Which of Green Would You Prefer, Case of Green Sukuk and Green Bonds?

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ABSTRACT

Growing environmental concerns highlight the urgent need to protect the planet and promote sustainable development. Consequently, many organizations are adopting environmentally friendly practices. Green finance helps projects that enhance environmental sustainability. Because of worldwide demand, green sukuk and bonds have grown significantly. The average yields of green bonds and sukuk differ substantially, indicating distinct return profiles. Empirical evidence suggests that green sukuk generate higher returns than green bonds. These findings imply that investors in green sukuk may achieve higher returns compared to other green finance instruments. Green sukuk may appeal to investors looking for higher returns with lower risk, those investing in non-Islamic financial jurisdictions, investors motivated by ethical or religious considerations, or those aiming to diversify their portfolio. From the issuer's perspective, green sukuk offer higher yields than green bonds, potentially attracting a broader investor base, especially Shariah-compliant investors. When properly managed, both green bonds and green sukuk can reduce risk while enhancing returns. Green sukuk also enable non-Islamic issuers to diversify their investor base while financing environmentally sustainable projects. The findings suggest that governments should adopt innovative approaches to promote green bonds and sukuk. Given their distinct structures and limited interconnectedness, these instruments require tailored regulatory frameworks, particularly in jurisdictions utilizing Islamic finance. A comprehensive green finance strategy can enhance national risk management and sustainability outcomes.

Keywords: Green bonds, Green sukuk, OLS, Sariah compliance, Green finance, YTM

1. Introduction

Many countries worldwide have increasingly prioritized a green economy and sustainable development. Sustainable financing refers to financial solutions that integrate long-term corporate investments with persistent social and environmental goals. These include green bonds, microcredit,

social banking, and impact bonds that are designed to support environmental activities [1]. Sustainable finance facilitates the mobilization of funds for equitable and environmentally sustainable development, thereby enhancing financial inclusion. Environmental sustainability has become a critical concern for governments, financial markets, and enterprises. As a result, various green financing instruments have been introduced to encourage investment in sustainable operations. Green debt is often expressed as green loans or green bonds. The International Capital Market Association (ICMA) defines green bonds as financial instruments whose proceeds are solely used to fund recognized green activities, such as renewable energy or sustainable infrastructure. Similarly, Green Loan Principles ensure that loan proceeds are used solely for environmentally sustainable purposes.

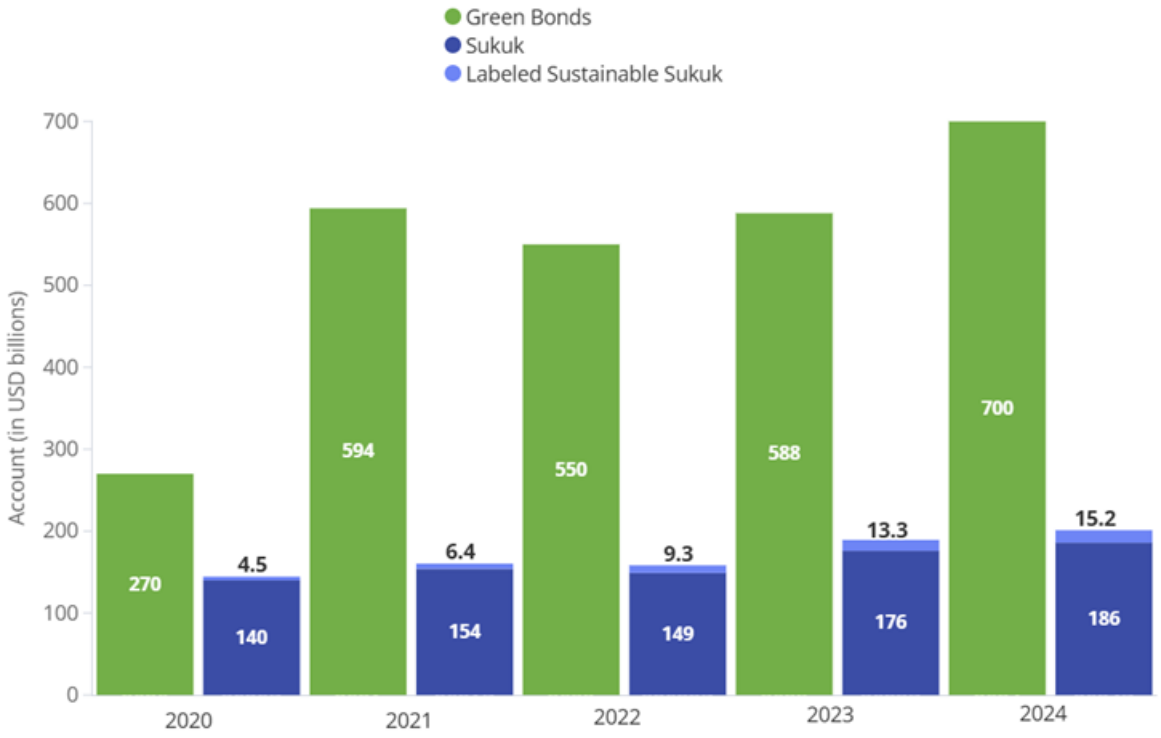

Figure 1. Green bonds, Green Sukuk and Sukuk volumes

Source: World Bank

Between 2020 and 2024, Figure 1 illustrates the annual issuance of green bonds and green loans. In 2021, green bond issuance increased dramatically, more than quadrupling from the previous year. In future years, the quantity stayed essentially constant. Although issued smaller volumes, green loans exhibited substantial growth, increasing more than tenfold between 2020 and 2023. Overall, these trends indicate a significant rise in the adoption of green financial instruments. A major concern associated with green bonds is greenwashing, which refers to the practice of misrepresenting the environmental benefits

of financial products, services, or activities. This strategy takes advantage of the increased customer interest in environmentally sustainable items. The goal of this "green sheen" or "spin" tactic is to fool customers by misrepresenting or fabricating bogus environmental benefits, hence impeding genuine measures to solve environmental degradation and climate change. As a consequence, investor confidence in green bonds has been adversely affected.

The authors of the study discovered that statements on the issue of green debt may have a detrimental influence on stock prices. According to Bhagat and Yoon [2], corporations may release comments expressing their commitment to increasing environmental awareness and climate friendliness, notwithstanding management's unwillingness to adopt alternative legislation. The fifth criteria established by Aloui and Hammoudeh [3] states that if the stock market is unconcerned about a company's efforts to greenwash through the issuing of green debt, there will be no market reaction to the announcement of such debt issuance. Alternatively, if the market perceives green debt issuance as an indication that management is aware of a financial, operational, or regulatory concern within the corporation but is taking no action, the stock price may fall.

Green sukuks, on the other hand, seek to provide benefits to the economy, society, and environment [4]. Countries are lobbying for a sustainable economy to combat climate change, food insecurity, and financial product difficulties. Innovative financial products such as green sukuk can make a substantial contribution to the growth of the green economy. Sharia law covers Islamic financial products based on environmental sustainability principles [5]. According to [4], Islamic scholars believe that Islamic finance should promote climate action and environmental preservation. Green sukuk, which combine Islamic financial principles with environmental and economic considerations, have the potential to play a critical role in tackling green finance challenges. Green Sukuk's major goal is to fund environmental initiatives that are aligned with the United Nations Framework Convention on Climate Change. According to [6], the major goal of these projects is to improve Islamic finance. Prior to issuing green sukuk in 2017, Indonesia established the Green Bond and Green Sukuk Framework.

In 2022, it successfully raised $6.9 billion by issuing its fifth green sukuk globally. Despite the world economy's continuous turmoil, the Green Sukuk 2022 issue was a significant success. This includes the largest Green Sukuk tranche ever established outside of Indonesia, as well as the first Green Sukuk issuance in Indonesia, with a 10-year maturity duration.

Due to its increased administrative and disclosure requirements, green sukuk issuance entails more stages. This minimizes the likelihood of them becoming "greenwashed" when compared to traditional green bonds. An issuer must get a "greenness" rating from an alternative opinion provider. To be classified as "green," the issuer must submit thorough information, including the project's objectives as well as the issuer's overall strategy, regulations, and procedures [7]. Prior to achieving green certification, significant investigations were carried out, including social and environmental impact evaluations, reporting, and inquiries. Individuals have expressed concerns about the technique, claiming that it complicates the green certification process and incurs large expenditures (OECD, 2017).

The lack of information about green sukuk exacerbates this worry. Nonetheless, the issues that issuers encounter in the green sukuk market have received little attention in academic literature. Since 2017, green sukuk have been actively traded on the Islamic capital market. Previous research on the potential of green sukuk has concentrated on promoting environmentally sustainable activities [8]. Furthermore, green sukuk benefits both markets and financial institutions [9-11]. Green sukuk have additional hurdles from global demand, competitiveness, and financial market specialists. This study will assess the effectiveness of green bonds and green sukuk by analyzing their yield to maturity (YTM). The sample includes daily year-to-date (YTM) data, which is an important statistic for evaluating the performance and financial returns of green bonds and sukuks. The initial section consisted of introduction to the study, followed by the review of the literature. This section is preceded by data and research methodology. The fourth section consists of results and discussion and the final section consists of the conclusion of the study.

2. Literature Review

Businesses that contribute to climate change by emitting greenhouse gases (GHGs) are under increased scrutiny [12]. Since 1988, approximately 100 corporations have been responsible for nearly 70% of total greenhouse gas emissions. In 2017, Griffin reported similar findings. According to Otek Ntsama and Yan [13], climate change poses a major risk to businesses because it affects their overall value. In 2015, governments formed the Paris Agreement to address the serious issue of climate change. According to the United Nations Framework Convention on Climate Change (UNFCCC) [14], global warming should not result in a temperature increase of more than two degrees Celsius above pre-industrial levels. International Energy Agency [15], estimates that more than USD 55 trillion must be raised to maintain this target. According to ElBannan and Löffler [16], several financial instruments have been developed to support this essential transition. Among these, green bonds stand out, accounting for approximately two-thirds of the green finance sector (CBI 2024). Green bonds are used to finance environmentally friendly projects including renewable energy, energy efficiency improvements, and energy conservation initiatives.

The relationship between environmental performance and the issuance of green bonds has not been thoroughly investigated, resulting in mixed findings. Lingnau, Fuchs [17] found that, unlike conventional bond issuers, firms issuing green bonds exhibited lower emissions and higher environmental scores after bond issuance. Studies conducted by ElBannan and Löffler [16], also indicate that the issuance of green bonds is associated with a reduction in scope 1 emissions and emission intensity. However, Zhou and Cui [18] and Cheong and Choi [19] found no evidence that corporate green bonds significantly improve environmental performance. Chausson and Welden [20] identified a significant inverse relationship between the volume of green bonds issued and the future carbon intensity of non-financial firms. This relationship was found to be specific to firms facing financial distress and higher credit risk. Their findings suggest that green bonds may have a limited impact on environmental outcomes. Lam and Wurgler [21] reported that the greenest bonds issued by U.S. firms and municipalities were used for debt refinancing, continuation of existing projects, or the initiation of projects lacking clearly defined green

components. Only 2% of green bond proceeds were allocated to projects utilizing advanced green technologies. According to Lam and Wurgler [21], market participants do not differentiate between varying levels of green additionality.

Regarding Sukuk, it is widely acknowledged among stakeholders and Shariah experts that there is a rigorous process involved in issuing Sukuk, ensuring financiers do not engage in any harmful or unethical activities. Consequently, conventional wisdom suggests that Sukuk have inherent characteristics aligned with socially responsible investment, potentially attracting investors with strong social awareness. Sukuk ensures that the funds raised are allocated to Shariah-compliant investments that are dependable. Several development projects have been financed using Sukuk funds, including affordable housing, vaccination programs, renewable energy initiatives, and educational projects [11, 22-24]. These initiatives appeal to investors who value social responsibility and align with welfare-oriented objectives. According to Nagano [25], the assets backing Sukuk payments are like those underlying conventional bonds.

The parameters used to evaluate conventional bonds and fixed-income cash flows apply to Sukuk investments by traditional investors. Most socially responsible investment (SRI) products are equity-based rather than fixed-income instruments [26]. Investors seeking socially responsible portfolios often face challenges in combining fixed income and equity instruments [22]. Because Sukuk, which matches traditional fixed income cash flows, is on the rise, Islamic financial instruments have the potential to attract the attention of socially responsible investment investors [6].

Various initiatives undertaken by successive administrations have contributed significantly to the promotion and public awareness of SRI Sukuk. In 2012, the Climate Bonds Initiative (CBI) established the green Sukuk working group in collaboration with the Clean Energy Business Council of the Middle East and North Africa (MENA) and the Gulf Bond and Sukuk Association (GBSA) in Dubai to promote low-carbon Sukuk. In Malaysia, Khazanah Nasional Berhad introduced the SRI Sukuk Ihsan. This marked the first instance in which the financial market provided funding for trust schools through sukuk. In early 2015, Khazanah established Ihsan Sukuk Bhd. as a special purpose vehicle to facilitate a ringgit-denominated SRI Sukuk program with a capital base of RM1 billion.

This SRI Sukuk received a AAA rating from RAM Rating Services Berhad and was the first sukuk approved under the Securities Commission’s SRI Framework [27]. The initial issuance on June 18, 2015 raised RM100 million through a seven-year structure with a profit rate of 4.3% (The Star Online, 2015). The proceeds were allocated to the construction of twenty new schools under the Yayasan Amir's Trust School Programme, a charitable initiative established by Khazanah to improve public school education in Malaysia in collaboration with the Ministry of Education. In late July 2017, Ihsan Sukuk Bhd, issued a second tranche of RM100 million under the same seven-year SRI Sukuk structure [27].

Due to their growing importance in financial markets, scholars have increasingly focused on SRI and SRI sukuk [4, 6, 8]. Over the past three decades, Sustainable finance research has emphasized green investment, commonly referred to as socially responsible investment (SRI). A search of the Web of Science database on June 10, 2019 for "Islamic Sukuk" yielded approximately 140 publications, while a

search for "socially responsible investment" produced over 800 publications [6]. This disparity suggests that SRI has received significantly greater scholarly attention than SRI Sukuk. Viviers and Eccles [28], in their 35-year literature review, found that prior SRI research primarily examined legality, trustworthiness, and financial performance. Junkus and Berry [29] provide a comparable appraisal of SRI research. Kim conducted a meta-analysis of SRI performance in 2019, while Viviers and Eccles conducted a comprehensive literature review on the topic in 2012. Despite the rapid growth of the Sukuk market, only a limited number of studies have examined SRI Sukuk [24, 30-32].

Research on SRI Sukuk remains insufficient. Haque, Chowdhury [33] provides a critical review of prior studies on Islamic bonds, highlighting associated risks and proposing mitigation strategies. Ibrahim [34] and Zulkhibri [22] examined the role of sukuk in the financial markets and their impact on economic development, while reviewing existing literature. Despite increasing criticism of SRI Sukuk research, a more systematic approach using bibliometric analysis is required. Apart from the study of Paltrinieri and Hassan [6], few studies have applied bibliometric techniques to analyze SRI Sukuk literature. The study by Paltrinieri and Hassan [6], was limited by its narrow search methodology, which relied on only four keywords. Comprehensive bibliometric analysis requires publication profiling, clustering, mapping, and visualization of research outputs.

This methodology involves a statistical evaluation of bibliographic data from scientific publications using both qualitative and quantitative indicators [35, 36]. Sukuk are Shariah-compliant financial instruments that facilitate liquidity in Islamic financial markets, while conventional interest-bearing bonds are prohibited under Shariah law [34]. Islamic financial markets can generate funds in accordance with Shariah law via Sukuk, which, unlike traditional bonds, provides asset-backed returns rather than interest-based income. Green sukuk has emerged as an innovative Islamic finance product for funding environmentally sustainable projects, representing the growth of the global green bonds market [10, 25, 37-39]. Countries such as Malaysia and Indonesia have demonstrated their capacity to address environmental and economic challenges within Islamic finance by issuing green sukuk to fund sustainable infrastructure and renewable energy projects.

3. Research Design

This study evaluates the performance of green bonds and green sukuk based on their yield to maturity (YTM). The daily year-to-date (YTM) data contained in the sample are an important metric for evaluating the performance and returns of Malaysian green bonds and sukuk issued between 2017 and 2023. These include corporate bonds and other fixed-income securities. The most recent data collected for this study, dated 2 April 2024, indicate that the sample period for both green sukuk and green bonds in Malaysia dates to 2017. Data for this study are obtained from the Thomson Reuters Eikon and DataStream databases, ensuring a comprehensive and reliable data set. The total number of observations includes 11,924 data points for green sukuk and 11,924 data points for green bonds. This extensive data set allows for a robust analysis of the YTM of these instruments.

This analysis uses a paired sample t-test to compare the returns of green bonds and green sukuk in the YTM market and to identify any significant differences. This approach allows for more precise comparisons by pairing the samples on a one-to-one basis, accounting for their uneven distribution. According to Ross and Willson [40], the use of a paired sample t-test enhances the reliability of results, aligns instruments based on specified criteria, and ensures comparability by controlling for confounding variables. Furthermore, this method facilitates straightforward comparison of average returns over the same time period [41].

4. Results and Discussion

In many circumstances, quantitative data are overlooked. Using regression analysis on heteroscedastic data can result in biased coefficients and erroneous results. The values of Green Sukuk vary from 1.596 to 7.997, with a standard deviation of 1.784. Green bonds have a more limited range, extending from 3.667 to 5.900, with a standard deviation of 0.701. Green bonds have higher standard deviations than green sukuk, regardless of their term. This suggests that green sukuk have higher return volatility than green bonds. Hossain et al. (2021) found that sukuk portfolios are more volatile and riskier than traditional bond portfolios, as shown by their higher standard deviations. The increased risk may be attributed to structural characteristics such as asset ownership and profits, which rely on the core asset.

Table 1. Descriptive statistics

Types	Mean	Median	Max.	Min.	SD	Skew.	Kurt.	N
Sukuk Bonds (green)	4.981	6.013	7.997	1.596	1.861	0.301	3.006	11924
Conventional bonds (green)	3.997	5.366	5.900	2.995	0.701	0.399	2.861	11924
Sukuk Bonds (green) Short-term	3.995	2.999	5.887	0.901	1.286	0.491	2.996	2,981
Conventional bonds (green) Short-term	5.136	3.001	4.661	4.222	0.458	0.594	2.661	2,981
Long-term Sukuk Bonds (green)	7.023	6.118	9.234	3.964	1.550	0.667	1.996	8,943
Long-term Conventional bonds (green)	6.236	3.994	7.003	2.636	0.686	0.055	2.012	8,943

The operational efficiency and profitability of these assets are closely linked to the performance of sukuk (Hossain et al., 2021). Furthermore, unlike traditional bond lender-borrower interactions, multiple sukuk arrangements (including Ijarah, Murabahah, Mudarabah, and Musharakah) add complexity and risk [24]. In markets with lower liquidity, higher risk levels are often correlated with price volatility. Finally, the implementation of new Shariah regulatory requirements, combined with the need to comply with environmental standards, may increase operational risks and compliance costs. Green sukuk exhibit a mean yield of 4.981, which is higher than the average yield of green bonds at 3.997. These findings show that green sukuk usually outperform green bonds. Short-term green bonds have an average tenure of 5.136 years, which is longer than the average duration of short-term green sukuk, which is 3.995 years. This shows that green bonds outperform green sukuks in the short run. Long-term green bonds have an average of 6.236, while long-term green sukuk average 7.023. This suggests that green sukuk provide higher long-term yields than green bonds.

4.1 Regression Analysis of Green Sukuk Characteristics

This study examines the yield characteristics of green sukuk by incorporating a time-specific volatility component into an ordinary least squares (OLS) regression model with year-fixed effects. The primary independent variables of the model include the amount issued, credit grade, spread to treasury, bid yield, and a green sukuk dummy, with the dependent variable being YTM. Yield to maturity (YTM) is the dependent variable. Green sukuk dummy represents the type of bond, where 1 indicates a green sukuk and 0 indicates a green bond. The amount issued refers to the total bond issuance size. Rating denotes the bond's credit rating. Spread to treasury measures the difference between the bond's yield and the corresponding treasury yield, while bid yield represents the yield at which the bond is bid in the market. Standard error is reported in parentheses.

Multiple control variables are also included. The results presented in Table 2 indicate that green sukuk maintain a significantly higher YTM compared to green bonds when considering all relevant variables. The data presented in Table 1 indicates that green bonds exhibit a lower average yield to maturity compared to green sukuks. This finding aligns with their results.

Table 2. Regression analysis of YTM

Variable	YTM
Dummy for Green Sukuk	0.059 *** (0.0049)
Issued Volume	−0.139 *** (0.0019)
Credit Rating	−0.059*** (0.0029)
Spread to Risk free rate	0.049*** (0.0020)
Yield for Bid	0.398*** (0.0048)
Intercept	4.449*** (0.1596)
R^2	0.596
Observations	181,081

*p < 0.10, **p < 0.05 and ***p < 0.01

4.2 Mean Difference

The results of the paired sample t-test for the YTM of green bonds and green sukuk are presented in Table 3. A p-value of 0.587 suggests that the mean difference is not statistically significant. The null hypothesis is flawed; green bonds and green sukuk represent distinct entities. The results indicate a notable difference in yield to maturity between green bonds and green sukuk, reflecting disparities in their performance. Multiple studies (Ayturk et al., 2017; El-Mosaid and Boutti, 2014) indicate that sukuk may not serve as an appropriate alternative to traditional bonds for debt repayment purposes.

Table 3. Paired t-test results for YTM differences

Instrument	N	Mean	Diff.	*t*-value	*p*-value
Green sukuk	**11924**	6.01	0.587	60.0	0.000***
Green bond	**11924**	5.38			
*$p < 0.10$, **$p < 0.05$ and ***$p < 0.01$					

Bonds and sukuk have unique contractual arrangements. Multiple studies [25, 37-39, 42] have found that different structures and operational procedures influence sukuk risk and performance outcomes. Sukuk holders share profits with issuers rather than acting solely as lenders or creditors. Bonds primarily function as a promise to repay borrowed funds. Sukuk and bonds are two distinct types of assets with varying returns. This study supports the distinct performance characteristics of green bonds and green sukuk, in line with empirical evidence documenting significant differences between these two instruments [8].

Table 3 shows that green sukuk yield a maturity (YTM) of 6.01 percent, whereas green bonds yield a YTM of 5.38 percent. Investors therefore currently experience higher returns on their green sukuk investments. The findings are consistent with those of [43], who found that sukuk yield averages outperformed those of conventional bonds. Several factors contribute to the high returns associated with green sukuk. The increased return may be due to the intrinsic risk premium associated with green sukuk. The data in Table 1 show that green sukuk have a higher standard deviation than green bonds. The risk standard deviation associated with sukuk is higher than that of regular bonds. The risk-return trade-off hypothesis implies that sukuk's higher risk profile may result in higher expected returns. Sukuk must follow Shariah law as well as environmental requirements in order to be classified as green. The need to follow two independent regulatory frameworks increases complexity and uncertainty, making green sukuk riskier than regular green bonds.

5. Conclusions

The growing number of environmental concerns emphasizes the urgent need to protect the planet and promote sustainable development strategies. As a result, many firms are working to incorporate environmentally friendly practices into their operations. Green financing is particularly helpful for initiatives and projects that promote environmental sustainability. The supply of environmentally friendly financial instruments, such as green sukuk and green bonds, has increased dramatically in response to global demand. The average yields of green bonds and green sukuk are significantly different, indicating that the two have distinct return profiles. Green sukuk offer higher returns than green bonds. According to these findings, investors in green sukuk may earn higher returns than their counterparts in the green finance market. Furthermore, the performance of green bonds and green sukuk cannot be directly compared, as the data do not establish a causal relationship between them. Consequently, these two financial alternatives, while both supporting environmental sustainability, serve different objectives.

Due to data limitations, this study primarily focuses on the Malaysian market. Nevertheless, its conclusions are applicable to a broader range of countries beyond Malaysia. As a result of Malaysia's prominent involvement in the worldwide sukuk market and the expanding global interest in Islamic and

green finance, these findings provide critical policy recommendations for nations who do not engage in Islamic finance. Research suggests that investors seeking long-term investments tend to prefer green sukuk over green bonds due to their higher returns. Green sukuk may also help to diversify portfolios and shield you from market downturns because of their lack of direct relationship to the green bond market. Green sukuk may appeal to those looking for higher returns with less risk, investing in non-Islamic financial countries, making investments with a moral or religious conscience, or diversifying their portfolios.

From the issuer's perspective, green sukuk offer higher yields than green bonds, which may attract a wider range of investors, particularly those seeking Shariah-compliant solutions. When used properly, green bonds and green sukuk can help issuers reduce risk and increase profitability. Green sukuk allow issuers in non-Islamic countries to broaden their investor base and raise funds for environmental projects. The findings suggest that governments should develop creative techniques to boost the issuance of green bonds and sukuk. Because of their separate functions and lack of interconnectedness, these instruments require tailored regulation; this is particularly true for countries that engage in Islamic funding. A comprehensive green finance strategy may improve a country's sustainable development and risk management. If green sukuk becomes more popular, subsequent studies may include a larger sample size and other nations. Comparing the risk and performance characteristics of green bonds and sukuk allows for a more comprehensive knowledge of the two.

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Conflicts of Interest

The authors confirm that there are no conflicts of interest.

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