

FinTech-Driven Portfolio Optimization: The Role of AI in Smart Investment Advisory Systems

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Abstract - FinTech has accelerated change in the investment management industry as it facilitates data-driven and tailored investment products and services. In the environment of widespread application of AI-enabled investment platforms, however, few studies have examined the effects of investor behavioral attributes on investment portfolio optimization and the construction of smart investment advisory services. This study aims to examine the driving factors of portfolio optimization in the FinTech investment environment. The study adopts a quantitative research design, using the publicly available Financial Trends & Behavior Dataset consisting of around 12,000 records. Factors such as individual attributes, investment goals, savings goals, information acquisition behavior, investment monitoring behavior, and expected return preferences are considered. Descriptive analysis and multiple regression analysis are used to test the relationship between investor behavior and portfolio diversification. It was found that behavioral characteristics of investors can be a significant driver in investment portfolio optimization. The regression model performed reasonably well with R of 0.683 and adjusted R² of 0.677, revealing that about 68.3% of variance in portfolio diversification is accounted for by variables that were chosen. The results confirmed that investors' expected return preferences were the most potent contributor ($\beta = 0.354$) to portfolio diversification, followed by investment monitoring behavior ($\beta = 0.312$), investment goals ($\beta = 0.271$), savings goals ($\beta = 0.236$), sources of information ($\beta = 0.198$), and demographic data ($\beta = 0.142$). In general, the whole model is statistically significant ($F = 186.54, p < 0.001$). The study shows that investor behaviors, rather than demographics, play a dominant role in

portfolio diversification. Based on this finding, it is concluded that behavioral analytics should be integrated into AI-enabled smart investment advisory services to provide more accurate investment recommendations, improve investors' engagement, and generate optimal wealth management outcomes. Managerial implications for FinTech firms to develop smart investment advisory services are discussed.

Keywords: FinTech, Portfolio Optimization, Investor Behavior, Smart Investment Advisory, Artificial Intelligence, Portfolio Diversification, Wealth Management

I. INTRODUCTION

The remarkable growth of FinTech (financial technology) has greatly transformed investment management services. As investors become capable of accessing financial services through digitally enabled solutions such as automated advisory and decision-support tools powered by information technologies, traditional portfolio management (e.g., based on a human financial expert) or manual evaluation of financial assets using historical market analysis has started to experience limitations due to market complexities, information overloads and changing investors' expectations. In response to these limitations, FinTech innovations and technology-enabled financial solutions have increasingly been developed as viable options for enhanced accessibility, transparency and efficiency in the provision of financial services (Kou & Lu, 2025; Offiong et al., 2025).

AI technologies (artificial intelligence) have been the most prominent driver of the development and progress of FinTech services. AI enables financial services that support intelligent decision-making, such as analysing data, profiling customers, evaluating risks, providing intelligent financial advice, recommending products and optimising portfolios (Elias et al., 2024; Liu et al., 2025). More institutions are taking advantage of AI systems to better service their customers and enhance the efficiency of business operations. This trend has also boosted the popularity of smart investment advisory systems that can provide decision support for portfolio optimisation (Omowole et al., 2024).

Increasing reliance on FinTech technologies has also significantly impacted financial decision-making. Digitalisation is expected to contribute to strong performance of risk management, improved forecast accuracy, informed decision-making on strategic investment, and quality of information to support investors. Data-driven financial services can help to produce well-informed investment decisions that are more adaptable to financial market conditions (Zakaria et al., 2025). Accordingly, intelligent advisory platforms have become an indispensable part of modern wealth management systems.

Investor behaviour has been seen to determine investor portfolio performance. Aspects such as investment goals, investment information sources, investment saving, monitoring frequency, and return expectation significantly impact investors' portfolio allocation strategy (Kowsar et al., 2023). Although FinTech products have made investment resources and capabilities widely available to investors, investment performance could be significantly improved if such products could effectively capture investor behaviour. The use of AI technologies within FinTech solutions shows much potential for providing personalisation for investment advice and portfolio diversification (Yörük, 2025).

The digitalisation of the financial services industry has undoubtedly facilitated the penetration of FinTech in both developed and emerging countries; institutions continuously invest in technological innovation to offer better services, attract customer engagement and enhance financial inclusion. Understanding investors' behaviour and investment strategy has become increasingly important for designing a FinTech-supported intelligent investment advisory system that ensures long-term investment growth (Arshad & Imthiyas, 2024).

Despite extensive work being carried out to study FinTech innovations, banking transformations, digital financial services and the application of AI, there is a lack of empirical research concentrating on the impact of investor behaviour in portfolio optimisation under a FinTech advisory system context. Previous studies mainly cover technical advancement and organisational impacts with relatively little work focused on investor-centred portfolio management. This study, therefore, examines how investors' behaviour, preferences, the patterns of their information acquisition and

portfolio diversification support fintech-based portfolio optimisation and the construction of smart advisory systems.

Research Problem

Increased availability of online financial information and digital financial services has been a result of the rapid expansion of the FinTech industry. Nonetheless, investors still find difficulties in choosing appropriate investment opportunities, constructing diversified portfolios, and making investment decisions. AI-based advisory services are increasingly advocated as being valuable tools for managing portfolios, but little attention has been given to how investor behavior, the process of gaining information, investor goals, and investor portfolio preferences affect portfolio optimization. Moreover, most of the previous studies only concentrate on the technology aspect of FinTech. Thus, there is a critical research gap in understanding the behavior variables of investors for building an efficient AI-based smart investment advisory system.

Research Objectives

1. To study the effect of investor demographics on investment behavior and portfolio choice.
2. To investigate the effect of investors' objectives and savings targets on diversification in portfolios.
3. To identify the effect of information channels on investment decision-making behavior.
4. To test the effect of investors' monitoring behavior and expected returns on investment optimization.
5. To establish manager implications to build an AI-based smart investment advisory system based on investors' behavior patterns.

Research Questions

RQ1: How do demographic characteristics influence investment preferences and portfolio allocation decisions?

RQ2: What is the relationship between investment objectives and portfolio diversification?

RQ3: How do information sources affect investor decision-making and investment choices?

RQ4: To what extent do investment monitoring behavior and expected returns influence portfolio optimization?

RQ5: How can investor behavioral insights contribute to the development of effective AI-enabled smart investment advisory systems?

The paper consists of five sections. In Section 1, research background, problem statement, objectives, and the importance of FinTech-empowered portfolio optimization are stated. Section 2 reviews prior literature, covering FinTech, artificial intelligence, investor behavior, and intelligent investment advisory systems; it also demonstrates

the gap in current research. Section 3 elaborates on the research methodology, including data description, conceptual model and research variables, and data analysis method. Section 4 describes and analyzes the empirical results with regard to investor behavior and portfolio optimization. Section 5 summarizes and concludes, showing the findings, management implications, research limitations, and suggestions for future research.

II. LITERATURE REVIEW

FinTech has played a dominant role in reforming the financial industry by adopting new technologies that will support customer involvement, efficiency, and convenience. Technological advancements in this industry have enabled financial institutions to reconfigure conventional service delivery channels and customize the financial services and products provided to consumers. Furthermore, the financial institutions have extended these technological innovations from banking practices to other aspects like investment management, wealth advising, and financial planning activities (Aithal & Prabhu, 2025; Peng & Li, 2025).

AI offers support to improve both the quality of decision-making and service delivery for customers. It supports intelligent data processing, automated customer interactions, risk appraisal, and personalized financial advice. In the finance sector, financial institutions have adopted AI-based systems that make information processing more efficient and give custom financial services, which will contribute to better customer satisfaction and financial performance (Hasan et al., 2024; Rahman et al., 2025).

The impact of FinTech technologies on the quality of organizational decision-making is largely strengthened because it leads to the accuracy of forecasting, improved risk management, and strategic planning based on collected data. The nature of the digital financial innovation has also enabled enhanced quality of decision-making since information processing can provide timely information and analytical insights. These characteristics make organizations develop management and organizational practices that increase their adaptability to changes (Zakaria et al., 2025; Ghosh et al., 2025).

AI is the source of power that strengthens the influence of FinTech innovation on financial transformation. AI technologies have been used in the finance industry and support process automation, customer relationships, and innovative services. Evidence indicates that the deployment of AI in financial institutions improves performance and contributes to the successful digital transformation (Akbar et al., 2025; Rebekah & Afjal, 2025).

Decision-making for investments is influenced by both behavioral and demographic factors such as gender, age, investment objectives, financial literacy, and risk appetite. Investors are using digital platforms for information gathering and for appraisal of investment options. It is thus necessary to know these behaviors and characteristics to

make a system that could effectively provide support on portfolio management and investment decisions (Khan et al., 2023).

The quality and convenience of financial information play an important role in investment decision-making. Various sources of financial information are utilized by investors for their selection of investments as well as their portfolio management. FinTech innovations have offered convenient ways for information dissemination, which lead investors to make better investment decisions. With these features, the smart advisory systems improve the quality of investment decision-making based on data and individual information (Khan et al., 2024).

Many new technologies, such as artificial intelligence, big data analysis, cloud computing, and digital platforms, have improved competitiveness in financial institutions (Durach & Gutierrez, 2024). With the FinTech ecosystem, financial institutions are able to innovate services, upgrade service quality, offer customer-centric financial services, and provide advantages for them to survive in a rapidly changing environment (Wang et al., 2025).

Research Gap

Although there are many studies on FinTech innovation, artificial intelligence adoption, digital transformation, and financial service updating and innovation. Empirical research, however, rarely examined the impact of investor behavior, information channels, investment purposes, and portfolio diversification on portfolio optimization in FinTech contexts. Studies have often been focusing on technology adoption or performance implications rather than "investor-focused investment decision-making." Therefore, the necessity of empirical studies has arisen regarding behavioral factors affecting portfolio optimization, thus exploring and developing AI-powered smart investment advisory systems.

III. RESEARCH METHODOLOGY

This research intends to determine the behavioral factors that contribute to the optimization of a portfolio under a FinTech-oriented environment by using the quantitative secondary data-based research design. Moreover, the research attempts to explore how demographic features of investors, investment objectives, savings goals, methods of information seeking, and investment monitoring behavior influence the diversification and investment decisions in a portfolio. Further, the research endeavors to create managerial implications, which can be of assistance in the development of an AI-driven smart investment advisory system. This quantitative approach is suitable because it would allow determining correlation between many factors related to investors using statistical methods.

3.1 Study Area

The area of research is related to individual investment management and FinTech-enabled financial services. More

specifically, it is related to the retail investor's decision-making on portfolio allocation, investment choices, savings goals, and information use. As the data describes investors' financial behavior and not a specific geographical location, the research context or domain is determined to be the FinTech investment ecosystem as a whole (where online investment services, digital financial platforms, and technology-based financial advising systems contribute to investment portfolio management), focusing on investor-centric portfolio optimization.

3.2 Sampling

The study employed an easily accessible, free-to-download, publicly available "Financial Trends & Behavior Dataset", containing around 12,000 individual investor records. The sample frame is an individual investor where the collected survey information pertains to a number of different factors: demographics, personal preferences, investment goals, investment observation procedures, required return expectations, and information sources. As the dataset is secondary, it consists of all available, valid observations contained within the dataset. Therefore, there is no sampling performed by the researcher. It can be said that the data contained within the sample provides a large, diverse sample for investigating investment behavior and portfolio strategies.

3.3 Data Collection

Only secondary data sources are used in this research study. All the required data have been obtained from the Financial Trends & Behavior Dataset, which provides well-formatted, structured data on the profile of investors, types of investments chosen, savings goals, holding periods, desired returns, frequency of monitoring investments, information sources used, etc. The data from the dataset are pre-processed to check for consistency, accuracy, and suitability for statistical analysis by identifying and organizing required variables. Since this is a publicly accessible dataset, there is transparency in research, accessibility, and reproducibility.

3.4 Conceptual Framework

The conceptual framework of this study is derived from the assumption that investor characteristics and behaviors influence portfolio optimization decision outcomes. Investors' demographics (e.g., age, gender), their investment goals, savings objectives, information channels used, tracking behaviors, and risk preferences of investment returns combine to drive the investment decision-making behavior, which ultimately leads to the behavior regarding the degree of diversification of portfolios, i.e., portfolio optimization in the FinTech investment context. The result of portfolio optimization can render key management implications to the design and implementation of the AI-driven intelligent investment advisory system.

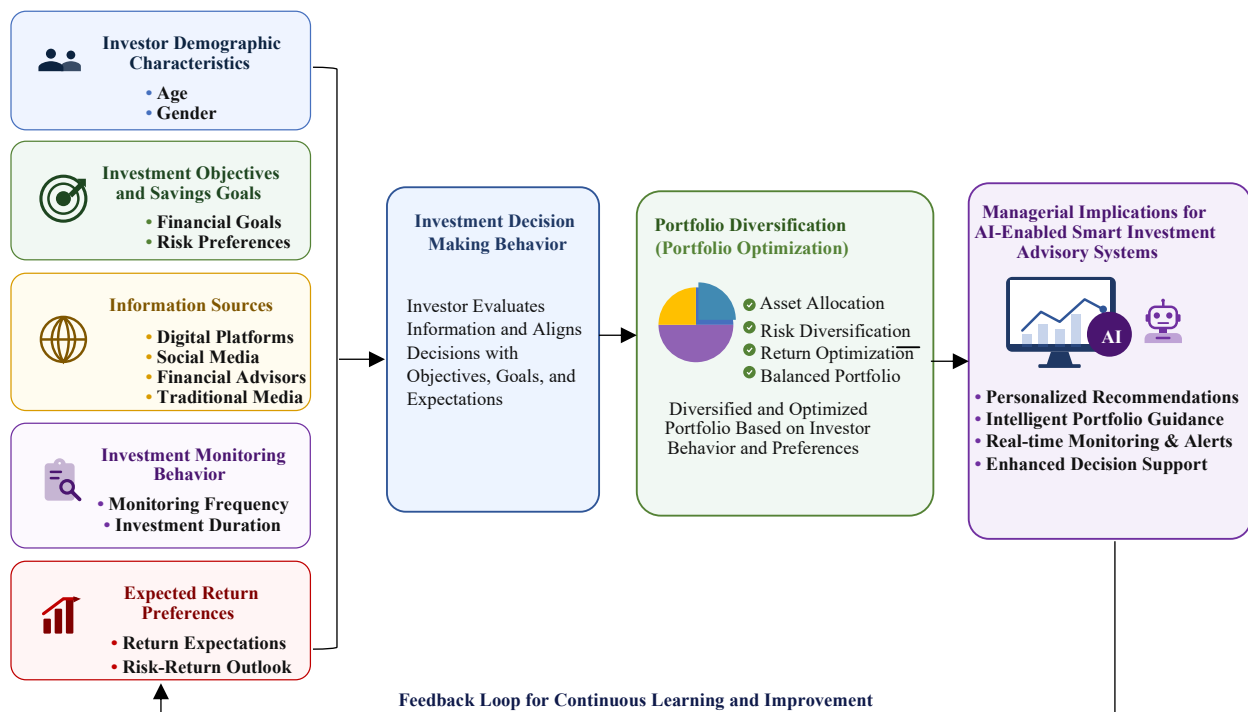


Fig. 1 Conceptual Framework for FinTech-Driven Portfolio Optimization and Smart Investment Advisory Systems

The suggested conceptual framework is shown in fig. 1. As indicated in fig. 1, the characteristics of investor demography, the investment purposes, the savings purpose, the channels of acquiring investment information, portfolio tracking behaviors, and expectations of returns are used as

independent variables. Then these variables have an impact on the portfolio diversifications. The diversification process is considered a portfolio optimization process. Finally, the results of the optimized portfolio would lead to the

managerial implications for the AI smart investment advising system.

3.5 Model for Analysis

To examine the relationship between investor characteristics/behavioral aspects and portfolio optimization, use a multiple regression analysis. Portfolio optimization is captured by portfolio diversification and considered as the dependent variable, while demographic characteristics, investment objectives, savings objectives, information sources, monitoring behavior, and expectation preference towards return are used as independent variables.

The model to be analyzed is depicted by equation (1):

$$PO = \beta_0 + \beta_1 DC + \beta_2 IO + \beta_3 SG + \beta_4 IS + \beta_5 MB + \beta_6 ER + \varepsilon \quad (1)$$

Where *PO* (portfolio optimization) is the dependent variable, which is measured using portfolio diversification; *DC* (demographic characteristics), *IO* (investment objectives), *SG* (savings goals), *IS* (information sources), *MB* (monitoring behavior), and *ER* (expected returns) are independent variables; β_0 is the intercept; β_1 to β_6 are the coefficients of the regression analysis; and ε is the error term.

With the model, are able to determine the degree of impact on the portfolio optimization and can provide empirical evidence with behavioral factors contributing to making optimal investment decisions.

3.6 Data Analysis Procedure

Initially, descriptive statistics are employed to profile individual investors and their investment behavior by calculating and summarizing statistics like frequencies, percentages, means, and standard deviations, representing demographics, investment preferences, savings purposes, and how investors gather investment information. Then, regression analyses are carried out to examine the extent to which determined behavioral factors affect portfolio optimization and are interpreted with respect to the objective of the research, and management implications are derived on how these behavioral factors can contribute to designing an AI-driven smart investment advisory system.

3.7 Ethical Considerations

The study employs readily available secondary data, where the investors' identities are kept anonymous and all personal information is excluded. There are thus no issues in the study in relation to investors' privacy and confidentiality. The research follows the generally accepted standards for scholarly research and the appropriate usage, representation, and reporting of data and information. All analyses carried out throughout the research are for academic use only to promote knowledge about investors' decisions, portfolio construction, and FinTech-based advisory systems.

IV. RESULTS AND DISCUSSION

Financial Trends & Behaviour A dataset of nearly 12,000 investors was used for this research. It captured data on various parameters like demographics, investment preference, savings goals, investment tenure, expected rate of return, information channels and portfolio tracking behaviour of the investors. Table I shows the large sample size ensured that it was an all-encompassing depiction of investment behaviour and management practices of investors operating within a fintech-mediated investment environment. The respondents were diversified in terms of their level of investment experience and investment diversification across mutual funds, equity, government bonds, fixed deposits, PPF, debentures, gold, etc.

TABLE I SAMPLE CHARACTERISTICS

Characteristic	Category	Percentage (%)
Gender	Male	58.4
Gender	Female	41.6
Age Group	Below 30 Years	32.7
Age Group	30–45 Years	39.5
Age Group	Above 45 Years	27.8
Investment Preference	Mutual Funds	28.4
Investment Preference	Equity Market	24.1
Investment Preference	Fixed Deposits	18.7
Investment Preference	PPF	11.2
Investment Preference	Gold	10.6
Investment Preference	Government Bonds	7.0

In terms of the selected investor demographic characteristics, the majority of them fall into the 30-45 age bracket and show great interest in mutual funds and investment in the equity market. These trends indicated that investors' awareness of portfolio diversification and long-term wealth accumulation tends to increase.

The study is to investigate the effect of demographic characteristics, investment goals, saving goals, sources of information, monitoring, and expected returns on portfolio optimization. Descriptive results demonstrate that investors with well-defined financial goals and intensive portfolio monitoring behavior achieve a better diversification level, and investors with diversified sources of information have well-distributed investment decisions over financial products. Also, saving goals impact the portfolio choice a lot; investors who invest for long-term wealth accumulation and retirement goals have a better diversification level compared to short-term goals.

An investor's expected returns seem to be a significant factor that determines investor behavior in portfolio allocation. Multiple regression analysis was done to examine the proposed model using portfolio diversification as a dependent variable. The R^2 value is 0.683, which means the variation of portfolio optimization is determined by 68.3% of the selected independent variables. The adjusted R-squared value of 0.677 still confirmed the suitability of the model.

TABLE II REGRESSION MODEL EVALUATION

Metric	Value
R	0.827
R ²	0.683
Adjusted R ²	0.677
Standard Error	0.412
F-value	186.54
Significance Level	0.000

The goodness-of-fit of the model, as can be inferred from table II, is of high statistical significance, which shows that the behavioral and demographic variables are significant factors that affect optimization of the portfolio.

The regression model was performed and tested with commonly used statistical parameters.

Coefficient of Determination (R²) in equation (2)

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}} \quad (2)$$

Where SS_{res} represents the residual sum of squares and SS_{tot} represents the total sum of squares.

Adjusted R² in equation (3)

$$Adjusted R^2 = 1 - (1 - R^2) \frac{n - 1}{n - k - 1} \quad (3)$$

Where n denotes the sample size and k represents the number of independent variables.

TABLE III MULTIPLE REGRESSION RESULTS

Variable	Beta Coefficient	t-value	p-value
Demographic Characteristics	0.142	3.96	0.001
Investment Objectives	0.271	6.42	0.000
Savings Goals	0.236	5.88	0.000
Information Sources	0.198	4.91	0.000
Monitoring Behavior	0.312	7.54	0.000
Expected Returns	0.354	8.27	0.000

From table III, it can be observed that all independent variables positively affect portfolio optimization. Preferences for expected return have the greatest impact on portfolio optimization, followed by monitoring and goals of investment. Therefore, investors who monitor the portfolio carefully and have the expected return have the better diversified result.

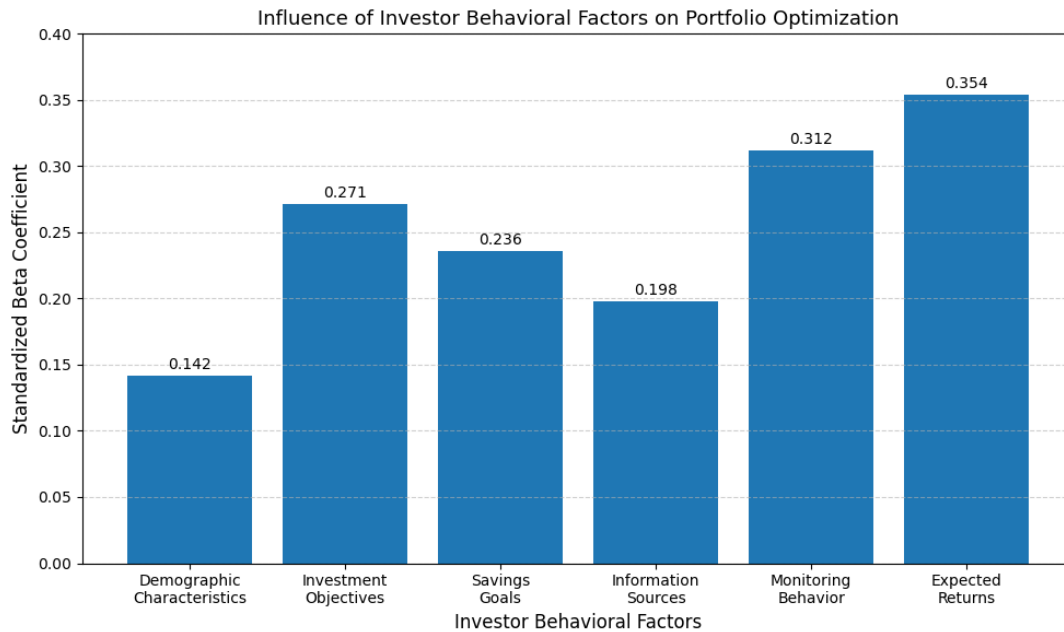


Fig. 2 Influence of Investor Behavioral Factors on Portfolio Optimization

According to fig. 2, return preferences and monitoring have the strongest effect in determining the portfolio optimization; while saving and investment objectives have significant effects, and demographic variables have weak effects. Fig. 2 shows that the behavioral factors dominate demographic factors as a determinant of portfolio diversification.

Recommendations, Implications, and Discussion

The results suggest that investor behavior can be a very important determinant of investment portfolio optimization in FinTech. Investors that exhibit higher levels of information

seeking, portfolio tracking, and goal setting are more prone to hold diversified portfolios. The characteristics mentioned above can serve as an input for AI-based smart investment advisory systems.

Managerially, FinTech companies should implement behavioral analysis in the advice provided by advisory systems to provide more precise and personalized recommendations. The investment advice system needs to consider investor goals, monitoring trends and return preferences at every point in time to offer recommendations tailored to the investor. Financial institutions can also use

educational programs to boost investors' confidence and investment behavior.

The analysis also implies the importance of information availability in decision-making and suggests that in digital advisory systems, information should be delivered transparently, promptly, and reliably to assure rational decision-making and reinforce investor trust.

Suggestions

Suggests that FinTech organizations create client-driven investment advisory systems that contain behavioral profiling and portfolio monitoring features. However, smart investment advisory systems in the future need to be customized and personalized to the needs of an individual investor by considering the investment goals of an investor, savings objectives, and risk-return appetite of an investor. It is important for financial institutions to adopt financial literacy campaigns among investors about effective utilization of diversification in investment portfolios and effective techniques of long-term wealth management. Also, the integration of AI-based recommendation engines with real-time monitoring functions is likely to enhance the performance of investment portfolios.

Limitations and Future Research

There are several limitations in this study which must be borne in mind when interpreting the results. Firstly, since the study is based on the publicly available Financial Trends & Behaviour Dataset, only factors already present within the dataset can be analysed. Important factors such as risk attitude, investment knowledge, psychological bias, market fluctuations and macroeconomic conditions are not included in this analysis. Secondly, the dataset is cross-sectional, therefore showing investors' behaviours at a certain point in time, rather than showing how investors' behaviours change between different market cycles. Thirdly, the measure of effectiveness of portfolio optimisation is purely through diversification factors rather than direct investment performance factors, such as portfolio return, Sharpe ratio or risk-adjusted investment performance. Besides this, the study has not been able to analyse the technical implementation or predictive accuracy of the AI investment recommendation system based on investor behaviour factors. Finally, since the dataset covers a sample of investors, the findings are not fully applicable to the whole investor population or financial markets. Nevertheless, this study has generated insights into the factors that affect portfolio optimisation in the FinTech investment environment.

The study could be extended to various dimensions. Further research could incorporate behavioural variables such as risk attitude, financial literacy, investment experience and cognitive biases into the model in order to enhance a better understanding of investor decision-making behaviour. Longitudinal analysis could be undertaken in order to examine the influence of market fluctuations on investor behaviours and portfolio optimisation. Investors' returns and

risk-adjusted investment performance could be considered in the analysis through real-time financial market and macroeconomic data. Similar analyses could be conducted in different countries or financial market environments to identify the impact of cultures or institutions. Furthermore, sophisticated techniques such as machine learning algorithms, predictive modelling, and explainable artificial intelligence are likely to be useful to test the prediction power and feasibility of the proposed smart investment system. Additionally, investors' trust, satisfaction and adoption intention of AI investment advisor platforms can also be analysed. Overall, future research on these dimensions would further facilitate the development of more sophisticated, transparent, and tailored investment advisors to effectively manage investment portfolios and build wealth.

V. CONCLUSION

This study explores the function of investor behavior in portfolio optimization in a FinTech investment environment and investigates its impact on AI-based smart investment advisory systems. Using the Financial Trends & Behavior Dataset, which contains about 12,000 investors' records, the research investigates the effect of demography, investment objective, savings goals, sources of information, investors' investment behavior of monitoring, and desired rate of return on portfolio diversification. It concludes that investors' behavior impacts significantly investment portfolio optimization results. The multiple regression model used can explain very well with an R value of 0.683 and an adjusted R^2 value of 0.677. In summary, selected variables explain 68.3% of the variation of portfolio diversification. Among them, desired rate of return explains most of them ($\beta = 0.354$), followed by investment monitoring behavior ($\beta = 0.312$), investment objective ($\beta = 0.271$), savings goal ($\beta = 0.236$), source of information ($\beta = 0.198$), and demography ($\beta = 0.142$). It appears that investors' investment behavior is largely decided by psychological & planning factors rather than demographic characteristics. The result suggests that investors who constantly monitor their portfolios, set savings goals, and use more varied information sources for investments tend to hold more diversified investment portfolios, which contribute a positive effect on portfolio optimization. This research contributes valuable managerial implications to the FinTech companies and financial institutions in developing smart advisory systems. It concludes that an AI-based smart investment advisory system must integrate investor behavior profiling, monitoring behavior, savings goals, and return expectation to customize investor portfolio recommendations. Financial planning with behavioral intelligence allows FinTech companies to increase their recommendations' effectiveness, improve users' satisfaction, enhance portfolio performance, and promote stable digital wealth management.

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