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Relative Efficiency of Bonds and Sukuk: A Case of Selected Islamic Countries

Hafiz M. Sarfraz Nihal[1], Syed Shabib Ul Hasan[2], Imran Majeed[3]

[1] Ph.D. Candidate, Department of Public Administration, University of Karachi, Pakistan. Email: sarfraznehal@gmail.com
[2] Professor, Hamdard University, Karachi, Pakistan. Email: huvc@hamdard.edu.pk
[3] Senior Lecturer and Researcher, Al-Ghazali University, Karachi, Pakistan. Email: imran.majeed@agu.edu.pk

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ABSTRACT

This study compares the efficiency of bonds and Sukuk through a comprehensive analysis using descriptive statistics and regression techniques. The dataset includes outstanding Sukuk and bonds issued between 1993 and 2023 in Malaysia, Indonesia, Pakistan, Turkey, and Saudi Arabia. Objectives focus on examining mean coupon rate and yield-to-maturity (YTM) differences, exploring yield variations, and assessing efficiency levels. The analysis employs t-tests and ordinary least squares (OLS) regression. Findings indicate that bonds and Sukuk are sold at a premium, with mean coupon rates exceeding YTMs. A separate analysis supports the hypothesis that Sukuk may have higher mean YTMs and coupon rates than bonds. Sukuk exhibits significantly higher YTMs, indicating greater returns compared to bonds across the selected countries. Sukuk also demonstrates higher efficiency, reflected by a positive and significant coefficient, implying a more efficient yield-to-tenure ratio. Policy implications highlight the need to enhance regulation quality and transparency in disclosing yield differentials and risks and promote Sukuk as an attractive investment option. Diversifying investment portfolios and improving market liquidity is also recommended. Limitations include limited data availability, preventing analysis of individual countries and segregation between corporate and sovereign issues within Sukuk. In conclusion, this study provides valuable insights into the efficiency of bonds and Sukuk, offering policy recommendations. Disparities in mean coupon rates, YTMs, and efficiency levels underscore the importance of informed decision-making. Policymakers and investors can utilize these findings to understand the potential benefits of Sukuk and implement strategies to foster a more efficient and robust market. Further research is necessary to address data limitations and explore specific country-level dynamics and Sukuk classifications.

Corresponding Author's Email: sarfraznehal@gmail.com

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1. Introduction

Despite its historical roots tracing back to the era of Prophet Muhammad (ﷺ), the practical revival of Islamic finance commenced in the 1970s. Initially focused on banking operations, Islamic finance has evolved significantly and now encompasses a diverse array of products and solutions that serve as alternatives to conventional interest-based offerings. For instance, Sukuk provides an alternative to conventional bonds, Islamic Shari'ah compliant derivatives serve as substitutes for traditional futures, forwards, options, and swaps, and Shari'ah compliant stocks are available as substitutes for ordinary stocks. Pertaining to Sukuk market, according to Islamic Finance Development Indicator report (2022), in 2021, the issuance of Sukuk, including re-opened Sukuk, reached an unprecedented level of USD 202.1 billion, representing a notable achievement for this segment. This growth of 9% in 2021 was on par with the previous year, highlighting the sustained positive performance. The total assets of the Sukuk sector, as indicated by the aggregate value of outstanding Sukuk, amounted to USD 713 billion in 2021, reflecting a significant 14% increase compared to the USD 626 billion recorded in 2020. The robust supply flow of Sukuk not only reinforces the sector's upward trajectory but also contributes to addressing the longstanding supply-demand imbalance (Khursheed et al., 2015).

Sukuk, as an alternative to conventional bonds, can help to bridge the existence financing gap for infrastructural development, especially in Muslim and under-developed countries. Organization of Islamic Cooperation (OIC) is an association of 57 Muslim countries where 51 of them exhibit fiscal deficits. Out of these 51 nations, 19 are classified as heavily indebted poor countries. Most of the OIC members are developing economies that often face government budget deficits, leading to increased indebtedness. Two significant challenges arise from this situation. Firstly, the budget shortfall is commonly addressed through interest-based borrowing. Secondly, due to insufficient domestic capital accumulation, governments resort to borrowing in foreign currencies. As a consequence, the economies become leveraged and prone to exchange rate risks. However, introduction of sukuk as a recent innovation has the potential to decrease the reliance on external borrowing, minimize leverage, and reduce vulnerability (Ismath Bacha & Mirakhor, 2018).

AAOIFI (Accounting and Auditing Organization for Islamic Financial Institutions) defines Sukuk as "certificates of equal value that represent undivided shares in the ownership of tangible assets, usufruct, services, or the assets of specific projects or special investment activities" (Masruki, Khairulannuar, & Dhar, 2020). Sukuk and bonds share certain similarities, including the generation of cash inflows and outflows, listing and trading on secondary markets, and evaluation by credit rating agencies. However, notable distinctions exist between them. Bonds primarily represent the issuer's debt obligation, whereas sukuk represent a proportional ownership stake in an underlying asset. For instance, sovereign sukuk commonly employ an Ijarah (lease) contract structure, establishing a lessee/lessor relationship that differs from the lender/borrower relationship typically associated with bonds (Cakir & Raei, 2007).

Multiple studies comparing Bonds and Sukuk have explored various aspects such as efficiency, yield, riskiness, market behavior, and investor preferences. For example, El Mosaid and Boutti (2014) find that Sukuk outperformed bond indices in Malaysia, while Almaskati (2022) conclude sukuk, on average, exhibit a lower coupon rates and reduced risk compared to bonds. Zulkhibri (2015) emphasizes the need for further research on Sukuk due to limited quantitative studies and market constraints, and Cakir and Raei (2007) demonstrate that firms and investors may enjoy the risk-reducing benefits of including Sukuk in investment portfolios. Additionally, studies by Haque, Chowdhury, Buriev, Bacha, and Masih (2017), Fathurahman and Fitriati (2013), and Said and Grassa (2013) explore the motivations of firms issuing Sukuk, yields to maturity comparisons, and macroeconomic factors influencing the development of the Sukuk market, respectively. The analysis of existing literature reveals a scarcity of studies that compare the effectiveness of bonds and sukuk in terms of their yield to maturity (YTM) and coupon rates

using both univariate and regression analysis. Consequently, this research aims to address this gap by attempting to provide insights in this area.

This study aims to address three main objectives related to the analysis of data on corporate and sovereign bonds and Sukuk in five selected countries: Malaysia, Indonesia, Pakistan, Saudi Arabia, and Turkey. These countries are chosen as they were among the top issuers of Sukuk in 2021 (Masruki et al., 2020). The data, downloaded from Thomson Reuters DataStream on April 15, 2023, focuses on the outstanding Sukuk and bonds at that specific time. The first objective of this study is to examine the difference in mean coupon rates and yield-to-maturity (YTM) between bonds and Sukuk using descriptive statistics. By comparing these key metrics, we can gain insights into the variations in financing costs and returns for both instruments. The second objective is to investigate whether Sukuk and bonds exhibit different yields and explore the factors that may influence these yield levels. By conducting an empirical analysis, we aim to identify the determinants that contribute to the yield differentials between Sukuk and bonds, which can have implications for investors' decision-making and market dynamics. The third objective focuses on examining the efficiency levels of Sukuk and bonds and exploring the factors that affect these efficiency measures. Efficiency is defined in this study as the YTM divided by the tenor. By assessing the efficiency levels of both instruments, we can assess their performance and efficiency in delivering returns relative to their respective tenors.

To achieve these research objectives, the standard t-test will be employed to analyze the difference in mean values between bonds and Sukuk for the first objective. For the second and third objectives, ordinary least squares (OLS) linear regression analysis will be conducted, with the YTM as the dependent variable for the second objective, and efficiency as the dependent variable for the third objective. The findings of univariate analysis revealed that securities were sold at a premium, with Sukuk having higher yields compared to bonds (Ariff, Chazi, Safari, & Zarei, 2017). And there are significant differences among sukuk and bonds (Godlewski, Turk-Ariss, & Weill, 2010). Sukuk also exhibited higher efficiency levels, suggesting a more favorable yield-to-tenure ratio (Cakir & Raei, 2007; Fathurahman & Fitriati, 2013). The remaining sections of this study are structured as follows. Section 2 offers a comprehensive review and synthesis of the existing literature on the topic under investigation. In Section 3, the data collection process and the methodology employed for the empirical analysis in this study are elaborated in detail. The subsequent section, Section 4, presents the descriptive statistics derived from the data and the outcomes of the regression analysis. Finally, Section 5 concludes the study by summarizing the key findings, discussing their policy implications, limitations of the current study and suggesting potential avenues for future research.

2. Literature review

The existing literature on sukuk can be divided into different categories depending upon the underlying question and methodology adopted. Several articles compare sukuk with conventional bonds from theoretical (for example, see M. T. Usmani (2007) and empirical aspects such as stock market returns Godlewski et al. (2010), performance El Mosaid and Boutti (2014), financial returns Almaskati (2022), selection in investment portfolio Cakir and Raei (2007), independence of sukuk from bonds Ariff et al. (2017), comparison of YTM Fathurahman and Fitriati (2013), market growth Van Wijnbergen and Zaheer (2013), preference for issuance sukuk vs bonds Mohamed, Masih, and Bacha (2015), and co-movement between bond and sukuk Haque et al. (2017) to name a few. Besides, some other also deal with the specific attributes of the sukuk such as pricing and performance factors of sukuk Zulkhibri (2015), efficiency of sukuk Sadeghi (2015), and benefits of sukuk structures Tariq and Dar (2007) among others.

Godlewski et al. (2010) find that the stock market reacts differently to Sukuk and conventional bonds, attributing the negative reaction to Sukuk to an adverse selection mechanism favoring lower-quality debtor companies. The study suggests that the increased use of Sukuk financing

may have short-term drawbacks for firms and economic development, warranting further research on its long-term implications. El Mosaid and Boutti (2014) conducted a study comparing Sukuk and bond portfolios in the Malaysian market. Analyzing performance using various indices, they found that Sukuk outperformed the bond index and market index, with a significant positive correlation between their returns. Almaskati (2022) introduces a new propensity score matching (PSM) procedure to compare the returns of Sukuk and conventional bonds in the primary market from 2000 to 2021, using OLS regression. The study finds that Sukuk are issued at lower overall coupon levels than conventional bonds, indicating lower risk, and suggests that the higher demand for Sukuk due to limited investment opportunities for Islamic investors leads to coupon discounts. Zulkhibri (2015) critically reviews the literature on Sukuk and concludes that Sukuk market has grown significantly but faces constraints due to a lack of standardization, concerns over investor protection, and low liquidity. More research is needed to identify factors affecting Sukuk pricing and performance and to understand the impact of Sukuk on economic development and social welfare.

Cakir and Raei (2007) find that including Sukuk in an investment portfolio reduces its value-at-risk compared to holding only conventional bonds from the same issuer due to different price behavior. However, Sukuk also have limitations such as lower returns and illiquidity. The paper contributes to the debate on Sukuk as alternative investment instruments. T. Usmani (2008) provides a clear comparison between Sukuk and Bonds, highlighting that Sukuk represent ownership in an enterprise and promote equitable wealth distribution, while Bonds represent debt and lack ownership. This article provides the theoretical foundations for the differences between sukuk and bonds. Ariff et al. (2017) find that Sukuk are priced differently from conventional bonds and their yields are not influenced by the yields of conventional securities, indicating the independent behavior of the Sukuk market. Fathurahman and Fitriati (2013) compare the yield to maturity ratio (YTM) of Sukuk and conventional bonds, finding that Sukuk generally offer higher yields than conventional bonds, with significant differences observed in certain groups. This suggests that investors and issuers are encouraged to consider Sukuk for higher yield opportunities.

Van Wijnbergen and Zaheer (2013) discuss the growth of Islamic finance instruments, specifically Sukuk, as an alternative to conventional interest-based bonds. They highlight that Islamic debt instruments exhibit more equity-like characteristics, but defaults have occurred due to property rights issues and conceptual mismatches. Adherence to Shari'ah principles and following Islamic jurisprudence can help reduce defaults and facilitate restructuring. Mohamed et al. (2015) investigate the motivations of firms issuing Sukuk or conventional bonds in Malaysia. Their study reveals that both types of issuers exhibit debt adjustment behavior, with conventional bond issuers focusing on tax benefits and financial flexibilities, while Sukuk issuers tend to be smaller firms with higher growth opportunities. The findings support the trade-off theory and emphasize the importance of tailored debt security principles for different firms. Alam, Hassan, and Haque (2013) examine the impact of Sukuk and conventional bond announcements on shareholder wealth, finding a negative market reaction to Sukuk during the global financial crisis and a positive reaction to conventional bonds before the crisis. The study suggests that stock market participants perceive Sukuk as an alternative financial tool, and companies issuing Sukuk are found to be less leveraged and less profitable compared to those issuing conventional bonds. Ibrahim and Minai (2009) investigate the wealth effects and determinants of Islamic debt offerings in Malaysia, observing a significantly positive market reaction during the announcement of Islamic debt issuance. They recommend that smaller firms with greater investment opportunities issue Islamic bonds and suggest stricter rules on bond issuance disclosure to enhance transparency.

Some recent studies also investigate the same issues. Hassan, Paltrinieri, Dreassi, Miani, and Sclip (2018) examine the relationship between sukuk (Islamic bonds) and conventional bond markets across Europe, the United States, and emerging markets. The study finds that sukuk and investment-grade bonds have lower volatility reactions to market shocks and higher

persistence, with sukuk returns exhibiting less volatility than U.S. and EU investment-grade bonds. Dynamic correlations between sukuk and bond markets increase during recessions and are influenced by macroeconomic and market conditions, emphasizing the importance of considering risk-return characteristics and diversification benefits of sukuk. Haque et al. (2017) focus on the relationship between sukuk and conventional bonds, specifically Malaysian government securities. The study reveals a causal relationship between the two securities, with sukuk leading bonds in the long term. It highlights differences in regulation, funding purposes, and structuring between sukuk and conventional bonds, suggesting the need for further research and implications for policy regulations and investment management. The findings also indicate the long-term favorable nature of sukuk compared to bonds in terms of mean yield and volatility, with variations in yield differentials and correlations based on maturity and central bank intervention.

Apart from above studies, some articles investigate the attributes of sukuk without comparing them with conventional bonds. Sadeghi (2015) investigates the sustainability and efficiency of Shari'ah-compliant investments (Sukuk) globally. Shari'ah-compliant investments performed better than global sustainable shares and the global market from 2006-2011, suggesting their resilience and sustainability in the long term. The study highlights the performance of Shari'ah-compliant investments in Muslim countries compared to predominantly non-Muslim countries, emphasizing implications for investors, regulators, customers, and Islamic financial institutions. Tariq and Dar (2007) discuss the principles, structures, risks, and benefits of Sukuk as Shari'ah-compliant financial assets, emphasizing their potential to expand financial markets and enhance liquidity. They highlight the need for efficient secondary markets and suggest methods to mitigate risks. Said and Grassa (2013) examine factors influencing the development of the Sukuk market in 10 countries, finding that GDP per capita, economic size, trade openness, and regulatory quality positively impact the Sukuk market. They also highlight the complementary nature of bond and Sukuk markets and the role of Shari'ah legal systems and the percentage of Muslims in driving the development of the Sukuk market.

In conclusion, it is evident that the existing literature on the comparison between Bonds and Sukuk lacks comprehensive univariate and multivariate (regression) analyses specifically focused on assessing the efficiency and yield-to-maturity (YTM) of these financial instruments in selected five countries. Further research incorporating such analyses would contribute valuable insights to the field and enhance our understanding of the relative performance of Bonds and Sukuk.

3. Data and Methodology

3.1. Theoretical Foundations

Why do firms or governments issue bonds or sukuk? Though bonds and sukuk entail different characteristics, risk profiles, cash flows and ratings, the reason behind their issuance is almost similar and that is to raise external financing. Internal financing, involving cash flows or retained earnings, and external financing options, such as debt in the form of bonds or debt-based sukuk, as well as equity (in the form of stocks or equity-based sukuk), are the available avenues for firms to fund their investment projects. However, issuer has to pay a cost to raise these funds which is directly proportional to the risk of the security or the issuer. For illustration, issuer has to pay a relatively higher cost if the risk associated with the issuer *per se* or the security is relatively higher. The cost, represented by the coupon rate, is influenced by investors' perceptions of various attributes associated with the issued security and the issuer. These attributes differ between sukuk and bonds. Notable distinctions exist, with bonds primarily reflecting the issuer's debt obligation, while sukuk represent a proportional ownership stake in an underlying asset. For instance, sovereign sukuk often adopt an Ijarah (lease) contract structure, establishing a lessee/lessor relationship that deviates from the lender/borrower relationship typically observed with bonds (Cakir & Raei, 2007). Consequently, the efficiency of

sukuk differs from that of bonds, and the determinants of yield to maturity for sukuk and bonds also vary. To empirically examine these theoretical foundations, the subsequent sections of this article include the discussion on the data, methodology, results, and conclusions.

3.2. Data

This research article aims to conduct a comprehensive comparative analysis of the operational effectiveness of Sukuk and bonds issued by corporate and government entities in five specifically chosen countries: Malaysia, Indonesia, Pakistan, Turkey, and Saudi Arabia. The study period encompasses the years from 1993 to 2023. Data pertaining to all Sukuk issued during the selected time span is employed for the empirical investigation, provided they remain outstanding at the time of data extraction from reputable sources such as DataStream Thomson and Reuters. The selection of these countries is based on their inclusion among the top 10 countries in 2021, as indicated in Table 1 given below.

Table 1
Sukuk Value Outstanding (amount in billion USD and rank) in selected 5 countries from 2019 to 2021

Countries	2019	2020	2021	No. of Outstanding Sukuk
Malaysia	242(1st)	262(1st)	279 (1st)	2317
Saudi Arabia	118(2nd)	158(2nd)	194 (2nd)	105
Indonesia	57(3rd)	73(3rd)	84(3rd)	258
Turkey	14(6th)	17 (6th)	14(7th)	157
Pakistan	NA	NA	11(9th)	45

Source: Islamic Finance Development Indicator Report (2020-2022).

Notably, Malaysia, Saudi Arabia, and Indonesia have consistently occupied the first, second, and third rankings, respectively, while Turkey has been identified as an emerging market. Pakistan, on the other hand, achieved a place among the top ten countries for the first time in 2021. Additionally, Table 1 also provides a visual representation of the quantity of outstanding Sukuk within each of the selected countries in 2023. The comprehensive dataset comprises a total of 5,476 entries, with 2,594 entries corresponding to bonds and 2,882 entries attributed to Sukuk. It is essential to note that our analysis treats the collected data as a cross-sectional dataset, allowing for a comprehensive examination of the comparative efficiency between Sukuk and bonds across the five countries.

3.3. Methodology

In line with the research objectives, our study employs two distinct methodologies to compare the efficiency of bonds and Sukuk. First, we utilize the difference in mean test to address our first research objective, drawing inspiration from the work of (Ariff et al., 2017). This statistical test enables us to assess the disparities in mean performance between bonds and Sukuk across the selected countries. This method helps us to conclude, at a given level of significance either 1%, 5% or 10%, whether the data provide sufficient evidence that a difference exists between the mean coupon rates and yield to maturity (YTM) of sukuk and bonds. This finding suggests that there are distinct variations in the coupon rates and YTM between sukuk and bonds. The comparison between sukuk and bonds in terms of coupon rates and YTM provides insights into the differences in financing structures and risk profiles associated with these financial instruments (Weiss, 2012). Therefore, this method is employed for univariate analysis of the underlying research question.

Furthermore, to investigate the second and third research questions, we employ multiple regression analysis where the dependent variable is explained by more than one regressor or independent variables. Multiple regression analysis is advantageous for several reasons. Firstly, it allows for -*ceteris paribus*- analysis by explicitly controlling for many control variables that

simultaneously impact the dependent variable (Gujarati, 2003). Moreover, by including additional factors (coupon, tenor, amount, and their interaction, for example) in the model that contribute to explaining the dependent variable, multiple regression analysis enhances the ability to predict and understand the variation in the dependent variable (i.e. YTM or Efficiency). Additionally, multiple regression analysis accommodates a wide range of functional form relationships like linear (as in our case) and quadratic etc. In summary, these advantages justify the use of multiple regression analysis in studying and generalizing functional relationships between dependent (YTM or Efficiency) and independent variables like coupon, tenor, amount, and their interaction (Gujarati, 2003; Wooldridge, 2015).

For the second research objective, we adopt the regression model proposed by Almaskati (2022), which allows us to examine the factors influencing the YTM (dependent variable) of bonds and Sukuk. By leveraging this model, we can explore the various variables and their impact on the YTM of both financial instruments, shedding light on the key drivers of Sukuk or bonds' YTM in the studied countries. For second research objective, the following regression equation is employed.

$$YTM_{i,j} = \beta_0 + \beta_1 Cou_{i,j} + \beta_2 Ten_{i,j} + \beta_3 Amnt_{i,j} + \beta_4 Cor_{i,j} + \beta_5 Suk_{i,j} + \beta_6 Suk_{i,j} * Cou_{i,j} + \varepsilon \quad (1)$$

In our analysis, we consider a cross-sectional unit denoted by subscript *'i'*, representing all bonds and Sukuk issued across the selected countries, whereas the subscript *'j'* runs from 1 to 5 denoting each of the selected five countries namely, Malaysia, Indonesia, Saudi Arabia, Turkey, and Pakistan. The index *'i'* takes on values from 1 to *'n'* where *'n'* is the maximum number of securities (either sukuk or bonds) issued in country *'j'*. Collectively, all securities (i.e. bonds and sukuk only) issued in the selected five countries with in the given time span amounts to 5476. The dependent variable of interest is the Yield to Maturity (YTM), which refers to the annualized rate of return earned by an investor who holds the security until its maturity and reinvests all coupon payments at the same yield. YTM accounts for both the interest/profit/rental income generated by the bond or Sukuk and any potential capital gain or loss resulting from the discrepancy between the purchase price and the face value of the security. To further explore the determinants of YTM, we incorporate additional independent variables. Firstly, the coupon rate (*Cou*) is included, representing the fixed percentage of the security's face value periodically paid by the issuer to the security holders. The inclusion of the coupon rate in our analysis as a variable influencing YTM is borrowed from the seminal work of Caks (1977), which establishes the relationship between YTM and the coupon rate.

Furthermore, we introduce the variable '*Ten*' to capture the tenor to maturity of the security, measured in years. Additionally, '*Amnt*' represents the cumulative face value amount of the security, denominated in USD. We also include the binary variable '*Cor*', which takes the value of "0" if the issuance is corporate and "1" if it is sovereign. Similarly, the binary variable '*Suk*' takes the value of "0" for bonds and "1" for Sukuk. To enhance the reliability of our model in equation (1), we incorporate an interaction term denoted as "*Suk*Cou*". This interaction term assumes that the effect of the coupon rate on YTM is moderated by the type of security, i.e., whether it is a bond or Sukuk. Finally, the standard error term 'ε' accounts for unexplained variation in the YTM. As our primary focus is on the independent variable, the coupon rate, we analyze the coefficients β_1 and β_6. However, due to the presence of the interaction term, the interpretation of the coefficient for the coupon rate on YTM as a partial effect is not applicable, as argued by (Brambor, Clark, & Golder, 2006). In this case, if the coefficient β_6 is statistically significant, it implies that the effect of the coupon rate on YTM significantly differs between Sukuk and bonds.

Our final objective is to compare the efficiency of bonds and Sukuk. Efficiency is measured as the ratio of YTM to the tenor to maturity in years. To achieve this objective, we employ a regression analysis following Almaskati (2022), where efficiency is regressed on YTM, coupon

rate, and other control variables. This analysis helps us understand the factors influencing the relative efficiency of bonds and Sukuk. Equation 2 provided below is used to answer second research question.

$$Eff_{i,j} = \beta_0 + \beta_1 YTM_{i,j} + \beta_2 Cou_{i,j} + \beta_3 Ten_{i,j} + \beta_4 Amnt_{i,j} + \beta_5 Cor_{i,j} + \beta_6 Suk_{i,j} + \beta_7 Suk_{i,j} * Cou_{i,j} + \beta_8 Suk_{i,j} * YTM_{i,j} + \varepsilon \quad (2)$$

The efficiency of a security, denoted as "*Eff*," is defined as the ratio of YTM to the tenor of the security. In our analysis, we are particularly interested in the coefficients β_1, β_2, $\beta_7$and β_8, which represent the relationship between different variables and the efficiency measure. To estimate these coefficients, we utilize the Ordinary Least Squares (OLS) technique, as our dataset consists of cross-sectional data. OLS is a commonly used statistical method for estimating the parameters of linear regression models when dealing with cross-sectional data. In the forthcoming section, we present the results obtained from the OLS estimation for Equation 1 and Equation 2, along with the corresponding discussions. These results will provide insights into the relationships between the variables and the efficiency of the securities under examination.

4. Results

4.1. Descriptive statistics

In order to gain a comprehensive understanding of the dataset and to provide valuable insights into the variables under investigation, a thorough analysis of descriptive statistics is conducted. This analysis serves to summarize the key characteristics of the data, including mean, standard deviation, and the range of values observed.

Table 2
Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Coupon	5,454	7.74324	6.483578	.1	48.13
YTM	3,566	5.746329	3.439757	-27.99827	37.3
Amount (in billion USD)	5,471	.196807	.7990198	1.76e-06	12.26769
Tenor (in Years)	5,476	7.918844	6.494957	.0722222	50

Table 2 above displays the descriptive statistics for each variable, facilitating a clear and concise overview of the dataset's characteristics. The "Coupon" variable represents the coupon rate both for bonds and sukuk. The table shows that there were 5,454 observations in total for the calculation of mean coupon. The mean coupon rate indicates that the average coupon rate for these instruments is around 7.74% in five selected countries. The standard deviation of 6.48 suggests that the coupon rates have a moderate amount of variation around the mean. The "YTM" variable represents the average yield to maturity for bonds and sukuk in five selected countries. YTM is a measure of the total return expected from holding the instrument until its maturity date. In this case, there are 3,566 observations. The mean YTM is approximately 5.75, indicating an average expected return of 5.75%. We observe that the mean YTM is lower than the average coupon rate which implies that, (i): the instrument is priced (on average) above its face value (par value). Investors are willing to accept a higher coupon payment relative to instrument's YTM because they can purchase the bond at a premium price, thereby decreasing their potential yield, (ii): if an investor purchases a bond at a premium (coupon rate > YTM) and holds it until maturity, they are more likely to face a capital loss. This loss arises because the investor receives the full face value of the instrument at maturity, even though they initially paid a higher price for it, and (iii): a lower average YTM indicates lower perceived risk. Investors demanding a lower mean yield for assuming lower probability of risk.

In order to assess the relationship between the mean coupon rate of sukuk vs bonds and their yield to maturity (YTM), a comparison is conducted using a difference in means test. Table

3 given below presents the results of this analysis, shedding light on the potential disparities between these two instruments in the selected five countries. In the table given above, the p-value for the difference in mean YTM and coupon between Bond and Sukuk is statistically significant. This suggests that there is a significant difference between the mean YTM values and mean coupon values of Bond and Sukuk, and these findings are in line with(Almaskati, 2022; Fathurahman & Fitriati, 2013; Ismath Bacha & Mirakhor, 2018). Moreover, our null hypothesis states that the mean YTM and mean Coupon for Bond is greater than Sukuk.

Table 3
Difference in Mean Test Results

Variables	Observations		Mean		p-value^	Standard Deviation	
	Bond	***Sukuk***	***Bond***	***Sukuk***		***Bond***	***Sukuk***
YTM	1,306	2,260	6.82	5.12	0.00***	4.5	2.4
Coupon	2,586	2,868	9.26	6.36	0.00***	7.7	4.8

Note: ^p-value for the difference in mean t-test where *difference=mean (bond) – mean (sukuk)* and these p-value are for the Null given below Ho = *difference* > 0. Moreover, *, **, and *** means $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively.

Apparently, the p-values suggest that the null hypothesis is rejected which means that there is evidence to suggest that the mean (YTM and Coupon) of Bond is not higher than the mean of Sukuk. In other words, the alternative hypothesis (H1) would be supported, indicating that the mean (YTM and Coupon) of Sukuk may be higher than the mean of Bond as in accordance with (Fathurahman & Fitriati, 2013). This indicate that, on average and based on descriptive statistics, the YTM and coupon is higher for Sukuk than Bonds in selected five countries suggesting that Sukuk are relatively more efficient than Bonds.

4.2. Regression Analysis

To check the existence of any multicollinearity issue first, Table 4 given below provides the summary of pairwise correlation among the independent variables employed in both equation 1 and equation 2. Table 4 shows that the absolute value of all pairwise correlations among independent variables is less than 0.8 which indicates that out data is not suffering from the problem of multicollinearity (Gujarati, 2003).

Table 4
Pairwise Correlation

Variables	YTM	Coupon	Amount (billion USD)	Tenor in Years	Sukuk Dummy	Corp Dummy
YTM	1					
Coupon	0.7191	1				
Amount (billion USD)	-0.0180	-0.0610	1			
Tenor in Years	-0.0849	-0.2825	0.1385	1		
Sukuk Dummy	-0.2375	-0.2233	-0.0584	0.2701	1	
Corp Dummy	0.0307	-0.0765	-0.0313	-0.0166	0.0199	1

The results of regression analysis are reported in Table 5 given below. We are interested in the interpretation of intercept and β_5 based on our second research objective. The value of β_0 (intercept) is -0.2577 which represents that the estimated YTM when all independent variables in the model are equal to zero. Since β_0 is insignificant, it means that the intercept is not statistically different from zero and may not have a meaningful interpretation or impact on the YTM.

However, β_5 which is the coefficient for "Suk" is 1.5. Since β_5 is significant at the 1% level, it indicates a statistically significant relationship between sukuk (Suk) and the YTM. The value of the coefficient is 1.5 which suggests that, on average, sukuk bonds have a higher YTM compared to conventional bonds (assuming other variables are held constant). This indicates a statistically significant difference between the two types of securities where the YTM of Sukuk is, *ceteris*

paribus, higher than bonds in the selected five countries. Based on the coefficient for "Suk" (β_5), which is significant, we can infer that sukuk tend to have higher YTMs compared to conventional bonds in the selected five countries on the basis of results derived from Equation 1. Moreover, the value of R-Square (=0.52) indicates that 52% variation in the dependent variable is defined by the variations in selected independent variables.

Table 5
Determinants of YTM; Comparative analysis of Sukuk VS Bonds

YTM is the dependent variable	OLS Regression
Coupon	0.9306***
	[0.019]
Tenor	0.0030
	[0.006]
Amnt	0.0421
	[0.043]
Corp	0.5013***
	[0.164]
Suk	1.5686***
	[0.202]
Coupon×Suk	-0.2381***
	[0.028]
_cons	-0.2577
	[0.163]
N	3561
R-Square	0.5266

Note: YTM (Yield to Maturity) is the dependent variable. The coefficients are estimated using Ordinary Least Square (OLS) estimation method. Standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All variables are defined in the previous section.

We also employed Equation 2 to investigate the differentiating impact of coupon rate and YTM on the efficiency of bonds and sukuk and the results are reported in Table 6 given below. The coefficient for "*Suk*" dummy (β_6) is 0.5488, and it is significant at the 1% level. This indicates that, on average, sukuk have a higher efficiency compared to bonds, assuming all other variables are held constant. Moreover, β_7, which is the coefficient for interaction term (*Suk*×*Cou*) is -0.1007, and it is significant at the 1% level suggesting that the relationship between coupon rate (*Cou*) and efficiency differs between sukuk and bonds. The negative coefficient indicates that the impact of the coupon rate on efficiency is lower for sukuk compared to bonds when all other variables are held constant. The coefficient of another interaction term (β_8) [Suk×YTM] is 0.1358, and it is significant at the 1% level. This indicates that the relationship between yield to maturity (YTM) and efficiency also differs between sukuk and bonds. The positive coefficient suggests that the impact of yield to maturity on efficiency is higher for sukuk compared to bonds when all other variables are held constant (Ariff et al., 2017; Cakir & Raei, 2007; M. T. Usmani, 2007).

Based on the above findings, we can derive the following implications. Sukuk tend to have a higher efficiency compared to bonds, as indicated by the positive and significant coefficient (β_6). This suggests that, on average, sukuk provide a relatively more efficient yield-to-tenure ratio compared to bonds. Furthermore, the coefficients for the interaction terms provide additional insights. The coefficient (β_7) for the interaction between sukuk and coupon rate suggests that sukuk are less sensitive to changes in the coupon rate compared to bonds. The impact of the coupon rate on sukuk bond efficiency is relatively lower. Moreover, the coefficient (β_8) for the interaction between sukuk and yield to maturity indicates that sukuk bonds are more responsive to changes in the yield to maturity compared to bonds. The impact of the yield to maturity on sukuk bond efficiency is relatively higher. Therefore, based on these results, sukuk appear to offer a potentially better efficiency in terms of the yield-to-tenure ratio compared to conventional bonds (Almaskati, 2022; Ariff et al., 2017; Cakir & Raei, 2007; M. T. Usmani, 2007). The next section concludes the current study and offers policy implications and limitations.

Table 6
Determinants of Efficiency Equation 2

Efficiency is the dependent variable	OLS Regression
YTM	0.2842***
	[0.019]
Coupon	0.3230***
	[0.024]
Ten	-0.1332***
	[0.006]
Amnt	0.0620
	[0.038]
Corp	-0.1871
	[0.146]
Suk	0.5488***
	[0.182]
Coupon×Suk	-0.1007***
	[0.035]
YTM×Suk	0.1358***
	[0.031]
_cons	-1.5357***
	[0.145]
N	3561
R-Square	0.4818

Note: Efficiency (which is defines as YTM / tenor) is the dependent variable. The coefficients are estimated using Ordinary Least Square (OLS) estimation method. Standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All variables are defined in the previous section.

5. Conclusion & Policy Implications

In conclusion, this study compared the efficiency of bonds and Sukuk using univariate and regression analysis. The data covered outstanding Sukuk and bonds issued between 1993 and 2023 in Malaysia, Indonesia, Pakistan, Turkey, and Saudi Arabia. The findings of univariate analysis revealed that securities were sold at a premium, with Sukuk having higher yields compared to bonds (Ariff et al., 2017). And there are significant differences among sukuk and bonds (Godlewski et al., 2010; T. Usmani, 2008). Sukuk also exhibited higher efficiency levels, suggesting a more favorable yield-to-tenure ratio (Cakir & Raei, 2007; Fathurahman & Fitriati, 2013; Mohamed et al., 2015). These results have important policy implications, including the need to focus on improving regulation quality to attract investors to the Sukuk market (Said & Grassa, 2013). Policymakers should provide transparent information on yield differentials and associated risks. Promoting Sukuk as an attractive investment option, diversifying investment portfolios, and enhancing market liquidity are also recommended. In summary, this research provides insights into the efficiency of bonds and Sukuk, offering policy recommendations for policymakers and investors. As a limitation of our study, it should be noted that the data on Sukuk is limited, preventing us from conducting analysis on individual countries and making a segregation between corporate and sovereign issues. Further exploration of these aspects would provide valuable insights.

Authors Contribution
Hafiz Muhammad Sarfraz Nihal: Introduction, methodology, review of the literature and interpretation, drafting, and proofreading.
Dr Shabib Ul Hasan: Discussion and recommendations.
Imran Majeed: Data collection, theoretical and empirical model and estimations.

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