






ESG and the Capital Market: How AI is Changing Sustainable Investing in South Asian Developing Nations

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Abstract. The current chapter tries to investigate how the integration of Artificial Intelligence (AI) and the development of financial markets contribute to the growth of Environmental, Social, and Governance (henceforth called ESG) investing in South Asian developing countries. Utilizing an instrumental variable approach for mitigating endogeneity concerns, analysis reveals that AI-driven data infrastructure plays a pivotal role in advancing ESG-focused capital allocation. The adoption of AI technologies; particularly in processing large datasets; significantly enhances sustainability evaluations, enabling more accurate and timely investment decisions. On the other hand, financial market development demonstrates a slight positive correlation with the worldwide activity of ESG investments. While more developed markets provide improved platforms for ESG-related instruments, their impact is not as substantial as AI-based data systems in driving sustainable finance. An important macroeconomic insight from the study is the inverse relationship between inflation and ESG investment levels. Elevated inflation rates appear to undermine investor confidence and divert capital away from long-term sustainable initiatives. Conversely, traditional macroeconomic indicators show no statistically significant effect on ESG investment, implying that economic growth alone is insufficient to propel sustainability objectives. The findings suggest that emerging economies can stimulate ESG investment by embracing AI technologies, enhancing financial market frameworks, and maintaining macroeconomic stability. Policymakers are encouraged to prioritize digital innovation, regulatory reforms, and inflation management to create a conducive environment for sustainable finance.

Keywords: ESG, FDI, Macroeconomic factors, AI, GDP.

1 Introduction

In the context of today's rapid, turbulent, and globalized financial systems, sustainable investment, therefore, is a long-term investment strategy that has been one of the pillar props. Environment, Social and Governance (ESG) principles were previously conceived as a peripheral idea, but are now of interest to those who would like to understand corporate performance, financial risk and resilience to market ups-and-downs. It has been developed by a small set of global institutional investors, because of the importance of mainstreams used by regulators and stakeholders worldwide, to align financial goals with large social and environmental issues for ESG integration, with increasing visibility and priority.

More than this, it is quite correct for developing countries that generally, economic development comes in hand with environmental degradation, labor issues and poor governance. Bangladesh, a lower-middle-income country, which is undergoing severe changes through much industrialization and urbanization. Bangladesh will soon be under heavy pressure to follow the Sustainable Development Goals (SDG) after its economy is largely operated by textiles and manufacturing. Even though awareness has increased progressively, the adoption of ESG-wise investment practices in Bangladesh is limited. Major obstacles for barriers include a lack of standards on ESG measures, fragmentation of reporting systems and comprehensive ignorance among investors about stability risk and opportunities.

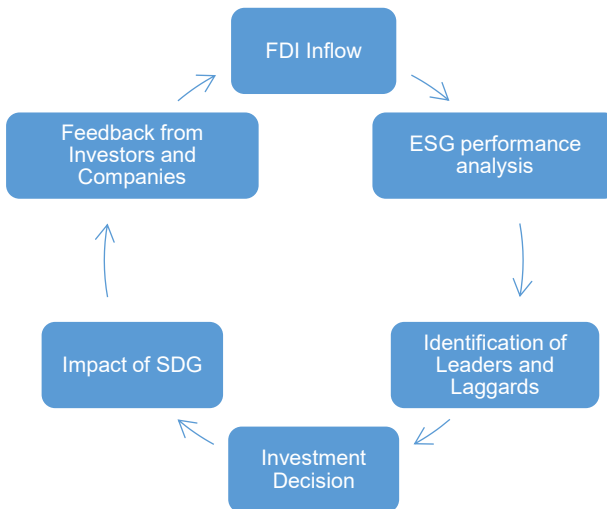
Table 1. Represent the ESG score, AI Adoption and FDI inflow of South Asian developing nations.

Country	ESG Score (2023)	AI Adoption Index	Green Bonds (USD)	FDI Inflow (USD)
India	65.2	62.5	1500	49.3
Bangladesh	54.7	45.3	230	2.9
Maldives	58.3	53.2	620	10.3
Sri Lanka	55.1	50.4	310	1.6
Nepal	49.2	43.0	120	0.6
Pakistan	50.8	44.1	250	2.1

Source:- Compiled by author data available on WDI and UNCTAD (till 2023)

Recent progress in technology, especially in large data and advanced analytics, has made great promises in addressing systemic challenges. Machine Learning (ML), Artificial Intelligence (AI), and Blockchains are already changing the means in which an investor collects, verifies, and applies for investment analysis. These technologies enable the processing of both large amounts of data from different sources, structured and unstructured. In this sense, they are creating opportunities with high levels of stability to evaluate ESG performance and to make better decisions. Better transparency and availability of real-time data also support regulators in monitoring compliance and implementing Sus-tainability.

Fig. 1. - Represents ESG performance analysis aligning the impact of SDG



Source: Compiled by author with existing literature reviews

2 Literature Review

Meneses et al., 2025 state that the evolution of sustainable investment is dealt with in a review-styled presentation as; AI-mediated innovation will lead towards boosting development in capital markets as well as attracting foreign direct investment (FDI) through enhanced transparency, risk analysis, and decision-making efficacy. Moreover, the study specifies that automation of the ESG score and predictive analytics with AI have revolutionized investor confidence during the turbulent markets.

In the recently enlarged BRICS countries, social aspects show a substantial and favorable association with sustainable development goals (Onan, Islam, Pinzon, et al., 2024). In the context of business, social governance refers to policies and procedures designed to improve relationships with stakeholders and protect their rights, well-being, and success. It facilitates the alignment of businesses and public stakeholders with the SDGs' top priorities.

Akram(2025) deals with the practical side of AI application in energy markets, especially with an emphasis on application in the areas of valuation of green bonds and financial forecasting. He identifies AI's ability to process heterogeneous datasets as an important factor for accurately pricing green instruments, which combined with future cash-flow prediction improves the credibility of green finance products among institutional investors.

Hanif (2025) also deals with the use of AI-powered fintech platforms to enrich ESG evaluation. This shows that such platforms increase consistency with which impact is analyzed and benchmarked. He said that this will inspire investors confidence and accountability in ESG investments. This is particularly important in new green bond markets in emerging economies.

Employing stock price indices, total market turnover, and market capitalization (2011-2022), Ahmed and Chaudhary (2024) and Chaudhary (2021), use data from time series demonstrating that capital market efficiency affects economic growth in the market. The market expansion depends on the financial market and the ESG.

Faruk and right (2024) evaluated regulatory structure of central banks, monetary policies and financial market activities. This emphasizes that climate risk evaluation, green bond markets and sustainable investment guidelines have some methods that can carry forward the Central Bank's green finance. The chapter provides intensive understanding of the strategy used by central banks for promoting a strong and robust financial environment by examining case studies and best practices.

The impact of ESG elements on business financial performance is examined by Lyon et al. (2023), who also look at how digital transformation may moderate this link. Research concludes that ESG affects the firm financial performance by utilizing regression analysis in adequate way. Furthermore, this beneficial effect is amplified by

digital transformation, indicating that incorporating ESG factors in digital projects is more probable of possessing superior financial results. The report also stated that the positive impact of ESG on financial performance may decrease in a period, indicating frequent commitment to technology improvement as well as ESG practices.

Serafeim and Amel-Zadeh (2023) concentrated on the European healthcare industry. This study investigates whether and how market-based and accounting-based metrics of financial success are impacted by ESG scores. A significant variability of effects across several ESG scores and financial performance indicators is found in the study, which analyses data from leading healthcare companies registered in the STOXX 600 Index over a ten-year period (2012 to 2022). The link varies based on the particular ESG components and financial measures taken into consideration, even though moderate positive benefits are typically projected. The report warns against using a one-size-fits-all method for assessing relationship among ESG and financial success and emphasizes the need of industry-specific analysis. In developing countries, AI improves sustainability assessments by providing real-time, data-driven insights from alternative and unstructured data sources. By analyzing sustainability reports, news feeds, and company filings, artificial intelligence (AI) tools like can identify trends in ESG compliance.

3 Econometric Analysis and Methodology

By examining its effects on financial markets and ESG investments, this study investigates how AI is changing sustainable investing in developing nations. The study uses a panel dataset from the World Development Indicators (WDI) for South Asian developing countries across a 5-year period (2018 to 2023) in order to address potential endogeneity in AI adoption. The following is the specification for the main econometric model:

$$ESG = \beta_0 + \beta_1 * AI \text{ adoption} + \beta_2 * Mkt \text{ Cap} + \beta_3 * GDP + \beta_3 * FDI + \beta_3 * INF + \epsilon_{it} \quad (1)$$

Where ESG: represents sustainable investment in the Asian developing nations (Afghanistan, Nepal, Bhutan, India, Bangladesh, Cambodia, Malaysia, Maldives, Pakistan, Sri Lanka) at time t , ϵ Error term measured by AI adoption is the most

important independent variable since it measures how much a nation's financial markets take on artificial intelligence technologies such as machine learning and alternative data for investing decisions. The independent variable that measures financial market development is market capitalization or market liquidity, which can be assessed using indicators of size, trading volume, or financial openness of the stock market. FDI, GDP and INF constitute vectors of macroeconomic and governance variables for GDP per capita, inflation rate, and foreign direct investment (FDI).

An instrumental variable approach is used because of the possible endogeneity of AI adoption, which could result from missing variables like regulatory frameworks or a nation's degree of technical readiness. The instruments used in this analysis are the internet penetration rate and ict ranking investment as a proportion of GDP. Such factors meet the requirements for legitimate instruments since they are highly connected with the deployment of AI but are unlikely to directly impact ESG investment choices. These variables demonstrate strong correlation with AI adoption capacity ,while examining the relationship between AI adoption and ESG investment Internet penetration rates provide a proxy for digital accessibility and ict investment indicates institutional commitment to technological advancement. Together these variables capture the enabling environment for AI adoption without directly measuring ESG investment preference. AI adoption is modelled in the first stage of regression as a function of these instrumental variables:

$$\text{AI adoption} = \alpha_0 + \alpha_1 * \text{int} + \alpha_2 * \text{ict} + \alpha_3 * \text{variable} + \mu_t \quad (2)$$

Where μ_t is the error term, To get objective estimates of how AI adoption affects sustainable investment, the study uses a two-stage least squares model. While the weak instrument test (based on F-statistics) guarantees the strength and applicability of the chosen instruments, a Sargan test is used to confirm the exogeneity of the instruments. The World Development Indicators (WDI) database, which offers thorough and trustworthy cross-country measures, is the source of the data used in the analysis. Stock market capitalization and liquidity indicators are used for measuring the development of the financial market, whereas sustainability indexes or financial databases are the source of ESG scores.

To isolate the impact of AI adoption on sustainable investment results, control factors like GDP per capita, FDI, inflation and regulatory quality are included. Both random effects and fixed effects models are generated for evaluating the findings' robustness.

By offering actual data on the role of AI adoption in financial decision-making, particularly in emerging economies, current research adds to the expanding body of investigation on sustainable investing. It provides fresh perspectives on how technology-driven investing strategies are influencing ESG results by resolving endogeneity issues through instrumental variable estimates. The findings underscore the revolutionary potential of artificial intelligence (AI) to promote sustainable financing in emerging nations, with implications for investors and governments alike.

To take into consideration the possibility of correlation between errors within clusters across time and between countries, econometric model utilizes cluster-robust standard errors that are clustered at both the year and country levels. By correcting for autocorrelation within groups and reducing heteroskedasticity, this method ensures more trustworthy inference. The model's high R-squared and modified R-squared values show that the exogenous regressors consider a sizable amount of variation in dependent variable. The following is a summary of the regression results:

Table 2. Represent the Econometric Model estimates of the Regression s

Estimate	S.D.	Error	t-value	Pr(> t)
β_0	8.172	1.2033	1.379	0.0001
AI adoption	0.51703	0.30358	-1.622	0.0057***
Mkt Cap	0.00035	0.000562	-0.611	0.0432**
FDI	-0.0015	-3.125	0.186	0.1538
GDP	0.01462	0.00461	-0.946	0.1151
INF	-1.4156	0.2136	0.241	0.0325

*** 1%, **5% and 10% * Significant Level

The regression results provide crucial information about how financial market development, AI adoption, and ESG investments relate to one another in developing nations. Even without the independent variables, there is a baseline level of ESG

investment activity, as indicated by the intercept, which is statistically significant at the 1% level. This research implies that national institutional frameworks and global ESG momentum are examples of structural elements that influence sustainable investing trends.

At the 1% level, coefficient for AI adoption (0.0057) is positive and statistically significant, signifying higher levels of ESG investment are linked to greater integration of AI technologies, like machine learning and alternative data analytics, in financial decision-making. This lends credence to the idea that investors' ability to assess ESG-related risks and opportunities is improved by technology-driven analytical tools, which in turn affects how capital is allocated to sustainable financial initiatives and instruments. The size of the coefficient indicates a strong correlation between higher ESG investment scores and advancements in AI deployment.

At the 5% significance level (0.0432), financial market development and ESG investment have a positive and statistically significant link, but with a small effect size. This emphasizes how important healthy financial systems are for directing funds toward long-term investments. The infrastructure, liquidity, and regulatory supervision provided by developed financial markets reduce transaction costs and increase access to financial products that are in line with ESG principles. The coefficient's tiny value suggests that although the growth of financial markets encourages ESG investment, other factors—like institutional frameworks, investor behavior, and policy incentives—may have a stronger impact.

However, GDP per capita does not have statistical significance, despite having a positive coefficient. A five year analysis window (2018-2023) cannot evaluate the full AI implementation in ESG framework, which continues to develop rapidly. This suggests that ESG investment in developing economies cannot be driven solely by macroeconomic success. Even while economic growth might produce favorable circumstances, elements like investor awareness, financial literacy, and regulatory incentives might be more important in advancing sustainable finance. The research also identifies disparities in ESG assessment across major rating agencies due to lack of proportionality in ESG elements and evaluation methods which potentially affecting result consistency. FDI is likewise statistically negligible, demonstrating that foreign

capital inflows do not essentially encourage the adoption of ESG practices. According to Salma (2021), this might be a reflection of the conventional, non-ESG-compliant businesses' continued dominance in the foreign investment scene, especially in resource-driven economies.

A particularly noteworthy finding is that inflation has a negative and statistically significant influence on ESG investment. It implies that inflationary circumstances increase economic uncertainty, inhibiting long-term financial commitments to viable initiatives. Investors are more inclined to put short-term financial stability first in these situations, which lowers their exposure to ESG assets. Findings align with earlier investigation on macroeconomic instability and how it inhibits sustainable investment activity.

4 Conclusion

The research examines the influence of AI adoption and market capitalization on ESG investments in emerging economies by applying an instrumental variable technique to resolve the issue of endogeneity. The evidence shows that AI adoption is a determinant of ESG advancement since the adoption of artificial intelligence, machine learning, and non-traditional data enhances ESG risk analysis and capital allocation. Relevant and positive statistical relationship between AI adoption and ESG investment validates that financial markets that leverage data-driven technologies are placed ideally to promote sustainable investment.

Furthermore, market capitalization has a positive effect on ESG investment, but its effect is quite small. Financial markets that are well-capitalized provide the critical infrastructure, liquidity, and availability of financing that enable the mobilization of funds to sustainable assets. However, the findings show that market capitalization by itself could be inadequate to effectively enhance ESG investment, and this calls for complementary policy interventions like investor incentives and sound regulatory frameworks.

The research's most noteworthy discovery is the statistically significant negative influence of inflation on ESG investments. A Investors prioritize financial stability in the short term over long-term sustainable investment because of economic uncertainty

introduced by high inflation levels. This underscores the importance of maintaining macroeconomic stability, particularly price stability, to encourage financial choices that are influenced by ESG aspects. To ensure sustainable investment, policymakers must maintain price stability and devise monetary and fiscal policies that are resilient to economic fluctuations. As regulatory frameworks evolve and technological adoption accelerates across South Asia, AI-enhanced ESG investment frameworks will likely play an increasingly important role in directing capital toward sustainable development initiatives. On the contrary, foreign direct investment (FDI) and GDP per capita are found to be statistically insignificant in the determination of ESG investment levels. This means that foreign capital inflows and economic growth do not by themselves generate sustainability efforts. Rather, variables like institutional quality, regulatory backing, and investor consciousness become more influential in framing ESG investment practices in developing economies.

In conclusion, the research presents solid empirical evidence that market capitalization and AI adoption are the prime drivers of ESG investment in evolving markets. But the fate of sustainable finance also depends upon macroeconomic stability, and foremost among them is the management of inflation. The findings have profound policy implications in that they propose that governments and financial policymakers give top priority to investment in digital technologies, deepen financial market infrastructure, and adopt macroeconomic policies favorable to ESG-oriented investing. In this way, emerging markets are able to leverage the transformative influence of AI and financial innovation to amplify sustainable investment and develop a more resilient, ESG-focused financial system.

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