
THE FUTURE OF SUSTAINABLE INVESTING: AI-POWERED STRATEGIES AND OPPORTUNITIES

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ABSTRACT

Artificial Intelligence (AI) in sustainable finance is becoming a groundbreaking force that can be used by businesses to make strong data-driven financial decisions. AI technologies like machine learning, large data analytics, and predictive modeling are used to improve corporate finance, risk management, and sustainable investment ideas. AI enhances the financial accessibility, efficiency, and transparency in social finance. Where it improves the efficiency of distribution and management of funds. By analyzing investment performance, identifying sustainable trends, and creating equal pricing models. AI is important for to and ethical finance.

In addition to this, AI has a vital role in achieving Environmental, Social, and Governance (ESG) goals. AI can help to predict long-term environmental and economic impact and assess climate-based risk and find sustainable investment opportunities through the analysis of large and complex datasets. By improving decision-making processes and optimizing investment strategies, these skills empower investors and financial institutions to align their financial objectives with sustainable targets.

Beyond traditional financial analysis, this study focuses on the growing importance of AI in sustainable finance. It examines how AI can help with impact assessment, regulatory compliance, sustainability risk management, and responsible investment. The study also highlights modern AI technologies that enhance the efficiency of processing and interpretation of large datasets. Which allows more sustainable and informed decision-making. An example of such a tool is the Financial Maximally Filtered Graph (FMFG) algorithm.

Despite many benefits, integrating AI into sustainable finance comes with ethical, technological, and legal challenges related to data privacy, transparency, and governance. To increase the application of AI in sustainable finance, the study suggests a best practice framework. The study emphasis on how AI can improve sustainability, accuracy, and efficiency and in financial institutions. AI technologies will create a new path to new avenues for investors, companies, and politicians to build a more resilient, inclusive, and sustainable financial future as they evolve.

KEYWORDS: ESG, Artificial Intelligence (AI), Sustainable finance, Maximally Filtered Graph (FMFG), Risk Management

INTRODUCTION

Artificial intelligence (AI) is revolutionizing sustainable finance by making financial decision based on data- divineness at the time of promotion of long term economic, social, and environmental objectives. Many financial institutes are using Artificial Intelligence (AI) to address global issues including social inequalities, scarcity of resources, and climate change. AI can process a huge data, it helps to identify hidden data and predict future events by using machine learning, big data analytics and predictive modeling. These capabilities will make organizations to make responsible decisions.

AI contributes to sustainable finance by assisting investors in assessing sustainable possibilities, examines ESG related risks, and helps to monitor investment performances, to increase the accuracy and to verify and track the performance it increases the accountability and transparency. AI facilitates the creation of innovative financial services and financial products that promotes sustained economic expansion while providing favorable social and environmental results.

Application of AI analytical tool is not sufficient for the future of sustainable investing. It also includes evaluating the collection, examination, interpretation and adoption of sustainability data with investment value chain. In the real world it includes using AI to felicitate capital allocation effectively along with the technology and sustainability standards. As a result AI has two requirements first it must have improved investments and should follow the principles of responsible investing.

Present Sustainable Investing

The main goal of sustainable investing is to distribute funds to businesses, plan strategies to control major ESG risks, and achieve social objectives. This often includes thematic

investing, positive screening, negative screening, and active ownership in institutional practice. Despite all these strategies relying on the quality of the underlying data, the existing system is still inadequate.

ESG disclosures tend to be unreliable, inconsistent, inadequate, and difficult to compare across the countries. Investors who discover a difference between true sustainability performance and marketing agreements or inadequate reporting face challenging consequences as a result. The stakes for improper data have increased due to regulatory pressure, including fund label surveillance and anti-greenwashing regulations. Based on this, sustainable investing currently calls for analytical rigor and continuous verifications in addition to value consistency.

Future predicted opportunities

AI-powered opportunities for sustainable investing are growing widely. One important field is financial support for the digital economy and infrastructure, particularly data centers, grids, and cooling systems designed to minimize water and energy intensity. Along with this, the other one is the creation of techniques that facilitate decarbonization in a few industries where AI can improve its operations and performance, like manufacturing, transportation, buildings, and agriculture. AI is also expected to strengthen climate scenario analysis, assisting investors in a clearer model.

Risks and constraints

AI risks associated with sustainable investing involves biased outcomes from inaccurate ESG data, decision making capacity, and environmental social difficulties. These challenges raise the question of how AI is sustainable ESG principles, demanding careful evaluation of AI as a source of sustainability risk along with a tool.

Objectives of the study

- To analyze the Role of AI in Sustainable Finance as a potential for future investors.
- How AI optimizes Sustainable Portfolio management and impact future investing.
- To investigate the role of AI in portfolio optimizing to achieve long-term financial sustainability while maximizing returns for investors.

Review of Literature

- The study “**Importance of artificial intelligence in achieving sustainable development goals through financial inclusion**” written by **A Fazal, (2024)** examines the relation between AI and financial inclusion in achieving the Un sustainable development gials (SDGs) along with it highlights the eight of 17 SDGs rely on financial inclusion. It considers qualitative approach explores how AI can improve financial inclusion and promote economic growth by using narrative and comparative techniques.
- The paper written by **Monika Rani 2024on AI in sustainable finance**, the paper focused on AI’s role in sustainable finance and it has demand for environmental activists to adopt sustainable practices, attention towards sustainability was achieved very lately but it has emerged with AI in recent trends. Businesses is also using AI in financial investments to improve the financial management in advance sustainability.
- The article written by **Nandini. G. (2024)** in her article she has examined the expanding role of AI in sustainable finance and highlighted how its use in business will bring changes and make it digital platform with the use pf technology. The study analysis the use of AI in financial sector and its capacity to promote sustainable finance practices by examining large number of publications.

Research Methodology

The research was done with the help of mixed method approach combining primary and secondary data with the help of published literatures, journals, conferences, and a primary data with a structured questionnaire.

Research tools

Statistical tools and techniques is used such as multiple regression analysis and chi-square testing to examine the data and suggest few recommendations.

Research Gap

The research gap was found that the previous research was much focusing on ESGs and SDGs but in this study along with ESG and SDGs AI’s contribution to long-term financial sustainability and highlights it potential to create robust financial system.

Data Analysis

➤ Chi-Square Test

Hypothesis

(H₀): There is no association between genders with perception of AI's role in financial sustainability.

(H₁): There is an association between genders with perception of AI's role in financial sustainability.

Results						
	highly positive	somewhat positive	neutral	somewhat negative	highly negative	Row Totals
Male	18 (18.12) [0.00]	21 (23.67) [0.30]	12 (9.25) [0.82]	2 (1.85) [0.01]	1 (1.11) [0.01]	54
Female	30 (29.20) [0.02]	42 (38.14) [0.39]	12 (14.90) [0.56]	2 (2.98) [0.32]	1 (1.79) [0.35]	87
Prefer not to say	1 (1.68) [0.27]	1 (2.19) [0.65]	1 (0.86) [0.02]	1 (0.17) [4.01]	1 (0.10) [7.84]	5
Column Totals	49	64	25	5	3	146 (Grand Total)

The chi-square statistic is 15.5846. The p -value is .048727. The result is significant at $p < .05$.

Interpretation

According to survey $\chi^2 = 15.58$, $p = 0.0487$ female comments were more positive. H₁ is approved since $p < 0.05$: H₀ is denied.

➤ Multiple Regression Analysis

(H₀): The independent variables (age, gender, and income) have no significant impact on the long-term finance while gaining maximum returns.

(H₁): The independent variables (age, gender, and income) have a significant impact on the long-term finance while gaining maximum returns.

Regression Statistics								
Multiple R	0.0792							
	53471							
R Square	0.0062							
	81113							
	0.0147							
Adjusted R Square	12948							
	1.1243							
Standard Error	86543							
Observations	146							

ANOVA								
	<i>df</i>	SS	MS	F	Significance F			
Regression	3	1.1347	0.3782	0.299	0.8259			
		30332	43444	18521	41675			
Residual	142	179.52	1.2642					
		28039	45098					
Total	145	180.65						
		75342						

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
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	1.8454 71387	0.3408 82234	5.4138 09235	2.563 75E- 07	1.1716 11639	2.519 33113 5	1.1716 11639	2.519 33113 5
Intercept								
	- 0.0341 94713	- 0.0863 70073	- 0.3959 09276	0.692 76618 2	- 0.2049 32022	0.136 54259 6	- 0.2049 32022	0.136 54259 6
What is your age?								
	0.1169 51837	0.1763 78494	0.6630 73109	0.508 35866 8	- 0.2317 1511	0.465 61878 4	- 0.2317 1511	0.465 61878 4
What is your gender?								
What is your Income?(in lakhs per annum)	0.0588 39692	0.0889 75482	0.6613 02318	0.509 49003 3	- 0.1170 48018	0.234 72740 3	- 0.1170 48018	0.234 72740 3

Interpretation

According to the survey conducted the result says that only 0.62% of the variation in the dependent variable which has very less explanatory power ($R^2 = 0.0062$) and based on regression analysis individual predictors like age, gender, and income have less impact on the result $P > 0.05$ and the model is not statistically significant (Significance = 0.8259).

FINDINGS

- It is observed that 57% of investors who are concerned about AI biases affecting sustainable financial decisions are facing biggest challenges in the integration of AI due to the lack of skilled workforce and AI biases in financial decisions.
- This study explores that 67% of investors feel that AI optimizes sustainable portfolio management and impacts future investing by analyzing real-time data to monitor and adjust investment portfolios in line with sustainability goals and by personalizing investment strategies to align with individual investor values.
- From the perception of 43% of investors found that the role of AI in financial sustainability is positive.
- It is observed that 60% of investors believe that the government should regulate the role of AI in sustainable finance by encouraging AI innovation through incentives and 40% believe that it can be done by implementing strict AI compliance law, by establishing an AI ethics board and by increasing financial AI literacy.
- 69% of investors see that AI will complement but not replace human decision-making, it also drives financial sustainability forward and 31% of them see that AI will have a moderate impact and limited influence in shaping AI in the future of sustainable

finance.

- 57% of investors whose income is up to 6 lakhs perceive that the role of AI will be significant in long-term finance while gaining maximum returns by reducing investment risks and by enhancing financial transparency.
- Risk management has the most potential in sustainable finance from investors' perspective whose age is between 18-25 think that the application of AI that is AI-driven finance.

SUGGESTIONS

- Addition of more Relevant Variables: There are different factors which will improve long-term decision making including risk tolerance, investment experience, financial knowledge, and investment objectives.
- Increase sample size: The accuracy and dependability of the regression report can be expanded to large and varied samples.
- Improve data quality: To improve the model performance and to reduce errors large and precise data is collected.
- Inclusion of other domestic factors: Investment behavior can be changed or strongly influenced by considering other factors like marital status, education and occupation.

CONCLUSION

Decision making, risk management, and investment strategies are all evolving as consequence of the integration of AI in sustainable finance. This study says that 67% of investors believe AI help them to maximize sustainable portfolio management, and 43% assume that AI has positive and supportive impact on financial sustainability. However problem still exist like biases in AI, lack of skilled and qualified labor, and regulatory issues.

The paper analysis shows that investor's main priority is to find AI's potential in long term finance and risk management. In fact 69% of investors believe AI will improve human intelligence and promote financial sustainability.

To increase the advantages of AI the study recommends, applying incentives to encourage AI innovation (60% of investors), AI compliance and regulation and ethics committee will enhance AI proficiency in finance in a larger sample size, improved data quality, and also include relevant factors are focused by the regression analysis. Investors, firms, policymakers, government, politicians, may create a more resilient, inclusive, and sustainable finance future by solving these challenges and encouraging AI potential.

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