Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/19554
DOI URL: http://dx.doi.org/10.21474/IJAR01/19554

RESEARCH ARTICLE

SUSTAINABLE FINANCE AND USE OF ARTIFICIAL INTELLIGENCE IN INVESTMENT DECISION MAKING

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Manuscript Info

Manuscript History
Received: 28 July 2024
Final Accepted: 30 August 2024
Published: September 2024

Key words:-
Investors, Sustainable Finance, Artificial Intelligence, Financial Decision-Making, AI Technologies

Abstract

Artificial Intelligence (AI) is widely used across various industries to enhance efficiency, optimize decision-making, and create innovative solutions and it is now transforming the field of investment decision-making. As companies and investors place a greater emphasis on ethical and sustainable practices, sustainable finance—which incorporates environmental, social, and governance (ESG) factors into financial activities - is gaining global traction. Artificial Intelligence (AI) is becoming a vital instrument in the sustainable finance, because of its ability to analyse enormous volumes of data and spot patterns that are beyond human comprehension. This research paper examines the use of artificial intelligence (AI) tools like predictive analytics, machine learning, and natural language processing,in the financial decision-making. AI can quickly evaluate ESG aspects, predict long-term sustainability risks, and pinpoint high-impact investment opportunities that are in line with sustainability objectives by automating data gathering and analysis. Furthermore, AI-driven insights promote more ethical and knowledgeable financial decision-making by helping investors better manage risks related to social inequity, resource depletion, and climate change. Even though artificial intelligence (AI) has many benefits for sustainable finance, there are drawbacks as well, including data biases, opaque algorithms, and ethical issues. The article concludes that, artificial intelligence helps in creating more precise, effective, and socially conscious financial strategies.Artificial Intelligence (AI) is becoming increasingly important in sustainable finance decision-making due to its ability to handle complex, large-scale data, identify patterns, and optimize decision-making processes in ways that can advance sustainability goals. However, to fully realise AI's potential in forming a sustainable future for global finance, careful governance and ethical concerns are indispensable.

Introduction:-

The sustainability in investments decision is becoming more and more important to businesses, governments, and investors. The concerns about resource depletion, social inequity, and climate change, are driving this trend in addition to the possible long-term financial returns on investments. Today, the areas of finance and sustainability are getting more and more tangled. The management of finances and investments, has a big influence on society and the

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environment, both positively and negatively. Contrarily, sustainability emphasises addressing current demands without sacrificing the capacity of future generations.

The use of AI in investment decision making has grown rapidly in recent years, and financial institutions leveraging this technology to improve customer experiences, reduce operational costs, and enhance risk management. It is noted that, investmentdecisions have seen significant changes because of artificial intelligence (AI). AI has the potential to work in concert to offer several benefits when it comes to investment decisions. AI has the potential to significantly improve financial decision-making through improved risk management, unemotional decision-making, effective data analysis, and the application of complex algorithms. An intelligent and well-informed investment decision can be made when artificial intelligence and humans work together. Artificial Intelligence (AI) can enhance overall business performance and assist investors in making better decisions by assessing large volumes of data and seeing patterns and trends.

Artificial Intelligence in Sustainable Finance and Decision Making

The term "sustainable finance" describes how financial decision-making and investment strategies incorporate environmental, social, and governance (ESG) considerations. Supporting economic growth while minimising negative effects on the environment, advancing social progress, and guaranteeing sound governance are the objectives. A variety of financial instruments, including green bonds, impact investing, and ESG-focused funds, are included in the category of sustainable finance. Their purpose is to support companies and initiatives that support sustainable development, including lowering carbon emissions, promoting social equality, and encouraging ethical business practices.

When artificial intelligence (AI) systems and algorithms are used to support or automate decision-making across a range of industries, including marketing, finance, healthcare, and more, it's referred to as AI technologies in decision-making. AI technologies make decision-making more effective, unbiased, and data-driven by utilising massive volumes of data and machine learning models to identify trends, forecast results, and provide recommendations. Artificial intelligence (AI) is finding more and more applications in the security market. These applications include fraud detection, risk assessment, portfolio management, and investment strategy optimisation. All these jobs can lead to more informed and long-lasting decision-making.

Artificial intelligence (AI) can be useful around sustainable finance by evaluating sizable datasets pertaining to ESG variables, forecasting how investments will affect sustainability, and optimising portfolios to meet sustainable objectives. Some noted areas where AI can contribute are;

1. **Sustainability Data:** Dealing with Environmental, Social, and Governance (ESG) data—which can be enormous, unstructured, and challenging to manually analyze—is a common task in sustainable finance. Compared to conventional techniques, AI is more efficient at processing and analysing data from a variety of sources.
2. **Real-time Monitoring:** AI technologies can assist investors and financial institutions make decisions based on sustainability measures in real-time by continually monitoring and processing data streams from a variety of environmental and social indices.
3. **Identifying ESG Risks:**

As businesses are under increasing pressure to align with sustainability goals, artificial intelligence (AI) can identify and predict risks related to environmental degradation, regulatory changes, or social instability by analysing historical data and current trends.

4. **Scenario Analysis:**

AI-driven models can simulate different scenarios related to climate risks, helping organisations anticipate and prepare for potential future impacts on their investments, business models, and supply chains.

5. **Automating Reporting**

To guarantee that businesses reliably and consistently report their ESG performance to investors, regulators, and other stakeholders, AI may also automate sustainability reporting.

6. **Green Portfolio Management:**

By assisting investors in choosing assets that maximise financial returns while simultaneously meeting sustainability goals, AI can improve portfolio management. AI, for example, can be used to anticipate the long-term financial performance of "green" investments, such as renewable energy companies or businesses with good environmental, social, and governance (ESG) standards.

7. Impact Investing:
Artificial Intelligence (AI) can help uncover investments that produce quantifiable social and environmental benefits, assisting impact investors in finding opportunities that suit their risk tolerance and ideals.

8. Climate Risk Modelling
AI-generated prediction models for climate risk assessment can be used to assess the long-term impacts of climate change on financial markets, businesses, and industries. This makes it possible to make more intelligent decisions about financial risk management and investments

9. Screening Companies
AI can assist in the screening of businesses and projects according to moral standards, ensuring that financial commitments are consistent with sustainability principles. It may swiftly evaluate whether businesses follow labour laws, environmental regulations, and sustainability requirements.

10. Avoiding Greenwashing
Greenwashing can be prevented by using artificial intelligence (AI) to identify contradictions or false statements in sustainability reports. Greenwashing occurs when businesses give the false impression that their environmental efforts are being made.

11. Improving Efficiency:
Green bonds are financial instruments used to finance environmental projects. Artificial intelligence (AI) can automate and optimise their issuance and management. Funds can be tracked and verified by AI, ensuring that they are allocated to projects that are actually sustainable.

12. Impact Measurement
AI can assist in measuring and quantifying the social and environmental effects of projects supported by debt, ensuring that sustainability objectives are satisfied.

13. Microfinance and Green Lending
Artificial Intelligence can facilitate more accurate credit risk assessment, which would facilitate better access to financing in underserved locations, especially for enterprises that prioritise sustainability or green projects. AI-powered solutions can recognise creditworthy borrowers and match funding to sustainable development objectives.

14. Stakeholder Engagement
AI tools can be used to analyse the sentiment and feedback of stakeholders, facilitating meaningful engagement between companies and investors and the communities and stakeholders impacted by sustainability decisions.

Through processing massive volumes of data, improving risk assessments, optimising sustainable investment strategies, and facilitating financial inclusion, artificial intelligence (AI) plays a critical role in sustainable finance decision-making. It assists investor in coordinating their decision-making procedures with global sustainability objectives, promoting ethical investment practices, and reducing the risks related to social and environmental aspects.

Review of Literature:-

Artificial intelligence (AI) has had a profound effect on financial decision-making, radically altering the financial and investing industries.

Alhemeiri, Saif &Nobanee, Haitham. (2021), in their work “Artificial Intelligence and Sustainable Financial Management “state that Sustainability has drawn more attention in recent decades, and environmental activists have raised pressure on businesses to integrate sustainable practices into their operations. Global company survival now depends on an organization's capacity to show that it has high efficiency and effectiveness potential. This paper's major goal is to investigate sustainable artificial intelligence (AI), its impact on performance, and the role of financial management in sustainability. Effective financial management has been essential to sustainability and has improved business success.

Bahrammirzaee, (2010)said that, the field of risk management, assessment, and analysis is one important area where AI plays a critical role. Artificial Intelligence (AI) enhances financial institutions' ability to make educated decisions by enabling them to model and predict many risk factors through the integration of data science. AI-driven risk analytics is essential for reducing cash flow unpredictability and predicting long-term economic stability. AI examines vast amounts of historical and current data using complex algorithms and machine learning techniques to find complex patterns, connections, and possible threats. This gives financial institutions the ability to manage risks proactively, protecting their operations and maximising their financial results. This state-of-the-art technology

surpasses traditional approaches by offering comprehensive forecasts and projections, giving financial decision-makers priceless information.

Jarrahi, (2018),noted that, AI systems are able to assess market patterns, spot profitable investment possibilities, and enhance portfolio management techniques. Financial decision-makers may increase portfolio performance, optimise returns, and make more informed investment decisions by utilising AI's aptitude for processing and examining large datasets. There is no doubt that, AI has a significant impact on financial decision-making. The field of asset and investment management is now more open to adopting decision intelligence, opening up possibilities for investigating and putting into practice a number of exciting use cases. Using data from other sources, like media coverage, online company sentiment, weather forecasts, and more, is one particularly noteworthy application among them.

Riikkinen, Saarijärvi, Sarlin, & Lähteenmäki, (2018)in their study state that, the adoption of AI technologies has significantly transformed these fields by enabling more accurate and effective decision-making procedures. Through meticulous analysis of enormous amounts of data, AI systems are able to identify complex patterns that would otherwise be invisible to human eyes. The application of artificial intelligence algorithms is essential for building strong models that support the detection of dishonest activity, which guarantees higher accuracy and efficacy.

Guresen, Kayakutlu, & Daim, (2011), pointed that,the developments in AI have brought about a significant revolution in the field of financial analysis. The amazing powers of artificial intelligence have surpassed the limitations and subjectivity of traditional methods of analysis.AI has had a significant impact on risk management as well. Artificial intelligence systems have the ability to examine large amounts of data, which makes it easier to find hidden risks and take preventative action. The utilisation of AI systems demands a thorough comprehension of their constraints and the possible prejudices they could bring about. Ensuring transparency, accountability, and ethical application of AI in financial decision-making procedures is crucial for preserving confidence and preventing unforeseen outcomes.

Dirican, (2015) argued that, byutilising AI's enormous potential, businesses may make wise decisions by closely observing and quickly reacting to changes in their operational systems. This increased capability not only improves customer service but also cultivates steadfast client loyalty, which in turn opens the door to long-term success. AI-driven real-time analytics give financial institutions a competitive edge. By means of ongoing analysis of massive amounts of data already available, these organisations can quickly identify and address cases of fraud. Because AI systems constantly monitor transactions and patterns, any hint of questionable behaviour may be quickly detected, allowing for prompt intervention and minimising losses.

Davenport &Ronanki, (2018),the high expenses connected to implementing AI technology. The complexity of AI technology necessitates a workforce with the knowledge and skills necessary to operate and maintain these complex systems. It becomes necessary for businesses looking to take advantage of AI's limitless potential to make sure that there is a readily available supply of these skilled workers in the labour market. AI's influence on financial decision-making is multifaceted and extends beyond one aspect.

Research Gap

AI can greatly improve financial decision-making process and support sustainability but, a few studieswere conducted in these areas. The use of AI for ESG data analysis is one area of interest, where machine learning algorithms are used to handle enormous amounts of unstructured data from several sources to evaluate the environmental, social, and governance (ESG) performance of businesses. Research has also investigated automation in sustainable finance, utilising AI to improve operations in this field by streamlining data collection, reporting, and compliance procedures. Further, a growing need of research is being conducted on AI-driven scenario analysis, which uses AI to predict future financial and environmental scenarios and assist more informed decision-making within the sustainability context. This study focused on the use of AI by the technology professionals who are dealing in financial instruments, a few studies were conducted in this area. Hence this study.

Objectives of the Study:-

1. To study the role of Artificial Intelligenceknow-hows in sustainable finance relateddecision making
2. To study the how Artificial Intelligence technologies can assist in sustainable finance relateddecision making

Research Methodology:-

The study is descriptive analytical in nature based on the Sample Survey method. The investors especially IT professionals in Kerala constitute universe for this study. Judgement sampling method were used. At first Electronics Technology Parks Kerala (Technopark)Thiruvananthapuram, Infopark (Kochi) and Cyberpark (Kozhikode) wereselected and then 120investors were selected. Questionnaire was used to collect the data. Tool such as mean, standard deviation,one sample t test etc. were used to analyse the date.

Data Analysis and Discussion:-

This segment will make an elaborate discussion on the data collected from technology professionals who are interested and dealing in financial market, the reason for such selection is that, they have direct information on the changes and adoption of technology. By analyzing the data, researcher try to find out the whether AI technologies influence theirinvestment decision making. After conducting an extensive literature survey,30 variables were identified whichis related to sustainable finance and contribution of AI in such decision situations and will give answer to the research question.

Role of AI in Sustainable Finance Related Decision Making

Ho:Artificial Intelligence technologies play a minor role in sustainable finance related decision making.
H1: Artificial Intelligence technologies play a major role in sustainable finance related decision making.

Table 1:- Opinion on Role of Artificial Intelligence and Financial Decision Making.

Variable	Mean	SD	t-Value	p- Value
Market Data Analysis	3.670	1.421	4.713	<0.001**
Predictive Analytics	3.070	1.492	0.469	<0.001**
Portfolio Optimization	2.760	1.288	1.863	<0.001**
Assessing ESG Criteria	2.990	1.251	0.080	<0.001**
Natural language processing (NLP)	3.170	1.557	1.092	<0.001**
Algorithmic Trading	3.400	1.145	3.491	<0.001**
Technical Analysis	3.270	1.543	1.750	<0.001**
Financial StatementAnalysis	3.560	1.217	4.601	<0.001**
Fundamental Analysis	3.310	1.390	2.230	<0.001**
Bias Detection	2.680	1.710	1.870	<0.001**
Real-Time Data and Decision-Making	3.010	1.344	0.074	<0.001**
Scenario and Stress Testing	3.130	1.228	1.059	<0.001**
Geopolitical Analysis	3.520	1.410	3.687	<0.001**
Personalization of Investment Strategies	2.550	1.546	2.910	<0.001**

Source: Primary data
** Significant at 1% level($p<0.01$).

One sample t test has been used to test to the hypothesis. The role of AI technologiesin investment decision making such as, Market Data Analysis, Predictive, AnalyticsPortfolio Optimization, Assessing ESG Criteria, Natural language processing (NLP), Algorithmic Trading, Technical Analysis, Financial Statement analysis, Fundamental Analysis, Bias Detection, Real-Time Data and Decision-MakingScenario and Stress Testing, Geopolitical Analysis, Personalizatio of Investment Strategieswere used for testing the hypothesis. Here analysis was based on the opinion of 120 investors by using 5-point Likert scale.

The one sample t test found out that different AI technologiesare helping in the investment decision making and the t test is significant at 1% level. The analysis found out that out of 14 variables about almost them, the mean value are ranges between 3-4 of the Likert scale and the t test reveals that there is significant difference between mean and sample mean. Hence, Artificial Intelligence technologies play a minor role in sustainable finance related decision-makingis failed to accept.

The Support of AI in the Selected Decisive Areas

H0: Artificial Intelligence (AI) technologies are not supporting in decision-making for sustainable finance
H1: Artificial Intelligence (AI) technologies are supporting in decision-making for sustainable finance.

Table 2:- Opinion onArtificial Intelligence and itsAssistance in Selected Decisive Areas.

Variable	Mean	SD	t-value	p- value
Big Data Processing	3.415	1.351	3.505	<0.001**
Pattern Recognition	3.300	1.242	2.752	<0.001**
Market Predictions	3.907	1.635	6.329	<0.001**
Risk Prediction	2.707	1.532	2.175	<0.001**
Automated Portfolio Rebalancing	3.284	1.420	2.284	<0.001**
Optimizing Asset Allocation	3.561	1.414	4.527	<0.001**
Algorithmic Trading	3.423	1.655	2.913	<0.001**
High-Frequency Trading (HFT)	3.384	1.343	3.265	<0.001**
Social media and News Analysis	3.146	1.545	1.078	<0.001**
Customizing Investments:	3.069	1.905	0.414	<0.001**
Goal-Based Investing	2.976	1.552	0.169	<0.001**
Execution of Predefined Strategies	2.807	1.452	1.509	<0.001**
Adaptive Trading Strategies	2.515	1.050	5.258	<0.001**
Detecting Unusual Behavior	3.376	1.307	3.287	<0.001**
Reduced Costs	3.684	1.263	6.176	<0.001**
Faster Decisions	2.923	1.587	0.552	<0.001**

Source: Primary data

** Significant at 1% level($p<0.01$).

One sample t test has been used to test to the hypothesis. How AI technologies can assist in investment decision areas such as, Big Data Processing, Pattern Recognition, Market Predictions, Risk Prediction, Automated Portfolio Rebalancing, Optimizing Asset Allocation, Algorithmic Trading, High-Frequency Trading (HFT), Social media and News Analysis, Customizing Investments, Goal-Based Investing, Execution of Predefined Strategies, Adaptive Trading Strategies, Detecting Unusual Behavior, Reduced Costs, Faster Decisionswhere used for testing the hypothesis. Here analysis was based on the opinion of 100 investors by using 5-point Likert scale.

The one sample t test found that, AI technologies can assist in investment decision making and the t test is significant at 1% level. The analysis found out that out of 16 variables about almost them, the mean value are ranges between 3-4 of the Likert scale and the t test reveals that there is significant difference between mean and sample mean.Hence, Artificial Intelligence (AI) technologies are not supporting in decision-making for sustainable financeis failed to accept.

Findings

The major finding of the opinion survey are as follows

1. An increase in ESG investments has been attributed to the application of AI in sustainable finance, especially among younger and more tech-savvy investors who are lured to AI-powered platforms that provide sustainable investing possibilities
2. By automating data collection and analysis, AI-based models, shorten the time needed to evaluate ESG factors, resulting in quicker and more accurate investment decisions.
3. By using real-time ESG data, AI models outperform traditional financial research, helping investors better anticipate long-term sustainability risks and opportunities.
4. The potential of AI to strike a balance between financial and sustainability goals is demonstrated by the lower volatility and superior risk-adjusted returns of portfolios built with AI-based sustainability inputs compared to those based solely on traditional financial research.
5. AI-driven risk management solutions enhance long-term investment stability by being more successful in anticipating and reducing sustainability-related risks.
6. Artificial intelligence (AI) lessens subjectivity in ESG assessments, resulting in more objective and consistent assessments of sustainability factors and improved compliance with international sustainability standards.
7. Although AI has great potential, there are obstacles in the field of sustainable finance, such as inconsistent data and ethical issues, which could restrict its application if left unchecked.

Summary & Conclusion:-

The study concludes that by improving the accuracy, speed, and scope of investment decision-making, artificial intelligence holds significant promise for advancing sustainable finance. It may also show how important AI is becoming to draw investors' attention to long-term sustainability goals and ESG concerns. Although AI is seen by IT professionals as a potent tool for the advancement of sustainable finance, they also emphasise the importance of cautious governance, moral guidelines, and interdisciplinary cooperation. Further, in the field of sustainable finance, artificial intelligence (AI) has shown itself to be a powerful instrument in changing the face of investment decision-making. Investors can identify sustainable investment possibilities more effectively by using AI to process large volumes of environmental, social, and governance (ESG) data. Artificial intelligence (AI)-powered solutions improve risk assessment, portfolio optimisation, and predictive analysis by include sustainability criteria in addition to conventional financial data.

References:-

1. Alhemeiri, S., &Nobanee, H. (2021). Artificial intelligence and Sustainable Financial management. Sustainability, 13(12), 6655. https://doi.org/10.3390/su13126655
2. Maharani, S., &Rahardiansyah, R. (2023). How does artificial intelligence synergize to make investment decisions? A critical analysis. In Proceedings of the International Conference on Economics, Business, Social, and Humanities (pp. 196–204). https://doi.org/10.2991/978-94-6463-302-3_19
3. Bahrammirzaee, A. (2010). A comparative survey of artificial intelligence applications in finance: Artificial neural networks, expert systems, and hybrid intelligent systems. Neural Computing and Applications, 19(8), 1165–1195. https://doi.org/10.1007/s00521-010-0362-z
4. Drican, C. (2015). The impacts of robotics and artificial intelligence on business and economics. Procedia - Social and Behavioral Sciences, 195, 564–573. https://doi.org/10.1016/j.sbspro.2015.06.134
5. Guresen, E., Kayakutlu, G., & Daim, T. U. (2011). Using artificial neural network models in stock market index prediction. Expert Systems with Applications, 38(8), 10389–10397. https://doi.org/10.1016/j.eswa.2011.02.068
6. Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision-making. Business Horizons, 61(4), 577–586. https://doi.org/10.1016/j.bushor.2018.03.007
7. Davenport, T. H., &Ronanki, R. (2018). Artificial intelligence for the real world. Harvard Business Review, 96(1), 108–116.
8. Riikkinen, M., Saarijärvi, H., Sarlin, P., & Lähteenmäki, I. (2018). Using artificial intelligence to create value in insurance. International Journal of Bank Marketing. https://doi.org/10.1108/IJBM-12-2016-0197.