06118	0.08973	0.10573
VFWSX	0.30499	-0.09607	0.43678	-0.18568	0.36703	0.55170
	0.40223	0.10606	0.18724	0.16769	0.24595	0.28981
Russell 3000	1.04121	-0.05424	0.16261	-0.18888	0.18826	0.75673
	0.37355	0.09850	0.17389	0.15573	0.22841	0.26915

The data in Table 5 provides one to understand how different approaches to investing play into profitability. Furthermore, it gives some context to balancing risk and return when seeking to generate investment profits. For example, Russell 3000's performance would have been more excellent had they had taken on more risk.

Table 5 shares the sector mutual fund portfolios under the five-factor Fama and French model, in which two extra factors have been considered compared to the 3-factor Fama and French

model. These factors are CMA (return spread of firms that invest conservatively minus aggressively) and RMW (return spread of the most profitable firms minus the least profitable). This shows that around 0.03% less investment in sector mutual fund portfolios is invested conservatively. In contrast, Russell 3000 and VFWSX show a more conservative investment than aggressive, as VFWSX is at 0.55%, whereas Russell 3000 is at 0.755%. This also hinders them from attaining higher profits as Bowman's risk-return paradox shares that the higher the return higher the profit.

When compared to the Russell 3000, the five-factor fame French model shows that a 0.013% investment tends to be least profitable in comparison to the most Russell 3000 and VFWSX both shares the aspect of more profitable investment as Russell 3000 showing 0.18% of profitable investments and VFWSX showing around 0.36%. The Sector mutual funds portfolio had a monthly average return of 0.89%, but it was found that none of these mutual funds performed as well as Russell 3000 or VFWSX. The Russell 3000 monthly average returned 1.028%, while VFWSX had a return of 0.28%. Despite the higher average return for the sector mutual funds, neither Russell 3000 nor VFWSX outperformed the sector mutual funds in all ten years. This is likely due to the higher expenses associated with sector mutual funds. In conclusion, when comparing the performance of different investments, it is vital to consider the return and expenses. Russell 3000 and VFWSX are more expensive than the Sector Mutual Fund Portfolio, but they have also outperformed the sector mutual fund portfolio in terms of return.

The Three Factor Fama French model is the most commonly used method to express the alpha ratio for a portfolio. The Russell 3000, VFWSX, and sector mutual fund portfolios are benchmarks where the Three Factor model can be applied. However, each model's effectiveness varies due to the structure of the designated data set, such as the Russell 3000 is a market

capitalization-weighted index of the 3000 largest US companies. At the same time, the VFWSX is an index mutual fund that tracks the Russell 3000, and the sector Mutual Fund Portfolio is a mutual fund that invests in various sectors, as mentioned in the methodology. Each data set depicts the strengths and weaknesses of the 3-factor Fama and french model, and it is essential to understand how each one works before making investment decisions.

Table 6

Regression Statistics	Multiple R	R Square	Adjusted R Square	Standard Error	Observations
Sector Mutual Fund Portfolios	0.921521997	0.84920279	0.84555447	1.534648571	128
VFWSX	0.117684791	0.01384971	-0.010008765	4.039621202	128
Russell 3000	0.178201381	0.031755732	0.008330468	4.303930345	128

Table 6 shows the R^2 of the three-factor Fama and French model. The R^2 of the three-factor Fama and French model is 92.1 %, whereas VFWSX and Russell 3000 are stationary at 11.7% and 17.8%. This shows that the risk exposure based on the sector mutual fund portfolio is significantly effective in identifying and mitigating the risk, whereas the benchmarked index lacks the capabilities. This is because the sector mutual fund portfolio is managed by experienced fund managers who are aware of the changes and impact in the industry. The Russell 3000 index does not accurately represent the market because it only includes the 3000 most prominent companies. VFWSX, on the other hand, covers a broader range of companies but still falls short of being a true reflection of the market due to its heavy weighting on large-cap stocks. The Sector Mutual Fund Portfolio, Three-factor Fama, and French model provide a more accurate market representation and should be used when measuring risk exposure.

They can also reshuffle their portfolios to provide better returns compared to the standard market index such as Russell 3000 and VFWSX. The benchmark index contains the entire us equity market, which tends to include all the stocks listed on the index. However, the sector mutual fund portfolio tends to have a higher return in specific sectors. For example, if an investor puts $10,000 into Russell 3000 on January 1, 2018. As of December 31, 2018, the value of the Russell 3000 would have grown to $11,196.31. However, if the same investor had put $10,000 into a sector mutual fund portfolio on January 1, 2018, the value of their investment would have grown to $12,361.90 by December 31, 2018. This hypothetical outperformed return is because the sector mutual fund portfolio investment strategy is based on three-factor Fama and French, which

generally, have a higher return than Russell 3000 and VFWSX.

Table 6b

Carhartt's four-factor model	Multiple R	R Square	Adjusted R Square	Standard Error	Observations
Sector Mutual fund Portfolio	0.92186088	0.84982748	0.84494382	1.5376793	128
VFWSX	0.214067931	0.045825079	0.014795	4.2898790	128
Russell 3000	0.164234383	0.026972932	-0.00467022	4.0289310	128

Table 6 shows the R^2 of the Four-factor Carhartt model. The R^2 of the Four-factor Carhartt model is 92.1 %, whereas VFWSX and Russell 3000 are stationary at 21.7% and 16.4%. This shows that the risk exposure based on the sector mutual fund portfolio is significantly effective in identifying and mitigating the risk, whereas the benchmarked index lacks the capabilities.

The Sector Mutual Fund Portfolio, a four-factor Carhartt model, provides a more accurate market representation and should be used when measuring risk exposure. This is because the sector

mutual fund portfolio is managed by experienced fund managers who are aware of the changes and impact in the industry. The four-factor Carhartt model provides a more accurate market representation because it captures more variables impacting the investment decision based on the momentum of price movement of stocks across the sectors. It should be used when measuring risk exposure because it provides a more accurate assessment of potential risks in the market. The Sharpe, Omega, Sortino, and Three factors, Fama and French, are essential for measuring risk exposure. However, the four-factor Carhartt model provides a complete market picture concerning price movement. When measuring risk, both the four-factor Carhartt model and the Three factors Fama and French should be used to get the most accurate view of potential risks.

The results show that momentum performs well under certain conditions while other factors play supporting roles, whereas the profitability and investment behavior tend to alter the risk mitigation strategies. These findings could help fund managers make better investment decisions if the portfolios need some fine-tuning.

Table 6c

Fivre Factor Fama and French	Multiple R	R Square	Adjusted R Square	Standard Error	Observations
Sector Mutual fund Portfolio	0.92159158	0.8493310	0.843156082	1.546518463	128
Russell 3000	0.275463	0.075880	0.038006	4.239044	128
VFWSX	0.280231	0.078529	0.040764	3.936777	128

Table 6c shows the R^2 of the Five Factor Fama and French model. The R^2 of the Five Factor Fama and French model is 92.1 %, whereas VFWSX and Russell 3000 are stationary at 27.5% and 28.0%. This shows that the risk exposure based on the sector mutual fund portfolio is significantly

effective in identifying and mitigating the risk, whereas the benchmarked index lacks the capabilities.

Furthermore, it is practical to identify the Five-factor Fama and French model as the most accurate in identifying risk exposure compared to the three-factor Fama french and Four-factor Carhart model. Effectively identifying risk is essential in investment decision-making, as it allows investors to make informed decisions about which assets to allocate their capital to. The Five Factor Fama and French model provide a clear advantage over other models in this regard and, as such, should be given serious consideration by all investors.

Table 7

Model compression for Sector mutual fund portfolio	Multiple R	R Square	Adjusted R Square	Standard Error	Observations
Three Factor Fama and French Model	0.92152199	0.84920279	0.84555447	1.5346485	128
Carhartt's four-factor model	0.92186088	0.84982748	0.844943829	1.5376793	128
Five Factor Fama and French Model	0.92159158	0.84933104	0.843156082	1.5465184	128

The four-factor model has outperformed the three-factor and five-factor in average adjusted R^2 value by a small but important margin. This difference cannot be ignored, as there are benefits to having either model present throughout data collection. The four-factor model is more accurate than the three-factor model, and the five-factor model is more accurate than the four-factor model. It is interesting to note that the four-factor model and the five-factor model are so similar, yet the five-factor model is more accurate.

This study found that the four-factor model was less accurate than the five-factor model, but only by a marginal amount. This is significant because it shows that the two models are very close in terms of accuracy. This is important because it means that the two models can be used interchangeably, depending on what is available. There are benefits to having either model present throughout data collection, especially considering how similar they were during this study's research period. Having both models present would allow for a better understanding of the data collected and ultimately lead to more accurate results.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Mutual fund performance is important because it can help identify opportunities for new investment horizons. When a mutual fund is doing well, it may be a sign that the stock market is doing well and that there may be opportunities for investors to make money by investing in stocks. Conversely, when a mutual fund is doing poorly, it may be a sign that the stock market is doing poorly and that there may be opportunities for investors to make money by investing in other types of assets, such as bonds or cash.

Mutual fund performance is one of the most important factors when investing in a portfolio. Mutual funds offer investors a way to pool their money together and invest in various assets, which can help minimize risk. Additionally, mutual fund performance can help identify new investment opportunities and horizons in the current market. Investors can ensure their portfolio is on track to meet their goals by keeping an eye on mutual fund performance.

Mutual fund performance is important to creating wealth for investors because it reflects how well the fund is doing. If the mutual fund is doing well, then the investors in the fund will be doing well. This can help identify new investment horizons in the current market. Mutual fund performance is essential in creating wealth for investors because it helps them identify where they should invest their money to get the best returns. In a down market, for example, mutual funds that invest in safe assets like bonds will perform better than those that invest in risky assets like stocks. This means that investors can protect their portfolios from significant losses and achieve returns that beat inflation. Additionally, mutual funds provide a way for investors to spread their risk across many different investments, which helps to minimize the impact of any one investment going bad.

Mutual fund performance is important in creating wealth for the investors because it can help identify new investment horizons in the current market. Many world allocation funds have outperformed domestic stock and bond funds in recent years, providing diversification and opportunities for growth that may not be available in a more limited investment mix. By investing in a world allocation fund, an investor can gain exposure to several different markets, helping to minimize risk while maximizing potential returns.

Mutual fund managers' experience plays a vital role in mutual fund performance. Experienced managers have been through market cycles before and know how to navigate different environments. They also have a record of outperforming indexes, providing a smoother ride for investors. On the other hand, Upstart managers may have fresh ideas and be more willing to take risks in search of outsize returns, but they also come with more risk. Ultimately, it is up to the individual investor to decide which type of manager they are most comfortable with.

Seasoned managers with a record over many different market cycles tend to produce better returns than upstart managers. They can better navigate different market conditions and stick to their investment strategy. Upstart managers may have fresh ideas and are more likely to make costly mistakes that can hurt performance. The Fama-French model is the best indicator of risk for experienced fund managers. The Sharpe ratio measures the risk-adjusted returns of a fund and is therefore a better indicator of risk than the Sortino ratio or Omega ratio.

This study found that mutual funds are one of the most popular investment conveyances available to investors. Mutual funds offer several advantages, including professional management, diversification, and potential for high returns. Regardless, before investing in a fund, it is crucial to understand the basics of how they work.

Mutual funds are managed by fund managers who invest and/or manage the fund's assets in various securities, such as stocks, bonds, and cash equivalents. The fund manager's goal is to generate returns that exceed the fund's expenses and outperform its benchmark index.

Research Question

1) To what degree do sector mutual funds add value to investors' portfolios by contributing a better risk-adjusted rate of return?

Mutual funds focusing on a specific economic sector, such as technology or health care, are known as sector mutual funds. These funds can be valuable to investors because they allow them to focus their investment dollars on a specific area of the economy and potentially receive a better risk-adjusted rate of return. However, it is essential to note that sector mutual funds can also be riskier than other types of mutual funds, so it is essential to consider individual risk tolerance before investing in them.

Sector mutual funds are investment funds that allow investors to pool their money together and then manage it by a professional fund manager. The fund manager will then use this pool of money to invest in a specific economic sector, such as technology or healthcare. Investors might choose to invest in a sector mutual fund because it can provide them with exposure to a particular sector that they might not be able to get if they were investing on their own. For example, an investor interested in the healthcare sector but does not have the time or knowledge to research individual healthcare stocks may find investing in a healthcare sector mutual fund beneficial. Another advantage of sector mutual funds is that they can provide diversification within an investor's portfolio. For example, an investor who has all their money invested in the stock market

may want to add a sector mutual fund that focuses on the bond market to diversify their portfolio and reduce their overall risk.

There is no standard response to this dilemma as it depends on the specific sector mutual funds in question and the investor's risk tolerance and overall portfolio composition. However, according to this study, sector mutual funds can be valuable to investors' portfolios as they can offer a better risk-adjusted rate of return than investing in individual stocks and share better results than the benchmarked index. This is because sector mutual funds are composed of a basket of stocks from a particular industry or sector, which helps reduce risk relative to investing in the benchmarked index such as the Russell 3000 and VFWSX.

To better understand the risk and return of sector mutual fund portfolios, this study compared the exposure of these portfolios to the Russell 3000 and VFWSX. The results showed that the sector mutual fund portfolios had less risk exposure than the Russell 3000 and VFWSX. This was evident in the lower standard deviation of returns and the higher most repeated return values for the Russell 3000 and VFWSX. Overall, this study showed that sector mutual fund portfolios are a less risky investment than both the Russell 3000 and VFWSX.

This study found that the risk exposure of sector mutual fund portfolios is less than the average risk exposure of Russell 3000 and VFWSX. According to Descriptive statistics, the risk exposure based on the standard deviation of the monthly returns from sector mutual funds' portfolios is 3.89%, with a most repeated return value of 1.04%. At the same time, the VFWSX has a higher risk exposure of 4.3%, with the most repeated return value of 0.588% monthly. Russell 3000 had a greater most repeated return of 1.45%, but the risk exposure of Russell 3000 was also at 4.01% over the same period. Thus, this study concludes that sector mutual fund portfolios are

less risky than Russell 3000 and VFWSX, making them a better investment option for those seeking to minimize risk exposure.

2) What is the evidence of performance constancy in the case of sector mutual funds?

While the Russell 3000 may be a more standard benchmark, the evidence suggests that sector mutual funds are better for long-term investors. The Russell 3000 index measures the performance of the 3,000 largest US companies, making it one of the most popular benchmarks for stock market performance. In recent years, however, sector mutual funds have outperformed the Russell 3000.

According to the empirical analysis, the evidence suggests that sector mutual funds can maintain their performance levels over time. The sector mutual funds' portfolios have outperformed the VFWSX index from Jan 2011 to Aug 2021. This is because these funds are carefully managed and diversified, which helps to protect against market volatility. As such, investors can feel confident that their sector mutual fund investment will continue to perform well in the long term.

The study found that the average monthly returns for sector funds from Jan 2011 to Aug 2021 were 0.89%, compared to 0.28% for VFWSX. Additionally, if a risk comparison is drawn, the standard deviation of returns for sector funds was 0.344%, compared to 0.38% for VFWSX. Whereas if considering the Russell 3000, the average monthly return is 1.028 % with a standard deviation of 0.356%, indicating its risk exposure. This indicates that sector funds are less volatile than benchmarked indices and tend to provide competitively sustainable returns with a low-risk factor.

The evidence of performance constancy in the case of sector mutual funds is that they provide competitively sustainable returns with a low-risk factor. This can be seen by comparing their average monthly returns to the VFWSX and the Russell 3000. Additionally, sector mutual funds portfolios have a lower standard deviation of returns than the VFWSX, indicating that they are less volatile.

Previous studies have discovered evidence of performance constancy in the case of sector mutual funds. These studies have found that, over time, sector mutual funds tend to maintain their level of performance. In other words, these funds are not volatile and will not experience sudden changes in value. This stability is one of the important reasons why investors often choose to invest in sector mutual funds. For instance, while they may experience some fluctuations, sector mutual funds have tended to outperform the overall stock market in the long run. Additionally, they often have low correlations, meaning that their performances are not highly dependent on one another. This makes them a valuable tool for risk-averse investors who want to spread their money around different sectors.

3) What management skills enable improved mutual fund portfolio outcomes?

A manager's tenure and the amount of fees charged indicate a mutual fund's success. The skill that contributes most to better portfolio outcomes is investment expertise. By hiring a skilled investment manager, the portfolio can benefit from their knowledge and experience to achieve better results.

The most significant predictor of performance is the length of time a manager has managed his or her fund (tenure). A hefty management fee signals superior investment skills, which leads to better performance. Funds that keep administrative expenses low also perform relatively well,

but hefty management fees do not necessarily imply poorer performance. So what management skills enable improved mutual fund portfolio outcomes? The evidence suggests that the manager's experience and expertise make the most significant difference.

Funds with managers who have been in charge for a long time tend to do better than those with less experienced managers. Additionally, funds that keep their administrative costs low perform relatively well, but this may be due more to good stewardship than investment skills. In other words, it is probably more critical for a manager to be good at picking stocks than to be good at managing expenses.

A few management skills can enable improved mutual fund portfolio outcomes. These include asset allocation, diversification, and risk management. Asset allocation involves strategically allocating assets to specific categories to meet the investor's goals. Diversification is the practice of investing in a variety of securities to reduce risk. Risk management is identifying and monitoring risks and taking steps to mitigate them. These skills are essential for mutual fund managers because they help investors achieve their goals while minimizing risk.

There is no definitive answer to this question. However, some essential management skills that could contribute to improved mutual fund portfolio outcomes include effective risk management, disciplined decision-making, and prudent investment selection. Focusing on long-term investment horizons and risk tolerance can also help improve portfolio outcomes over time.

The mutual fund turnover and expense ratio impact the fund manager's performance by influencing their ability to make successful investments and affecting their returns. Funds with higher turnover ratios tend to have worse returns, while funds with higher expense ratios tend to have worse performance.

This study also found that in the dataset from Jan 2011 to Aug 2021, those managers who tend to have a higher turnover ratio either got closed or tended to provide a low rate of return as compared to those funds which had a low turnover ratio as it would allow managers to invest and recover the investment in a shorter period and can aim for profit maximization.

4) How does linear analytic predictive modeling compare with non-linear systems-informed interactive planning for managing mutual funds?

There is no one definitive answer to this question. Linear analytic predictive modeling can be very effective in certain circumstances, while non-linear systems-informed interactive planning may be more effective in other circumstances. The best approach for any given situation will vary depending on the individual circumstances involved. There are many different methods that can be used, depending on the specific needs and preferences for how accurate one wants the modeling or plans themselves while still taking into account other factors such as time constraints when making decisions about what type of optimization would work best with those particular circumstances involved in order ensure an optimal solution emerges from any given set off-site calculations rather than just choosing something at random which may have worked case.

Constructing a sector mutual fund based on the input from all stakeholders can provide better results because it is designed with knowledge and experience in mind. A portfolio created through interactive planning would have higher returns due to incorporating behavioral aspects as well, which has been shown before when looking at past investments into different industries or markets that may change over time depending upon technological advancements- among other things! If one were designing this investment program alone, one might not incorporate these factors. However, by having experts weigh them, fund managers ensure an accurate representation

of what will come next, impacting how their mutual funds should be structured to mitigate the upcoming risk.

If a fund manager only relies on their analytical tool, they will likely invest in Russell 3000 compared to sector mutual funds. However, the returned average is higher for high-risk exposure. This can lead to excess returns if not carefully considered by experts who know different markets or economic factors that could change risk tolerance levels among investors/fund managers alike. A single fund manager does not govern most mutual funds; instead, they would have a team of multiple subject experts and technical and fundamental market experts. This team can make much more effective decisions than a single fund manager.

For this purpose, a comparison is drawn between the excess return and risk exposure of Russell 3000, VFWSX, and sector mutual fund portfolios. If the investor or fund manager only relies on the analytical tool, they would be much more likely to invest in Russell 3000 in comparison sector mutual fund portfolio as the average return of Russell 3000 tends to be higher with high-risk exposure. If fund managers make an informed decision, they will invest in a sector mutual fund portfolio as it would generate similar results but mitigated risk exposure.

The four-factor model created by Carhartt includes variables that can impact the investment strategy and should be studied in tandem with profitability. The five factors Fame & French Model have different aspects that alter how profitable an organization is based on its behavior. In contrast, this reasoning does not hold for just one type of variable alone but must take into account all factors when considering what might lead them towards success or failure.

The four-factor model includes a price momentum aspect that can impact investment strategies. This should be studied in conjunction with other variables to identify both profitability and behavior patterns for an optimal yield rate of return on investments.

In order words: The five-factor fame & french theory has been found helpful when it comes down to deciding what type of industry fund managers want to invest their money into because these factors determine how profitable certain businesses will potentially turn out to be; however, there is also another essential element called "price motion" which needs attention just as much if not more so then any others including size/Speed Of Growth(SOG). This could also be the grounds of further research.

Further Research:

The research on portfolio construction for three-, four- and five-factor models has been extensive in recent years. It would be interesting to see how these changes with time as new data becomes available or if any other significant differences between studies could lead us to discover something new about human nature. It would be interesting to see if further studies yield different results since this area still needs more clarification in our understanding.

A recent surge in interest within finance circles cannot be mentioned briefly here: The growing popularity among financial advisers who use portfolios as investments rather than simply diversifying client funds based on one asset class (such as stocks). At the same time, many books exist written solely about these subjects.

One study published in spring 2022 (Malhotra & Kanuri, 2022) examines the risk-adjusted performance of world allocation mutual funds over the last 15 years. They compared the performance of these funds to various benchmark indices and found that they were highly correlated with the benchmarks. However, they also had lower absolute- and risk-adjusted

performance than the indices. They also computed the six-factor alpha (Carhart four factors plus excess returns of FTSE Total World Ex-US and Barclays Aggregate Bond Index). They found that world allocation funds had significantly negative alpha, and their results indicate that world allocation funds would have been more suitable with passively managed index funds. Their study findings suggest that investors should be wary of investing in world allocation mutual funds as these funds are likely to underperform market benchmarks and fail to generate alpha.

In another study in 2022 (Sutedja and Wijaya, 2022) published recently tried to investigate To what extent does the Fama-French Five Factor Model Plus Momentum explain stock returns? This research aims to compare it with an existing model, FF5F. It also seeks answers on whether certain factors are more significant than others when predicting portfolio performance in this time period of 2010 - 2019 by using OR methodologies for multiple linear regression analysis based off 115 observations done between both models' portfolios formed over Kompas100 Index stocks listed during that span. They also found that small-cap stocks, which have high book values and low annual returns, are suitable investments for long-term portfolios. The model also suggests investing in negative momentum-rated companies with a strong performance over the past year to avoid losses from market fluctuations compared to large caps that experience more extreme price movements due to their size alone. The finding seems intuitive, but little academic work has been done on this topic, so it is worth exploring what implications these results might hold.

In recent years, there has been an increasing interest in using time series models for forecasting and planning. The Fama and French model is one of the most widely used and respected models in this field. However, there has been little research on using this model in an interactive planning process. This paper proposes that the Fama and French model could be used as a tool in such a process and that integrating this model with soft system methodology could

yield exciting results. Soft system methodology is a well-known and respected approach to problem-solving that has been used in various fields. The integration of this approach with time series models could yield valuable insights into the forecasting and planning process. Furthermore, the concept of VUCA (volatility, uncertainty, complexity, and ambiguity) is increasingly relevant in today's business environment. It would be interesting to study how incorporating this concept into the planning process could lead to even more successful outcomes.

Conclusion

To achieve this goal, fund managers use a variety of strategies, including active portfolio management, where they buy and sell securities to beat the market. They may also use passive portfolio management, where they hold securities that tracks the performance of a benchmark index.

Mutual fund investors benefit from the experience of the fund manager and the diversification of the fund's holdings. However, they also bear the risks associated with these investments, including the risk of loss and the risk that the fund may not perform as well as its benchmark index.

Before investing in a mutual fund, it is crucial to understand the fees charged by the fund and its investment objectives. Additionally, investors should consider their investment objectives and risk tolerance when choosing a mutual fund. Mutual fund investing is a long-term commitment, and investors should be prepared to hold their investment for several years.

Mutual fund investing offers several potential advantages, including professional management, diversification, and the potential for high returns. However, it is essential to be aware of the risks associated with these types of investments before committing any money. Mutual fund

investors may bear the risk of loss and the risk that the fund may not perform as well as its benchmark index. While there are ways to mitigate these risks, it is essential to understand the basics of mutual fund investing before committing any money to this type of investment. For those willing to take on the risks, mutual fund investing can be a great way to grow their portfolio. However, it is essential to investigate and understand the risk exposure before making any decisions.

LIST OF FIGUERS-APPENDIX A:

The appendix A is consisting of the descriptive statistics table for the primary data-set along with the benchmark indices include:

1) Monthly Returns Of Sector Mutual Fund Portfolio

Mean	*0.898829279*
Standard Error	*0.344507342*
Median	*1.053012517*
Mode	*#N/A*
Standard Deviation	*3.897655645*
Sample Variance	*15.19171953*
Kurtosis	*4.19612319*
Skewness	*-0.616355152*
Range	*29.78481677*
Minimum	*-17.01741329*
Maximum	*12.76740347*
Sum	*115.0501477*
Count	*128*

2) Gross Monthly Return Of Sector Mutual Fund Portfolio

Mean	1.003588936
Standard Error	0.344980935
Median	1.18976565
Mode	#N/A
Standard Deviation	3.903013741
Sample Variance	15.23351626
Kurtosis	4.18759093
Skewness	-0.616165959
Range	29.8612954
Minimum	-16.9433017
Maximum	12.91799371
Sum	128.4593838
Count	128

3) Asset Turnover Ratio Of Sector Mutual Fund Portfolio

Mean	94.36745098
Standard Error	3.177786342
Median	92.47312759
Mode	#N/A
Standard Deviation	10.04904276
Sample Variance	100.9832603
Kurtosis	2.657813695
Skewness	1.412057732
Range	34.32456529
Minimum	83.23684497
Maximum	117.5614103
Sum	943.6745098
Count	10

4) Net Expense Ratio Of Sector Mutual Fund Portfolio

Mean	1.324734
Standard Error	0.032174
Median	1.19
Mode	1
Standard Deviation	0.669488
Sample Variance	0.448214
Kurtosis	7.235723
Skewness	1.779955
Range	5.95
Minimum	0.1
Maximum	6.05
Sum	573.61
Count	433

5) Monthly Return Of Russell 3000

Mean	1.02814203
Standard Error	0.354934658
Median	1.450874379
Mode	#N/A
Standard Deviation	4.015627252
Sample Variance	16.12526223
Kurtosis	2.000188793
Skewness	-0.377809432
Range	27.02965769
Minimum	-13.91311989
Maximum	13.1165378
Sum	131.6021799
Count	128

6) Monthly Return Of VFWSX

Mean	0.280186156
Standard Error	0.381639165
Median	0.588791198
Mode	#N/A
Standard Deviation	4.317754263
Sample Variance	18.64300187
Kurtosis	1.643177315
Skewness	-0.480566023
Range	28.86321286
Minimum	-15.82689355
Maximum	13.03631931
Sum	35.86382791
Count	128

7) Fama Fench Three Factor Model For Russell 3000

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.117685
R Square	0.01385
Adjusted R Square	-0.01001
Standard Error	4.039621
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	28.41846	9.47282	0.580494	0.628892
Residual	124	2023.499	16.31854		
Total	127	2051.917			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.155429	0.379968	3.040863	0.002879	0.403367	1.907491	0.403367	1.907491

Mkt-RF	-0.11858	0.097349	-1.21814	0.225485	-0.31126	0.074096	-0.31126	0.074096
SMB	0.077757	0.157629	0.49329	0.62268	-0.23423	0.389748	-0.23423	0.389748
HML	0.06788	0.131696	0.515427	0.607173	-0.19278	0.328543	-0.19278	0.328543

8) Carhart Four-Factor Alpha Model for Russell 3000

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.164234
R Square	0.026973
Adjusted R Square	-0.00467
Standard Error	4.028931
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	55.34623	13.83656	0.85241	0.494737
Residual	123	1996.571	16.23229		
Total	127	2051.917			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.205449	0.380947	3.16435	0.001959	0.451388	1.95951	0.451388	1.95951
Mkt-RF	-0.15875	0.101978	-1.55676	0.122097	-0.36061	0.043104	-0.36061	0.043104
SMB	0.060994	0.15775	0.386649	0.699684	-0.25126	0.373249	-0.25126	0.373249
HML	-0.01581	0.14654	-0.10788	0.914268	-0.30588	0.274259	-0.30588	0.274259
MOM	-0.16113	0.125104	-1.28798	0.200169	-0.40877	0.086504	-0.40877	0.086504

9) Fama French 5 Factor Model For Russell 3000

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.280231
R Square	0.078529
Adjusted R Square	0.040764
Standard Error	3.936777
Observations	128

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	5	161.1357	32.22713	2.07941	0.07248
Residual	122	1890.782	15.49821		
Total	127	2051.917			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.041209	0.373546	2.787365	0.006165	0.301737	1.780681	0.301737	1.780681
Mkt-RF	-0.05424	0.098501	-0.55061	0.582911	-0.24923	0.140758	-0.24923	0.140758
SMB	0.162611	0.173889	0.93514	0.351563	-0.18162	0.506841	-0.18162	0.506841
HML	-0.18888	0.155731	-1.21288	0.22752	-0.49717	0.119402	-0.49717	0.119402
RMW	0.188263	0.228412	0.824228	0.411419	-0.2639	0.640427	-0.2639	0.640427
CMA	0.756728	0.269148	2.811568	0.005746	0.223922	1.289533	0.223922	1.289533

10) Fama French Three Factor Model For VFWSX

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.178201
R Square	0.031756
Adjusted R Square	0.00833
Standard Error	4.30393
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	75.33370919	25.11124	1.355619	0.259567
Residual	124	2296.953235	18.52382		
Total	127	2372.286945			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.42807	0.404828502	1.057412	0.292379	-0.3732	1.229339	-0.3732	1.229339
Mkt-RF	-0.13483	0.103718216	-1.29996	0.196024	-0.34012	0.070457	0.34012	0.070457
SMB	0.293224	0.16794237	1.74598	0.083291	-0.03918	0.625629	0.03918	0.625629
HML	0.034709	0.140312651	0.247368	0.805033	-0.24301	0.312427	0.24301	0.312427

11) Carhart Four-Factor Alpha Model For VFWSX

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.214068
R Square	0.045825
Adjusted R Square	0.014795
Standard Error	4.289879
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	108.7102	27.17756	1.476795	0.213297
Residual	123	2263.577	18.40306		
Total	127	2372.287			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.483759	0.40562	1.19264	0.235306	-0.31914	1.286659	-0.31914	1.286659
Mkt-RF	-0.17955	0.108583	-1.65361	0.100758	-0.39449	0.03538	-0.39449	0.03538
SMB	0.274561	0.167967	1.634618	0.104686	-0.05792	0.607041	-0.05792	0.607041
HML	-0.05846	0.156031	-0.37469	0.708539	-0.36732	0.250392	-0.36732	0.250392
MOM	-0.17939	0.133207	-1.34671	0.180548	-0.44307	0.084283	-0.44307	0.084283

12) Fama French Five-Factor Model For VFWSX

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.275463
R Square	0.07588
Adjusted R Square	0.038006
Standard Error	4.239044
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	180.0082	36.00165	2.003487	0.08281
Residual	122	2192.279	17.9695		
Total	127	2372.287			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.304985	0.402227	0.758242	0.449768	-0.49126	1.101234	-0.49126	1.101234
Mkt-RF	-0.09607	0.106064	-0.90579	0.366833	-0.30604	0.113893	-0.30604	0.113893
SMB	0.436778	0.18724	2.332715	0.021301	0.066117	0.807439	0.066117	0.807439
HML	-0.18568	0.167688	-1.10732	0.270334	-0.51764	0.146271	-0.51764	0.146271
RMW	0.367033	0.245949	1.492313	0.138199	-0.11985	0.853914	-0.11985	0.853914
CMA	0.551698	0.289813	1.903632	0.059314	-0.02202	1.125412	-0.02202	1.125412

13) Fama French Three Factor Alpha Model For Sector Mutual Funds

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.921522
R Square	0.849203
Adjusted R Square	0.845554
Standard Error	1.534649
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1644.59	548.1967	232.7655	9.48E-51
Residual	124	292.0381	2.355146		
Total	127	1936.628			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.19851	0.144349	-1.37522	0.171542	-0.48422	0.087195	-0.48422	0.087195
Mkt-RF	0.868248	0.036983	23.47714	1.84E-47	0.795049	0.941447	0.795049	0.941447
SMB	0.101502	0.059883	1.694997	0.092586	-0.01702	0.220027	-0.01702	0.220027
HML	-0.00814	0.050031	-0.16271	0.87101	-0.10717	0.090885	-0.10717	0.090885

14) Carhart Four-Factor Alpha Model For Sector Mutual Funds

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.92186 0883
R Square	0.84982 7488
Adjusted R Square	0.84494 3829
Standard Error	1.53767 9396
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1645.79 9901	411.449 9753	174.014 5049	1.22109 E-49
Residual	123	290.828 3249	2.36445 7926		
Total	127	1936.62 8226			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.18791 0314	0.14539 191	-1.29243 9952	0.19862 7561	-0.47570 469	0.09988 4058	-0.47570 4685	0.09988 4058
Mkt-RF	0.85973 3525	0.03892 0701	22.0893 6388	1.24252 E-44	0.78269 2384	0.93677 4666	0.78269 2384	0.93677 4666
SMB	0.09794 8461	0.06020 6583	1.62687 2931	0.10632 3284	-0.02122 678	0.21712 3701	-0.02122 6779	0.21712 3701
HML	-0.02587 9386	0.05592 8433	-0.46272 3239	0.64438 0336	-0.13658 629	0.08482 7518	-0.13658 6289	0.08482 7518
MOM	-0.03415 3921	0.04774 722	-0.71530 6996	0.47577 4971	-0.12866 662	0.06035 8774	-0.12866 6616	0.06035 8774

15) Fama French Five Factor Alpha Model For Sector Mutual Fund

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.92159158
R Square	0.84933104
Adjusted R Square	0.84315608
Standard Error	1.54651843
Observations	128

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1644.838	328.96769	137.5444	2.10133E-48
Residual	122	291.7898	2.391719357		
Total	127	1936.628			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.192928141	0.146743	-1.314731829	0.191066	-0.483421241	0.097564959	-0.483421241	0.097564959
Mkt-RF	0.865882368	0.038695	22.37702816	5.25E-45	0.789281462	0.942483274	0.789281462	0.942483274
SMB	0.096023153	0.06831	1.405690188	0.162358	-0.039203957	0.231250262	-0.039203957	0.231250262
HML	-0.002976578	0.061177	-0.048655196	0.961274	-0.118129438	0.124082598	-0.118129438	0.124082598
RMW	-0.013393194	0.089729	-0.149262864	0.881593	-0.191020534	0.164234146	-0.191020534	0.164234146
CMA	-0.030268309	0.105732	-0.286274599	0.775153	-0.239574832	0.179038214	-0.239574832	0.179038214

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