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Environmental, Social, and Governance Investment Decisions Among Students: Partial Least Squares and Machine Learning Analysis

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Abstract
Purpose: This study aims to explore the factors influencing university students' interest in investing in companies that prioritize Environmental, Social, and Governance (ESG) principles in Indonesia, focusing on financial literacy, ESG awareness, subjective norms, and ESG risk perceptions.
Methodology: A quantitative approach was employed using survey data collected from 104 accounting students at two public universities. The analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) and machine learning-based PLS regression, providing both causal inference and predictive modeling.
Results: The study found that ESG awareness and subjective norms were the strongest predictors of students' interest in ESG investments. Financial literacy and ESG risk perception had weaker influences. PLS-SEM yielded an R^2 of 0.653, while PLS the regression showed an average R^2 of 0.482.
Conclusions: ESG awareness and subjective norms are critical in shaping students' investment behavior, with ESG education in curricula and leveraging social influence being crucial to This promotes sustainable investment decisions. Financial literacy alone did not significantly affect ESG investment interest.
Limitations: The study is limited by its sample size, which only includes students from two universities, and its cross-sectional design, restricting generalizability and the examination of changes over time.
Contributions: This research provides a novel framework for understanding ESG investment behavior by integrating PLS-SEM and machine learning-based PLS regression, contributing to both theoretical insights and practical implications for promoting sustainable investment practices.

Keywords: *Environmental, Social, and Governance Investment, Financial Literacy, PLS Regression, Subjective Norms, Sustainability*

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1. Introduction

Interest among students in investing in companies that implement Environmental, Social, and Governance (ESG) principles has emerged as a significant concern, reflecting the growing recognition of sustainability's critical role in the business landscape (Sahisnu & Zaim, 2025). Organizations are now evaluated not only based on their economic outcomes but also on their social and environmental impact,

which is becoming a central part of investment analysis (Khan, Serafeim, & Yoon, 2016). The increasing interest in Environmental, Social, and Governance (ESG) investment among university students signals a shift in how young investors perceive sustainability's role in business. As awareness of global challenges such as climate change, social inequality, and environmental degradation rises, the younger generation is becoming more inclined to prioritize sustainability in their investment decisions (Munyepwa, Mudzengerere, Ranganai, & Gwesu, 2026). This growing awareness has made ESG principles a central component of investment strategies, leading to a broader trend of integrating social responsibility and sustainability with traditional financial objectives. This phenomenon has prompted investors, particularly younger generations, such as students, to consider ESG factors when making investment decisions (Seth & Singh, 2024).

The current younger generation faces a landscape characterized by significant global challenges, including climate change, social inequality, and environmental degradation. Members of this generation have an increased awareness of sustainability challenges and the importance of corporate social responsibility (Ruggie & Middleton, 2019). This recognition has led to the development of sustainable investing trends that incorporate ESG values into financial choices and promote responsible business practices. The impact of ESG investing, particularly in emerging markets such as Indonesia, is poised to significantly influence future economic policies. Emerging economies are beginning to recognize the potential of sustainable investments, not only in improving corporate social responsibility but also in creating long-term financial stability. By aligning investments with ESG standards, these countries can foster business practices that contribute to environmental protection, social justice and governance reforms (Azizov & Azizli, 2025).

In Indonesia, financial literacy remains a significant challenge, particularly among students. Financial literacy plays a crucial role in shaping investment decisions and influencing how individuals evaluate investment opportunities, assess risks, and manage financial portfolios (Aren & Aydemir, 2014). A lack of knowledge regarding investment tools and financial management can hinder students from making informed ESG investment choices. Therefore, promoting financial literacy is essential for enhancing students' ability to engage in ESG investing in an informed and responsible manner. Where financial literacy remains a challenge, it is crucial for students to develop a solid understanding of ESG principles to make informed investment decisions in the future.

Financial literacy, along with ESG awareness, plays a significant role in shaping how future investors evaluate companies and manage portfolios that align with sustainability goals (Darbeni, Zaharuddin, & Safariningsih, 2026). However, while financial literacy remains essential, awareness of ESG factors and social pressures (subjective norms) has emerged as a more potent predictor of students' interest in sustainable investing. As these students mature into active investors, their growing preference for ESG-compliant companies may create significant demand for policies that encourage sustainable business practices and investment transparency (INFE, 2020). Alongside financial literacy, ESG awareness is becoming increasingly important in guiding investment decisions. As students develop an understanding of ESG principles, they become better equipped to assess and invest in companies that align with sustainability goals. However, it is the awareness of ESG factors, coupled with social influences (subjective norms), that strongly predicts students' interest in sustainable investing. As this younger generation matures into active investors, their growing preference for ESG-compliant companies may drive demand for policies that promote sustainable business practices and greater investment transparency.

In addition to financial literacy, awareness of ESG factors and subjective norms significantly influence investors' interest. ESG awareness reflects an individual's understanding of corporate sustainability initiatives and their impacts on both the environment and society (Miati, Ariyanto, Widanaputra, & Putri, 2026). Subjective norms refer to the social influences that individuals perceive from family, friends, or the broader community regarding ESG investment behavior (Ajzen, 1991). Moreover, risk perception related to ESG investments reflects how individuals assess and weigh these risks when making decisions (Wang, Huang, & Zhou, 2026). This study adopts Partial Least Squares (PLS) modeling to understand the impact of these factors on ESG investment interest. PLS regression

quantifies the relationship between observed indicators and underlying constructs, whereas PLS-SEM evaluates causal relationships among constructs by examining the model's validity and reliability (Hair et al., 2021). This methodological approach is increasingly used in studies that explore sustainable behavior and investment decisions.

The primary contribution of this research lies in its dual approach: methodologically, it integrates PLS-SEM with machine learning-based PLS Regression, improving both predictive accuracy and causal inference. Contextually, this study offers new insights from an emerging market, focusing on university students as prospective ESG investors. This demographic plays a pivotal role in shaping the future of sustainable finance, particularly in developing economies, where ESG standards are still evolving.

2. Literature Review and Hypotheses Development

The importance of Environmental, Social, and Governance (ESG) factors in investment decisions has gained increasing attention, particularly among younger generations, including university students. This shift is largely attributed to the growing awareness of global challenges, such as climate change and social inequality, which have sparked interest in sustainable investing. ESG criteria provide a framework for evaluating companies not only on their financial performance but also on their social and environmental impacts (Khan et al., 2016).

2.1 Financial Literacy and ESG Investment

Financial literacy, defined as an individual's ability to understand and apply financial concepts, plays a critical role in investment decision-making processes. Kurowski, Rutecka-Góra, and Smaga (2026) argue that financial literacy is essential for making informed decisions regarding investments, including ESG investments. In the context of ESG, financial literacy encompasses the ability to evaluate risks and opportunities related to ESG factors. Tauni, Fang, and Iqbal (2017) further suggest that financially literate investors are better equipped to consider non-financial factors such as environmental and social impacts when making investment decisions. This highlights the link between financial literacy and sustainable investment behaviors.

2.2 Environmental, Social, and Governance Awareness and Investment Decisions

Environmental, Social, and Governance (ESG) awareness refers to an individual's understanding of corporate sustainability initiatives and their impact on society and the environment. Previous studies have emphasized the role of ESG awareness in promoting sustainable investment behaviors. Zhu, Jones, Mehmood, Almulhim, and Aljughaiman (2025) found that students with higher ESG awareness were more inclined to support companies that comply with ESG standards. Furthermore, Kaakandikar, Soni, Barole, More, and Waghmare (2025) note that social approval and the perceived benefits of ethical investment can foster greater interest in ESG investments. These findings indicate that increasing ESG awareness can influence students' investment preferences for companies that prioritize sustainability.

2.3 Subjective Norms and Environmental, Social, and Governance Investment

Subjective norms, as outlined by Ajzen (1991), refer to the perceived social pressure to engage in certain behaviors, including investing in Environmental, Social, and Governance (ESG) compliant companies. Several studies have demonstrated that subjective norms significantly influence investment decisions. Makhija, Chacko, Kukreja, and Agarwal (2023) found that individuals' investment decisions were shaped by social norms and expectations, with students often being influenced by peer behavior and societal trends. Additionally,Kaakandikar et al. (2025) argue that the perception of social approval plays a crucial role in promoting sustainable investment practices, suggesting that social norms are a powerful driver of ESG investment behavior.

2.4 Environmental, Social, and Governance Risk Perception and Investment Behavior

Risk perception, particularly in the context of ESG investments, refers to how individuals assess and weigh the risks associated with investing in companies that comply with ESG standards. Despite the ethical appeal of ESG investments, risk perception remains a significant barrier for investors. Amel-Zadeh and Serafeim (2018) found that novice investors often perceive ESG companies as riskier and economically unstable. Kräussl, Oladiran, and Stefanova (2024) further noted that ESG investments are

often perceived as less financially viable in the short term, which can deter potential investors. Therefore, understanding how students perceive ESG investment risk is crucial for promoting sustainable investment practices.

2.5 Theoretical Models in Environmental, Social, and Governance Investment Research

To examine the factors influencing Environmental, Social, and Governance (ESG) investment behavior, numerous studies have applied the Theory of Planned Behavior (TPB) proposed by Ajzen (1991), which posits that attitudes, subjective norms, and perceived behavioral control shape behavioral intentions. In the context of ESG investments, this theory has been extended to incorporate constructs such as ESG awareness and financial literacy. Subjective norms, in particular, play a significant role in shaping individuals' investment intention. Moreover, recent studies have increasingly employed advanced analytical methods, including Partial Least Squares Structural Equation Modeling (PLS-SEM) and PLS Regression, to investigate the complex relationships among financial literacy, ESG awareness, subjective norms, and risk perception (Hair et al., 2021). These methodologies provide valuable insights into how these factors interact to influence ESG investment behaviors.

2.6 Research Gaps and Future Directions

Despite the growing body of literature on ESG investing, several gaps remain, particularly in developing countries such as Indonesia. Many studies have focused on developed markets, leaving the unique challenges and opportunities in emerging economies unexplored. Additionally, while financial literacy has been widely recognized as a key factor in investment decisions, its role in ESG investment behavior remains understudied. Further research is needed to examine how financial literacy influences ESG investment, particularly among university students, who are the next generation of investors. Furthermore, integrating machine learning techniques with traditional PLS-SEM approaches could provide a more nuanced understanding of ESG investment behavior, improving both explanatory and predictive accuracy (Sarstedt, Ringle, & Hair, 2021).

2.7 Hypotheses

2.7.1 Financial Literacy's Direct Effect

Financial literacy is expected to positively influence students' interest in ESG investment. Students with higher financial knowledge can evaluate investment options and risks more effectively. This ability enables investors to align their investments with their personal values, increasing their interest in sustainable investment opportunities.

H_1: Financial literacy has a significant positive effect on students' interest in ESG investments

2.7.2 Environmental, Social, and Governance Awareness's Direct Effect

ESG awareness was hypothesized to enhance students' interest in ESG investments. Awareness of environmental, social, and governance principles helps students understand the ethical and sustainability implications of their choices. Greater awareness motivates a preference for responsible investments, leading to a higher interest in ESG-focused opportunities.

H_2: ESG awareness has a significant positive effect on students' interest in ESG investments

2.7.3 The Role of Subjective Norms

Subjective norms are proposed to positively affect students' interest in ESG investment. Social influence from peers, family, or society encourages sustainable investment behavior. Students who perceive supportive norms are more likely to engage in ESG investments.

H_3: Subjective norms have a significant positive effect on students' interest in ESG investments

2.7.4 Impact of Environmental, Social, and Governance Risk Perception

ESG risk perception is expected to negatively influence students' interest in ESG investment. High perceived risks, such as market volatility and uncertain returns, may discourage participation. Thus, risk perception reduces the willingness to invest in ESG opportunities despite ethical or sustainability benefits.

H_4: ESG risk perception negatively influences students' interest in ESG investments

3. Methodology

This study explores the factors influencing university students' interest in investing in companies that implement Environmental, Social, and Governance (ESG) principles. This study investigates the impact of four primary independent variables on the dependent variable, ESG investment interest (Y), such as financial literacy (X_1), ESG awareness (X_2), subjective norms (X_3), and ESG risk perception (X_4). A quantitative research approach was used to address the research questions and test the hypotheses outlined in the study.

3.1 Research Design

This study employed a causal research design to examine the direct effects of financial literacy, ESG awareness, subjective norms, and ESG risk perception on students' ESG investment interests. To improve the robustness of the findings, this study should not rely solely on a cross-sectional design but should also consider a longitudinal approach. A longitudinal design would allow future researchers to observe changes in students' ESG awareness, financial literacy, and investment interest over time, particularly after exposure to sustainability-related courses, investment education or ESG campaigns. This approach provides stronger evidence regarding the development of ESG investment behavior and reduces the limitations associated with single-period data collection.

3.2 Participants and Sampling

The population of this study consisted of Indonesian university students with a potential interest in investment and sustainability-related issues. To improve generalizability, the sample should be expanded beyond accounting students and include students from different academic disciplines such as management, economics, finance, environmental studies, law, engineering, public policy, and social sciences. Involving students from diverse disciplines is important because ESG investment interest may be shaped by different educational backgrounds, levels of financial exposure, sustainability awareness and professional orientation.

A purposive sampling technique was used to select respondents with basic knowledge of investment, sustainability, or business-related issues. However, to strengthen the representativeness, future studies should combine purposive sampling with stratified sampling based on academic discipline, university type, and year of study. This sampling strategy allowed the study to compare ESG investment interest across student groups and provide broader insights into how educational background influences sustainable investment behavior.

3.3 Data Collection

Data were collected using an online questionnaire that was distributed to the participants in June 2025. The survey instrument included questions designed to measure the four independent variables: financial literacy, ESG awareness, subjective norms, and ESG risk perception, as well as the dependent variable, ESG investment interest. Each construct was assessed using six indicators adapted from previous research, including the works of (Ajzen, 1991; Sarstedt et al., 2021; Taber, 2018). Participants responded to the items on a 5-point Likert scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). A pilot test was conducted prior to the main data collection to ensure the reliability and validity of the survey instruments. The pilot test confirmed that the items were clear and that the measurement scales demonstrated acceptable levels of reliability, with Cronbach's alpha values exceeding 0.7 for each construct.

3.4 Analytical Techniques

Two analytical methods were employed to analyze the data: Partial Least Squares Structural Equation Modeling (PLS-SEM) and PLS Regression (Hair Jr, Howard, & Nitzl, 2020). PLS-SEM was used to evaluate the theoretical model, assess the relationships between the constructs, and examine the validity and reliability of the measurement model. The software package 'plspm' in R was used for this analysis. The model fit was assessed using the Average Variance Extracted (AVE), Composite Reliability (CR), and path coefficients. A Goodness-of-Fit (GoF) index was calculated to evaluate the overall model fit (Cheung, Cooper-Thomas, Lau, & Wang, 2024).

PLS Regression was applied to enhance the predictive accuracy of the model. This method focuses on unaveraged indicators, allowing for more granular insights into the relationships between the independent and dependent variables. The analysis was conducted using the '' pls package in R. Key metrics, such as beta coefficients, R^2 values, Root Mean Square Error of Prediction (RMSEP), and Variable Importance in Projection (VIP) scores, were computed to assess the performance of the regression model (Kante & Michel, 2023).

3.5 Measurement Model

Each construct in this study was measured using a set of indicators adapted from the existing literature, and the measurement model was assessed for validity and reliability. Financial literacy (X_1) was measured using indicators that evaluated participants' understanding of financial principles and their ability to assess investment opportunities. ESG awareness (X_2) was assessed using indicators reflecting participants' knowledge of environmental, social, and governance issues and corporate sustainability practices. Subjective norms (X_3) were captured using items that measured perceived social pressure and approval from family, peers, and academic figures regarding ESG investment decisions. ESG risk perception (X_4) was measured using indicators representing participants' perceptions of the potential risks and uncertainties associated with ESG investments. Finally, ESG investment interest (Y), the dependent variable, was measured using indicators related to participants' willingness and intentions to invest in companies that prioritize ESG practices.

3.6 Statistical Analysis

The data were analyzed using two key statistical techniques: PLS-SEM was used to assess the hypothesized relationships between the constructs, focusing on model fit, path coefficients, and significance levels (p-values). Structural model results, such as R^2, Average Variance Extracted (AVE), and CR, were also calculated to evaluate the validity and reliability of the constructs (Sarstedt et al., 2021). PLS Regression provided a robust prediction of ESG investment interest by quantifying the impact of each independent variable and calculating the predictive accuracy of the model. R^2, beta coefficients, RMSEP, and VIP scores were the key metrics used to assess model performance. The results were compared to identify the most significant predictors of ESG investment interest, with emphasis on the impact of ESG awareness and subjective norms, as well as the mediating role of financial literacy (Mou, Zhou, Chen, Liu, & Li, 2025).

4. Results and Discussions

4.1 Result

This study collected primary data through a questionnaire administered to 104 university students from Cenderawasih and Papua Universities in Papua, Indonesia, in June 2025. Four independent constructs were examined: Financial Literacy (X_1), ESG Awareness (X_2), Subjective Norms (X_3), and ESG Risk Perception (X_4), along with the dependent variable, ESG Investment Interest (Y). Each construct was measured using six indicators, resulting in 30 indicators. Using a machine learning-based PLS Regression method in R, the beta coefficients of each construct on ESG investment interest were 0.1953 for X_1, 0.2131 for X_2, 0.1870 for X_3, and 0.1426 for X_4. The model demonstrated moderate explanatory power, with an average R^2 of 0.482 across the six Y indicators.

All independent constructs contributed significantly to the predictive model, as indicated by their Variable Importance in Projection (VIP) values: 20.04 for X_1, 21.89 for X_2, 19.69 for X_3, and 18.16 for X_4. Since all VIP values exceeded the standard threshold of 1, each construct was considered essential, highlighting the critical role of financial literacy, ESG awareness, subjective norms, and ESG risk perception in explaining students' interest in investing in companies based on ESG principles. Consequently, the PLS Regression model reliably confirmed that all four constructs significantly contributed to predicting students' ESG investment interest.

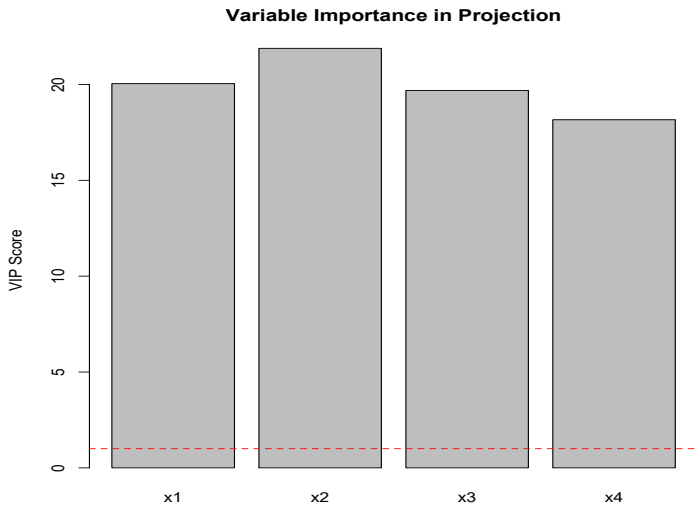

Figure 1. Variable importance in projection

Figure 1 shows the results indicate that all constructs influence the dependent variable *Y* (Hair et al., 2021). Using the traditional PLS-SEM approach with the Partial Least Squares Path Modeling (PLS-PM) package in R, the structural model yielded an R^2 value of 0.653 and an AVE of 0.602 for Y. The total effects of the independent variables were as follows, Financial Literacy (X_1) → Y: 0.167 (p = 0.0873), ESG Awareness (X_2) → *Y*: 0.404 (p < 0.001), Subjective Norms (X_3) → *Y*: 0.286 (p = 0.0289), and ESG Risk Perception (X_4) → *Y*: 0.117 (p = 0.1287). Statistical significance was observed only in the X_2 → *Y* and X_3 → Y pathways, highlighting ESG awareness and subjective norms as the strongest predictors of interest in ESG investment. These findings align with the Theory of Planned Behavior Ajzen (1991) and are consistent with previous research (Nguyen, Randall, & Lewis, 2024).

Similarly, the results from the PLS Regression confirmed that X_2 (ESG Awareness) and X_3 (Subjective Norms) exerted the greatest influence on *Y*. Although PLS Regression does not provide p-values, all coefficients were positive and supported by high Variable Importance in Projection (VIP) scores. This indicates that machine learning methods, such as PLS Regression, emphasize predictive accuracy while identifying key predictors of ESG investment interest.

Table 1. Summary of coefficients for PLS regression and PLS-SEM

Constructs	PLS-R Coefficient	PLS-SEM Coefficient	p-value (PLS-SEM)
Financial Literacy (X_1)	0.1953	0.167	0.0873
ESG Awareness (X_2)	0.2131	0.404	0.0000
Subjective Norms (X_3)	0.1870	0.286	0.0289
ESG Risk Perception (X_4)	0.1426	0.117	0.1287

Table 1 summarizes the coefficients from both the PLS Regression and PLS-SEM methods for the constructs under study, showing the relationships between independent variables (Financial Literacy, ESG Awareness, Subjective Norms, ESG Risk Perception) and the dependent variable (ESG Investment Interest). The results indicate that ESG Awareness (X_2) and Subjective Norms (X_3) are the strongest predictors of students' interest in ESG investments, with significant positive effects confirmed by both PLS-SEM and PLS-Regression. Financial Literacy (X_1) showed a moderate positive influence, although its statistical significance in PLS-SEM was marginal. ESG Risk Perception (X_4) exhibited the weakest effect and was not statistically significant, suggesting that perceived risks do not strongly deter students from investing in ESG companies. Overall, the findings highlight the critical roles of ESG awareness and social influence in shaping university students' interest in ESG investment.

4.2 Discussion

PLS-SEM showed statistical significance for hypothesis testing and facilitated the assessment of construct validity through metrics such as AVE and CR. However, it occasionally shows limitations in predictive power compared to machine learning techniques (Sarstedt et al., 2021). Beyond confirming the key roles of ESG awareness and subjective norms, this study's methodological novelty lies in combining PLS-SEM with machine learning-based PLS Regression using unaveraged indicators. This approach improves both explanatory power and predictive accuracy, offering a replicable framework for future research on sustainable finance. The integration of these methods responds to recent calls for more innovative and interpretable modeling techniques in ESG-related behavioral finance studies, particularly in emerging markets.

The understanding of ESG factors among students significantly impacts investment decisions regarding companies prioritizing these principles. As the younger generation, specifically students, begins to navigate the investment landscape, the values and awareness of ESG issues play an increasingly important role in shaping financial behavior and preferences. Nafisa et al. emphasized the importance of moral awareness in guiding retail investors' strategies for corporate ESG issues (Nafisa, Alam, & Qian, 2023). The results showed that investors with a comprehensive understanding of ESG implications tended to engage positively with companies that exhibited strong ESG practices. As supported by Karmacharya (2023), both institutional and individual investors progressively integrate ESG factors into investment strategies, relating decisions to personal values and societal expectations. This trend reflects a shift in the investment environment, where ethical considerations are becoming increasingly significant in conjunction with conventional financial measures.

Zhong (2023) further emphasized the increasing appeal of ESG investment, presenting it as a means for investors to harmonize financial objectives with personal values, potentially improving returns while contributing positively to society. This alignment is particularly important for students, who often pursue investment opportunities that reflect their ethical beliefs and aspirations. Chen (2024) observed some challenges, specifically the barriers hindering the incorporation of ESG factors into investment decision, namely the lack of standardized ESG disclosures and discrepancies in ESG ratings. These discrepancies can lead to confusion and discourage investors from exploring ESG opportunities, emphasizing the need for improved transparency and education regarding ESG metrics to strengthen students' confidence in making informed investment decisions. The influence of students' awareness of ESG factors on investment decisions reflects a broader trend in which ethical considerations are increasingly integrated with financial objectives. By fostering a deeper understanding of ESG principles through education and active engagement, the next generation of investors can be empowered with the knowledge and tools necessary to make responsible and impactful investment decisions.

The impact of students' subjective norms on investment decisions in ESG companies presents a multifaceted landscape that intertwines personal convictions, societal pressures, and economic reasoning. Subjective norms refer to the social pressure that individuals perceive, which can influence investment decisions, particularly in relation to companies that prioritize ESG considerations. Studies have shown that subjective norms influence investors' attitudes toward socially responsible investments. According to Makhija et al. (2023), social ESG initiatives play a crucial role in shaping investors' perceptions, with positive social practices directly affecting investment decisions. In support of this notion, students influenced by peer behavior and prevailing societal trends may be motivated to invest in businesses embodying their comprehension of ethical practices (Friede, 2019).

Kräussl et al. (2024) emphasized the significance of investors beliefs and perceptions regarding sustainability performance. It is posited that individual perceptions influence both investment expectations and the subsequent actions taken by investors in the market. Students, influenced by current discussions on sustainability, often feel strong pressure to integrate ESG factors into investment strategies, potentially shaping actual investment behavior. Deka, Sharma, Agarwal, and Tiwari (2023) identified a statistically significant correlation between ESG awareness and risk perception among investors, confirming that awareness and societal influences related to ESG issues can prompt students

to embrace ethical investment behavior. This framework implies that students are influenced by broader societal views on sustainability, reinforcing the role of subjective norms in investment decision-making.

Zhang, Ma, and Zhang (2024), further explored the relationship between subjective norms and students' perceptions of investment efficacy, specifically addressing the role of social self-efficacy in determining investment intention. In contexts where peers endorse ESG investments, students may sense an increased obligation to follow suit, perceiving investment decisions as beneficial to societal outcomes. However, there are still challenges, with Friede identifying several challenges that hinder investors from effectively incorporating ESG factors into decision-making processes. These include deeply rooted societal norms prioritizing short-term financial returns over ethical considerations, consequently affecting students' willingness to embrace sustainable investments. Despite the ability to promote ESG-oriented behavior, subjective norms can also constrain investments due to prevailing societal values and beliefs (Friede, 2019).

The subjective norms of students significantly impact investment decisions in ESG companies. Students increasingly relate financial decisions to sustainability commitments, shaped by peer pressure, societal expectations, and personal values. This dynamic interaction underscores the crucial role of social psychology and normative influences in shaping investment behavior related to ESG initiatives. The relationship between students' financial literacy and investment decisions in ESG companies is complex. Although financial literacy is often considered an essential element affecting investment behavior, its direct impact on ESG investment may not be as pronounced as expected. Febrynanda and Martono (2023) explored the relationship between financial literacy and students' investment interest, observing that limited financial literacy can lead to reduced motivation to engage in investment activities.

Although financial literacy may affect general investment interest, it may not necessarily dictate decisions concerning ESG investments. It was found that financial literacy did not mediate herding bias in investment decisions. Therefore, students may follow collective investment decisions irrespective of their financial literacy levels, emphasizing the dominant role of social factors in ESG-related decision-making. Ekanagara, Puspitasari, and Munir (2023) reported varying effects of financial literacy on investment decision, stating that while some studies found a correlation, others did not identify a significant relationship. The results confirm that the influence of financial literacy can vary depending on the investment type, exemplified by the lack of a significant relationship between financial literacy and the decision to invest in Islamic stocks.

The study conducted by Wicaksono and Jihadi (2022) confirmed that although students with strong financial literacy might effectively manage and plan finances, there was no direct correlation with the decision to invest in ESG stocks. Therefore, financial literacy alone may not be sufficient to predict specific investment behaviors. The results emphasize the importance of understanding the relationship between students' social environments, perceptions, and financial literacy. Al Hakim and Jihadi (2023) provided differing results, relating increased financial literacy to improved overall investment decision making 2025/6/28. However, the results did not explicitly consider the effects of ESG investment.

Investigations into behavioral biases confirmed that while financial literacy was a contributing factor, it might not be significant enough to mitigate biases like overconfidence or herding, both capable of influencing students' investment decisions irrespective of their financial education (Al Hakim & Jihadi, 2023). The influence of financial literacy on students' investment decisions in ESG companies appears to be constrained. Factors such as social norms, behavioral biases, and potential gaps in ESG-focused educational resources can obscure the benefits of financial literacy in guiding ethical investment decisions. Although financial literacy is a significant aspect of financial decision-making, its direct influence on students' ESG investment behavior tends to be limited. The impact of students' perceptions of ESG risks on investment decisions in ESG companies can be analyzed through multiple studies, emphasizing inconsistencies in this area. Although conventional finance literature has shown that risk perception significantly influences investment behavior, studies focusing on ESG-specific contexts have reported a more complex scenario.

Raut, Shastri, Mishra, and Tiwari (2023), confirmed that perceived risk did not significantly affect the intention to invest in ESG stocks among investors who held a favorable view of investment. Although investor satisfaction may be shaped by perceived risks relative to expectations, these perceptions do not significantly influence the actual decision to invest in ESG companies. Students with a positive attitude toward ESG initiatives may find that their risk perceptions do not hinder their intention to invest.

Aksoy, Buoye, Fors, Keiningham, and Rosengren (2022) emphasized that despite being able to influence customer attitudes, increased perceptions of risk did not inherently result in reduced engagement with companies prioritizing ESG initiatives. Therefore, other factors may take precedence over risk-related concerns when students make investment decisions. Deka et al. (2023) found a significant relationship between ESG awareness and perceived risk among Indian retail investors, although the relationship did not consistently influence investment decision. The studies confirmed that many investors, including students, exhibit a gap between their comprehension of ESG risks and the impact of risks on investment decisions. Makhija et al. (2023) emphasize the significant role of subjective beliefs in shaping investors perspectives on ESG issues. This study further confirmed that the perceived benefits of social ESG initiatives typically outweigh the associated risks. Therefore, investors perspectives, often shaped by social dynamics rather than risk considerations, play a crucial role in guiding investment decisions.

The influence of risk perception appears limited when students evaluate ESG investments, despite being recognized as a component of financial decision-making. Factors such as ethical alignment and societal impact can outweigh perceived risks. As supported by Lee et al., the performance of ESG-integrated portfolios shows that perceived risks do not significantly influence investment behavior. Instead, investors tend to prioritize long-term benefits over short-term ones (Lee, Fan, & Wong, 2021). Generally, students' perceptions of ESG risks did not significantly impact their investment decisions in ESG companies. Favorable views toward ESG initiatives, social dynamics, and ethical considerations often take precedence in decision-making processes, thereby reducing the role of perceived risk in ESG investment evaluation.

5. Conclusions

5.1 Conclusion

This study demonstrates that ESG awareness and subjective norms are the primary drivers of university students' interest in ESG investments. Both Partial Least Squares Structural Equation Modeling (PLS-SEM) and machine learning-based PLS Regression confirmed that these two factors play a significant role in shaping students' investment decisions. Financial literacy had a positive influence but was not as strong as ESG awareness and subjective norms in predicting ESG investment interest. Similarly, ESG risk perception has a relatively limited impact on students' investment behavior. These findings indicate that students' ESG investment interest is shaped not only by financial knowledge but also by their understanding of sustainability issues and the social environment surrounding their investment choices. Therefore, integrating ESG education into university curricula, strengthening sustainability-related learning, and encouraging positive social influences can help foster a more responsible investment culture among young investors.

5.2 Research Limitations

This study had several limitations. First, the sample size was relatively small and limited to 104 accounting students from two universities in Papua, Indonesia, which may restrict the generalizability of the findings to broader populations. Second, the cross-sectional design limits the ability to observe changes in ESG investment interests over time. Third, this study focused only on financial literacy, ESG awareness, subjective norms, and ESG risk perception, while other potential factors, such as social media exposure, digital financial platforms, peer investment communities, and online ESG campaigns, were not examined. These limitations suggest that the findings should be interpreted carefully, particularly when applied to students from different disciplines, regions or investment experience levels.

5.3 Suggestions and Directions for Future Research

Future studies should expand the sample size and include students from various academic disciplines, such as management, economics, finance, law, engineering, environmental studies, and social sciences to improve the generalizability of the findings. Longitudinal research is also recommended to examine how ESG investment interest develops over time, especially after students receive ESG education, investment training or exposure to sustainability campaigns. In addition, future research should explore the influence of social media on ESG investment decisions, considering that platforms such as Instagram, TikTok, YouTube, X, and LinkedIn increasingly shape young investors' awareness, attitudes, perceived norms and trust in sustainable investment products. Further studies should examine how ESG-related content, financial influencers, online investment communities, and digital campaigns affect students' ESG awareness, risk perception, and investment intentions. Finally, future research should integrate social media variables into the PLS-SEM and machine learning framework to provide a more comprehensive understanding of ESG investment behavior in the digital era.

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Author Contributions

BP conceived the study design, developed the research questions, and conducted the data analysis using PLS-SEM and machine learning-based PLS Regression. JW assisted with the literature review, data collection and manuscript drafting. CM reviewed and provided feedback on the methodology and YM results interpretation and contributed to the final editing of the manuscript. All the authors have read and approved the final manuscript.

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