

Limitations and Critique of Modern Portfolio Theory: A Comprehensive Literature Review

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Abstract: This paper employs a systematic literature review approach to select and summarize 12 papers published within the past five years. It critically assesses the limitations of Modern Portfolio Theory (MPT), including its reliance on the assumptions of a strong, efficient market, rational investor behaviour, and excessive dependence on historical data. Furthermore, the paper explores how emerging theories such as Behavioral Portfolio Theory (BPT) and Behavioral Finance offer remedies for the deficiencies in traditional investment theories. Through a comprehensive review of relevant literature, the study delves into the strengths and applications of these theories and investigates whether they can offer more rational and adaptable investment strategies for investors and decision-makers. The authors assert that the emergence of these emerging theories expands the range of choices and possibilities within the field of finance, potentially assisting investors in better navigating market uncertainties and complexities while enhancing the effectiveness of investment decisions. Consequently, this research underscores the significance of considering emerging theories in portfolio construction to adapt to the ever-changing financial landscape.

Keywords: portfolio theory, limitation, behaviour finance

1. Introduction

In the realm of finance, investors often seek investment opportunities that not only yield substantial returns but also minimize potential losses. The trade-off and equilibrium between these returns and risks constitute the crux of investment decision-making, catalyzing the development of Portfolio Theory—an innovative concept within modern finance.

The origin of Portfolio Theory can be traced back to Harry Markowitz's seminal paper in 1952, in which his insights into the amalgamation of probability theory, mathematical models, and security portfolios revolutionized the understanding of investment diversification and laid the foundation for Modern Portfolio Theory (MPT). This theory, introduced as a pioneering concept, posits that diversifying investments across one or more different assets can reduce the overall portfolio risk without sacrificing returns. This revolutionary idea departed from the traditional focus solely on individual asset characteristics, ushering in a paradigm shift in investment strategy [1].

While the significance of Portfolio Theory is undeniable, it cannot be universally applied to all investment scenarios due to evolving financial market dynamics and data. Given its early formulation, financial scholars have found that the assumptions of Portfolio Theory do not always align with the complexities of real-world markets. MPT is built upon the efficient market hypothesis, which assumes

that all investors possess perfect information and make rational decisions, a premise that often falls short of reality. Additionally, MPT assumes that asset returns follow a Gaussian distribution, an assumption challenged by empirical evidence indicating the presence of fat tails and extreme events. By combining recent data and applying various mathematical models, along with feedback from different regions and time periods, researchers have suggested that investors or relevant advisory institutions selectively utilize different investment strategies in response to the current market environment [2]. Scholars have proposed new portfolio approaches, considering psychological factors such as overconfidence and herd behavior, which may impact investor decisions. Additionally, there have been extensions and developments of MPT, such as Behavioral Portfolio Theory (BPT).

This paper aims to summarize the limitations of Portfolio Theory, present existing improvement strategies, and suggest potential avenues for future research. The contributions of this research are twofold. Firstly, it provides researchers in this field with a comprehensive summary of the limitations of Portfolio Theory and novel avenues for improvement, offering valuable guidance for shaping the future trajectory of academic inquiry. Secondly, the finding empowers investors with a nuanced perspective on applying Portfolio Theory in practical decision-making, facilitating more informed choices in constructing investment portfolios.

To achieve this objective, this research employs a literature review approach. The author meticulously selected 12 relevant papers from Google Scholar and SCOPUS databases. This literature review method fosters an understanding and timely synthesis of the current status and development of Portfolio Theory and related concepts, enabling us to identify gaps, challenges, and emerging trends."

The structure of this paper is organized as follows: Section 2 elucidates the methodology and sample selection process employed in this research. Section 3 presents the results of the analysis, accompanied by in-depth discussions. Finally, Section 4 encapsulates the key takeaways, outlines future research directions, and concludes the study.

In the subsequent sections of this paper, I embark on a journey to unearth the limitations of Portfolio Theory, unravel its complexities, and illuminate a path toward its evolution in the face of a dynamically changing financial landscape.

2. Method and Sample

A systematic literature review is a targeted research method that, by clearly defining research questions and establishing a literature search strategy, aims to ensure the inclusion of all relevant literature. The literature search strategy typically encompasses searching, screening, data extraction, and analysis. Subsequently, the author collects, organizes, and analyzes existing relevant literature, summarising similar or differing viewpoints to address specific research questions [3].

In this study, I will conduct a systematic literature review to address research questions related to portfolio theory. The primary objective of this research is to gain an in-depth understanding of the current state of research on the shortcomings of portfolio theory. Through a systematic literature review, the paper will explore and summarize key viewpoints, trends, and research findings related to portfolio theory within the available literature. The research will analyze selected literature from multiple perspectives. Firstly, it will focus on the core concepts and models of portfolio theory as presented in the literature. Secondly, it will investigate limitations, issues, and proposed improvement methods related to this theory found in the literature. Lastly, the author will examine connections and differences between various studies to identify potential research trends.

To ensure comprehensiveness and credibility in the literature review, the researcher utilized specialized search engines such as Scopus and Google Scholar to retrieve literature related to portfolio theory. The retrieved literature included content in their titles, abstracts, or keywords containing terms such as 'portfolio theory,' 'limitations,' 'shortcomings,' and 'improvements.' The author filtered the

literature based on these keywords to ensure relevance to the research questions. The research restricted the publication date range of selected literature to 2019 and 2023 to ensure that the literature review reflected the latest research developments. The selected literature was in the form of articles. The paper focused on analyzing articles with academic value to gain an in-depth understanding of portfolio theory. Then, the paper further ranked the recommended literature based on the number of citations and relevance to the research question, prioritizing the most influential and relevant literature. The author chose the top 20 articles and thoroughly reviewed their titles, abstracts, and keywords to exclude any literature that was irrelevant to the study, ensuring the high quality of the literature review.

Finally, after screening and review, the research obtained 12 articles that met the requirements, which served as key materials for this systematic literature review. Through this research method and sample selection, I will delve into the latest developments in portfolio theory, providing robust answers and deep insights into the research questions.

3. Result Analysis and Discussion

As a cornerstone of modern finance, portfolio theory aims to assist investors in constructing portfolios with the optimal risk-return balance. However, due to the unrealistic assumptions upon which Markowitz founded this theory, such as strong, efficient markets and the perpetual rationality of investors, it remains an imperfect tool in the real world. Despite its widespread application in finance, it is not a perfect solution. In selecting 12 papers from the past five years, the author has observed that scholars have analyzed the theory's shortcomings and combined them with the real-world conditions of different national stock markets. They have constructed the theory on the foundation of practical application and provided insights into its limitations.

One significant drawback of portfolio theory is its disregard for investors' irrational behavior. The original assumption posited that investors make rational decisions, but the emergence of behavioral finance has revealed that multiple factors influence investor behaviours. Research by scholars [4-6] has delved into investor psychology and conducted surveys among different groups. The findings suggest that both personal and environmental factors influence investors. For instance, due to the herd effect, investors may follow the crowd and purchase stocks of companies with good reputations, leading to overbuying or overselling and disrupting the equilibrium posited by traditional theory.

Additionally, Soni, K., & Desai, M. conducted grouped surveys based on different age and gender categories and found that variations in risk tolerance among different age groups can impact investors' decision-making [4]. Consequently, the rise of behavioral finance, which incorporates emotional factors and investors' irrational behavior, has led to the development of behavioral portfolio theory (BPT) as a more comprehensive investment strategy [5-7]. It is suggested for application in real markets. This modification allows for a better explanation of market volatility and investor behavior.

Portfolio theory is predicated on assuming a strong, efficient market, but real markets exhibit imperfections. Various unforeseen events, such as economic fluctuations or changes in government policies, can trigger market uncertainties. For instance, the recent COVID-19 pandemic had varying degrees of impact on the economies of different regions worldwide. Such unforeseen events can affect investors' purchasing power and the stock prices of various industries, deviating from predictions based on historical data and contradicting theoretical assumptions. Therefore, in Noreen et al.'s article, they proposed the Adaptive Market Hypothesis, suggesting that markets may not swiftly adjust to restore equilibrium in certain situations [7]. Investors may remain rational under normal circumstances but become irrational during exceptional periods.

Moreover, differences in government policies among countries can also lead to market imperfections. For example, Zilu Wang, focusing on the Chinese capital market, found that disparities in trading systems and dividend policies between mainland China and Hong Kong resulted in differences in investor demand and actual stock returns, leading to divergent stock prices [2].

Additionally, variations in risk and information asymmetry due to differences in information dissemination further exacerbate market defects, rendering real markets inefficient. To address this, Qiang et al. mentioned Value at Risk (VAR) in their paper, considering the maximum loss for an asset portfolio under given conditions. Compared to traditional MPT theory, VAR considers more market factors that could influence market conditions [8].

Portfolio theory relies on historical data to estimate the risk and return of assets, but recent developments such as economic globalization and unexpected events like the COVID-19 pandemic have increasingly highlighted the limitations of this historical data-based approach. Firstly, it assumes that future market performance will resemble the past, but the heightened uncertainty of the future renders this assumption riskier. Secondly, historical data analysis carries the risk that major global economic or market events that were not reflected in past data may occur in the future. For example, unforeseen events like the COVID-19 pandemic completely disrupted market expectations, which could not have been predicted based on historical data. In a study conducted by Cui and Cheng, six stocks from the Australian market during COVID-19 were selected for a simulated investment to assess whether MPT remained applicable during exceptional times. The research indicated that the conservative investment portfolio calculated by MPT did not yield significant gains or losses during the investment period. However, it is undeniable that investors cannot guarantee timely updates of the required data from professional databases [9]. Furthermore, the risk-free interest rates during COVID-19 cannot accurately represent the current financial conditions. Therefore, proposing new mathematical models to assist portfolio strategy calculations becomes increasingly crucial.

Another reason that necessitates the assistance of effective mathematical models or algorithms is the difficulty in calculating the parameters required by portfolio theory. The theory assumes that asset returns follow a normal distribution, but it may not adhere to this assumption [10]. In an analysis based on the Chinese stock market, the author found that because the parameters of the actual model can only be estimated from historical data, there exists an estimation error between the final data and the real data. Additionally, for long-term stock investors in China, the prevalence of suspended stocks can impact actual investment strategies [11].

Furthermore, as pointed out by Zanjirdar, due to the large number of tradable assets and trading volumes involved in fundamental capital markets, investment risk is composed of multiple factors based on the distinction between systematic and non-systematic risk [12]. Similar to the distribution of investment returns, it is not easily calculated accurately through linear relationships. Moreover, while maximizing portfolio returns may seem straightforward, there may be multiple ways to form the optimal investment portfolio in practice. Various constraints in the real world make using MPT theory for actual investment decision-making more complex. Consequently, Zanjirdar also introduced a variety of mathematical algorithms centred around metaheuristic algorithms, aiming to optimize the shortcomings of traditional algorithms by integrating these innovative approaches and enhancing traditional portfolio theory [12]. In addition to improving traditional portfolio theory, some scholars have combined algorithms with MPT to propose novel investment approaches and attempted their application. For instance, Castro Pérez et al. integrated fuzzy neural networks with portfolio theory, focusing on the Mexican capital market. Using fuzzy neural networks to provide early information regarding asset price fluctuations, they could select assets with the highest expected returns, resulting in better returns than MPT [13].

Furthermore, Rodríguez once again integrated behavioral risk and investment strategies, employing novel risk measures to gauge investors' risk tolerance [14]. They introduced diversified behavioral portfolios and put them into practice. Depending on different time windows, they concluded that these portfolios yielded returns equal to or greater than traditional portfolios.

Portfolio theory holds a significant financial position, but its limitations demand serious consideration. With the development of behavioral finance, the application of real-time data

technology, and the emergence of post-modern investment theories, investors can anticipate further advancements in investment theory to better address the challenges of real-world markets. This will aid investors in managing risks, implementing more robust investment strategies, and achieving better performance in uncertain markets.

4. Conclusion

This study aimed to conduct a systematic literature review based on 12 papers from 2019 to 2023 to delve into the limitations of Modern Portfolio Theory (MPT). The findings suggest that the assumptions of rational investor behavior and market efficiency, upon which MPT is built, do not align well with real-life scenarios. Additionally, the complexity of calculating data due to factors like transaction costs, the number of tradable assets, and the non-linearity of crucial influencing factors poses a challenge. Furthermore, as MPT relies on historical data for its models, it may struggle to respond to the impact of unforeseen events. Addressing these limitations, future developments in portfolio theory should consider the integration of new algorithms and incorporating investor behavior factors, such as those proposed in Behavioral Portfolio Theory (BPT), fuzzy neural networks, or big data analytics.

Furthermore, I acknowledge the study's limitations due to the limited number of papers reviewed. Future research should explore a broader range of elements that can be added to portfolios, such as a company's social value, to assist investors in selecting investments that align with their values. Expanding the scope of investable assets to include emerging currencies like Bitcoin could also explore new investment avenues.

In conclusion, this study has provided profound insights into the limitations of MPT and has outlined potential directions for the future development of portfolio theory. This research holds significant academic and practical value by aiding investors in better understanding and navigating the complexities of the investment landscape, ultimately improving investment decision-making.

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