Bond and Sukuk Interconnectedness Analysis: A Comparative Study between GCC and MENA Countries Amidst Global Crises

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Abstract

This paper aims to analyze the interconnectedness between Bond and Sukuk markets in the Gulf Cooperation Council (GCC) and Middle East and North Africa (MENA) countries. This study utilized the TVP-VAR extended joint connectedness method. The observed period was from January 2020 to October 2023, encompassing significant global events such as the COVID-19 pandemic, the Russia-Ukraine war, and the Israeli-Palestinian war. The results show the interconnectedness of bond and sukuk markets in both regions by 73% (based on TCI). The Bond and Sukuk instruments in MENA act as transmitters, while Bond and Sukuk in GCC act as receivers. The study suggests that the Sukuk in GCC and MENA may serve as an attractive option for diversified assets compared to Bonds. Additionally, the paper highlights structural changes and market dynamics during the crisis period that affected financial stability in both regions. The anticipated contribution of this study is to enriching the global economic in term of financial literature and offering policy insight to manage risks and improve financial system resilience in GCC and MENA countries.

Keywords: *Bond, Sukuk, GCC, MENA, Interconnectedness, TVP-VAR, Global Crisis*

I.   Introduction

There has been a high level of volatility in the capital market in current years. The effects of external shocks affect economic performance that propagates through macroeconomic sectors and financial systems in the world. External shock can be affected by unstable macroeconomic conditions or in the form of risk, such as external risk caused by natural risk (natural disasters and pandemics), political instability, war, conflict, or larger business

failures (Houben et al., 2004). The latest research also confirms that COVID-19 has a detrimental impact on stock market performance in many major equity markets (Albulescu, 2021; Yilmazkuday, 2020).

As a global external disturbance, the COVID-19 pandemic also resembles the current endogenous global financial crisis (GFC) in terms of damaging financial markets, severely impacting crucial securities markets globally, and disrupting global economic progress. The GFC encouraged investors and asset managers to invest in safe-haven products such as gold (Baur & Lucey, 2010). Furthermore, Islamic finance (IF) assets, Islamic stocks (IS), and Sukuk have become recognized as viable investment options in times of economic and financial turmoil (Saâdaoui et al., 2017). Specifically, bonds and sukuk are considered reliable financial system instruments and are widely implemented by countries worldwide. These issues will be discussed intensively in this study.

Bonds and sukuk, as debt financial instruments, have an important role in supporting the economic activity of a country or region. In this context, bonds are debt securities issued by governments or companies to obtain loans from investors. Meanwhile, Sukuk (Islamic bonds) has unique characteristics that are in line with ethical and *Sharī'ah* principles (Islamic law) that prohibit *riba*, *gharar*, and *maysir* (Solé, 2008; Uluyol, 2023). Sukuk represents debt and ownership in real assets, projects, or business ventures. Sukuk holders have a profit-sharing mechanism and, simultaneously, can bear a portion of the losses that may occur (Profit-loss-sharing) (Ghaemi Asl & Rashidi, 2021). When issuing a bond, the issuer commits to repay the principal amount by a predetermined maturity date while providing periodic interest payments (profit for Sukuk) to the asset holder. Bond and sukuk provide an alternative investment that is considered relatively safer than stocks. It is because it offers fixed interest payments and principal returns at a predetermined time. In contrast, the Sukuk issuance process involves the establishment of a special purpose entity (SPV) that holds the underlying assets and issues certificates to investors. These certificates, reflecting holdings in the underlying asset, can be traded in the market.

These two financial instruments, bonds, and sukuk, have been the subject of particular attention in the context of the global financial crisis involving the COVID-19 pandemic, the conflict between Russia and Ukraine, and tensions in Israel-Palestine. Investigation of interconnectedness among bond and sukuk are essential because it can illustrate how efficiently these markets are associated and how one market is transmitted to another (Bhuiyan et al., 2019). Subjective to rational investor behavior in the financial market, safe-haven instruments are the most desirable appliances during high fluctuation and financial instability (Setiawan et al., 2022). Nevertheless, this downturn aggravated volatility in financial asset clusters (Le et al., 2021). Therefore, numerous studies on investment diversification, including varied assets, such as conventional shares, Islamic stock, Environmental Social and Governance (ESG) stock, assets commodities, and bonds and sukuk, have garnered considerable scrutiny during the recent economic downturns.

During the crisis, bonds were considered one of the relatively safe haven instruments, mainly because the state-guaranteed nature of bonds and low-interest rate policies prompted investors to look for financial instruments that offered stable interest payments. Governments of many countries also issue bonds to fund economic stimulus and health programs, making government bonds the top choice for investors seeking security. On the other hand, Sukuk provides an attractive alternative, especially for investors who prioritize Islamic finance principles or seek diversification in their portfolios. The study by Yarovaya et al. (2021) and Danila (2023) highlighted that the nature of Sukuk can be a safe haven and more stable than a bond. When sukuk issued by the state is also guaranteed by the

government, it is safer in the face of possible risks. But, a study from Almaskati (2022) denied which one is better. Bond and sukuk return depend on the timeline, issuer, and in which region. This argument is also supported by Grassa & Miniaoui (2018).

This study focused on analyzing the interconnectedness between the bond and sukuk markets in the Gulf Cooperation Council (GCC) and Middle East and North Africa (MENA) countries. The GCC countries comprising the United Arab Emirates (UAE), Bahrain, Saudi Arabia, Oman, Qatar, and Kuwait, formed on May 25, 1981, in Abu Dhabi, have been a region of rapid growth in capital flows. MENA countries are countries located in the Middle East and parts of North Africa. These countries include Saudi Arabia, Egypt, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia, and several others. These two regions are considered the most affected areas due to the crisis situation from COVID-19, the conflict between Russia and Ukraine, and tensions in Israel-Palestine. The approach used is the TVP-VAR extended joint connectedness method introduced by Balcilar et al. (2021), which allows a deep understanding of the connectedness between these financial instruments. The observation period was done from January 2020 to October 2023, during significant global events such as the COVID-19 pandemic, the Russia-Ukraine war, and the Israel-Palestine war.

Then, the study aims to answer these research questions:

1. Are Bond and Sukuk in the GCC and MENA interconnected?
2. Which markets are the main transmitters/receivers of spillover to other markets?
3. Is there any effective international portfolio diversification during the crisis?

Hopefully, this study can contribute to the global economic and financial literature while providing a valuable view of risk management. These findings can serve as policy insight to improve financial system resilience in GCC and MENA countries. By better understanding the interconnectedness between the bond and sukuk markets as well as their impact in periods of crisis, this research provides a basis for better decision-making in the face of future economic and financial challenges. The next chapter explains the fundamentals of existing theories and related studies. Continued discussion of the method flows in chapter 3. Chapters 4 and 5 analyze and discuss emerging findings, followed by conclusions, policy, and practical recommendations.

II.   Literature Review

2.1. Background Theory

The relationship between bonds and sukuk can be shown as a basic comparison of the systems and performance of the two financial concepts. Sukūk, a sharia bond, is the plural form of the Arabic word "*sakk*" which in a financial context means a certificate or document that validates a transaction and outlines the rights, obligations, and conditions of the parties concerned. Several governments and corporations worldwide are turning to sukuk issuances to meet their financing needs, since sukuk markets have shown to be one of the most sustainable funding sources in many economies today (Sa'ad et al., 2022). In addition to the concept itself, in the sukuk concept, profits are obtained through transactions that comply with Sharia, such as renting or selling assets, or through profit-sharing business ventures that comply with Sharia, in sukuk transactions. In contrast, in traditional bonds, the bond issuer and bondholder often have an interest-bearing loan contract called usury (Kunhibava et al., 2020).

Interconnectedness theory became relevant for this study. Interconnectedness in finance states that financial markets around the world are interrelated, and events in one region can have a domino effect on markets in another region (Oppermann, 2002). This means disruptions to bond and sukuk markets in the Gulf Cooperation Council (GCC) and Middle East and North Africa (MENA) may not be isolated but could be affected by global financial events/risk. In addition, there is a transmission concept that supports the theory of interconnection. This concept of financial transmission focuses on the transmission mechanism by which the global crisis affects financial markets. This concept used in this study of how endogenous shock because of the COVID-19 pandemic, the Russia-Ukraine war, and the Israel-Palestine war can transmit their impact to the bond and sukuk in the GCC and MENA countries. The concepts of financial risk and financial system stability imply that during a crisis, financial risks may increase, threatening the stability of the financial system (Hasan et al., 2022). This concept explains that disruptions that impact financial risk and financial system stability will affect unstable capital flows. It may affect financial stability in the GCC and MENA. The concept assesses how risk is transmitted between the bond and sukuk markets and provides insight into the resilience of the financial system as a whole in these regions during the global crisis (Berry et al., 2015). In different regional conditions, there is a concept that economic, political, and legal factors in one region can affect the dynamics of financial markets in other regions. In this study, understanding regional dynamics is the focus for contextualizing the connectedness between the bond and sukuk markets in the GCC and MENA. This study helps identify whether and how regional factors contribute to the observed interconnectedness and how these regions have different capabilities in responding to global crises.

2.3. Previous Studies

Various studies in the financial sector became the main focus during the crisis period. In-depth studies related to sukuk to dampen turmoil were conducted. Naifar et al. (2022), in their study on time-frequency co-movement among Islamic bonds in the DJSI index, used the wavelet method from January 2020 until May 2022. The study highlighted that Sukuk spillover is quite high during the crisis period. Samitas et al. (2021) examined the connectedness of sukuk and bonds globally from January 2010 until April 2020 using the TVP-VAR method. This study mentioned that bonds and sukuk are highly interconnected and sensitive to external shock. Research by Billah et al. (2023) on the asymmetric connectedness and spillover effect between bond and sukuk found that both markets have a persistent connectedness and are less affected by global risk factors. In terms of portfolio analysis, it shows that Sukuk is effective as a hedge against bond risk and global factors, especially during the Covid-19 pandemic. This study used a linear regression model from 15 sukuk and bond global indices. Furthermore, Shahzad & Naifar (2022), in their research investigating the static and dynamic dependence between sukuk and bond using a dependency network approach from August 2015 until August 2020, shows that the COVID-19 pandemic has increased the level of risk spread in global financial markets. Islamic and conventional equities behave differently during normal conditions and crises. During the pandemic, the reliance on conventional equities was stronger than on Islamic equities. These findings have important implications for portfolio selection and risk management. Raza Rabbani et al. (2023) analyzed the impact of geopolitical risks during the COVID-19 pandemic and the Russia–Ukraine war. The findings show that geopolitical risk (GPR) predominates during both periods. It highlights the important role of sukuk in responding to and overcoming geopolitical risks and emphasizes the potential of sukuk as a strong and stable investment instrument during crises. This research used a mixed wavelet-based approach from data from the geopolitical risk index, DJSI, DJII, DJCI, and BRENT, from May 2012 to June 2022. The study by Naeem et al. (2022) investigate the return connectedness

in the median, left and right tail of sukuk and bond in GCC, Malaysia, and Indonesia using quantile-based connectedness method from january 2013 to october 2020. The result conclude that sukuk experienced an increase in dynamic spillovers during crises, especially during the COVID-19 period besed on research

Syed (2022) researched the impact of the COVID-19 pandemic on GCC financial markets. Using TVP-VAR and DCC-GARCH approaches, the study found a persistent role of surprise shippers from equity markets to bond and sukuk markets in the GCC region. Overall dynamic connectedness increased during the pandemic. The study also shows a significant degree of connectedness among GCC financial markets. Khan et al. (2022) conducted a study using wave cohesion econometric models to analyze the complex relationship between bond and sukuk indices, including those in MENA and GCC. The study's findings point to strong but similar implications of the initial shock of COVID-19 deaths on Islamic and conventional market volatility. The results challenge the common belief that Islamic finance is more resilient and less volatile during crises than the traditional financial sector. In addition, the study reported a diverse relationship between the bond and sukuk connectedness throughout the sample period.

III. Methodology

3.1. Data

The study used historical data from four global financial indices taken from www.spglobal.com. The indices are the S&P GCC Bond Index (Bond performance in the GCC region), S&P MENA Bond Index (Bond performance in the MENA region), S&P GCC Sukuk Index (Sharia-compliant Sukuk performance in the GCC), and S&P MENA sukuk Index (Sharia-compliant sukuk performance in the MENA region). This data provides a comprehensive overview of the Bond and Sukuk markets in that region.

3.2. Sample and Procedure

Daily data is used from January 6, 2020, to October 31, 2023. Since the data indexes are non-stationary according to the unit-root test (Table 4.1), they are transformed into a first log-difference $y_{it} = log\ (x_{it}) - log\ (x_{it}\text{-}1)$. The results of the transformation in the first difference can be seen in Figure 1.
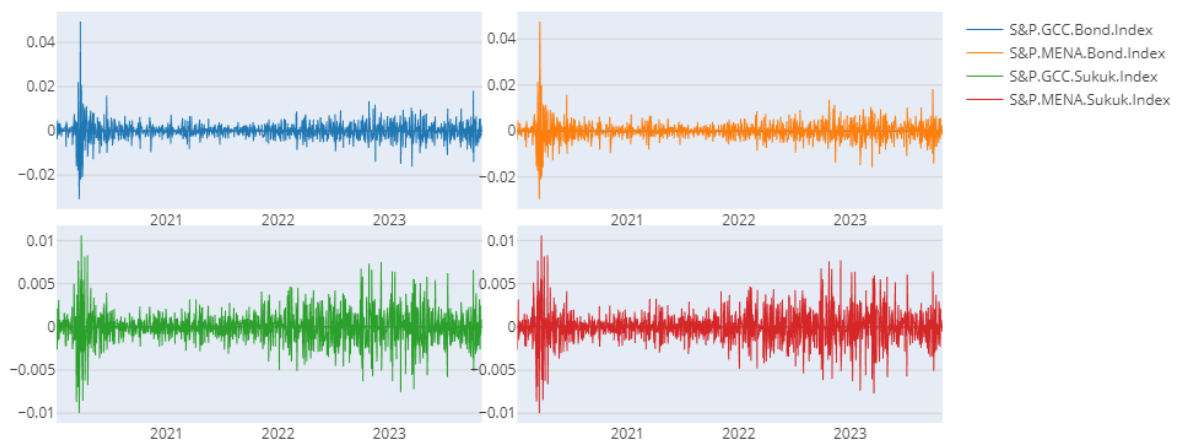

Figure 1. First Log-difference of the Data

Based on the results of the normality test of Jarque & Bera (1980), not all index data follow the normal distribution significantly. The results of the ERS root unit test from Elliott et al. (1996) show that all returns have stationary, at least at a significance level of 1%. Furthermore, Fisher & Gallagher's (2012) portmanteau test states that there is a correlation between return and the square of return, supporting the decision to apply the TVP-VAR approach in modeling the relationship of this index.

3.3. Data Analysis

This study applies a connectedness approach that summarizes the complex transmission mechanisms of large networks. Using the VAR toolkit, this method allows comparison of the relative impact of shocks on one variable against another and considers feedback loops from across the network. This study combines the methodologies of Diebold & Yilmaz (2012, 2014), Antonakakis et al. (2020), and Lastrapes & Wiesen (2021) to obtain a TVP-VAR-based co-connectedness approach.

$$y_t = A_t y_{t-1} + u_t \quad u_t|F_{t-1} \sim N(0, V_t) \quad \text{...(1)}$$

$$vec(A_t) = vec(A_{t-1}) + v_t \quad v_t|F_{t-1} \sim N(0, S_t) \quad \text{.................................(2)}$$

F_{t-1} represents the information available until time t-1, while y_t, y_{t-1}, and u_t are defined as m×1 vectors (with K as the data sample size). Additionally, A_t and V_t are characterized as m×m matrices. Furthermore, vec (At) and vt are specified as m_2×1 vectors, while S_t is a m_2×m_2 matrix.

The TVP-VAR approach, on its own, is incomplete and necessitates an approach that examines the interconnectedness between variables, which is contingent on time-varying parameters and error variances. Two parameters, generalized impulse response functions by Koop et al. (1996) and generalized forecast error variance decompositions by Pesaran & Shin (1998), are introduced to address this. The computation of these parameters involves a transformation from TVP-VAR to its vector moving average (TVP-VMA), utilizing the relationship expressed in Equation (3):

$$z_t = \sum_{i=1}^{k} A_t y_{t-1} + u_t = \sum_{i=1}^{\infty} A_{j,t} u_{t-j} \quad \text{...(3)}$$

The strength of employing generalized impulse response functions is denoted as $\psi_{j,t}(K)$. A given forecast horizon (K) lies in its robustness when interpreting VAR models, attributed to its independence from the order of errors. Generalized Impulse Response Functions effectively capture variations in dynamics both within individual variables and across variables. This is formally expressed in Equation (4):

$$GIRF\left(K, \sqrt{H_{jj,t}}, F_{t-1}\right) = E(y_{t-k}| \in_{j,t} = \sqrt{H_{jj,t}}, F_{t-1}) - E(y_{t-k}|F_{t-1}) \text{..........(4a)}$$

$$\psi_{j,t}(K) = H_{jj,t}^{-1/2} A_{k,t} H_t \in_{j,t} \quad \text{...(4b)}$$

Subsequently, Generalized Forecast Error Variance Decomposition plays a role in revealing the individual contributions of each variable concerning the forecast error variance of a specific variable. In simpler terms, it quantifies the extent to which the forecast variance of one variable influences the forecast error variances of other variables. This is formally expressed in Equation (5):

$$\psi_{ij,t}(K) = \frac{\sum_{t=1}^{k-1} \psi_{ij,t}^2}{\sum_{j=1}^{m} \sum_{t=1}^{k-1} \psi_{ij,t}^2} \quad \text{...(5)}$$

With $\sum_{j=1}^{m} \psi_{ij,t}(K) = 1, \sum_{ij=1}^{m} \psi_{j,t}(k)) = m$ The interconnectedness metrics obtained from *GFEVD* were generated from:

$$TO_{jt} = \sum_{i=1,i\neq j}^{m} \psi_{ij,t} \; (K) \text{...}(6)$$

$$FROM_{jt} = \sum_{i=1,i\neq j}^{m} \psi_{jt,t} \; (K) \text{...}(7)$$

$$NET_{jt} = TO_{jt} - FROM_{jt} \text{...}(8)$$

$$TCI_t^g(K) = \sum_{i,j=1,i\neq j}^{m} \psi_{ij,t}^g \; (K) \text{...}(9)$$

$$NPDC_{ij,t} = \psi_{ji,t}(K) - \psi_{jt,t}(K) \text{...}(10)$$

$$PCI_{ijt}(K) = 2\left(\frac{\psi_{ij,t}^g (K) + \psi_{ji,t}^g (K)}{\psi_{ii,t}^g (K) + \psi_{ij,t}^g (K) + \psi_{ji,t}^g (K) + \psi_{ij,t}^g (K)}\right) \text{....................................}(11)$$

The impact of a shock on variable i is represented by $\psi_{ij,t}^g$ (K) Equation (6) outlines the overall impact of a shock on variable j, considering all other variables (total connectedness). Meanwhile, Equation (7) defines the collective influence of all variables on j (total directed connectedness from others to j). By subtracting Equation (7) from Equation (6), we obtain a net total directional connectedness, indicating whether j is a net receiver or transmitter of the shock (Equation 8). Following this, Equation (9) introduces the total connectedness index, illustrating the influence of j on other variables. It is important to note that all connectedness measures capture the combined impact, while Equations (10) and (11) present net pairwise directional connectedness, delineating a relationship between two variables and the pairwise connectedness index between them (i and j).

Next is the extended joint connectedness approach.

$$X_{i,t}^{jnt,FROM} = \sum_{i=1,i\neq j}^{m} \psi_{jt,t} \; (K) \text{...}(12)$$

$$X_{i,t}^{jnt,TO} = \sum_{i=1,i\neq j}^{m} \psi_{jt,t} \; (K) \text{...}(13)$$

Then, generalize the scaling

$$\eta_i = \frac{X_{i,t}^{jnt.FROM}}{X_{i,t}^{gen,FROM}} \text{..}(14)$$

$$\eta_i = \frac{1}{z}\sum_{i=1}^{z} n_i \text{..}(15)$$

Finally, allowing the scaling parameter to vary by row allows us to compute the net total and pairwise directional connectedness measures as follows:

$$X_{i,t}^{jnt,NET} = X_{i,t}^{jnt.TO} - X_{i,t}^{jnt,FROM} \text{...}(16)$$

IV.   Result and Analysis

4.1. Result

Table 1 shows the Statistical Summary for the bond and sukuk index in the S&P GCC (Gulf Cooperation Council) and S&P MENA (Middle East and North Africa) markets. Here is an interpretation of the data:

Table 1. Statistical Summary

Statistic	S&P GCC Bond Index	S&P MENA Bond Index	S&P GCC Sukuk Index	S&P MENA Sukuk Index
Mean	-0,0103	-0,010	0,00023	0,00109
Variance	0,0015	0,0014	0,0003	0,0003
Skewness	0.910***	0.864***	0.062	0.065
	(0.000)	(0.000)	(0.418)	(0.402)
Ex.Kurtosis	18.967***	17.453***	2.642***	2.738***
	(0.000)	(0.000)	(0.000)	(0.000)
JB	15052.151***	12751.989***	290.062***	311.461***
	(0.000)	(0.000)	(0.000)	(0.000)
ERS	-17.940***	-4.582***	-11.909***	-2.764***
	(0.000)	(0.000)	(0.000)	(0.006)
Q(10)	190.488***	189.523***	364.921***	376.710***
	(0.000)	(0.000)	(0.000)	(0.000)
Q2(10)	347.701***	340.376***	373.886***	379.631***
	(0.000)	(0.000)	(0.000)	(0.000)

*Denote significance at 10%   **Denote significance at 5%   ***Denote significance at 1%

Table 1 provides information on descriptive statistics. The mean value shows the return trend of the index. Negative mean values for the S&P GCC and S&P MENA Bond Indices indicate an overall downward trend in yields, while positive mean values for the Sukuk Index indicate a positive trend. Variance reflects the degree of fluctuation in the index. High variance indicates greater variation in the index performance over a specific period. Variance S&P GCC and S&P MENA Sukuk are lower than S&P GCC and S&P MENA Bond, indicating no significant variation in the performance of those indices. This means the sukuk index in the GCC and MENA regions was relatively stable in the observed period.

Skewness measures the degree to which data distribution tends to tilt to the right or left. There is significant skewness in the S&P GCC Bond and S&P MENA Bond indices, with values of 0.910 and 0.864, respectively, at a significance level of 1%. This indicates a significant distribution slope in Bond performance in both regions (D'agostino, 1970). Excess Kurtosis measures whether the data distribution is more or less inclined to the tail of the distribution than the normal distribution. High kurtosis values on all indices indicate that the data distribution tends to be sharper or has a thicker tail than the normal distribution (Anscombe & Glynn, 1983). All JB values show significance at the level of 1%, indicating that the data distribution on all four indices does not follow the normal distribution (Jarque & Bera, 1980).

All ERS values show significance at the level of 1%, indicating that time series on all four indices have unit roots, or in other words, they are not stationary (Elliott et al., 1996). The values of Q(10) and Q2(10) in all indices show significance at the level of 1%, indicating that there is spatial autocorrelation in all four indices (Fisher & Gallagher, 2012). This test supports our decision to model series relatedness using the TVP-VAR approach.

Averaged Dynamic Connectedness Result

Table 2. Average Dynamic Connectedness Table

Indicator	S&P GCC Bond Index	S&P MENA Bond Index	S&P GCC Sukuk Index	S&P MENA Sukuk Index	FROM
S&P GCC Bond Index	5.39	61.13	1.89	31.58	94.61
	(*0.02981*)	(*0.02939*)	(*0.02946*)	(*0.02879*)	
S&P MENA Bond Index	4.66	45.76	1.80	47.78	54.24
	(*0.03017*)	(*0.02974*)	(*0.02982*)	(*0.02913*)	
S&P GCC Sukuk Index	4.81	29.45	2.40	63.34	97.60
	(*0.03098*)	(*0.03053*)	(*0.03061*)	(*0.02991*)	
S&P MENA Sukuk Index	5.06	39.72	3.82	51.40	48.60
	(*0.03086*)	(*0.03042*)	(*0.03050*)	(*0.02980*)	
TO	14.53	130.31	7.50	142.70	**295.04**
Inc.Own	19.92	176.07	9.91	194.10	TCI
NET	-80.08	76.07	-90.09	94.10	**73.76**
NPT	1.00	2.00	0.00	3.00	

Table 2 provides a detailed picture of how closely related the bond and sukuk are in the S&P GCC and S&P MENA regions. The analysis in Table 2 showed interconnectedness between the index and sig. The P-value is all < 0.05 in the first difference d(1), indicating a strong relationship between variables. FROM and TO describe the transmitter and receiver correlation of each index to all other indices. The higher the value, the more closely related the indices are. In this case, the value of FROM describes "affect," and TO describes "influenced." Inclusive Own (Inc.Own) represents the total correlation, including the influence of the index itself. This value gives an idea of the extent to which each index affects itself and influences other indices. Net Connectedness (NET) is a value that indicates the total correlation or net influence between indices. A positive value indicates a transmitter, while a negative value indicates a receiver. This value gives an idea of the direction and strength of the relationship between indices as a whole. Net Positive Total (NPT) gives an idea of how much the net positive contribution of each index is to the others.

An interconnectedness value of 61.13% indicates that the S&P MENA Bond Index is significantly connected to the S&P GCC Bond Index. If the S&P MENA Bond Index changes, around 61.13% of the change is predicted to be reflected in the S&P GCC Bond Index. A correlation value of 1.89% indicates that the S&P GCC Sukuk Index positively connects to the S&P GCC Bond Index. The effect is lower than the connectedness between bond indices but still shows a positive direction. A correlation value of 31.58% indicates that the S&P GCC Sukuk Index has a stronger positive connectedness with the S&P MENA Sukuk Index than the influence on the S&P GCC Bond Index. A correlation value of 1.80% indicates that the S&P GCC Sukuk Index positively connects to the S&P MENA Bond Index. Although the value is lower, it still shows a positive direction. A positive correlation value of 47.78% indicates that the S&P MENA Sukuk Index has a strong positive connectedness to the S&P MENA Bond Index. This relationship shows that changes in the performance of the bond index in the MENA region tend to positively affect the performance of the sukuk index in the same region. A positive value of 63.34% indicates that the S&P MENA Sukuk Index strongly connects to the S&P GCC Sukuk Index. This indicates that changes in the performance of the sukuk index in the MENA can make a significant contribution to the performance of the sukuk index in the GCC region.

The presence of negative values on the NET connectedness of the S&P GCC Bond Index and S&P GCC Sukuk Index show variables as receiver spillover. Then, the positive values on the NET connectedness represent the net transmitter. Overall, a high value on the FROM and

TO lines (295.04) indicates a significant degree of connectedness among the indices. Further analysis is found in Figure 2, which provides a more in-depth view of how changes in one index can influence other indices.

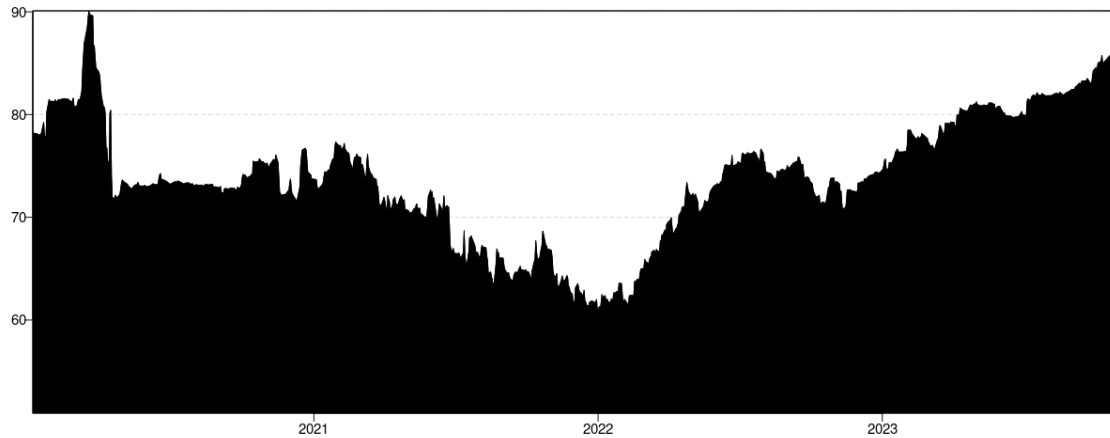**Dynamic Total Connectedness**

Figure 2. Dynamic Total Connectedness

Figure 2 illustrates changes in the Total Correlation Index (TCI) over time. It can be seen that TCI values vary over the sample period, and high values indicate a significant impact between indexes. In particular, total dynamic connectedness was high, especially at the beginning of 2020, peaking above 80%. After that, TCI fluctuated until early 2021 and then experienced a significant upward trend, reaching high values (around 65%–70%) between 2020 and 2021. This increase is likely related to significant changes during the COVID-19 pandemic. After the pandemic, the connectedness level decreased but began to rise again in early 2022. This may be related to the uncertain global conditions caused by the conflict between Russia-Ukraine and Israel-Palestine. The dynamic evolution of TCI in Figure 2 shows a response to a particular event, with the degree of connectedness increasing during periods of high uncertainty.
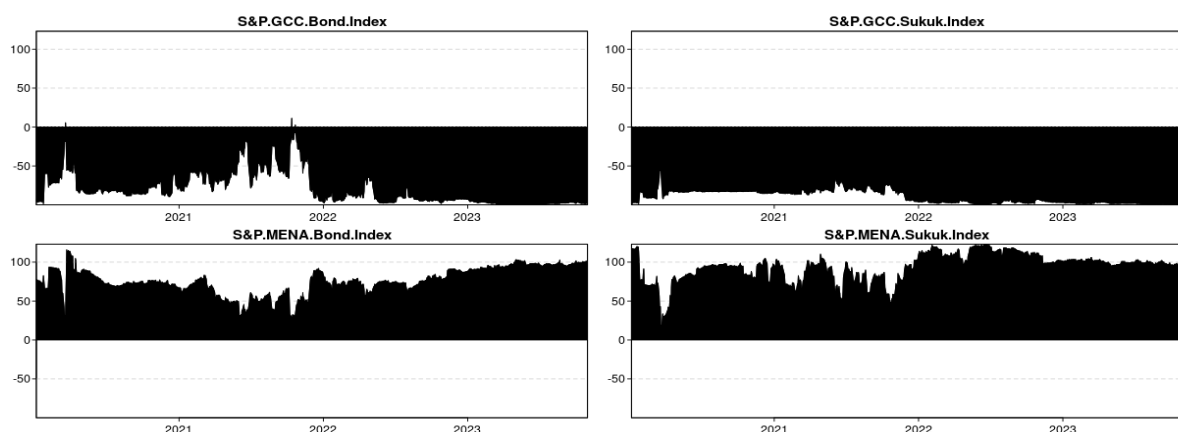
Net Total Directional Connectedness

Figure 3. Net Total Directional Connectedness

Figure 3 provides an overview of the volatility experienced and the impact on the variables used in this study. According to the findings in Table 2, the S&P MENA bond Index and S&P MENA Sukuk Index act as net transmitters, variables that have volatility that affects others.

While the S&P GCC Bond Index and S&P GCC Sukuk Index act as net receivers, they generally experience volatility spillovers. From the end of 2021 to the beginning of 2022, there was a decrease in spillover. But 2022 is a period in which the Russia-Ukraine war and the Israeli-Palestinian conflict escalate, increasing the level of global uncertainty. In the period from 2020 to 2023, the level of volatility varies for all four variables. This has increased during the COVID-19, the Russia-Ukraine war, and the Israeli-Palestinian war.
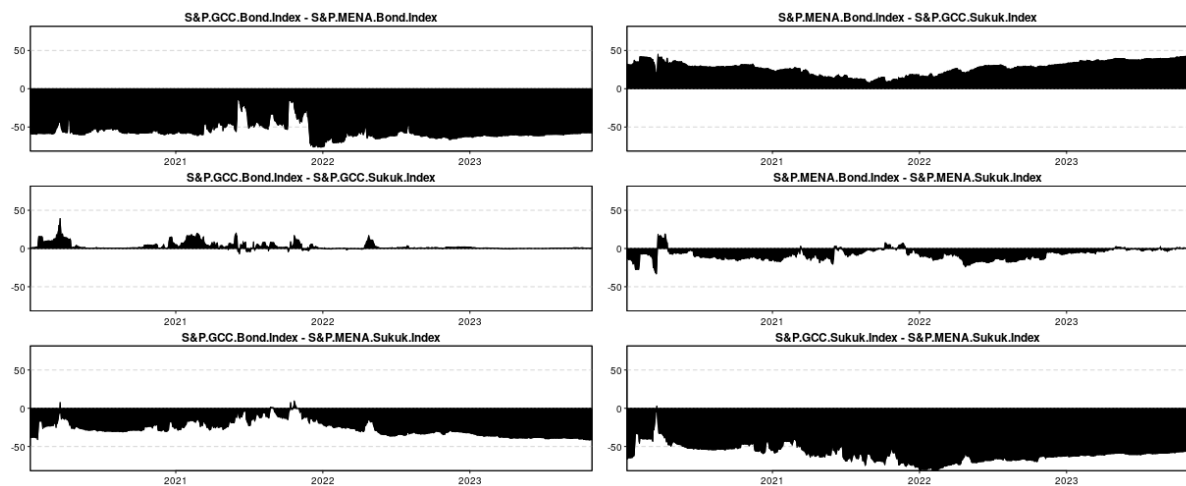
Net Pairwise Directional Connectedness

Figure 4. Net Total Pairwise Directional Connectedness

Figure 4 shows that the Net pairwise between the S&P GCC Bond Index and the S&P MENA Bond Index has a high level of connectedness but is moving in a negative direction. This shows that this combination of assets gives a negative return. This case is the same as the net pairwise between the S&P GCC Sukuk Index and the S&P MENA Sukuk Index. Net pairwise moving in a positive direction are the S&P GCC Bond Index-S&P MENA Sukuk Index as well as the S&P GCC Bond Index-S&P GCC SUKUK Index.

4.2. Discussion

Global crises are always a focal point of attention, especially when involving financial instruments such as bonds and sukuk. The analysis data highlights a significant level of interconnectedness between bonds and sukuk in the GCC (Gulf Cooperation Council) and MENA (Middle East and North Africa) regions. This interconnectedness is reflected in the Total Connectedness Index (TCI) of 73% (Table 2), which shows the extent to which bonds and sukuk in the region influence each other. That is, changes or crises that occur in one part can spread and affect financial instruments in other regions. This phenomenon illustrates that bond and sukuk markets in the region do not operate in isolation but are interrelated in response to a global crisis.

The data analysis highlights the unique role of the S&P MENA Bond Index and S&P GCC Bond Index in regional financial market dynamics, particularly in the context of the global crisis. In the concept of net transmitter and net receiver, the S&P MENA Bond Index and S&P MENA Sukuk Index act as net transmitters with net connectedness of 76.07 and 94.10, while the S&P GCC Bond Index and S&P GCC Sukuk Index act as net receivers with net connectedness of -80.08 and -90.09 respectively (seen from Table 2). It is important to look closely at the implications of the role of net transmitters and receivers in the Bond and Sukuk markets. By having high net connectedness, the S&P MENA Bond Index and S&P MENA Sukuk Index

make a major contribution to spreading the impact of market changes to other regions. This suggests that events or crises occurring in the MENA region can significantly affect the Bond and Sukuk markets in the GCC region, creating a domino effect that requires serious attention from market participants and regulators. On the other hand, the S&P GCC Bond Index and S&P GCC Sukuk Index as net receivers indicate that the bond and sukuk markets in the GCC region are more vulnerable to outside influences (External shock). In the context of a global crisis, when the MENA region experiences turmoil, markets in the GCC region tend to receive greater impact. This may create additional challenges for market participants in the region, who may need to take extra prudential measures to manage risk and maintain financial market stability.

The role of GCC as a receiver is strengthened by the fact from the World Economic Forum, which stated that every GCC country is more open to international trade than the global average. This economic openness continues to be a significant strength of the region in attracting new businesses to offer products and services in and around the region. For instance, the UAE has considerably extended its trade openness since 2006 and is now the most open GCC country (Jahani, 2021).

However, the instrument from the MENA region is indicated as the transmitter that can influence the sukuk index movement in other areas (in this study, GCC region). This finding is related to the fact that the MENA region has tremendous human and natural resources, accounts for a substantial share of global petroleum production and exports, and has a reasonable standard of life on average. According to the IMF, MENA has a land area of approximately 15 million square kilometers and a population of over 6% of the world's population, roughly the same as the European Union (EU). Additionally, a study from Asik & Marouani (2021) discovered that conflict dynamics in the MENA area differ from those in the rest of the world. Despite the fact that the research is only correlational, Asik & Marouani (2021) show that there is no significant trade disruption following a conflict and that trade increases exceed the baseline much faster than the time horizon recorded in the previously related literature.

Bond and sukuk performance in the MENA region as a determining factor in influencing other indices provides an interesting basis for discussing the potential for superior asset diversification during periods of global crisis caused by various events, such as the COVID-19 pandemic, the Russia-Ukraine war, and the Israeli-Palestinian conflict. In the context of a global crisis, well-performing financial assets can provide protection and stability to an investor's portfolio. In this case, bonds and sukuk in the MENA region are emerging as attractive options. However, if it is observed at the performance return during the global crisis, sukuk is more stable and gives a positive return than bond (Table 1). The data showed that the performance of bonds and sukuk in the MENA region had a greater impact on others, suggesting a possibly more significant role in providing stability and resilience to global market turmoil.

V.   Conclusion and Recommendation

5.1. Conclusion

This study concludes with three points. First, the Total Connectedness Index (TCI) of 73% shows that the bond and sukuk markets in the GCC and MENA regions have a high level of interconnectedness. This shows that a change or crisis in one region can significantly impact another, creating close relationships among financial instruments. Second, The S&P MENA Bond Index and S&P MENA Sukuk Index act as net transmitters, while the S&P GCC Bond

Index and S&P GCC Sukuk Index act as net receivers. In other words, turmoil in the MENA can be a major factor in spreading the impact of market changes to GCC, making it more vulnerable to external shock. Third, bonds and sukuk in the MENA region can serve as superior asset diversification during a global crisis because these instruments act as transmitters to the GCC region. But, on the return side, sukuk in both regions is better as a diversification choice. The complexity of market characteristics and geopolitical risks needs to be recognized. The decision to include assets from this region in the portfolio should be based on a careful understanding of economic conditions and potential risks. In the face of high levels of interconnection and the role of net transmitters to net receivers, risk managers and market participants need to implement prudential strategies in their portfolio management. Although sukuk is often considered a more stable financial instrument, the analysis highlights that regional factors can be critical in changing its performance. Therefore, these general assumptions need to be adapted to the geographical context.

5.2. Recommendation for Future Research

The provided analysis criticizes the need for a more comprehensive examination of specific factors triggering spillover and interconnection between the GCC and MENA regions. Including variables such as macroeconomic factors, monetary policy, and geopolitical turmoil in the analysis is crucial for a nuanced understanding of the dynamics at play. One constructive criticism is that the analysis could benefit from specifying the methodologies and data sources used to identify and measure these factors. Providing transparency in this regard would enhance the credibility of the study and allow for better reproducibility by other researchers or policymakers. Moreover, the call for more sophisticated forecasting models to predict the performance of bond and sukuk markets is well-founded. However, it would be advantageous to elaborate on the models that could be employed and how they would address the complexities of the interconnected markets in the GCC and MENA regions.

For the policymakers and other related stakeholders, supportive policies such as financial deepening and financial inclusion should be accelerated, especially in the emerging financial markets, such as GCC and MENA regions, to attract domestic and foreign investors. The GCC countries made tremendous progress in financial depth and created an extensive financial infrastructure during the 1970s and early 1980s. Affluent oil revenue resulted in substantial state foreign assets and private wealth, a portion of which was mediated by GCC financial institutions. To conclude, deep financial markets are critical to fostering economic growth. Based on the important function that financial markets play in boosting economic expansion, the financial market improvement and deepening program aims to produce a liquid, efficient, and deep financial market.

5.3. Managerial Implication

By understanding the level of market interconnectedness, governments, and investors can design more effective risk management strategies. This helps protect the portfolio from the impact that may arise during periods of global crisis to ensure investment stability and resilience. From the investors' perspective, one approach to dealing with such a circumstance is to evaluate investment performance by closely monitoring portfolios and reducing risk by spreading assets across numerous instruments, especially during global economic instability. Additionally, domestic investor participation in the financial industry must rise to lessen dependency on foreign investors and regulate financial asset volatility, particularly when international investors rebalance financial assets during financial or

economic turmoil. Adaptive responses to global events are key to maintaining financial stability. Furthermore, effective management in response to crises makes it possible to cope more effectively with possible impacts.

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