

An Empirical Analysis of the Equilibrium Between Islamic Finance and the Economy: An Insight from the Johansen Cointegration Test

İslami Finansman ile Ekonomi Arasındaki Dengeye İlişkin Ampirik Bir Analiz: Johansen Eşbütünleşme Testi'nden Çıkarılan Sonuçlar

Abstract: The study tests whether Sukuk/Islamic bonds and the economy are in a dynamic equilibrium using quarterly data from GCC countries and Türkiye. The Johansen cointegration technique is adopted. Also, we have applied the LRSM to check whether the long relation is consistent with the a priori information. Additionally, to enhance the robustness of the findings, a Bayesian approach was employed. It has been revealed that the economy and Sukuk are in a dynamic equilibrium. As such, a spurious relation is ruled out. This implies that the coefficient of the cointegrating vectors encompasses the necessary information of whether the previous values can have an impact on their own present value or on another variable in the long run. Moreover, owing to "LRSM" subjected to exactly and over-identifying restrictions, the findings further revealed that the long-run coefficients significantly enter the cointegrating vector, hence aligning with theoretical expectations; as such, we ascertain that the estimated model is both data and theory-consistent. In terms of directional and statistical significance, the LRSM's finding is consistent with the Bayesian regression results. Therefore, evidence of cointegration is crucial for investors seeking to diversify their portfolios into the Sukuk markets. As such, a strong GDP may signal a potential for higher returns on Sukuk investments.

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Öz: Bu çalışma, Körfez Arap Ülkeleri İş Birliği Konseyi (KİK) ülkeleri ve Türkiye'den alınan çeyreklik verileri kullanarak, Sukuk/İslami tahviller ile ekonominin dinamik bir dengede olup olmadığını test etmektedir. Çalışmada Johansen eşbütünleşme tekniği benimsenmiştir. Ayrıca, uzun dönemli ilişkinin teorik ön bilgilerle tutarlı olup olmadığını kontrol etmek amacıyla LRSM uygulanmıştır. Buna ek olarak, bulguların sağlamlığını artırmak için Bayesyen bir yaklaşım istihdam edilmiştir. Analiz sonucunda, ekonomi ve Sukuk piyasasının dinamik bir dengede olduğu ortaya konulmuştur. Bu durum, değişkenler arasındaki ilişkinin sahte olma ihtimalini ortadan kaldırmaktadır. Bu sonuç, eşbütünleşme vektörlerinin katsayılarının geçmiş değerlerin, değişkenlerin kendi mevcut değerleri veya uzun dönemde başka bir değişken üzerinde etkisi olup olmayacağına dair gerekli bilgileri kapsadığı anlamına gelmektedir. Dahası, tam tanımlanmış ve aşırı tanımlanmış kısıtlamalara tabi tutulan LRSM analizi sayesinde, uzun dönem katsayılarının eşbütünleşme vektörüne anlamlı bir şekilde dahil olduğu ve böylece teorik beklentilerle örtüştüğü saptanmıştır; bu bakımdan, tahmin edilen modelin hem veriyle hem de teoriyle tutarlı olduğu teyit edilmiştir. Yönel ve istatistiksel anlamlılık açısından LRSM bulguları, Bayesyen regresyon sonuçları ile tutarlılık göstermektedir. Dolayısıyla, eşbütünleşmeye dair kanıtlar portföylerini Sukuk piyasalarına çeşitlendirmek isteyen yatırımcılar için büyük önem arz etmektedir. Bu bağlamda, güçlü bir GSYH, Sukuk yatırımlarında daha yüksek getiri potansiyeli için bir sinyal niteliği taşıyabilir.

Anahtar Kelimeler: Sukuk, İslami Finans, VECM, Johansen Eşbütünleşme Tekniği, LRSM, GSYH

JEL Sınıflandırması: A12, G00, G10.

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Introduction

Literature has become rife with disagreements over how mainstream finance relates to the real economy versus how Islamic finance relates to it. The nature of this dialogue has been greatly influenced by the alleged failure of mainstream finance to support the real economy and the potential of Islamic finance to serve as a substitute for a faltering economy. It is alleged that due to the dominance of mainstream finance in the global economy, non-financial firms such as manufacturing have been increasingly diverting their capital away from their main productive activities to financial markets; consequently, their contribution to the real economy is exorbitantly diminishing (Igna *et al.*, 2020; Kahf, 2015; Krippner, 2005). For instance, in the US, between 1950 and 2001, the contribution of the non-financial sectors to the real economy (GDP) declined by 20% and 40% in terms of employment and corporate profits, respectively (Krippner, 2005). Further evidence indicates a prolonged disconnection between the stock markets, real estate market, and the real economy (Jia *et al.*, 2025; Igna *et al.*, 2020; Berger & Roman, 2018; Krippner, 2005).

Additionally, recent economic data reflect a similar pattern as non-financial corporations are holding more financial assets than their core products. For instance, during the year ended 2020, the financial assets of non-financial corporations in the European Union were valued at 147% of the GDP (Eurostat, 2022). Likewise, the total value of global debt has rapidly increased more than the value of the real GDP. In 2020 alone, global debt rose by 28%, reaching 256% of the debt-to-GDP ratio (Gasper *et al.*, 2021). This pattern has been mirrored in the economic affairs of the GCC countries, where, until the year ended 2019, Bahrain had the highest debt among the GCC countries with a 126% Debt to GDP ratio, though it slightly declined to 121% in 2024, nevertheless, the country remains with the highest debt in the region (World Population Review, 2025; Countryeconomy.com, 2019). Other GCC countries with high debts include Qatar, Oman, and the UAE, of which, until the year ended 2024, they have accumulated a Debt to GDP ratio of 43.3%, 36.5% and 32.4% respectively (World Population Review, 2025). These debt figures in part describe how the mainstream finance slowly distances itself from supporting the real economy (Igna *et al.*, 2020; Kahf, 2015; Krippner, 2005).

Consequently, many scholars, including Kazak *et al.* (2023); Yussuf (2022); Ather and Siddiqui (2019), Güçlü (2019), Alawode (2015), and Kahf (2015), have drawn attention to this disconnection and as such, advocate for the idea of Islamic finance which is believed to be capable of reverting financial resources to supporting the real economy. Their argument is founded on several key reasons: first, it is believed that, under Islamic finance, financial resources always exchange hands with real goods or services, making it closer to supporting

the real economy (Kahf, 2015, 2021; Ahmed, 2010). Also, the value of debts in the economy will always reflect the market value of goods and services available (Kahf, 2021). In such a situation, debt cannot exceed the market value of the real goods and services. This is so because credit growth is attached to the expansion of the real economy primarily through the sales and purchase of real goods, services, or usufructs (Ahmed, 2010). The moves, in part, prevent creditors from transferring the default risk to a third party, thereby making them more vigilant during credit underwriting processes (Ahmed, 2010). Therefore, it is hypothesized that a robust application of Islamic finance would entail pursuing a balanced financial development goal that is in harmony with the real economy (Ledhem and Mekidiche, 2020; Ahmed, 2010; Kahf, 2014, 2015; Alawode, 2015).

Despite being in the early stages of development, Islamic finance in the context of GCC and Türkiye shares a number of key features that can align with the above hypothesis. For instance, in 2024, the GCC economy grew by 1.7% up by 0.3% from 2023, and in 2025 it is projected to expand at 3.8% (World Bank Group, 2025). This macroeconomic growth is consistent with the growth of Islamic financial service institutions (IFSI). For instance, between 2023 and 2024, Islamic finance grew by 5.8% from 1,740.4 USD billion to 1,847.42 USD billion (IFSB, 2023, 2024). Moreover, the share of global Islamic finance in the GCC region increased by 35% in 2021, and in 2024, the region remained the largest Islamic finance hub with a global market share of over 52%, up from 50% recorded in 2021 (IFSB, 2022, 2024). Even though the global market share of Islamic finance in Türkiye remained relatively low at 2.9%, however, it is promising in terms of Islamic bond/*Sukuk* issuance (IFSB, 2022; 2024).

Further reports by IFSB 2024 indicate that the Islamic capital market (ICM) segment seems to be the fastest-growing part of Islamic finance, with an average annual growth of 12.5% over the past five years. In the year 2023, per se, the ICM accounted for 29.08% of global Islamic finance, mostly dominated by *Sukuk* (Islamic bonds), and the GCC region endured the second largest market share of the *Sukuk* market with a share of over 42%.

Additionally, over the past five years, the GCC region has held an average market share of 48% of the US dollar-denominated *Sukuk* issuance (Bloomberg, 2020). During 2023, Saudi Arabia remained the largest issuer of *Sukuk* in the GCC region, raising 24.06% of total *Sukuk* issuance globally, followed by the UAE, 7.36%, Kuwait, 6.4%, Bahrain, 2.4%, Qatar, 1.6% and Oman, 0.73 (IFSB, 2024; Othman et al., 2021). *Sukuk* issuance in Türkiye also experienced an upward trend, showing more improvement in comparison to most countries in the GCC region; its total share by domicile remained at 7.4% of the global *Sukuk* issuance (IFSB, 2022; 2024). The trends provide convincing evidence on how Islamic finance can serve as an

alternative financing option. Theoretically, it entails the existence of a certain relationship between the economy and Sukuk variables.

This, in part, has triggered the motivation behind the present study. This is because an economic theory may suggest that certain variables have an equilibrium relationship; however, real economic data may not conform to this hypothesis (Yussuf, 2021; Utkulu, 1997). Auspiciously, recent econometric literature offers a method to determine the existence of an economic relationship between variables with a unit root (Arize, 1994; Engle and Granger, 1987; Granger, 1981).

So, in the present study, we adopt the Sukuk/Islamic bond variable as a percentage of the GDP and the GDP growth as a proxy of the economy to determine whether short- and long-run dynamics hold. This is also because there is a dearth of studies that have focused on the relationship between *Sukuk* and the GDP, specifically in the GCC countries and Türkiye, in the context of cointegration, including the long-run structural modeling (LRSM).

Also, previous studies have ignored the application of the Bayesian technique, which is more suitable for small samples. Therefore, the application of the cointegration technique, along with its seven-step procedures, including LRSM, and the Bayesian approaches, forms a novel addition to the existing literature.

The remainder of the paper is organized as follows: Section two revisits various literature, Section three describes the data and the adopted methodology, Section four analyzes the findings, and Section five summarizes the findings and suggests policy implications.

1.Literature Review

Various empirical studies have been conducted to analyze the relationship between the economy and Islamic finance. Nevertheless, these studies have yielded varying and inconclusive results. For example, Kazak et al (2023), Pérez-Montiel (2023), and Koruklu (2022) have indicated a positive relationship between the economy and Islamic finance.

Other studies, including Soedarmono and Yusgiantoro (2023), Ledhem et al. (2022), and M Anwar et al. (2020), have also indicated that Islamic finance, particularly Islamic banks, is associated with higher economic growth. Moreover, Ozcelebi and Pérez-Montiel (2023) contended that Islamic finance shares a long-term relationship with the economy. In their study, they have revealed that the Dow Jones Islamic Market Index is cointegrated with the volatility index of the Chicago Board Options Exchange.

Also, Furqani and Mulyany (2009), Avdukic and Asutay (2024) studied the relationship between Islamic banking development and economic growth and revealed a significant

impact of Islamic banking on economic growth. Their findings align with an earlier study by Abduh and Azmi Omar (2012), who found a significant bidirectional causality between Islamic banking development and economic growth in Indonesia. Abdul Manap *et al.* (2012) and Farah *et al.* (2025) have revealed a significant but unidirectional causality between Islamic banking development and economic growth. Their findings are supported by Jobarteh and Ergec (2017) and Koruklu (2022), who found a unidirectional causality between Islamic finance and economic growth in the short and long run in Türkiye. Furthermore, Ledhem *et al.* (2022), Kalayci and Tekin (2016) also analyzed the relationship between economic growth, foreign direct investment, and Islamic finance, particularly participation banks in Türkiye from 2013Q4 to 2019Q4, and from 2002 to 2014, respectively. They have revealed that long-term economic growth is, in part, determined by the proxies of Islamic banks and foreign direct investments.

Contrary to the above findings, Bozkurt (2019), as cited from Kazal *et al.* (2023), argue that the impact of Islamic finance on economic growth appears to be negative in the short term. Bozkurt's findings are supported by Polyzos *et al.* (2022), who also contended that, to some extent, Islamic finance, specifically Islamic banking systems, may curtail economic activity. Moreover, a comparative study by Sekmen (2021) concluded that Islamic Finance (i.e., Islamic banking) contributes less to economic growth in comparison to conventional banking.

Also, Goaid and Sassi (2011) explored the relationship between Islamic financial development and economic growth in MENA countries. The study revealed a negative relationship for petroleum-exporting countries and a positive but insignificant relationship for countries without petroleum exports.

Based on the findings from extant empirical studies, the findings of the previous studies can be broadly grouped into three main categories regarding the relationship between Islamic finance and the economy. The first category, including Polyzos *et al.* (2022), Sekmen (2021) Goaid and Sassi (2011), have found either an insignificant or a negative relationship between Islamic finance and the economy. The second category of studies, such as Ghroubi (2023), Jobarteh and Ergec (2017); Koruklu (2022), and Abdul Manap *et al.* (2012), found unidirectional causality from the economy to Islamic finance, and the third category, which includes Kazak *et al.* (2023), Pérez-Montiel (2023), and Koruklu (2022), Abduh and Azmi Omar (2012), have found bidirectional causality from Islamic finance to the economy.

It is evident from previous studies that the findings on the relationship between Islamic Finance and the economy are not only inconclusive, but also these studies have remained

silent on the relationship between the GDP growth and the Islamic bonds (*Sukuk*), which has recently been surging in terms of new issuances.

Thus, the present study departs from the earlier studies and advances the knowledge in the subject area in the following ways. (i) It adopts the most recent cointegration technique, such as the LRSM, which endeavours to estimate theoretically meaningful cointegration relations based on *a priori* information, see also Masih *et al.* (2009, 2010). (ii) While most previous studies, including Avdukic and Asutay (2024), Kazak *et al.* (2023), Soedarmono and Yusgiantoro (2023), mostly adopted economic growth as a proxy for the economy, and the Islamic banking growth as a proxy for Islamic finance. Hence, little is known about the dynamic relationship between Islamic bonds/*Sukuk* and GDP growth. (iii) Moreover, the present study adopts a seven-step procedure to conduct a cointegration test, which is rarely followed by earlier studies in the context of the economy (GDP growth) and *Sukuk*. We have also applied an alternative methodology, i.e., the Bayesian approach, to enhance the robustness of our findings. Hence, the use of seven-step procedures with the Bayesian approach, the present study advances a nuanced contribution to the literature.

2.Data and Methodology

The sample data includes the GDP growth as a proxy for the economy and *Sukuk* as a percent of GDP as a proxy for Islamic finance for the selected GCC states and Türkiye. The sample period includes quarterly time series data from 2014Q1 to 2024Q3. The respective data were extracted from the IFSB metadata and the World Bank Database. The use of *Sukuk* as a percentage of GDP is intended to normalize the scale differences between the financial (Islamic bond) and macroeconomic variables. This gives a contextualized insight into the *Sukuk*'s significance within the broader economy. Also, it improves the interpretability, especially when modelling the long-run relationship.

Therefore, the present study employs high-frequency observations through a seven-step procedure to examine the long-run and short-term dynamics between the economy (GDP growth) and *Sukuk*. Although there is a debate over the sample length (i.e., data sample with a long period) versus the high-frequency observations (i.e., data sample with a short period, such as quarterly data for determining the cointegration test). Nevertheless, there has been an increasing number of studies, including Kalia (2024), Ozcelebi and Izgi (2023), Ledhem *et al.* (2022). Moreover, past studies such as Edison and Fisher (1989), Patel (1986), and Mark (1986) have been relying on the use of high-frequency observations, i.e., quarterly data.

In the present study, the seven-step procedure starts with an analysis of the unit root, VAR lag order selection, cointegration test, analysis of long-run structural modeling (LRSM), and analysis of within-sample causality (short-run and long-run dynamics) using vector error correction (VECM). Also, it extends to analyze out-of-sample causality using variance decomposition (VDC), impulse response function (IRF), and persistency profile (PP).

The application of the seven-step procedure is useful because each step has unique strengths and limitations. For instance, the VAR lag order selection is used to determine the order of cointegration. However, VAR cannot determine the cointegration ranks; as such, the Johansen technique is applied.

The limitation of the cointegration test is that it only tells if there is a theoretical relationship among variables; however, it cannot quantify the coefficient of cointegrating vectors (Masih et al., 2009; Pesaran and Shin, 2002). In this case, we adopt a long-run structural modeling (LRSM) proposed by Pesaran, Shin, and Smith (2001) that uses the cointegration ranks to quantify the *atheoretical* relation, so that researchers can compare against a priori information of the economy. In doing so, it conducts structural identification by imposing restrictions based on economic theory on the cointegrating vectors (Masih et al., 2009, 2010; Pesaran and Shin, 2002; Yussuf, 2021).

The use of LRSM cannot discern between exogeneity and endogeneity among variables; in this case, the VECM. It is used to determine which variable is endogenous and which is exogenous, including the short-run and long-run dynamics as described by Johansen and Juselius (1990). However, VECM cannot explain the degree of exogeneity and endogeneity of the cointegrating variables. As such, we adopt the variance decomposition (VDC), which helps to determine the relative endogeneity and exogeneity. This, in turn, assists in identifying the leader variable that would be the focus for policymakers and researchers (Masih et al., 2009, 2010). Yet, the application of VDC cannot indicate the time taken by the cointegrating variables to return to their equilibrium when the whole cointegrating equation is shocked (Masih et al., 2009; Yussuf, 2021); thus, to accomplish this task, we adopt the persistence profile (PP).

In addition to the frequentist approach, a Bayesian technique is applied to the data. Due to the limited sample size of our data, the application of Bayesian statistics offers several benefits, as it can exhibit better performance (Kruschke et al., 2012; Oanh et al., 2023). Thus, providing more precise and evidence-based inferences (Nguyen et al., 2024). Moreover, under the Bayesian approach, the inference can be continually updated as more data becomes available (Oanh et al., 2023). This allows for a more nuanced understanding of the relationships between *Sukuk* and GDP growth.

Due to the challenges in prior selection, we have aligned with Nguyen and colleagues (2024) and Kosheleva *et al.* (2021) and used non-informative priors for every unknown parameter in the model. Additionally, to obtain the posterior probability distribution of the parameters, we applied MCMC and Gibbs sampling.

4.Results and Discussion

4.1.Unit Root Test

The first step in the cointegration test is to check whether the time series data is stationary. Thus, the variables are expressed in the *k*-th order of the VAR(k) matrix as shown in Equation (i).

$$\Delta Y_t = \delta_0 + \text{§}_1 \Gamma_t + \text{§}_2 \Gamma_{t-1} + \text{§}_3 Y_{t-1} + \dots, \Gamma_k + Y_k + \prod \Gamma_{t-k} Y_{t-k} + \varepsilon_t \dots (i).$$

Such that, Y_t and Γ_t are non-stationary time series vectors representing the GDP growth and *Sukuk* as a proportion of the GDP, respectively.

Δ is the first difference operator. δ_0 is a constant term, § represents the coefficients, and \prod is the matrix of vectors Y_t , and Γ_t with *k* variables.

The VAR in Equation (i) can be rewritten as follows

$$\Delta Y_t = \delta_0 + \sum_{i=1}^{k-1} \text{§} \Delta(\Gamma_{t-i} Y_{t-i}) + \dots, \prod \Gamma_{t-k} Y_{t-k} + \varepsilon_t \dots (ii)$$

The time series variables in Equation (i) are said to be cointegrated if their linear combination is stationary. To confirm this, we have adopted the KPSS proposed by Kwiatkowski *et al* (1992) and Augmented Dickey-Fuller (ADF) tests to analyse the stationarity of the variables. The results are shown in Table I (a) and Table I (b).

Table I(a): Unit Root Test (KPSS)

| | LGDP | | LSK | | d.GDP | | d.SK | |
|--------------|---------|----------|---------|-----------|--------|-----------|--------|-----------|
| | T -stat | C- Value | T -stat | C - Value | T-stat | C – Value | T-stat | C - value |
| Kuwait | .196 | .152 | .423 | .376 | .232* | .389 | .189* | .379 |
| Saudi Arabia | .384 | .383 | .415 | .376 | .358* | .389 | .126* | .379 |
| UAE | .463 | .376 | .463 | .376 | .232* | .389 | .144* | .379 |
| Oman | .252 | .141 | .405 | .379 | .407* | .413 | .167* | .379 |
| Türkiye | .413 | .376 | .408 | .376 | .132* | .379 | .195* | .379 |

Note: "L" and "d" denote in level form and first difference, respectively

* 5% significance level

Table I(a) is the output of the unit root test using the KPSS test. In the level form represented by LGDP and LSK, the null hypothesis of stationarity (H_0) was rejected at a 5% significance level. However, in the first difference, we failed to reject the null hypothesis.

Additionally, we have conducted another stationarity test using the Augmented Dickey-Fuller (ADF) test, as shown in Table I(b). In the level form, we failed to reject the null hypothesis of a unit root. Consistent with the KPSS results in Table I(a), also, the result of the ADF test in Table I(b) indicates that the variables are stationary at the first difference.

Table I(b): Unit Stationarity Test (Augmented Dickey-Fuller ADF Test)

| Country | Lag | LGDP | | LSK | | d.GDP | | d.SK | |
|--------------|--------|--------|---------|--------|---------|--------|---------|--------|---------|
| | | T-Stat | C-Value | T-Stat | C-Value | T-Stat | C-Value | T-Stat | C-Value |
| Kuwait | ADF(1) | 1.589 | 3.126 | 2.957 | 3.527 | 2.727* | 2.004 | 3.675* | 1.902 |
| | ADF(3) | 1.452 | 3.137 | 2.956 | 3.524 | 2.217* | 1.849 | 2.132* | 1.852 |
| Saudi Arabia | ADF(1) | 1.123 | 3.721 | 1.600 | 3.527 | 3.287* | 3.126 | 2.685* | 1.901 |
| | ADF(3) | 1.508 | 3.709 | 1.333 | 3.524 | 3.223* | 3.137 | 1.899* | 1.845 |
| UAE | ADF(1) | 1.719 | 2.033 | 1.449 | 3.527 | 2.727* | 2.004 | 2.624* | 1.902 |
| | ADF(3) | 1.574 | 1.894 | .869 | 3.524 | 1.988* | 1.881 | 2.184* | 1.845 |
| Oman | ADF(1) | 2.30 | 4.863 | 1.530 | 3.471 | 2.47* | 2.110 | 4.998* | 1.934 |
| | ADF(3) | 3.451 | 5.297 | 2.171 | 3.527 | - | - | 3.721* | 1.839 |
| Türkiye | ADF(1) | 2.014 | -2.87 | .275 | 2.874 | 3.346* | 1.902 | 2.736* | 1.902 |
| | ADF(3) | 3.109 | 3.524 | .334 | 2.850 | 3.015* | -1.85 | 3.648* | 1.867 |

Note: * indicates 5% significance level

Therefore, the overall results indicate that all variables are stationary after the first difference; as such, we can adopt VECM to analyse the long-run and short-run cointegration

In addition to the stationarity test, a residual diagnostic test is conducted to check whether the normality assumption is maintained by the data. This procedure was executed to

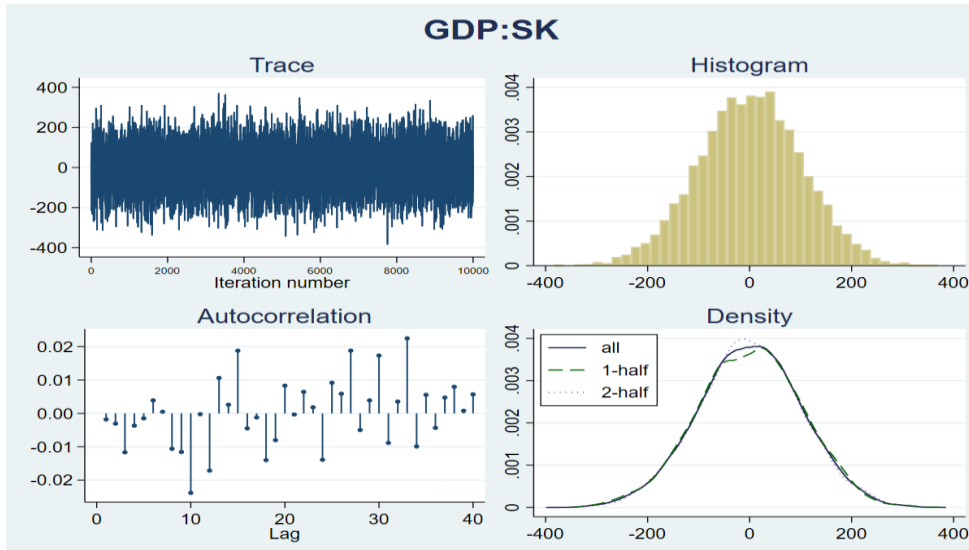
determine whether the data follows a linear or non-linear pattern, so that an appropriate model can be applied to the data (i.e., whether a linear or nonlinear model). Results are shown in Table II, indicating insufficient evidence for violating the normality assumption. Also, Jarque-Bera (JB) cannot reject the normality assumption at a 5% significance level. Hence, the stationarity assumption still holds under the J & B test.

Table II: Residual Diagnostics and Summary Statistics

| Country | Mean | Max | Min | Std | Skewness | Kurtosis | J&B | Prob |
|--------------|-------|--------|--------|--------|----------|----------|-------|--------|
| Kuwait | -3.96 | .229 | -.39 | .182 | .0065 | 2.283 | 2.711 | (.257) |
| Saudi Arabia | -.000 | 7.27 | -1.3 | 5.72e+ | .0066 | 2.198 | 3.196 | (.202) |
| UAE | .000 | 5.92e+ | 8.04e+ | 3.94e+ | .0057 | 2.181 | 2.682 | (.261) |
| Oman | -3.62 | 1.31 | -2.6 | 1.09e+ | .00771 | 2.734 | 3.269 | (.195) |
| Turkey | .000 | 1.32 | -1.8 | 9.61e+ | .0032 | 1.984 | 1.950 | (.377) |

Based on these results, we conclude that the data is likely to follow a normal distribution, and as such, the variables may have some sort of linear relationship. Hence, we adopt a linear-based cointegration model like the Johansen Test.

In addition to the frequentist approach, we have applied the Markov Chain Monte Carlo (MCMC) method to verify whether the model converges to stationarity, which is crucial for ensuring the stability of estimates under Bayesian analysis (Nguyen et al., 2024; Thach, 2024). Based on Kalia (2024), Kosheleva et al.'s (2021), and Jiang and Liu's (2020) approach, we have applied non-informative normal priors for each unknown parameter. To obtain the posterior distributions of the parameters, we apply the Markov Chain Monte Carlo (MCMC) technique and Gibbs sampling algorithm.

Figure 1: Posterior Probability for MCMC Convergence Diagnostic

For this reason, a total of 11,000 simulation samples were drawn, and the first 1,000 were discarded to ensure the accuracy of the analysis. The result for the convergence diagnostics is shown in Figure 1, where the convergence diagnostics indicate that the overlap of the trace plots is nearly perfect, and the Kernel density curves are very compact with each other. Moreover, the autocorrelation plot indicates relatively low autocorrelation, which dies soon after the 40th lag. Based on the convergence diagnostics, the MCMC appears to have converged and mixed well. Hence, the posterior probability distribution of GDP growth and *Sukuk* variables does not violate the normal distribution assumption; as such, it is evident that the MCMC converges to stationarity.

4.2. Lag Order Selection of the Unrestricted VAR

The lag order selection is useful in the cointegration test, as it is used to determine the order of cointegration among the variables. In this procedure, we have adopted both the traditional and the Bayesian VAR approaches. This approach is encouraged for the reliability and enhancing robustness of the findings (Kalia, 2024; Nguyen *et al.*, 2019). In the traditional VAR lag order selection, the selection criteria are based on the Schwarz Bayesian Criterion (SBC), as it is believed to perform better in smaller samples, whereas the optimal lag order for the Bayesian VAR is based on marginal likelihoods.

Table III: Bayesian VAR Posterior Probability and Traditional VAR

| Countries | Bayesian VAR | | | | Traditional VAR |
|--------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | Lag 1 P(M/y) | Lag 2 P(M/y) | Lag 3 P(M/y) | Lag 4 P(M/y) | VAR Lag Order |
| Kuwait | 0.0984* | 0.999 | 0.0003 | 0.8300 | (2) |
| Saudi Arabia | 0.999* | 0.0000 | 0.0004 | 0.0000 | (2) |
| UAE | 0.998* | 0.0055 | 0.9944 | 0.0000 | (2) |
| Oman | 0.997* | 0.9876 | 0.0004 | 0.0000 | (2) |
| Türkiye | 0.995* | 0.0046 | 0.0001 | 0.0000 | (2) |

Note: * asterisks and parentheses indicate the optimal lag order for Bayesian VAR and Traditional VAR, respectively. P(M/y) is the Bayesian VAR posterior probability.

The outputs for traditional VAR are shown in Table III in the last column, with the heading traditional VAR: as such, the lag order of 2, i.e., VAR [2], is selected as the optimal lag for the variables in all countries under the sample.

Unlike traditional VAR, the Bayesian VAR approach uses model comparison to select the optimum lags (Helmut and Kratzig, 2004). To implement this procedure, a reasonable set of possible lags was chosen (i.e., from lag 1 to lag k , i.e., 4), and then a subsequent Bayesian VAR(k) model was fitted for each chosen lag k . Finally, the log-marginal likelihood was used to compare the VAR(k) fitted models. The results are shown in Table III under the heading of Bayesian VAR.

As seen in Table III, there is a slight difference in terms of the optimal lag order between Traditional VAR and Bayesian VAR. In traditional VAR, in the last column in Table III, the lag order 2 or VAR (2) is chosen as the optimal lag order, whereas in Bayesian VAR, lag 1 has the highest posterior probability, indicating that lag 1 or VAR (1) is the optimal lag order for the variables in all countries under investigation.

This difference is quite normal for the two approaches, because, in traditional VAR, the BIC, AIC, and HQIC emphasize balancing fit and parsimony; hence, they are sensitive to small sample size, as such favouring slightly higher lags to capture the dynamics. In contrast, Bayesian VAR tends to select a more parsimonious specification, which favours simpler models.

Because the goal of applying both approaches is to assess their robustness, we conducted a sensitivity check for both lags and compared the stability of the coefficients. The main results showed that the models are stable across both specifications. Consequently, the sensitivity check demonstrated that both approaches produced consistent results regarding coefficient stability. To save space, the results are not included. In this case, we can proceed with the traditional VAR lag order of 2. This is because including very short lags can lead to an inadequately specified model and a loss of degrees of freedom, while very long lags could cause an overparameterized model (Yussuf, 2021).

4.3. Analysis of Cointegration and Long-Run Structural Modelling (LRSM)

After establishing the lag order of the VAR, in this step Johansen technique is adopted. The Johansen procedure applies maximum likelihood to determine the presence of cointegrating vectors in a non-stationary time series (Yussuf, 2022). This procedure uses the trace test and maximum eigenvalue to determine the number of cointegrating vectors. In both tests, a null hypothesis of no cointegration ($r = 0$) is tested against an alternative hypothesis that at least one cointegration ($r + 1$) exists.

Table IV depicts the results of the cointegration test, where in both the trace test and the maximal eigenvalue, the t-statistics are greater than critical values at a 5% significance level, particularly for three countries in our sample, i.e., Kuwait, Oman, and Türkiye. On the other hand, the t-statistics are greater than the critical value at a 10% significance level for two countries, i.e., the UAE and Saudi Arabia.

Hence, in both tests, the null hypothesis of no cointegration is rejected. This observation is further supported by the unit root test results in Table III. Therefore, we argue that Islamic bonds/*Sukuk* and the GDP have a cointegrated relationship.

Table IV: Cointegration Based on Maximal Eigenvalue and Trace Test Stochastic Matrix

| | H_0 | H_1 | <i>Maximal</i> | <i>Trace</i> | | |
|--------------|-------------|--------------------|-------------------|----------------|-------------|----------------|
| | <i>Null</i> | <i>Alternative</i> | <i>eigenvalue</i> | | <i>Test</i> | |
| Countries | | | t-Statistic | Critical Value | t-statistic | Critical Value |
| Kuwait | $r=0$ | $r=1$ | 25.41 | 19.22* | 33.44 | 25.77* |
| Saudi Arabia | $r=0$ | $r=1$ | 19.77 | 17.18** | 25.92 | 23.08** |
| UAE | $r=0$ | $r=1$ | 18.54 | 17.18** | 24.68 | 23.08** |
| Oman | $r=0$ | $r=1$ | 54.90 | 19.22* | 68.70 | 25.77* |
| Türkiye | $r=0$ | $r=1$ | 21.66 | 19.22* | 47.25 | 25.77* |

Note: *, ** Significance at .5, .10 Critical Values respectively. r indicates the number of cointegrating vectors.

Please note that the evidence of cointegration between these variables rules out the possibility of a spurious relation; hence, there is a high likelihood that the two variables are interdependent (Masih *et al.*, 2019; Masih *et al.*, 2010; Yussuf, 2022). This finding has potential implications for investors and policymakers; due to the cointegrated relation, the improvement in GDP may likely signal high profitability in the *Sukuk* market.

The evidence of cointegration is not a coincidence, as it aligns with some economic data. For instance, in countries like Saudi Arabia and the UAE, the improvement in GDP after 2020 was parallel with the surge in *Sukuk* issuance, where about 38% and 34% of primary *Sukuk* were issued in the two countries during 2021, respectively. In the same period, the two countries became the highest issuers of *Sukuk* in the GCC region. See also Othman *et al.* (2021).

Please note that the existence of cointegration can only explain the long-term relationship, which is theoretical in nature. The limitation of cointegration is that it cannot indicate standard errors for the long-run coefficients (Masih *et al.*, 2010). To prove whether the coefficients of the cointegrating vectors are consistent with the theoretical information, we perform a long-run structural modeling (LRSM). The LRSM quantifies the estimates of the theoretically meaningful long-run relationships in an unrestricted VAR model (Garratt *et al.*, 2000; Garratt *et al.*, 2003; Garratt *et al.*, 2004). So much so that researchers can compare the estimated coefficients against theoretical expectations (Masih, Dewandru, and Kamil, n.d., p.3). To the best of our knowledge, this procedure is rarely implemented in the context of *Sukuk* and the GDP, especially in the GCC region and Türkiye. Hence, its application adds a nuanced contribution to the literature.

To implement this procedure, we have imposed the exactly and over-identifying restrictions on the cointegrating vectors. To specify the equation, we have normalized the coefficient of GDP, as seen in Table V. This is useful to examine whether the computed coefficients reflect the established assumption of a long-run relation as established in the cointegration test, see, for example, Soedarmono and Yusgiantoro (2023), Pérez-Montiel (2023), and Koruklu (2022).

Table V: The maximum likelihood outputs subject to exactly identifying Restrictions with Unrestricted Intercepts and Restricted Trends in the VAR

| Countries | Vector 1 | | | |
|--------------|---------------|----------------------|--------------------|-----------|
| | <i>lGDP</i> | <i>ISK</i> | <i>Trend</i> | <i>LL</i> |
| Kuwait | 1 (*NONE*) | -1.598 [.0257]* | .22142 [.0133] | 10.847 |
| Saudi Arabia | 1 (*NONE*) | 19.069 [40.407] | -.16253 [.364] | 14.068 |
| UAE | 1 (*NONE*) | .559 [-.06036]* | .1683 [-.0184] | 23.612 |
| Oman | 1 (*NONE*) | 1.838 [.175]* | -.319 [.0254] | 8.207 |
| Türkiye | 1 (*NONE*) | 2.116 [-0.6404] * | .220 [.180] | 2.017 |

Note: In parentheses are standard errors (SE). *ISK* and *lGDP* are the Islamic bond/Sukuk and GDP, respectively. * Indicates 5% significance level.

After normalizing the coefficient of GDP, the results in Table V indicate that the coefficients of cointegrating vectors for four countries out of five, i.e., Kuwait, UAE, Türkiye, and Oman, are statistically significant as indicated by asterisks, except for one country, i.e., Saudi Arabia.

Next, we must perform the ML estimates subject to over-identifying restrictions with unrestricted intercepts and restricted trends in the VAR. In this case, we have imposed zero coefficients for the *Sukuk*/Islamic bonds variable. This is essential to test whether the zero coefficients of the Islamic bond's variable significantly enter the cointegrating vector. The results are shown in Table VI

Table VI: ML Estimates Subject to an Over-identifying Restriction(s) with Unrestricted Intercepts and Restricted Trend in the VAR

| Countries | <i>lGDP</i> | <i>ISK</i> | <i>Trend</i> | <i>LL</i> | <i>Chi</i> ² (1) |
|--------------|---------------|---------------|-------------------|-----------|-----------------------------|
| Kuwait | 1 (*NONE*) | 1 (*NONE*) | .1385 [-.055] | 10.845 | 4287[.948] |
| Saudi Arabia | 1 (*NONE*) | 1 (*NONE*) | -.1828 [-.519] | 74.306 | 9.0045[.3003] |

| | | | | | |
|---------|----------|----------|---------|--------|--------------|
| UAE | 1 | 1 | -.0089 | .1458 | 4.896[.270] |
| | (*NONE*) | (*NONE*) | [.0041] | | |
| Oman | 1 | 1 | -.40583 | 3.539 | 9.337[.2002] |
| | (*NONE*) | (*NONE*) | [-.176] | | |
| Türkiye | 1 | 1 | -.11945 | .77193 | 2.490[.115] |
| | (*NONE*) | (*NONE*) | [-.002] | | |

Note: *SEs in Brackets*

As seen in Table VI, the restriction of zero coefficients is rejected by the Chi-square statistics, with a p-value greater than 5% for variables in all countries, including Saudi Arabia. Hence, the imposed restriction is incorrect, which suggests that only positive coefficients of Islamic bond/*Sukuk* significantly enter the cointegrating vector and, as such, Islamic bond (*Sukuk*) has a significant long-run impact on the GDP. Therefore, the cointegrating relation between *Sukuk* and the GDP still holds under the LRSM procedure. Based on this observation, we can argue that the postulated theoretical relationship between *Sukuk* and the GDP aligns with the LRSM procedures for all five countries under review.

Additionally, to enhance the robustness of this finding, we have adopted the Bayesian approach to test whether the coefficients of Islamic bonds remain significant under the Bayesian approach. Owing to the hurdles in selecting the prior distributions for Bayesian analysis, we have aligned with the approach adopted by Kalia (2024), Kosheleva et al. (2021), and Jiang and Liu (2020); as such, we have applied uninformative priors. So, the Bayesian regression models with their prior distributions are shown below.

$$Y_t = b_o + b_1X_t + u_t \dots\dots\dots(iii).$$

Where Y_t represents the GDP growth, X_t represents the proxy for Islamic bond, i.e., *Sukuk* as a percentage of the GDP, and u_t is the error term. Table VII depicts. Again, the Bayesian posterior outputs in Table VII indicate that all posterior mean coefficients for all countries are positive and significant. Also, the efficiency is above .90 for both variables in all countries, indicating good mixing of the models, and the credible intervals do not include zero; this indicates a strong posterior certainty.

Table VII: Alternative Model -Bayesian Regression for Robustness Check

| Country | Posterior Mean {GDP:SK_cons} | Equal-tailed 95% Credible Interval | Average Efficiency |
|--------------|---------------------------------|--|-----------------------|
| Kuwait | .148 | [.192 .196] | .974 |
| Saudi Arabia | .866 | [.185 .198] | .967 |
| UAE | .230 | [.193 .198] | .972 |
| Oman | .365 | [.195 .197] | .987 |
| Türkiye | .0189 | [.161 .201] | .965 |

Moreover, the posterior mean coefficients are strongly positive with a tight credible interval for Kuwait, the UAE, Saudi Arabia, and Oman, suggesting strong evidence of a significant effect of *Sukuk* on GDP. The findings are consistent with the reports by the Islamic Financial Institutions Boards, 2024, which indicate that until 2023, GCC countries held the highest market share of 34% of global outstanding *Sukuk*/Islamic bonds, which appears to have some impact on the regional economy. The results also indicate that the mean coefficient of *Sukuk* for Türkiye includes zero, indicating a weak effect. However, the credible interval (CR) does not encompass zero, suggesting that there is a 95% chance that the true parameters will lie within the specified intervals. The small coefficient of *Sukuk*'s posterior mean might be because Türkiye is a little behind the GCC region in terms of *Sukuk* market development. Nevertheless, there is a good sign of a significant positive impact of *Sukuk* on Türkiye's economy. Consistent with the LRSM results in Tables V and VI, the Bayesian posterior probability also indicated that the predictor variable, i.e., *Sukuk*, can exert a positive effect on GDP.

4.4. Modelling the Vector Error Correction Model (VECM) and Variance Decomposition (VDC)

Following the presence of 1 cointegration for the two variables in all countries in our sample. In this step, we adopt the concept of VECM to analyze short-run and long-run Granger causality between *Sukuk* and GDP. Table VIII displays the results of VECM, where in the short run, the impact of one variable on another is indicated by the lagged variables (i.e., dLGDPI and dLSK1).

In all five countries in our sample, the overall results show that at least one short-run coefficient of the lagged value of either GDP or *Sukuk* is significant at 5%, indicating the existence of short-run relationships between GDP and Islamic bonds.

Table VIII: ECM Estimated by OLS Based on Cointegrating VAR

| Regressor | <i>Kuwait</i> | <i>Saudi Arabia</i> | <i>UAE</i> | <i>Oman</i> | <i>Turkey</i> |
|------------------|---------------|---------------------|---------------|--------------|---------------|
| Intercept | 10.846[.048] | -4.465[.00] | .960[.047] | 32.867[.028] | -.039[.726] |
| d.LGDP1 | .234[.400] | 1.30 [.100] | .295[.140] | 1.085[.002]* | .599[.002]* |
| d.LSK1 | .184[.007] * | .389[.04]* | 2.994[.026]* | .775[.083] | -.171[.794] |
| <i>ecm1</i> (-1) | -.380[.047]* | -.023[.00]* | -.018 [.04] * | -.081[.300] | .0669[.00]* |

Note: * significant at 5%

The results further indicate that, for three countries, Kuwait, Saudi Arabia, and the UAE, the proxy of GDP (dLGDP) appears to be exogenous, and the proxy of *Sukuk* (dLSK) is endogenous in the short run. This implies that in the short run, the *Sukuk* variable is the primary receiver of an exogenous shock. In other words, the GDP can act as a driving force, while the *Sukuk* can adjust to such an equilibrium. This observation can be related to the real macroeconomic data in several GCC countries. For instance, based on the World Bank data (2022), the GDP of Kuwait grew by 1.1% in 2021, which was followed by a subsequent surge in *Sukuk* issuance. In the same year, *Sukuk* issuance grew by 11% y-o-y until 2021, making Kuwait the second largest issuer of *Sukuk* in the Gulf states (The Times, 2021). A similar pattern appears in the data for the UAE, where the GDP increased by 4.4% in 2021, aligning with the 34% rise in *Sukuk* issuance in H1 2021 (Othman et al., 2021).

Additionally, as for Oman and Türkiye, the proxy of Islamic bond appears to be exogenous, whereas the proxy of GDP appears to be endogenous. This indicates that, in the short run, the direction of causality can run from the *Sukuk* variable to the GDP. i.e., the GDP variable can respond to the *Sukuk* variable in the short run. This observation is consistent with the study by Ledhem and Mekidiche (2022), who indicated that the causality runs from Islamic finance (Islamic banks) to economic development in Türkiye.

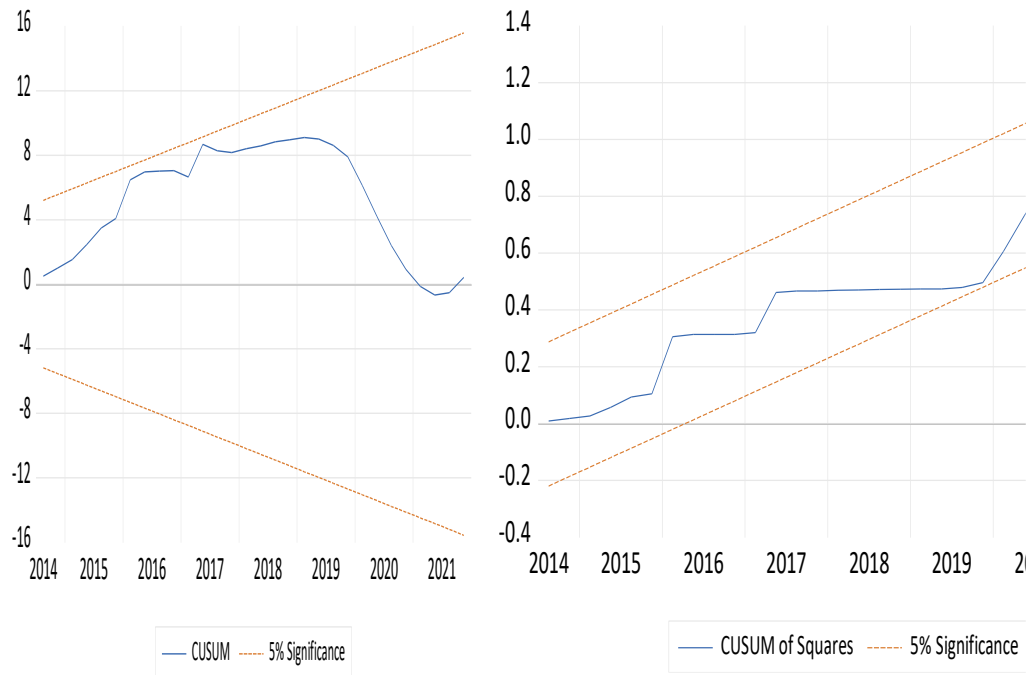
Also, the error correction model (*ECM1*) in Table VIII indicates a significant long-run relationship between the two variables for all countries except for Oman. This finding also aligns with the findings of the previous studies by Ledhem and Mekidiche (2022), Atici (2018), Jobarteh and Ergec (2017), and Koruklu (2022).

Additionally, the speed of adjustments for error correction models for the long run equilibrium bears proper signs of restoring the equilibrium in the long run, except for

Türkiye, where it is positive. Implying that the previous year's deviations from the equilibrium are adjusted for within the current year at the convergence speeds of 380%, 23%, and 18%, for Kuwait, Saudi Arabia, and the UAE, respectively. The speed tends to disappear, with no feedback effects in the long run for Türkiye. This might be because Islamic bonds in Türkiye are less advanced compared to most countries in the GCC region.

To enhance the robustness of the VECM results, we have checked the stability of the VECM coefficients using recursive estimation, i.e., CUSUM and CUSUM SQUARE Figure 2). The results indicate that we cannot reject the null hypothesis of stable coefficients. Hence, we can rely on our VECM findings.

Figure 2: Cumulative Sum of Recursive Residuals (left) and Cumulative Sum of Squares of Recursive Residuals (right)



The limitation of the VECM procedure above is that it can only indicate within-sample causality. Therefore, to understand the out-of-sample causality and the relative degree of endogeneity and exogeneity of the two variables (GDP and *Sukuk*), we have adopted a generalized variance decomposition technique (VDC). The variance decomposition is the complement of the VECM, which partitions the variance of the forecast errors for each variable into portions attributable to innovations in the system (Jones *et al.*, 2005). It offers a precise analysis of how changes in one variable from previous periods affect the value of another variable, including its own, in the current period.

Table IX contains the outputs for variance decomposition. The striking feature about these results is the extreme exogenous nature of the variable GDP for countries like Kuwait, Saudi Arabia, and the UAE. Where, in the short-run period (i.e., horizon 1), the contribution of its own past shock in explaining the forecast error variance is 92% (Kuwait), 94% (Saudi Arabia), and 86% (UAE). The variable that is most explained by its past shock depends less on the other variables, and becomes the leading variable, see also Masih *et al.* (2010) and Yussuf (2021).

Table IX: Relative Forecast Variance Explained by Shocks in Generalized Forecast Error Variance Decomposition

| Horizon | KUWAIT | | SAUDI ARABIA | | UAE | | OMAN | | Türkiye | |
|---------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| Horizon | Δ GDP | Δ SK | Δ GDP | Δ SK | Δ GDP | Δ SK | Δ GDP | Δ SK | Δ GDP | Δ SK |
| 1 | 92.00 | 8.00 | 94.00 | 6.00 | 85.60 | 14.40 | 42.49 | 57.51 | 5.90 | 94.10 |
| 3 | 99.40 | 0.006 | 97.00 | 3.00 | 61.00 | 39.00 | 22.42 | 77.58 | 7.08 | 92.96 |
| 5 | 96.70 | 3.30 | 99.00 | 1.00 | 55.10 | 44.90 | 42.97 | 57.03 | 7.20 | 92.80 |
| 7 | 84.74 | 15.26 | 97.09 | 2.91 | 67.24 | 32.76 | 32.21 | 67.79 | 6.75 | 93.25 |
| 9 | 94.30 | 5.70 | 97.03 | 2.97 | 66.18 | 33.82 | 30.72 | 69.28 | 6.61 | 93.39 |
| 11 | 86.97 | 13.03 | 96.99 | 3.01 | 65.58 | 34.42 | 28.91 | 71.09 | 6.47 | 93.53 |
| 13 | 96.35 | 3.65 | 96.94 | 3.06 | 65.38 | 34.62 | 27.94 | 72.06 | 6.33 | 93.67 |
| 25 | 81.63 | 18.37 | 96.96 | 3.04 | 65.42 | 34.58 | 24.93 | 75.07 | 5.52 | 94.48 |
| 27 | 82.10 | 17.90 | 99.00 | 1.00 | 51.60 | 48.40 | 13.05 | 86.95 | 3.50 | 96.50 |
| 33 | 79.00 | 21.00 | 96.87 | 3.13 | 65.41 | 51.90 | 7.70 | 92.30 | 3.20 | 96.80 |
| 35 | 78.10 | 21.90 | 99.00 | 1.00 | 52.41 | 48.00 | 6.15 | 93.95 | 3.10 | 96.90 |

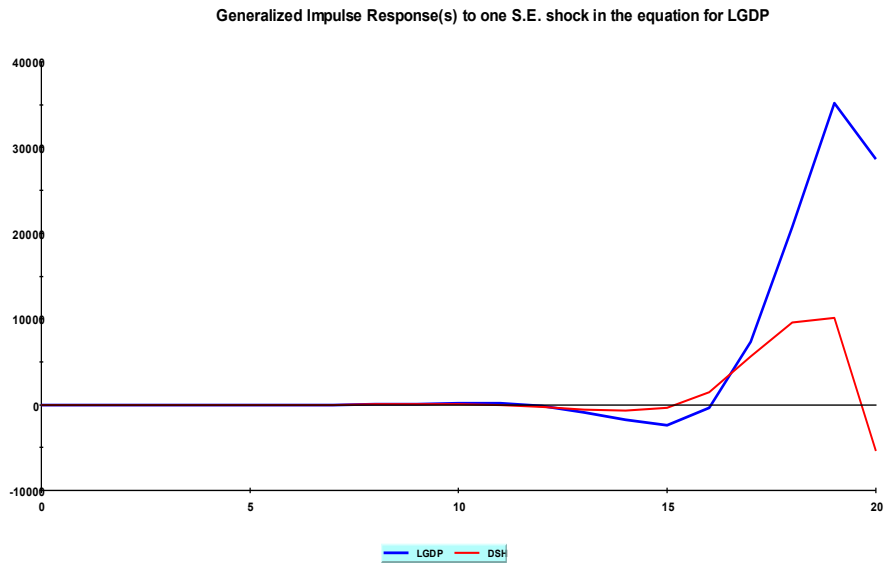
This implies that the GDP variable for Kuwait, Saudi Arabia, and the UAE is highly exogenous and can significantly contribute to the forecast error variance of *Sukuk*. Hence, the out-of-sample results, provided by generalized variance decomposition in Table IX, reflect the within-sample results shown in Table VIII. This finding is essential for policymakers in these three countries, as it indicates that the GDP variable is the leading variable; hence, the appropriate policy should target the GDP to stimulate and enhance the *Sukuk* market.

4.1. Analysis of Impulse Response and Persistence Profile

The impulse response function (IRF) is an extension of variance decomposition, which is presented in a graphical form. It maps out the dynamic response path of one variable due

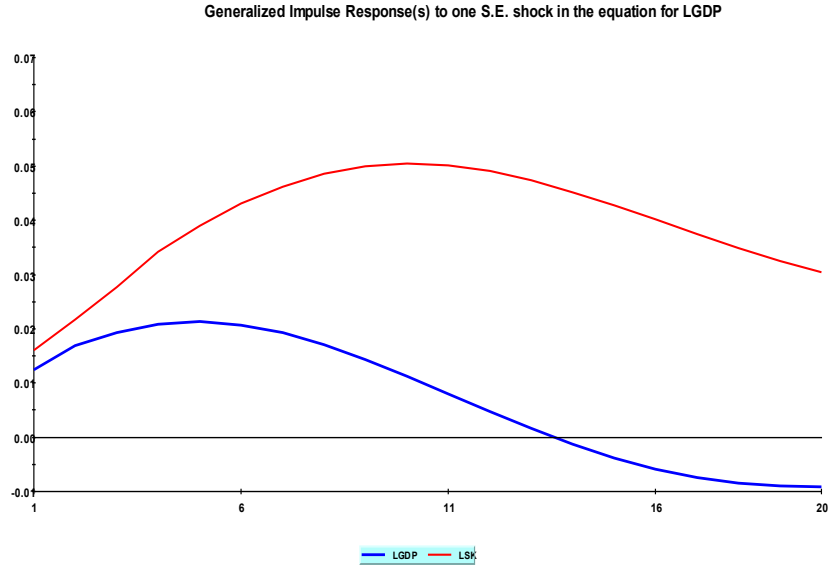
to a one-period standard deviation shock to another variable (Yussuf, 2021). Figures 3 [A, B, C] depict the impulse responses to one S.E. shock in the equations. Where the red line represents the *Sukuk* variable (LSK) and the blue line represents the GDP variable (LGDP).

Figure 3. A: Impulse Response of LSK – Kuwait



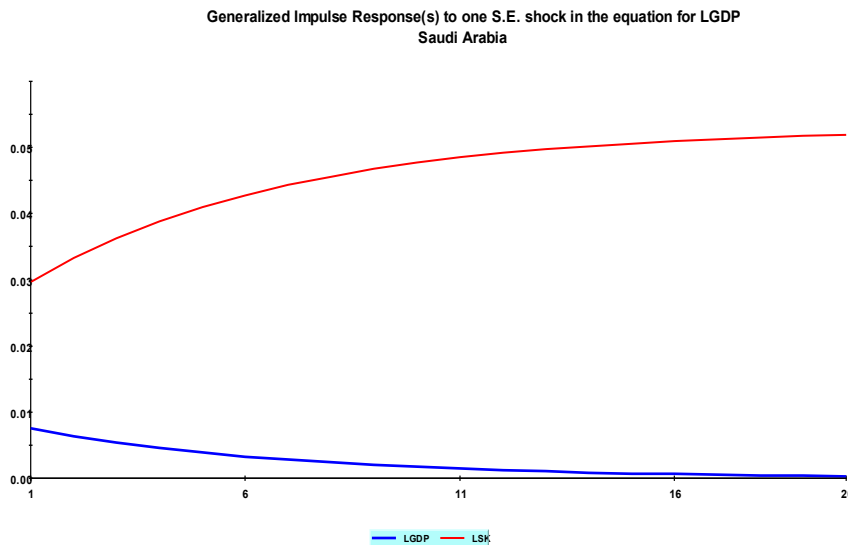
The results in Figure 3A, Figure 3B, and Figure 3C indicate that, with a one standard deviation shock on the GDP, there is an active response for the *Sukuk* variable.

Figure 3. B: Impulse Response LSK - U.A.E



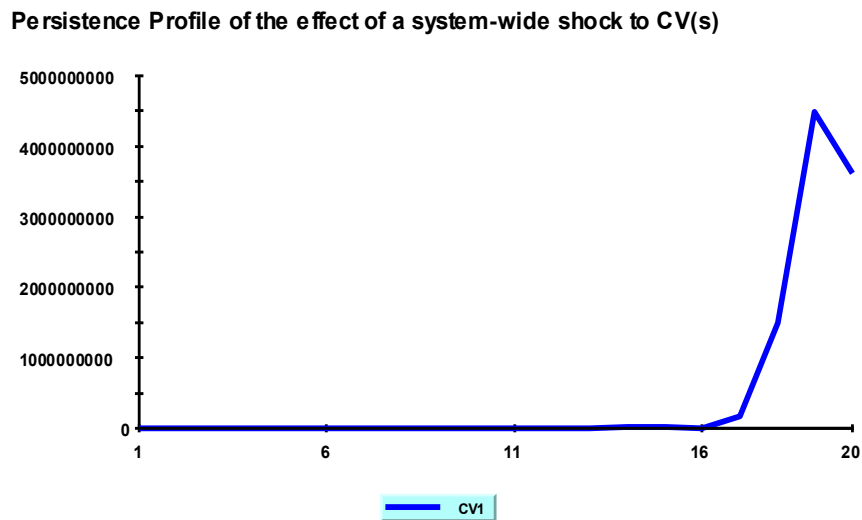
For instance, in Figure 3A. [Kuwait], when the GDP is shocked, there is no instantaneous response of the *Sukuk* variable; however, after about 3 years (approximately 16 quarters), it converges to positive before declining again from the 19th quarter. This implies that a one-standard-deviation shock on the economy has marginal feedback on the *Sukuk* variable, which is consistent with the VDC observation.

Figure 3. C: Impulse Response - Saudi Arabia



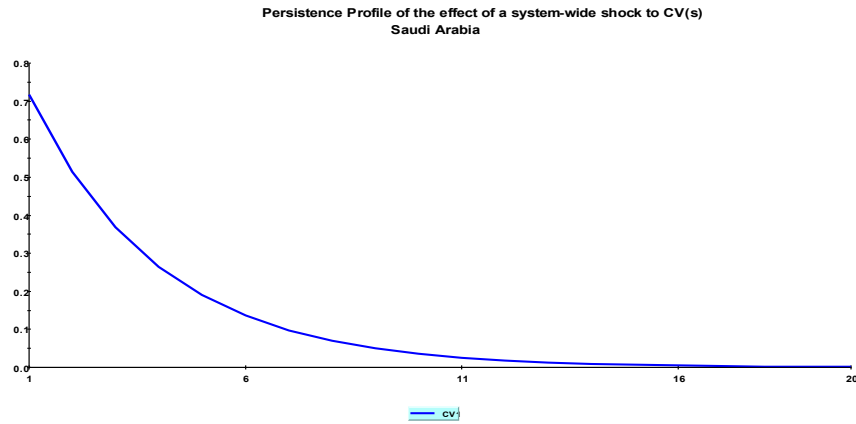
The Impulse Response, as seen in Figure 3, can only determine one variable-specific shock. Therefore, to determine the effect of system-wide external shocks on the cointegrating variables, we have performed a persistence profile. This procedure estimates how long it would take for the variable to get back to the equilibrium if the entire cointegrating equation is “shocked”. Figures 4 [A, B, C, and D] portray the persistence profile of the effects of system-wide shock to cointegrating variables, i.e., the speed with which cointegrating variables (CV) get back to their equilibrium, when the whole cointegrating equation is shocked

Figure 4. A: Persistence Profile – Kuwait



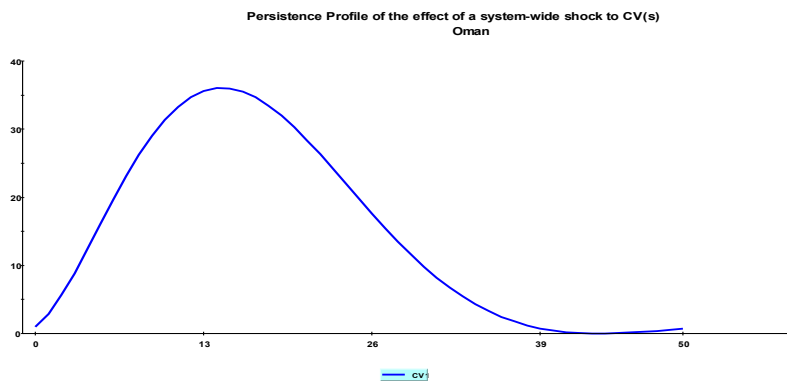
The responses vary from one country to another. For instance, in Figure 4. A [Kuwait]. Due to a standard deviation shock, it may take just a few quarters for the equilibrium to be restored.

Figure 4. B: Persistence Profile - UAE



As for the UAE, Figure 4. B, the cointegrating variables may take almost 16 quarters before the equilibrium is fully restored.

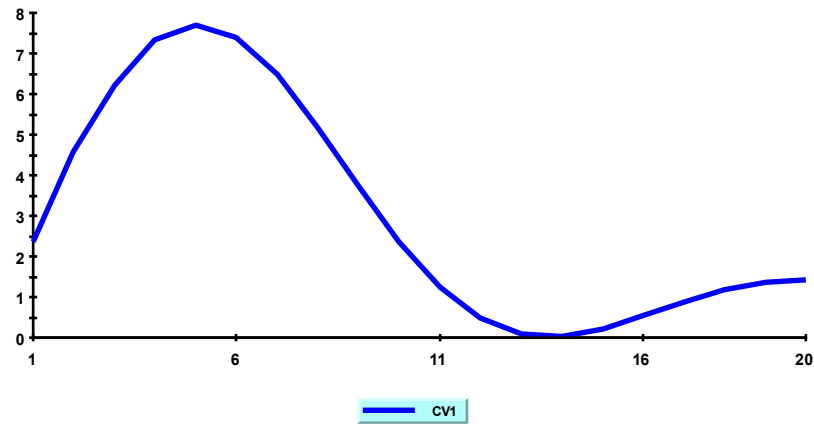
Figure 4. C: Persistence Profile - Oman



In the case of Figure 4. C (Oman), and Figure 4.D (Saudi Arabia), due to system-wide shocks, the cointegrating variables (CVs) may take over 40 and 13 quarters, respectively, to converge back to the equilibrium. Therefore, observations in Figures 4 [A, B, C, and D] are consistent with the earlier observation of VECM and variance decomposition (VDC).

Figure 4. D: Persistence Profile-Saudi Arabia

Persistence Profile of the effect of a system-wide shock to CV(s)



Conclusion

The purpose of the present study was to empirically examine the dynamic relationships between *Sukuk*, measured by Sukuk as a percentage of GDP, and the economy (GDP) measured by GDP growth. Thus, we have adopted the Johansen cointegration due to its ability to overcome the shortcomings imposed on the two-step cointegration technique. Also, to enhance the robustness of the findings, we have adopted the Bayesian approach. The sample size includes quarterly data from four GCC countries and Türkiye, covering from 2014Q1 to 2024Q3.

The findings indicated that the *Sukuk* variable and the GDP are cointegrated. The cointegration result is consistent with LRSM, which indicates that the theoretical relationship between *Sukuk* and the GDP aligns with the expectations in all countries under review. Also, the Bayesian posterior probability distribution revealed a significant relationship between the *Sukuk* and the GDP variables. Moreover, the application of VECM indicated the existence of both long-run as well as short-run dynamics between *Sukuk* and the GDP for all countries. Our findings are consistent with the findings of Kismawadi (2024), Khan *et al.* (2022), Yıldırım *et al.* (2020), and Atici (2018).

In theory, non-cointegration would imply that the application of any economic policies to influence one of the two variables, in the long run, such policies would not be feasible. However, the evidence of cointegration is essential for policymakers and investors wishing to invest in the *Sukuk* market in the GCC region and Türkiye. The cointegration between two variables suggests that a thriving economy, i.e., the rapid GDP growth, can signal an opportunity for advancing *Sukuk* markets and vice versa. That is, the improvement in GDP

may signal the possibility of high profitability in the *Sukuk* investment. Thus, the higher the GDP, the more there is economic potential to spur investment in the *Sukuk* market. Therefore, policymakers and investors may track the trends in GDP when assessing the potential of *Sukuk* investments and vice versa.

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