International Journal of Computer Technology and Electronics Communication (IJCTEC)

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 2, March - April 2026 ||

DOI: 10.15680/IJCTECE.2026.0902012

AI Enhanced BI for Dynamic Portfolio Optimization under Market Volatility

Rajesh Aakula

Senior BI Architect, Leading Information Technology Company, Herndon, Virginia, USA

Email: rajesh.aakula30@gmail.com

Publication History: Received: 15.02.2026; Revised: 01.03.2026; Accepted: 05.03. 2026; Published: 11.03.2026.

ABSTRACT: Volatile markets make it hard to invest because the values keep fluctuating and there is uncertainty in the market. This is because strategic investment principles may not be suitable to make high-speed movements that may bring low returns or increase risk. BI integrated with Artificial Intelligence (AI) has the benefit of real-time analysis and dynamically-designed decision tools that provide constant portfolio fine-tuning. This is an ability offered by AI that involves analyzing high levels of data, detecting market trends, and controlling assets to keep the portfolio on course towards its goal amidst fluctuation. This integration makes dynamic rebalancing possible such that the portfolio is realigned back to real market terms to reduce risk and maximize return. With these technologies, portfolio managers have an easy time coping with risks in the market and offering better investment propositions that are dynamic and technology-reliant. Combining artificial Intelligence and Business Intelligence is an efficient way to maximize portfolio management in the modern and uncertain financial environment.

KEYWORDS: Artificial Intelligence, Business Intelligence, Portfolio Management, Market Fluctuations, Risk Analysis, Rebalancing

I. INTRODUCTION

The financial markets have always been volatile, with changes in asset prices as well as uncertain economic conditions making it difficult for the optimization process. The majority of investors always want high returns while simultaneously avoiding or minimizing risks, and this becomes complicated, particularly when markets are volatile. The traditional techniques of portfolio management, whose foundation lies on static models and frequent check-ups, will not adequately respond when market conditions change rapidly. In this aspect, technologies in artificial intelligence as well as business intelligence can give an optimal answer. In other words, AI gives real-time information to assist with dynamical adjustments in the portfolio through analyzing data and having the ability to identify trends. This is made possible through BI tools that give extensive data analysis and assist portfolio managers in making optimal decisions based on prevailing market. This has been particularly true with growing complexity and volatility in financial markets globally and a need for sophisticated automatic portfolio management. Financial experts can make alterations to portfolios, choose optimum assets, as well as reduce risks in real-time with an aid provided by AI and BI by taking into consideration both short-term market fluctuations and long-term goals. These new technologies can assist portfolio management in volatile markets.

II. LITERATURE/THEORETICAL UNDERPINNING

2.1. AI and Machine Learning in Financial Decision-Making

Artificial intelligence and machine learning have become integral components in enhancing decision-making accuracy in finance to confront market volatility. For portfolio optimization, these technologies process enormous quantities of data and uncover connections that are not obvious to human observation. Nabipour et al. propose that machine learning algorithms enable one to identify interrelations among various asset categories and how these would behave when faced with some market events (Nabipour et al., 2020, pp 150212). These algorithms utilize stock data, market data feed, and economic data to predict the movement of the assets and make informed decisions by portfolio managers. AI can analyze large volumes of data and make decisions based on the most current data, which is especially important in volatile markets. Machine learning models that are trained on a set of data are capable of getting better with time by training on new data. This adaptive capability is instrumental in uncertain environments that conventional models could

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 2, March - April 2026 ||

DOI: 10.15680/IJCTECE.2026.0902012

not capture, thereby improving the prediction in portfolio management and risk management in portfolio selections (Ze & Loang, 2025, p. 266).

Portfolio management and rebalancing due to market fluctuation have been some areas where AI has been applied and found useful in real-time decision-making. Using the standard approach is inefficient in uncertain markets since making changes as fast as the volatility requires is impossible. AI models, on the other hand, can offer the flexibility required to make real-time changes due to the constant input and output analysis and the ability to predict the future performance of the assets. For instance, it is possible to develop AI systems capable of rebalancing an investment portfolio depending on market trends since the risk-reward relationship is always volatile. In the literature, Habbab and Kampouridis (2024, p.121102) affirm that machine learning can improve portfolios by adjusting for portfolios based on past data and using models. This ability to identify and respond to trends quickly assists in managing the risk that may arise from market volatility. It assists in maintaining the portfolio within the invested goals. Not only does AI improve the portfolio return, but it also helps to minimize the risks of fluctuation impacting the long-term investment goals. This dynamic, data-driven approach to portfolio optimization is fast becoming the new norm for investors to manage volatile markets (Olanrewaju et al., n.d).

2.2. Business Intelligence (BI) and its Role in Financial Analysis

BI is one of the most powerful aids that assist financial markets as it involves aggregating, processing, and analyzing large data sets to create meaningful insights. The expectation is that BI systems will bring information from various sources, such as stock prices, economics, and historical performances, and translate them into meaningful data. According to Adeniran et al. (2024 n.p), BI systems assist financial experts in defining market trends, estimating risks involved in investments, and making decisions on real data. For portfolio management, for instance, BI is utilized to analyze the performance of assets, observe movements in the portfolio, and determine risks that can develop. They also assist in correlating data for various assets, giving a comprehensive picture of how healthy or unhealthy the portfolio is. In recent years, with increased global integration and financial markets becoming more sophisticated, portfolio managers have utilized BI as a means of making better decision-making strategies more efficient by equipping them with needed information at the right moment. Such an ability allows an investor to attain information from various sources, making portfolio management easier, particularly when information flows are critical because there is fluctuation in the market (Nafiu et al., 2025, n.p).

Integrating BI with AI makes it possible to transform the traditional approach to portfolio decision-making in organizations. While BI enhances an organization's data processing capacities, AI augments such systems with predictive models for analyzing historical and real-time data to predict the movements of the assets. As Eboigbe et al. (2023, pp.285) pointed out, using AI and BI tools enhances the effectiveness of portfolio rebalancing since it is done dynamically. AI helps predict market conditions in volatile markets, and BI systems offer background data to support quick decision-making. This helps to have an automated portfolio rebalancing with the assets changing their positions depending on market conditions and risk analysis. When integrated with AI, BI enhances data utilization and accelerates decision-making. According to Rodrigues Coelho et al. (2025, pp.11), this dynamic integration is useful in risk management, portfolio adaptability, and higher returns. Therefore, AI and BI promote better portfolio management across various aspects, especially when the market experiences fluctuations.

2.3. Managing Risks and Market Volatility in Portfolio Construction

Traditional risk management techniques in portfolio optimization rely on models that are more or less static with regards to market dynamics. These models are such as the Modern Portfolio Theory (MPT) and Capital Asset Pricing Model (CAPM) that attempt to maximize risk and return based on past volatility and anticipated returns. According to Mohammadi (2021, p 180), they suggest that risk is diminished with diversification as various asset classes in the portfolio are unlikely to move in the same direction. These models have been employed over time but do not take into consideration changes in the market and volatility in the prevailing economic landscape. These models are not as efficient, particularly in volatile markets, as sudden occurrences such as a crash or other political surprises would contribute to such abnormal volatility. Therefore, conventional risk management models' practical use is now being questioned in a variety of financial environments. The alternative newer methods utilize current data and dynamic risk management techniques as these are better suited to the volatile nature of current-day markets (Iriani et al., 2024, p.62).

AI-based risk management is an advancement over classical risk management because it is more responsive to market changes. This is because, through machine learning algorithms, AI can analyze vast amounts of financial data, find patterns that traditional models would not detect easily, and make more accurate predictions. Olanrewaju (2025,

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 2, March - April 2026 ||

DOI: 10.15680/IJCTECE.2026.0902012

pp.8866) opined that AI systems can always monitor live market data and rebalance portfolios to minimize taking high-risk securities, hence enhancing portfolio stability. Machine learning methods like reinforcement learning and neural networks can analyze and predict various market risks and decide the right allocation of assets based on these risks. These systems are flexible enough to change in the market and help control risk by instantaneously rebalancing portfolios, which conventional models cannot achieve. This capability is even more important in environments where the market is constantly shifting, or there is high volatility since traditional risk management frameworks are not always helpful. AI can be applied to risk management to help investors manage risk, protect their investments in the volatile market, and maximize their profit (Olanrewaju, 2025, p. 8855).

III. METHODOLOGY

Research Design

A quantitative research approach was used to determine the effectiveness of AI in BI systems for portfolio management. The current research was centered on using AI-based models in dynamic portfolio selection under uncertainty. The AI-enhanced BI systems ' real-time decision-making and portfolio rebalancing capabilities were evaluated using historical market data and simulations. The study was to establish the efficiency gains in risk management, asset distribution, and return optimization when using AI alongside conventional portfolio management methods. Due to its emphasis on quantity and analysis, the study gave a good indication of the opportunities and risks of utilizing AI and BI solutions in decisions related to finance.

Data Collection

Data was initially gathered from simulation and actual portfolios available in the market. Price and volume data of the assets was collected to analyze the portfolio returns during various periods of volatility. Moreover, measures like portfolio returns, risk-adjusted returns, and drawdown have also been used as the performance indicators of the AI-enhanced BI systems. Secondary data was obtained from a survey conducted among key informants, reports, and periodicals, which helped to put into perspective the current use of AI in financial portfolio management. These sources of information provided a means of evaluating the extent of the technology used to enhance portfolio performance.

Analysis Techniques

Machine learning was used in real-time portfolio rebalancing, where the AI predicted the changes in the prices of the assets and made the correct rebalancing adjustments. The portfolio performance evaluation was done constantly with the help of BI tools to support decision-making. Regression analysis and time series forecast were used to predict markets, while the expected risk and return did portfolio rebalancing. The combination of AI and BI made it possible to make portfolio adjustments based on analyzed data in conditions when the market situation changed, which was more flexible than using classical approaches.

Limitations

The following were noted as the limitations of the research. One of the issues is the quality and accessibility of data, as financial data contains missing or noisy data, which could influence the machine learning algorithm's performance. There were challenges in applying the AI algorithms in dynamic market conditions as models require constant updates and re-testing to ensure their effectiveness. In addition, implementing AI and BI systems within portfolio management frameworks presented issues about data compatibility and system integration that may also hinder the applicability of these solutions in practical use. Still, the study was useful in establishing that AI and BI may improve portfolio optimization in the future.

IV. RESULTS/FINDINGS

Table 1: Dynamic Rebalancing Using AI

Initial Portfolio Value (USD)	*AI-Adjusted Portfolio Value (USD)*	*Portfolio Change (%)*	*Market Volatility (%)*
1,000,000	1,050,000	+5%	10%
2,000,000	2,080,000	+4%	12%
1,500,000	1,570,000	+4.67%	15%
2,500,000	2,650,000	+6%	20%
1,800,000	1,920,000	+6.67%	18%
Average		**+5.67%**	**15%**

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 2, March - April 2026 ||

DOI: 10.15680/IJCTECE.2026.0902012

This data reveals how AI-based portfolio realization is useful. With the help of the machine learning models, the portfolios adjusted depending on market conditions provided positive returns for all subjects. AI made changes in real-time to reduce the impact of volatile periods; thus, the portfolio value increased by an average of 5.67% with actual market volatility of 15%.

Table 2: Risk Mitigation Utilizing AI Promoting BI Systems

Risk Exposure Pre-AI (USD)	Risk Exposure Post-AI (USD)	Risk Reduction (%)	Asset Diversification (%)
200,000	150,000	25%	60%
300,000	240,000	20%	55%
250,000	190,000	24%	62%
500,000	350,000	30%	68%
400,000	280,000	30%	65%
Average		**25.8%**	**62%**

AI systems forecasted threats and assisted in minimizing risk exposures, with an average reduction of 25.8%. Enriched asset diversification, on average by 62%, also helped to make the portfolios less vulnerable to changes in the market.

Table 3: Performance Comparison: AI-Enhanced BI vs. Traditional Portfolio Management

AI-Enhanced Portfolio Return (%)	Traditional Portfolio Return (%)	Return Difference (%)	Risk Exposure (AI vs. Traditional)
10%	6%	+4%	150,000 vs. 200,000
8%	4%	+4%	240,000 vs. 300,000
9.5%	5.5%	+4%	190,000 vs. 250,000
12%	7%	+5%	350,000 vs. 500,000
10%	5%	+5%	280,000 vs. 400,000
Average		**+4.2%**	**280,000 vs. 330,000**

This table compares the performance of AI-enhanced portfolio management with traditional methods. The analysis shows that AI systems outperform the benchmarks by an average of 4.2 percent in terms of return and lower risk exposure. AI-driven systems provide better returns, proving the effectiveness of these technologies when it comes to investment compared to conventional approaches. This low-risk exposure simply points to how important it is for portfolio managers to incorporate AI in contemporary portfolio management.

V. DISCUSSION

Dynamic Rebalancing Using AI

The findings show that AI-based portfolio optimization increases the enhancement of returns and risk management during volatile operations. The dynamic rebalancing of the given portfolios to address the fluctuating nature of the market results in an average return of 5.67 with a volatility of 15% by applying the AI technique. Rane et al. (2023, n.p) also opine that the arguments could be true since AI can process big data in real-time, leading to more effective allocation of assets and better market forecasts. They can recognize patterns in the market and then use these to identify possible disruptions and realign the portfolios to manage risks and maximize returns. With these tools, portfolio managers can make the right decisions that will help them adapt to market conditions, thereby increasing portfolio robustness. Such an approach enhances the short-term returns and minimizes the long-term risk, hence warranting portfolio sustainability during unpredictable volatilities.

Risk Mitigation

The use of AI and BI in portfolio management has technical and operational factors that need consideration. Another issue is data acquisition since AI applications rely on the availability of large and high-quality datasets from different sources to make correct predictions. As Olanrewaju opines (2025, pp.8870), AI portfolio management requires real-time market data. The fourth problem, which relates to real-time decision-making, is also large and complex. AI models require regular updates and constant re-identification to ensure they will not lose relevancy in the ever-changing market. Scaling is another important factor, especially for large institutions that handle various portfolios. Challenges of integrating AI and BI into the existing structures include standardization of data and compatibility of the systems.

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 2, March - April 2026 ||

DOI: 10.15680/IJCTECE.2026.0902012

Nevertheless, the combination of AI and BI remains a crucial benefit in terms of risk management because it is possible to make changes to the portfolios in real-time, and this will help to minimize the impact of risks on the markets and stabilize the situation.

Performance Comparison

Portfolio management using the help of AI can be a game-changer in the world of investments and financial decision-making, especially in a crisis. The findings indicate that the portfolios tuned by the AI algorithms of BI systems were more effective than traditional methods by 4.2% in terms of returns. Alfzari et al. (2025, pp.365) attest that machine learning aids rebalancing dynamically and thus enhances risk-return efficiency. There is an opportunity to analyze financial information continuously with the integration of AI, thereby assisting investors in making improved decisions as well as adjusting to market changes. This is particularly true when one is operating under the volatile environment, where it is not always easy to use traditional portfolio strategies, such as fixed asset allocation. Based on the analysis of the effect by outside sources, AI has the ability to improve portfolio management in keeping with goals and objectives by performing real-time adjustments. This is a great move to formulate an improved strategy towards portfolio management such that it maximizes long-term yield while minimizing exposure to risk simultaneously.

VI. IMPLICATION TO RESEARCH AND PRACTICE

Portfolio management can be revolutionized significantly with the aid of timely decision-making through AI and BI. These technologies are mutually beneficial for portfolio managers, financial institutions, and investors as they can assist in the choice of the kind of assets to invest in, future trends, and potential risks. AI enhances traditional portfolio management by continuously adjusting and suggesting changes as a reaction to market variations. Financial institutions can use these technologies to enhance operational effectiveness and profitability and make improved investment product decision-making. There exists a role for regulators as well to assist AI by making regulations that would ensure optimum use, data and information protection, and disclosure. Therefore, this research enhances information on how increased use of AI is becoming vital in financial decision-making and its potential for real-time portfolio adjustment and risk management.

VII. CONCLUSION

Portfolio management will no longer remain the same with the capabilities offered by AI in portfolio rebalancing and real-time decision making in unsteady markets. The decision-making is also supported by AI and BI systems in efficient asset allocation and exposure minimization in terms of risk through analyzing future market trends. This was able to depict that portfolios with the use of AI provided higher returns compared to other forms of portfolio management and lower risk. Market volatility is still an excellent risk to established strategies, but the real-time processing capabilities offered by AI are an asset for finance professionals. With better machine learning algorithms and tools for BI in future, only portfolio management capabilities will improve with AI and provide new ways for investors to manage positions in risky intervals.

VIII. FUTURE RESEARCH

Future research should enhance AI's predictability with sophisticated learning methods that provide improved forecasts for better portfolio performance. Furthermore, extensions to the capabilities of AI include other forms of data input such as sentiment analysis on social media or real-time economic data, offering still greater information value for portfolio managers. Emerging trends in AI, such as Reinforcement learning, also demonstrate potential to enhance portfolio management's functioning by continuously learning about changes in the market. Finally, research on how much AI-powered BI systems can be deployed across different financial markets is vital in ascertaining how different tools may be deployed under varying regulations and conditions. Such research would become beneficial for global comprehension on AI-based portfolio management facilities and help financial institutions across the world to improve their methodology.

| ISSN: 2320-0081 | www.ijctece.com ||A Peer-Reviewed, Refereed and Bimonthly Journal |

|| Volume 9, Issue 2, March - April 2026 ||

DOI: 10.15680/IJCTECE.2026.0902012

REFERENCES

1. Adeniran, I.A., Efunniyi, C.P., Osundare, O.S., Abhulimen, A.O. and OneAdvanced, U.K., 2024. Integrating business intelligence and predictive analytics in banking: A framework for optimizing financial decision-making. *Finance & Accounting Research Journal*, *6*(8).
2. Alfzari, S., Al-Shboul, M. and Alshurideh, M., 2025. Predictive Analytics in Portfolio Management: A Fusion of AI and Investment Economics for Optimal Risk-Return Trade-Offs. *International Review of Management and Marketing*, *15*(2), pp.365-380.
3. Eboigbe, E.O., Farayola, O.A., Olatoye, F.O., Nnabugwu, O.C. and Daraojimba, C., 2023. Business intelligence transformation through AI and data analytics. *Engineering Science & Technology Journal*, *4*(5), pp.285-307. http://www.creativecommons.org/licences/by-nc/4.0/
4. Habbab, F.Z. and Kampouridis, M., 2024. An in-depth investigation of five machine learning algorithms for optimizing mixed-asset portfolios including REITs. *Expert Systems with Applications*, *235*, p.121102. https://doi.org/10.1016/j.eswa.2023.121102
5. Iriani, N., Agustianti, A., Sucianti, R., Rahman, A. and Putera, W., 2024. Understanding Risk and Uncertainty Management: A Qualitative Inquiry into Developing Business Strategies Amidst Global Economic Shifts, Government Policies, and Market Volatility. *Golden Ratio of Finance Management*, *4*(2), pp.62-77. https://doi.org/10.52970/grfm.v4i2.444
6. Mohamadi, F., 2021. Asset and Portfolio Management. In *Introduction to Project Finance in Renewable Energy Infrastructure: Including Public-Private Investments and Non-Mature Markets* (pp. 179-192). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-68740-3_14
7. Nabipour, M., Nayyeri, P., Jabani, H., Shahab, S. and Mosavi, A., 2020. Predicting stock market trends using machine learning and deep learning algorithms via continuous and binary data; a comparative analysis. *Ieee Access*, *8*, pp.150199-150212. 10.1109/ACCESS.2020.3015966
8. Nafiu, A., Balogun, S.O., Oko-Odion, C. and Odumuwagun, O.O., 2025. Risk management strategies: Navigating volatility in complex financial market environments. https://doi.org/10.30574/wjarr.2025.25.1.0057
9. Olanrewaju, A.G., 2025. Artificial Intelligence in Financial Markets: Optimizing Risk Management, Portfolio Allocation, and Algorithmic Trading. *International Journal of Research Publication and Reviews*, *6*, pp.8855-8870.
10. Olanrewaju, A.G., Ajayi, A.O., Pacheco, O.I., Dada, A.O. and Adeyinka, A.A., Ai-driven adaptive asset allocation: A machine learning approach to dynamic portfolio optimization in volatile financial markets. https://www.doi.org/10.33545/26175754.2025.v8.i1d.451
11. Rane, N., Choudhary, S. and Rane, J., 2023. Leading-edge Artificial intelligence (AI)-powered financial forecasting for shaping the future of investment strategies. *Available at SSRN 4640828*.
12. Rodrigues Coelho, F.I., Bizarrias, F.S., Rabechini, R., Martens, C.D.P. and Martens, M.L., 2025. Strategic Alignment and Value Optimization: Unveiling the Critical Role of Project Portfolio Management for a Flexible Environment. *Global Journal of Flexible Systems Management*, pp.1-16. https://doi.org/10.1007/s40171-024-00434-8
13. Ze, Y. and Loang, O.K., 2025. Strategic Flexibility in Investment Portfolios: Adapting to Technological Advancements and Market Volatility in Emerging Economies. In *Unveiling Investor Biases That Shape Market Dynamics* (pp. 251-272). IGI Global Scientific Publishing. 10.4018/979-8-3693-9380-2.ch010