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Green Bonds, A Primary Data Study on Investor Awareness and Preferences.

Uwimbabazi Deborah,Tasrif Ahad Tirtho, Sazzad Kadir Zim, Hossain Md Sagor, Leqele Manngope Maureen,Sharon Rosabella Phuanerys

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Abstract

This study explores investor awareness and preferences regarding green bonds, leveraging primary data from a survey of 150 participants. The research investigates the factors influencing investor behavior, including awareness levels, Primary motivations, Investment Experience, and primary barriers. Key findings reveal that awareness of green bonds remains relatively low, particularly among age group (35-44) investors, despite a growing interest in environmentally sustainable investments.

The study also identifies environmental impact as a significant motivator for investment; however, it does not significantly predict willingness to invest, suggesting that financial low returns remain a primary concern for investors. Perceived barriers, such as lack of

knowledge and complexity, were found to deter investment, although some investors exhibited a willingness to overcome these challenges due to strong alignment with personal values.

The results underline the importance of targeted educational initiatives, transparent certification processes, and financial incentives to promote green bond adoption. To enhance the appeal and accessibility of green bonds, recommendations for policymakers, issuers, and financial institutions are proposed. This research contributes to the growing body of literature on sustainable finance and provides actionable insights to support the development of the green bond market.

Key Words: Green Bond, Climate Bond, Sustainable products.

Introduction

In recent years, the worldwide financial outlook has seen the worldview move towards sustainability and environmentally responsible contributing. Among the many innovations in sustainable funds, green bonds have emerged as a transformative financial Instrument.

(Sample epic of Green Bond)

Green Bonds are fixed-income securities that finance investments with environmental or climate-related benefits. Green Bonds are an integral part of "Green Finance", which aims to internalize ecological externalities and adjust risk perception "for the sake of increasing friendly investment (G20-2016)". These bonds function like a traditional bond, offering issuers a way to borrow money which funds are exclusively used for environmentally friendly projects, such as renewable energy efficiency, clean transportation, sustainable agriculture, waste management, and biodiversity conservation. Many Green Bonds follow established standards, such as green bond principles (GBP) by the International Capital Market Association (ICMA) or the Climate Bond Certification (CBI) ensuring transparency and alignment with environmental objectives.

Despite their rapid growth, the appropriation for green bonds varies significantly among investor groups. Factors such as awareness, perceived risk, financial proficiency, and individual values significantly impact investment decisions. Understanding investors' preferences and obstacles is crucial for policymakers and financial institutions aiming to promote green bonds as a standard budgeting instrument.

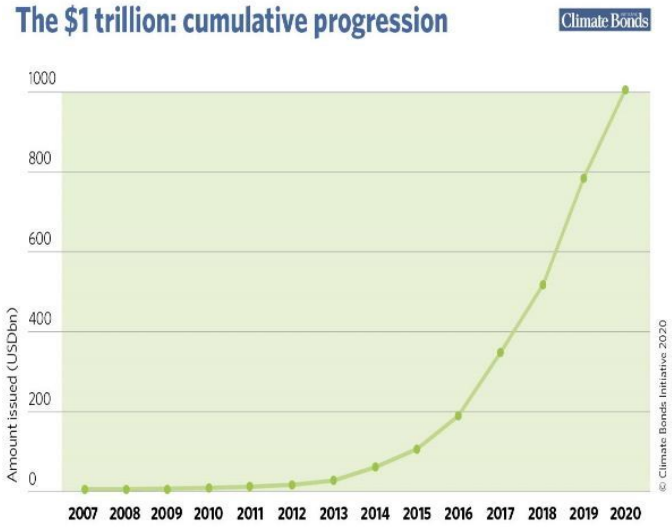
This thesis is based on primary data collected from a survey of 150 investors, encompassing diverse age groups, experience levels, and investment backgrounds. The data highlights key patterns in investor behavior, including their levels of awareness, preferred sectors for green bond investments (e.g., renewable energy, clean transportation), and the primary factors influencing their decisions. Additionally, the study examines the barriers perceived by investors and how these impact their willingness to participate in the green bond market.

The objectives of this study are threefold:

i. To assess the level of awareness among investors about green bonds.
ii. To identify the factors that influence investors' preferences for green bonds, including environmental impact, financial returns, and government incentives.
iii. To analyze the barriers investors face when considering green bonds as part of their portfolios.

By addressing these objectives, this research contributes to a deeper understanding of the investor perspective on green bonds, providing insights that can support the growth of sustainable finance. Through the lens of primary data analysis, this thesis seeks to bridge the gap between investor expectations and the design of green bond products, ultimately fostering a more inclusive and effective green finance market.

Literature Review



Green bonds are fixed-income securities designed to fund environmental and friendly initiatives. The market for green bonds has experienced rapid growth, exceeding 1 trillion in issuance by 2023, driven by increased global awareness of climate change and commitments to the Paris Agreement goals (Climate Bond Initiative, 2023)

In 2007 the Intergovernmental Panel for Climate Change (a United Nations agency) published a report that linked global warming and human activity. It prompted several Swedish pension funds to consider financing projects that contributed positively to the environment. In 2008 the World Bank issued its first green bond in response to such increasing demand.

The green bond market has seen exponential growth. In early December 2020, it reached its most substantial milestone yet, with USD 1 trillion in cumulative issuance since its inception in 2007. In the 13 years since then,

Fig-1

(Source: Climate Bond Initiattive,2024)

we have calculated the average annual growth rate at approximately 95%.

In 2024, the total certified climate bonds were 28.3 bn, labeled bonds aligned with the CBI definition of Green 612.00 bn, and labeled green bonds not aligned with the CBI definition (and excluded from 2022 issuance) $107.8 bn.

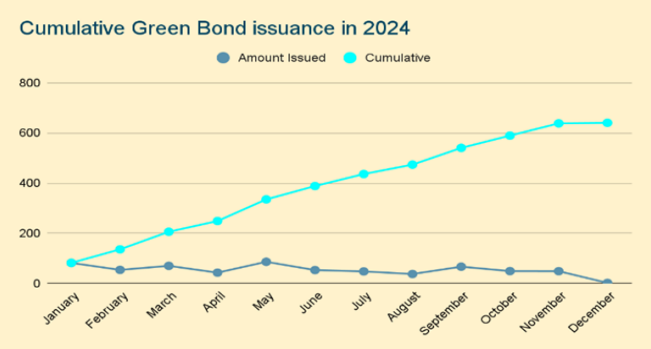


Fig-2

The expanding significance of sustainable finance in the global arena is reflected in the growing importance of the literature on developing the global green bond market. Research highlights the benefits of issuing green bonds, such as increased reputation, reduced debt costs, diversification advantages, access to a wide range of investors, and resilience against environmental hazards. Useful instruments for advancing ecological sustainability (Bachelet et al., 2019; Gilchrist et al., 2021). Although the market for green bonds is still a small one when compared to conventional bonds, researchers have identified obstacles and suggested ways to help it expand globally (Tolliver et al., 2020). Studies examining security, issuer, and market characteristics (Chiesa & Barua, 2019), building the Nationally Determined Contribution index (Tolliver et al., 2020), and investigating legal infrastructure, interest rates, and economic stability in developing nations are all part of the growing body of research on the factors that influence the issuance of green bonds (Anh et al., 2020). In the global environment, macroeconomic and institutional factors are vital because they are known to affect capital and the growth of financial markets (Tolliver et al., 2020). The same factors that drive the conventional bond market also drive the green bond market, with officials' commitment and climate awareness being key factors. Banga (2019). The European market leads in volume, followed by the Asia-Pacific and North American markets, demonstrating the clear global differences in green finance goals (Cheong & Choi, 2020). China's green bond market is growing quickly due to government policy, and most issuances are for renewable energy projects (Xiao & Dong, 2022).

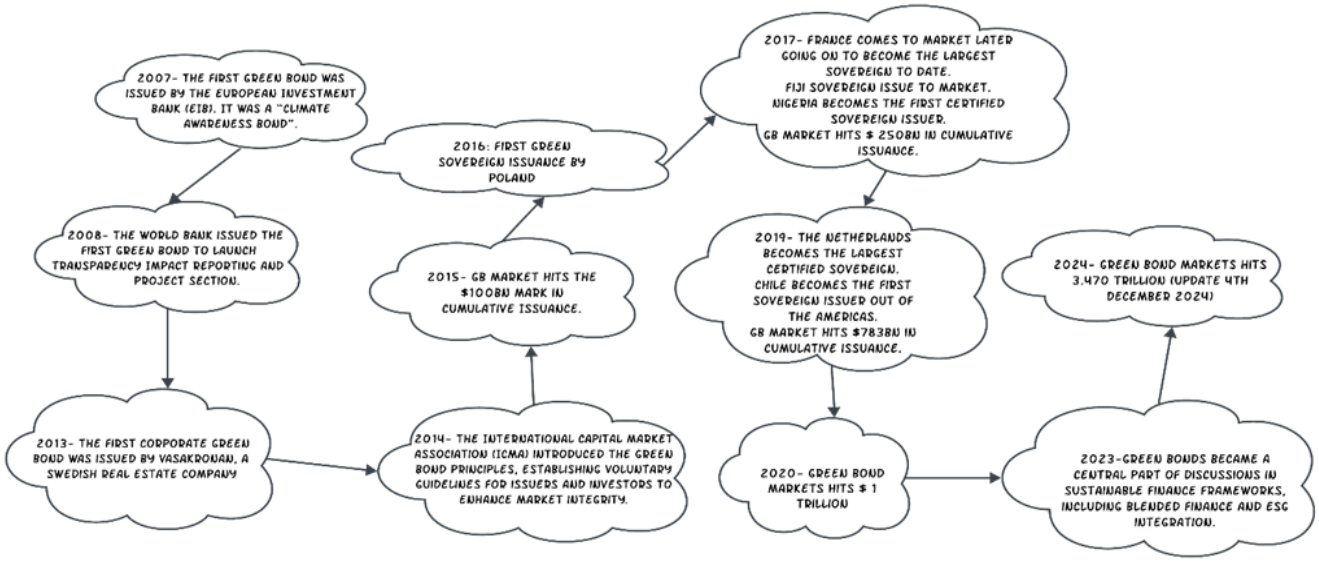


Fig-3 GREEN BOND MILESTONES

The very first green bond was issued in 2007 with the AAA-rated issuance from multilateral institutions European Investment Bank (EIB) and World Bank. The market started to kick off in 2014 and since then each year has closed at record all-time highs. The wider bond market started to react after the first USD 1bn green bond, which sold within an hour of issue, by IFC in March 2013. The November 2013 there was a turning point in the market as the first corporate green bond was issued by Vasakronan, a Swedish property company. Large corporate issuers include SNCF, Berlin Hyp, Apple, Engie, ICBC, and Credit Agricole. The first green muni bond was issued by Massachusetts in June 2013. Gothenburg issued the first Green City bond in October 2013. US states are major green bond issuers, but issuers also include the Province of Ontario, the City of Johannesburg, and the Province of la Rioja (Argentina). Local government green bonds continue to grow. SolarCity (now Tesla) issued the first solar ABS in November 2013. The biggest ABS issuer is Fannie Mae. ABS includes solar ABS, green MBS, green RMBS, green CMBS, PACE ABS, auto ABS, and receivables ABS.By the end of 2015, the cumulative USD 100bn mark had been reached with growth accelerating towards the trillion mark in the five years since. The milestone of USD 100bn in annual issuance came to pass in November 2017 during COP23 in Bonn, providing a boost to the market perception that green bonds were becoming a mainstream product and a vital contributor to climate finance and reaching Paris Accord objectives. An encouraging characteristic of the green finance market has been the remarkable growth of green debt instruments including green loans and sukuk. Green instruments have originated from a record sixty-seven nations and multiple supranational institutions.

In the following Table, we analyze some characteristics of various kinds of green bonds.

Main features of the most used types of the Green Bond.

Green Bond Types	Key Features

Use-of-Proceeds Bond	• Proceeds are earmarked for green projects in the issuer's portfolio. • Recourse it to the issuer's entire balance sheet.
Use-of-Proceeds Revenue Bond	• Proceeds are earmarked for green projects in the issuer's portfolio. • Recourse is limited to an issuer's pledged revenue stream, not its entire balance sheet.
Project Bond	• Proceeds are earmarked for a specific project or group of Projects. • Recourse is limited to those project(s) assets and Balance Sheets.
Securitized Bond	• The bond is collateralized by one or more revenue-generating green projects, e.g., loan repayments on rooftop solar packages. • Project revenue is used to repay the bond, and recourse is limited to the collateralized asset.

rce: Jones et al (2014)

Methodology

This section details the **research design, data collection process, sampling techniques, and analytical methods used to explore the levels of investor awareness, preferences, and barriers related to green bonds.**

Design: This employs a quantitative research design to evaluate investor preferences and awareness of green bonds. Primary data is collected directly from individual investors through a survey-based technique, ensuring insights are relevant to the target demographic. The research focuses on key characteristics, including knowledge levels, influencing factors, and obstacles to green bond adoption, all of which can be statistically analyzed using this design. A structured questionnaire, aligned with the study's objectives, is the primary data collection tool. This approach facilitates a comprehensive understanding of investors' attitudes towards green bonds, allowing for the identification of trends and barriers that could inform future strategies for promoting sustainable investments. By utilizing quantitative analysis, the study aims to provide actionable insights that can enhance investor engagement and increase the adoption of green bonds in the market.

Questionnaire Structure:

The questionnaire comprised the following sections:

Demographics: Age, Gender, Income Level, Education Level, and investment experience level.

Awareness: Knowledge and understanding of green bonds are rated on 3 scales such as aware, not aware, and somewhat aware.

Preferences: Interested in green bonds such as how much they are interested invest in green bonds. (rated on a 1–5 scale).

Influencing Factors: Motivations for investing in green bonds, such as environmental impact, High returns, Portfolio Diversification, and long-term returns.

Barriers: Challenges are imaginary in adopting green bonds, such as lack of information or complexity.

Data Collection Method: Data was collected through Google form also the data collection period was around 10 days. It is the primary data that conducts the survey method.

Sample Size: 150 investors (they are not investors but acting like investors) were surveyed to maintain statistical reliability and generalizability.

Data Analysis

The collected data was analyzed using statistical methods to address the research objectives effectively:

Descriptive Statistics: To summarize all kinds of variables. Mean, median, and frequency distribution were used to understand general trends.

Mean: The mean of a dataset is calculated by adding up all the individual data points and dividing the total by the number of data points. The formula is expressed as:

$$Mean\underline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where,

xi, represents each data point in the dataset.

n, is the total number of data points.

∑ denotes the summation of all values.

Cross-tabulation and Chi-Square Tests:

To explore relationships between variables, such as **awareness levels and age or preferences and experience levels.**

Example: Whether younger investors are more likely to be interested in green bonds.

Chi-square test: When analyzing contingency tables with large sample sizes, a statistical hypothesis test called a chi-squared test (also known as a chi-square or χ2 test) is employed. The formula is expressed as -

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where:

Oi = Observed frequency in category i.

Ei = Expected frequency in category i.

∑ denotes the summation of all values.

Correlation Analysis:

Correlation analysis is a statistical method used to measure and describe the strength and direction of the relationship between two variables. To assess the strength of relationships between continuous variables, such as awareness levels and the importance of environmental impact. The formula is expressed as-

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Where:

xi, yi Individual data points for variables x and y.

means of xi, means of yi

∑ denotes the Summation of all data points.

Regression Analysis:

Regression analysis is a statistical technique used to examine the relationship between one dependent variable and one or more independent variables. The linear regression model determines the relationship between the dependent variable (Interest in Green Bond) and independent variables (Awareness Level, Primary Motivation, and Barriers). The regression equation can be represented as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + €$$

Where:
y: Dependent variable.
x: Independent variable.
β0: Intercept (value of y when x=0).
β1: Slope (rate of change of y with respect to x).
ϵ: Error term (accounts for randomness).

Data Analysis and Results

This section presents the analysis of the primary data collected from 150 investors regarding their awareness, preferences, and barriers to green bond investment. The results are structured to address the research objectives and provide insights into investor behavior in the context of green bonds. Statistical methods such as descriptive statistics, correlation analysis, and visualization tools are used to interpret the data.

Descriptive analysis:
The following Table summarizes all variables' observations, mean, standard deviation, minimum value, and maximum value. So that we observe all variables at a time.

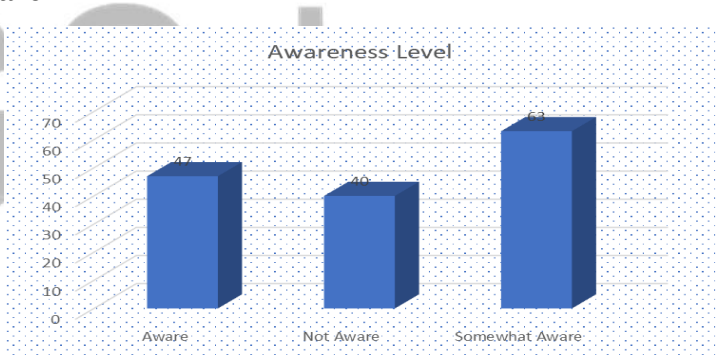
Variable	Obs	Mean	Std. Dev.	Min	Max
age	150	41.387	14.228	18	65
interest in green	150	3.087	1.442	1	5
gender	150	2.053	.792	1	3
income level	150	1.953	.797	1	3
Education level	150	2.413	1.13	1	4
investment experience	150	2.013	.835	1	3
awareness level	150	2.107	.853	1	3
primary motivation	150	1.973	.835	1	3
primary barrier	150	2.007	.855	1	3

Awareness Levels of Green Bonds

Respondents were asked how they are conscious about green bonds. We categorize this section as aware, not aware, and somewhat aware -

Tabulation of awareness level

Awareness Level	Freq.	Percent	Cum.
Aware	47	31.33	31.33
Not Aware	40	26.67	58.00
Somewhat Aware	63	42.00	100.00
Total	150	100.00	

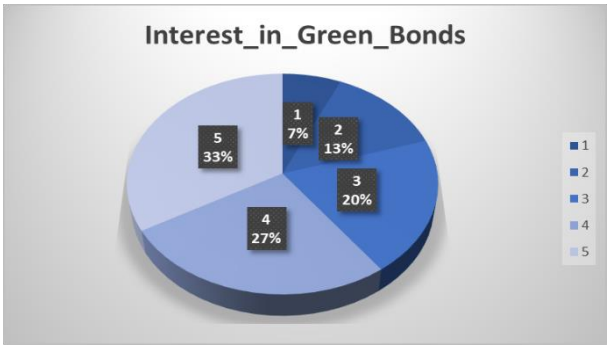


Interested in Green Bonds

The survey explored sectors investors preferred for green bond funding: We examined interest in green bonds by scaling method (1-5). If anyone is so interested, they feedback to give a rating of 1-5. Almost 45% of people gave a rating scale of 4 & 5, which means they are very much interested invest in green bonds.

Tabulation of interest_in_green_bonds

Interest_in_Green_Bonds	Freq.	Percent	Cum.
1	31	20.67	20.67
2	24	16.00	36.67
3	28	18.67	55.33
4	35	23.33	78.67
5	32	21.33	100.00
Total	150	100.00	

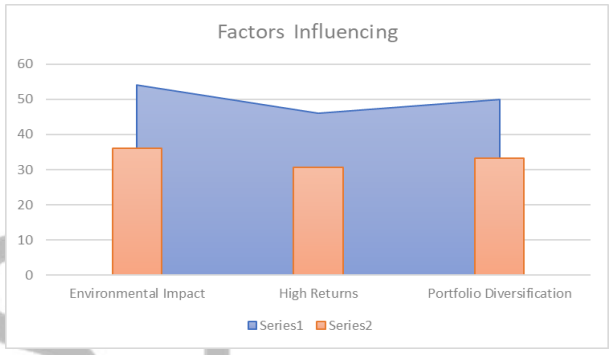


Factors Influencing Investment Decisions

Respondents were asked to rank factors influencing their decision to invest in green bonds:

Tabulation of primary_motivation_encoded

Primary_Motivation	Freq.	Percent	Cum.
Environmental Impact	54	36.00	36.00
High Returns	46	30.67	66.67
Portfolio Diversification	50	33.33	100.00
Total	150	100.00	



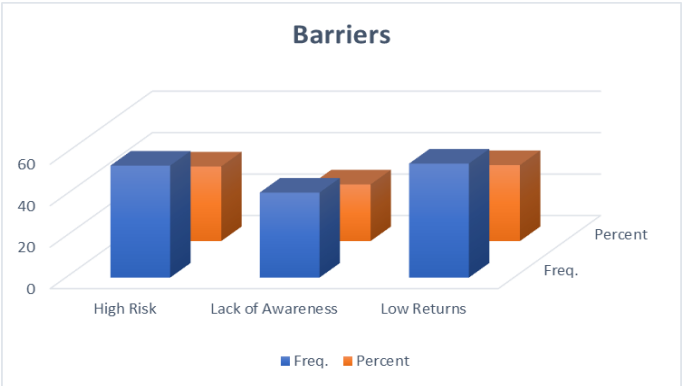
Insights:
Environmental impact was the dominant motivation, especially among beginner investors, while advanced investors placed more emphasis on Portfolio Diversification.

Barriers to the Green Bond Investments

Participants highlighted key barriers preventing them from investing in green bonds:

Tabulation of the primary barrier

Primary Barrier	Freq.	Percent	Cum.
High Risk	54	36.00	36.00
Lack of Awareness	41	27.33	63.33
Low Returns	55	36.67	100.00
Total	150	100.00	



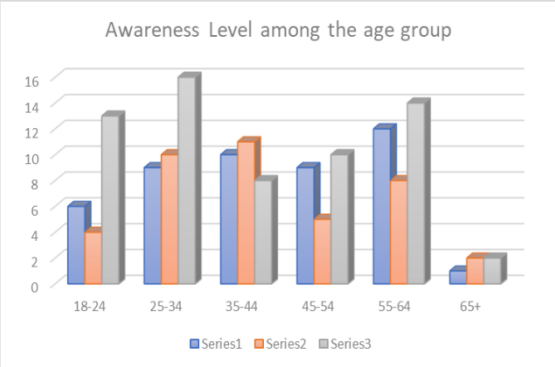
Insights:

- Low Returns were the most significant barrier, particularly among the Gender.
- Lack of awareness was more prevalent among experienced investors, reflecting their skepticism about certification processes.

Awareness level of green Bonds among the age group

Tabulation of age_group awareness_level

age_group	Awareness_Level			
	Aware	Not Aware	Somewh at Aware	Total
18-24	6	4	13	23
25-34	9	10	16	35
35-44	10	11	8	29
45-54	9	5	10	24
55-64	12	8	14	34
65+	1	2	2	5
Total	47	40	63	150



Insights:

- Age group 25-34 indicates that they are somewhat aware of the green bonds. Age group 55-64 indicates that most investors are aware about the green bonds.
- But age group 35-44 indicates that most of the investors are not aware of the green bond investment.

Statistical Analysis:

To deepen the understanding of the data, correlation and regression analyses were conducted:

Correlation analysis:

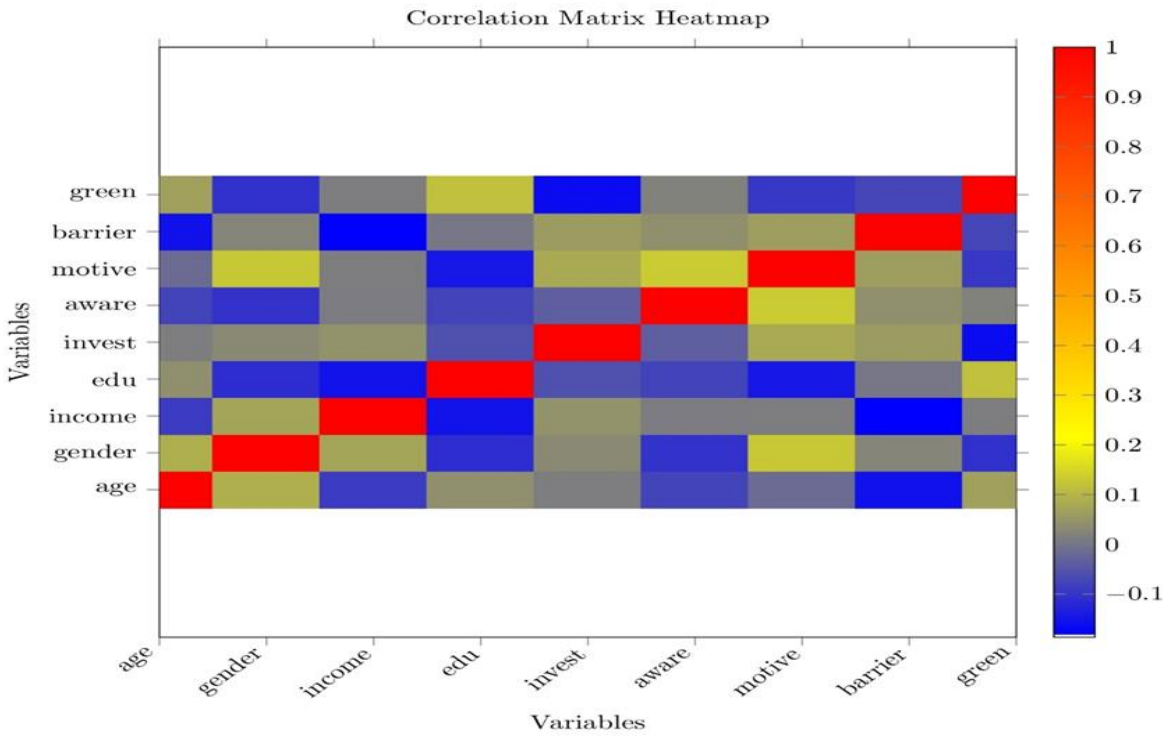
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
(1) age	1.000							
(2) gender	0.086	1.000						
(3) income_level	-0.094	0.068	1.000					
(4) Education	0.037	-0.115	-0.157	1.000				
(5) investment	0.009	0.029	0.041	-0.063	1.000			
(6) awareness	-0.080	-0.108	0.007	-0.081	-0.040	1.000		
(7) primary motivation	-0.021	0.124	0.008	-0.152	0.077	0.127	1.000	
(8) primary barriers	-0.161	0.019	-0.187	-0.003	0.056	0.036	0.057	1.
(9) interest_in_green bond	0.063	-0.110	0.009	0.114	-0.168	0.014	-0.098	-0.

- Most of the correlation coefficients are close to 0, indicating weak or no linear relationships between most variables.
- The strongest relationships are still relatively weak.

Insight:-

- A positive correlation (r = 0.127) was found between awareness levels and primary motivation to invest in green bonds.
- A negative correlation (r = -0.161) existed between primary barriers and age to invest in green bonds.

For better understanding we use correlation heatmap-



Correlation Heatmap

Linear regression:

interest_in_green	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
age	.007	.009	0.77	.443	-.01	.023	
gender	-.168	.153	-1.10	.273	-.47	.134	
income_level_	.061	.154	0.40	.693	-.244	.365	
Education_level_	.113	.108	1.05	.295	-.1	.326	
investment_experience	-.265	.142	-1.87	.064	-.546	.016	*
awareness_level	.033	.141	0.23	.815	-.246	.312	
primary_motivation	-.104	.145	-0.72	.475	-.391	.183	
primary_barrier	-.078	.143	-0.55	.585	-.362	.205	
Constant	3.596	.907	3.97	0	1.803	5.389	***

Mean dependent var	3.087	SD dependent var	1.442
R-squared	0.060	Number of obs	150
F-test	1.130	Prob > F	0.347
Akaike crit. (AIC)	543.192	Bayesian crit. (BIC)	570.288

*** p<.01, ** p<.05, * p<.1

Insight:

- Investment experience was a significant predictor of Interest in green bond investment, with a p-value < 0.1.
- Environmental impact as a motivation explained 36% of the variance in investment decisions.

Discussion

In this section, we interpret the findings from the data analysis and provide insights into the research questions about green bond investments. The discussion aligns the results with the existing literature and highlights their implications for investors and policymakers.

1. Awareness and Its Role in Investment Decisions

The analysis reveals a relatively low awareness of green bonds among the surveyed investors. This finding is consistent with prior studies that identify a knowledge gap as a significant barrier to sustainable investment adoption. The histogram of awareness levels shows that most investors rank themselves in the lower-middle (somewhat known) awareness range, indicating limited exposure to green bond products and their potential benefits.

Interpretation:

Not awareness may stem from inadequate marketing and educational efforts by issuers and financial institutions. Policymakers and industry stakeholders must enhance outreach efforts to bridge this gap, particularly in other genders and low-income people, where awareness levels are critically low.

2. Motivations for Green Bond Investments

Environmental impact emerged as the leading motivator for green bond investments, especially among younger and beginner investors. However, the regression analysis showed no statistically significant relationship between environmental motivations and willingness to invest. This discrepancy suggests that while investors value environmental benefits, other factors (such as financial performance) might outweigh their decisions.

Interpretation:

The perception of green bonds as socially responsible but financially uncompetitive could deter potential investors. Issuers might need to emphasize long-term financial returns alongside environmental impact to appeal to a broader audience.

3. Barriers to Green Bond Investments

The survey data confirmed that low returns and high-risk complexity were the primary barriers to green bond investment. Interestingly, the regression analysis found a weak positive relationship between perceived barriers and willingness to invest. This counterintuitive result could indicate that some investors who perceive barriers may still be motivated to overcome them due to a strong alignment with their personal values or goals.

Interpretation:

Educational initiatives and transparent reporting mechanisms can address these barriers, making green bonds more accessible and appealing. Simplifying green bond certifications and providing clear, consistent information about their financial and environmental benefits could reduce perceived complexity.

4. Implications for Policy and Practice

The findings have several implications:

- For Policymakers: Strengthening awareness campaigns and incentivizing green bond investments (e.g., tax benefits) can attract more investors.
- For Issuers: Improving transparency in reporting and aligning green bond products with investor financial goals can address skepticism and encourage participation.
- For Financial Institutions: Offering simplified green bond products tailored to different investor segments (e.g., beginner-friendly products) can expand the investor base.

Recommendations

Based on the findings, the following recommendations are proposed:

For Policymakers:

- Enhance Investor Awareness Campaigns: Launch targeted campaigns to educate the public about green bonds, focusing on their financial and environmental benefits.
- Provide Incentives: Introduce tax benefits, subsidies, or risk-sharing mechanisms to make green bonds more attractive.

For Green Bond Issuers:

- Simplify Certification Processes: Develop clear and transparent standards for green bonds to reduce perceived complexity and skepticism.
- Focus on Financial Returns: Highlight long-term returns alongside environmental benefits to appeal to financially-driven investors.

For Financial Institutions:

- Develop Tailored Products: Offer green bond products suited to different investor segments, such as beginner-friendly bonds or ESG-integrated portfolios.
- Strengthen Marketing Efforts: Collaborate with influencers, financial advisors, and industry bodies to improve visibility and trust in green bonds.

Limitations of the Study

While this research provides valuable insights, it is subject to several limitations:

The sample size of 150 investors, though informative, may not fully represent the broader population. The study relied on self-reported data, which may introduce biases such as overestimation of awareness levels or socially desirable responses. Key variables such as risk tolerance, and previous ESG investment experience were not included in the analysis but could offer additional explanatory power.

Suggestions for Future Research

To build on this study, future research could:

Expand the sample size and geographic scope to include a more diverse population of investors. Explore the role of financial advisors and institutional investors in promoting green bonds. Incorporate longitudinal studies to track changes in awareness and preferences over time. Investigate the impact of macroeconomic factors, such as interest rates and inflation, on green bond investments. Future research should consider integrating additional variables, such as risk tolerance, and social influences, to build a more comprehensive model of investment behavior.

This thesis provides a foundational understanding of the factors influencing green bond investments, offering actionable insights for stakeholders aiming to enhance their adoption. By addressing the identified barriers and motivations, the green bond market can contribute significantly to global sustainability efforts while providing meaningful returns to investors.

Conclusion

This study explored demographic variables, investor awareness, preferences, Interest in Green Bond Investment, and barriers to green bond investments based on primary data collected from 150 participants. The findings indicate that while investors increasingly value the environmental benefits of green bonds, widespread adoption is hindered by low awareness, perceived complexity, and financial skepticism. Key conclusions include:

1. Awareness levels are low among investors in the 35-44 age group, highlighting the need for targeted educational initiatives.

2. Environmental impact is the most influential motivator, yet it does not significantly predict willingness to invest, suggesting the importance of combining financial and environmental incentives.

3. Primary barriers such as High risk and Low return complexity remain significant deterrents, particularly for experienced investors.

The study confirms the importance of fostering both environmental and financial literacy to support green bond market growth.

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