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Dynamic relationship between sukuk and economic growth in Indonesia: Evidence from Vector Error Correction Model (VECM) and Wavelet Analysis

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Abstract

This research highlights the positive development of the sukuk market in Indonesia, mainly corporate sukuk and sovereign sukuk. Sovereign sukuk experienced faster growth despite corporate sukuk being issued earlier. Corporate sukuk is considered an economic stimulus through corporate capital expenditure, while sovereign sukuk is used for infrastructure financing. Both types of sukuk are expected to drive economic growth, although the role of sukuk in economic growth is still debated. Therefore, research under current conditions remains highly relevant. This study employs the Vector Error Correction Model (VECM). The findings indicate a positive contribution of Sukuk to long-term economic growth, and economic growth positively impacts the Sukuk market in the short term. Impulse Response Function (IRF), Variance Decomposition (VD), and Granger Causality analyses are utilized to measure the influence and causality of variables. The impact of sovereign sukuk on economic growth, including during the COVID-19 pandemic, has increased compared to the pre-pandemic period. Wavelet analysis is also employed to explore the movements of retail and non-retail sovereign sukuk concerning economic growth in various periods. The movements of retail sovereign sukuk may indicate economic growth, and a strong correlation is found between retail sovereign sukuk and economic growth.

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Introduction

As a Sharia-compliant financial instrument, Sukuk is crucial in developing the capital market. With the increasing demand for Sharia-compliant investments, sukuk significantly contributes to economic growth. This occurs through various means, such as serving as a funding source, promoting infrastructure investment, opening access to global markets, and providing stable and secure investment instruments. Its existence, supported by real assets and sharia principles, creates financial stability, encourages investor participation in the economy, and helps establish a stable economic environment for long-term growth (Kusuma & Silva, 2014).

In the beginning, Corporate Sukuk in Indonesia was issued by PT. Indosat Tbk with a mudharabah sukuk amounting to 175 billion rupiahs in 2002. Since then, corporate sukuk issuance has continued to grow, reaching its peak in 2022 with a total issuance of 16.815 trillion rupiahs, making it the largest issuance in the 20 years since its introduction. As seen in Figure 1, a positive trend in corporate sukuk growth can be observed since 2010, where the outstanding corporate sukuk has consistently increased, although it experienced a slowdown during the COVID-19 pandemic. However, it has started to rise again in 2022. When compared to the GDP value, the continuous increase in the corporate sukuk value indicates a growing corporate sukuk market (DJPPR, 2023)

Law No. 19/2008 on Sharia Securities or the Sovereign Sukuk (SBSN) recognizes Sukuk as a financing instrument. Sukuk is utilized as a means of funding for various economic activities and development projects (Kammer et al., 2015). Sovereign Sukuk funds various projects in the State Budget (APBN) to enhance economic growth through infrastructure development, education, research, and social initiatives. The first Sovereign Sukuk was issued in 2008 with Islamic Fixed Rate Sukuk (IFR001) issued to 2.714 trillion rupiahs. In Figure 2, we can observe a positive trend in the outstanding value of the sovereign sukuk market, similar to the corporate sukuk market. However, a distinction is noticeable during the COVID-19 pandemic, where the outstanding sovereign sukuk continued to increase. Additionally, the sovereign sukuk market also holds a larger market share when compared to corporate sukuk.

The issuance of sukuk, whether by corporations or the government, has consistently shown growth since its introduction. While the development of sovereign sukuk has outpaced corporate sukuk, both have played a crucial role in facilitating sustainable financing, ensuring compliance with Sharia financial principles, and promoting inclusive and sustainable economic growth (Lina et al., 2022). Therefore, the positive correlation between economic growth and the development of sukuk reinforces each other.

Several studies indicate a close correlation between sukuk and economic growth, particularly in the case of Malaysia, where sukuk significantly contributes to economic growth (Salem et al., 2016). Similar findings have also been observed in studies related to sukuk in Indonesia, such as the research by Mitsaliyandito et al. (2017), which reveals the positive role of sukuk in the Indonesian economy, aligning with the findings of Suriani et al. (2021). Recent research by Ledhem (2022) highlights the contribution of Sukuk issuance in Southeast Asia to economic growth in the region, including Indonesia. Yildirim et al. (2020) also examined the impact of sukuk market development in several countries, including Indonesia, concluding that sukuk positively contributes to long-term economic growth.

As a country with a predominantly Muslim population, Indonesia's interest in the sukuk market has proliferated, attracting various institutions and retail investors. The Indonesian government's issuance of retail sovereign sukuk is a step to support financial inclusion and provide a reliable financing alternative. In addition to being an investment option, retail sukuk also offers an opportunity for the public to contribute to the nation's development, especially in infrastructure projects spread across the 34 provinces in Indonesia (Direktorat Pembiayaan Syariah, 2023).

Several studies have explored the potential development of retail sovereign sukuk, with Mulyani & Setiawan (2020) highlighting the strategic role of retail sovereign sukuk in building the Islamic economy. Gustina (2021) examined the performance of retail sukuk during the COVID-19 pandemic and found that their performance remained stable. Abitaha & Soelistyo (2021) mentioned the positive influence of series SDHI, PBS, and SR sovereign sukuk on infrastructure financing in Indonesia. However, different findings were reported by Echchabi et al. (2018) and Kartini & Milawati (2020), suggesting that sukuk had little impact on short-term economic growth in GCC countries and Indonesia. Similar findings were also expressed by Marsi & Wardani (2020), stating that sukuk did not prove to affect Indonesia's GDP significantly.

Given the ongoing debates about research findings related to the impact of sukuk on economic growth, examining the relationship between sukuk and Indonesia's economic growth in the current conditions is crucial. What roles do corporate sukuk and sovereign sukuk play in Indonesia's economic growth? Can Sukuk be a suitable alternative financing option to support economic growth in Indonesia and establish causality? This is particularly relevant considering the rapid growth of the sovereign sukuk market compared to the corporate sukuk market. Additionally, research exploring their roles and comparisons is limited (Mitsaliyandito et al., 2017). This study will analyze this relationship using the Vector Error Correction Model (VECM), initially examining the cointegration relationship between these variables. The VECM test, trimming the period of the COVID-19 pandemic, will be employed to understand the impact of sukuk before the pandemic period. The research findings can provide valuable insights for the government in determining strategies to support the development of the sukuk market in Indonesia.

Furthermore, since there currently needs to be more research comparing the relationship or impact of domestic sovereign sukuk, both retail and non-retail, on the economy over time (Bella & Inas, 2023), this research aims to fill this gap. This is crucial to assess the roles of retail and non-retail sovereign sukuk issued by the government in developing the sovereign sukuk market in the future to sustain continuous economic growth. How do retail and non-retail sovereign sukuk correlate with economic growth over time? Wavelet analysis will be used to analyse this relationship. This method has yet to be previously employed to identify the connection between sukuk and economic growth. Wavelet analysis allows identification at specific periods and frequencies, visualising this relationship.

Literature Review

IS-LM theory is a macroeconomic model that illustrates the interaction between the goods market (IS) and the money market (LM) within the Keynesian framework. This model uses the IS and LM curves to depict the equilibrium in the goods and money markets. The issuance and investment of sukuk can influence both curves, especially in the context of fiscal and monetary policy (Hariyanto, 2017).

Through the IS curve, issuing sukuk to finance investment projects can increase aggregate spending in the economy. This results in a rightward shift of the IS curve, indicating an increase in national income at the same interest rate level. The effects can be more sustainable if investment projects positively impact productivity or long-term growth. Via the LM curve, significant sukuk issuance can affect the money supply in the economy, potentially reducing interest rates in the IS-LM model as funds are allocated to sukuk, decreasing the money in circulation. Decreased interest rates can stimulate investment and aggregate spending, supporting economic growth. Therefore, Sukuk issuance can influence economic growth by impacting the IS and LM curves as theory (Mankiw, 2008).

Additionally, the theory of sukuk demand and supply suggests that the level of income and the financing needs of the issuer can affect sukuk demand and supply, providing potential

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insight into the causality between sukuk and economic growth (Mitsaliyandito et al., 2017).

Research on the positive impact of financial market development on economic growth has been conducted for a long time, acknowledging that a sound financial system can enhance investment efficiency and economic growth. Levine (2004) identified five channels as contributors to long-term growth: resource allocation, corporate control, trade enhancement, risk management, savings mobilisation, and facilitation of exchanging goods and services. The causal relationship between the financial market and economic growth has also been found, supporting Schumpeter's (2011) theory on the role of the financial market in economic growth.

Research on Islamic finance highlights Islamic banks' positive and significant contribution to GDP growth in MENA countries (Boukhatem & Ben Moussa, 2018). However, this positive impact is hindered by an underdeveloped institutional framework. Al Fathan & Arundina (2019) found that the Islamic finance industry can positively impact economic growth, in line with the findings of Santoso & Nurzaman (2020).

Research on sukuk indicates both short-term relationships and long-term causality between sukuk and economic growth, as well as the influence of sukuk on inflation and exchange rates in Gulf countries (Suriani et al., 2018; Al-Raeai et al., 2018). Studies related to Southeast Asia, such as Ledhem (2022), demonstrate that sukuk can effectively foster economic growth in the region. Smaoui & Nechi (2017) found a positive and significant relationship between the development of the sukuk market and economic growth, aligning with the findings of Yildirim et al. (2020). However, there are differing opinions in the literature; Echchabi et al. (2018) and Kartini & Milawati (2020) found that sukuk did not have a significant impact on economic growth, while Ramadhani (2020) and Prabowo (2017) stated that sukuk did not have a direct influence on Indonesia's economic growth within a specific time frame.

Mitsaliyandito et al. (2017) investigated domestic sukuk in Indonesia, revealing that sovereign sukuk has a supply-leading relationship with a positive impact on GDP, while corporate sukuk has a demand-leading relationship with a negative impact on GDP. Domestic sovereign sukuk is divided into retail and non-retail sukuk. Research has been limited on retail sovereign sukuk, with Mulyani & Setiawan (2020) and Tanjung & Windiarto (2021) highlighting the strategic role and significant potential of retail sukuk in the Islamic economy, particularly in financing development and social welfare. Despite being qualitative, the success of retail sovereign sukuk is evident in infrastructure development, education, and healthcare sectors. Nevertheless, the strength of quantitative analysis can provide solid and objective empirical evidence regarding the relationship between sukuk, retail and non-retail, and economic growth. This will be further analysed in this study using wavelet analysis.

Methodology

This research utilises the outstanding values of corporate sukuk and sovereign sukuk with longitudinal data from 2010 to 2022 every quarter, obtained from Bloomberg, IDX, KSEI for corporate sukuk, and the Directorate General of Financing and Risk Management - Ministry of Finance for sovereign sukuk. Data related to economic growth uses GDP data based on constant prices in 2010 provided by the Central Statistics Agency through its website. Furthermore, sukuk and GDP variables will be transformed using logarithms for this research.

In this research, the Vector Error Correction Model (VECM) is used to analyze the relationship between sovereign sukuk and economic growth with the equation models as follows:

First Model: using agregat sukuk

$$PDB_t = \beta_0 + \beta_1 PDB_{t-1} + \beta_2 Sukuk_{t-1} + \varepsilon_t \quad (1)$$

$$Sukuk_t = \beta_0 + \beta_1 PDB_{t-1} + \beta_2 Sukuk_{t-1} + \varepsilon_t \quad (2)$$

Second Model: using corporate sukuk and sovereign sukuk

$$PDB_t = \beta_0 + \beta_1 PDB_{t-1} + \beta_2 SKorp_{t-1} + \beta_3 SGov_{t-1} + \varepsilon_t \quad (3)$$
$$SKorp_t = \beta_0 + \beta_1 PDB_{t-1} + \beta_2 SGov_{t-1} + \beta_3 SKorp_{t-1} + \varepsilon_t \quad (4)$$
$$SGov_t = \beta_0 + \beta_1 PDB_{t-1} + \beta_2 SKorp_{t-1} + \beta_3 SGov_{t-1} + \varepsilon_t \quad (5)$$

Note:
PDB_t : Gross Domestic Product
PDB_{t-1} : Gross Domestic Product in the previous period
$Sukuk_t$: Outstanding sukuk in aggregate
$Sukuk_{t-1}$: Outstanding sukuk in aggregate in the previous period
$SKorp_t$: Outstanding corporate sukuk
$SKorp_{t-1}$: Outstanding corporate sukuk in the previous period
$SGovt_t$: Outstanding sovereign sukuk
$SGovt_{t-1}$: Outstanding sovereign sukuk in the previous period

The VECM model has no distinction between endogenous and exogenous variables. This allows for the exploration of simultaneous relationships between these variables. To investigate the movements between the growth of retail and non-retail sovereign sukuk and economic growth, outstanding sukuk and GDP are used as two main variables. Wavelet (ψ) generally refers to small waves generated from the mother wavelet. These small waves are used to transform data into time and frequency scales. A wavelet coherence diagram illustrates the relationship between two-time series. The horizontal axis reflects time, while the vertical axis reflects frequency, with low frequency at the top. Warm colours (red) indicate areas where the two series have a significant relationship, while cool colours (blue) indicate lower dependence. Arrows in the diagram depict the phase relationship between the two series, with right (left) arrows indicating phase (anti-phase). Phase indicates in-phase movement, while anti-phase indicates out-of-phase movement. Arrows to the lower right or upper left indicate that the first variable leads, while arrows to the upper right or lower left indicate that the second variable leads (Grinsted et al., 2004).

Results and Discussion

The stationarity test on VECM is conducted using unit root tests such as the Augmented Dickey-Fuller (ADF) test. Based on this test, the variables in this study are stationary.

Table 1. The results of the Augmented Dickey-Fuller (ADF) test collectively

Variabel (log)	P-Value	
	Level	First Difference
LPDB and LSUKUK	0.1649	**0.0000 *** **
LPDB, LSGOV and LSKORP	0.2623	**0.0000 *** **

Significant at a level of confidence * α : 10%; ** α : 5% dan *** α : 1%
Source: The results of the processing with EViews (2023)

In models 1 and 2 with lag 3, there is a significant improvement in the likelihood ratio and a significant decrease in FPE, AIC, SC, and HQ. Therefore, the choice of lag 3 is favourable for the VECM model.

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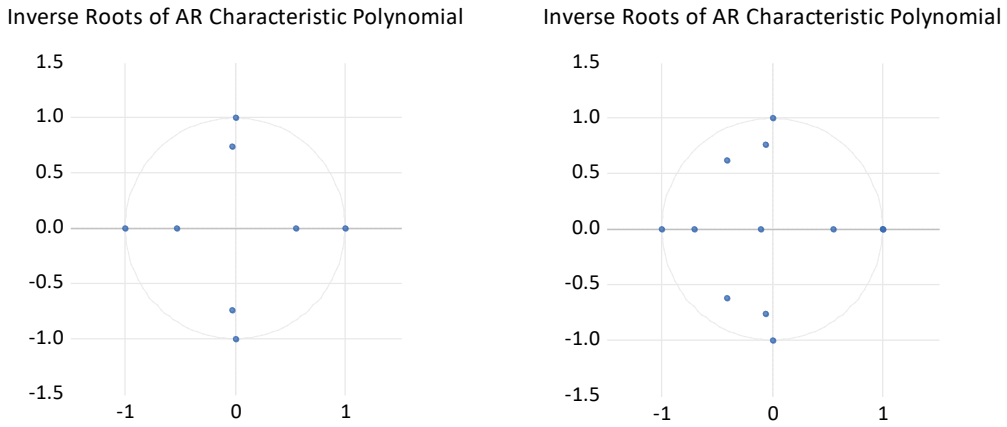

Figure 1. Stability of Model 1 (top) and Model 2 (bottom)
Source: The results of the processing with EViews (2023)

The above graph shows the stability test results at lag 3, in line with the selected optimal lag. We can observe that the modulus values for all models are less than one (<1), indicating that the estimation models have met the stability assumptions, which can be further used for Impulse Response Function (IRF) and Variance Decomposition (VD) analysis. Additionally, all models have cointegration rank values with P-values less than α (5%), suggesting the presence of cointegration relationships.

Model 1

Table 2. The Estimation Results of VECM – Model 1

Long Term		
Variable	Koef	
D(LSUKUK)	3,3466	***
C	- 0,0983	
Short Term		
Variable	D(LPDB)	D(LSUKUK)
CointEq1	0,0187	- 0,3342 ***
D(LPDB(-1))	- 1,0139 ***	0,2563 ***
D(LPDB(-2))	- 1,0090 ***	0,1666 ***
D(LPDB(-3))	- 1,0052 ***	0,0964 ***
D(LSUKUK(-1))	- 0,0471	0,0785
D(LSUKUK(-2))	- 0,0340	- 0,1827
D(LSUKUK(-3))	- 0,0285	- 0,1566
C	- 0,0002	- 0,0017

significant at a level of confidence *α = 10%, ** α = 5%, *** α = 1%
Source: The results of the processing with EViews (2023)

Long Term Relationship

In Model 1, which examines the cointegration between aggregate sukuk and GDP, the results indicate the presence of a long-term relationship between Sukuk and GDP with significant coefficients. The interpretation for analysing dynamic linkages will be examined in the Impulse Response Function (IRF) analysis and Variance Decomposition (VD) analysis, as well as the Granger causality test derived from the equations of this model.

Short Term Relationship

There is a significant influence of changes in GDP growth, where, in this case, changes in past GDP growth play a crucial role in current GDP growth and drive sukuk growth.

Model 2

Table 3. The Estimation Results of VECM – Model 2

Long Term		
Variable	Koef	
D(LSGOV)	0,3241	***
D(LSKORP)	0,1313	*
C	- 0,0141	

Short Term						
Variable	D(LPDB)		D(LSGOV)		D(LSKORP)	
CointEq1	- 0,0475		- 2,9132	***	- 0,2300	
D(LPDB(-1))	- 0,9643	***	2,1882	***	0,2009	
D(LPDB(-2))	- 0,9767	***	1,4524	***	0,1378	
D(LPDB(-3))	- 0,9893	***	0,7398	***	0,0737	
D(LSGOV(-1))	0,0090		- 0,0969		0,3884	
D(LSGOV(-2))	- 0,0034		- 0,3144		0,2348	
D(LSGOV(-3))	- 0,0134		- 0,2318	***	0,2599	
D(LSKORP(-1))	0,0276		0,3800		- 1,1273	***
D(LSKORP(-2))	0,0393		0,2010		- 0,8028	***
D(LSKORP(-3))	0,0178		0,0946		- 0,1725	
C	-6.36E-05		0,0041		0,0028	

significant at a level of confidence *α = 10%, ** α = 5%, *** α = 1%

Source: The results of the processing with EViews (2023)

Long Term Relationship

Further examination, the long-term relationship between the growth of sovereign sukuk and corporate sukuk shows a positive correlation with GDP. Statistically, sovereign sukuk exhibits a significant long-term relationship with GDP at a 1% confidence level, while the growth of corporate sukuk statistically significantly influences GDP growth at a 10% confidence level. From these results, it can be inferred that in the long term, Sukuk can stimulate economic growth. The utilisation of sovereign sukuk in financing various sectors, including infrastructure in areas such as roads, natural resources, land, sea, air transportation, agriculture, and education, has proven to yield positive performance, thereby contributing to economic growth.

Short Term Relationship

There is a significant influence of changes in past GDP growth on current GDP growth, which can drive the growth of sovereign sukuk. The current growth of sovereign sukuk is influenced by the past GDP growth (one to three quarters ago) and the growth of corporate sukuk in the previous quarter. The growth of corporate sukuk itself is not significantly influenced by both GDP growth and the growth of sovereign sukuk.

Table 4. Granger Causality Test - Model 1

Pvalue Granger Causality Test

Variabel dependent	**LSUKUK**	**LPDB**
LSUKUK		**1.E-31*** **
LPDB	**0,0314 ****	

Significant at a level of confidence *α = 10%, ** α = 5%, *** α = 1%

Source: The results of the processing with EViews (2023)

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Table 4 identifies a significant causal relationship between GDP and Sukuk. These findings reflect a two-way cause-and-effect relationship between GDP and Sukuk, with significant economic implications. This discovery indicates the interconnection between economic growth and the sukuk market, which can influence a country's economic and financial policies.

Table 5. Granger Causality Test Model 2
Pvalue Uji Kausalitas Granger

Variabel dependent	LPDB	LSGOV	LSKORP
LPDB		**0,0324 ** **	0,6960
LSGOV	**2.E-31*** **		0,1398
LSKORP	**2.E-15*** **	0,2510	

significant at a level of confidence *α = 10%, ** α = 5%, *** α = 1%
Source: The results of the processing with EViews (2023)

From Table 5, the results show statistically significant evidence of a two-way causal relationship between sovereign sukuk and GDP. In contrast, corporate sukuk has a one-way relationship where corporate sukuk can influence GDP growth. The results align with the Harrod-Domar theory, where investments, in this case, the utilisation of sukuk funds entering both the public (government) and real sectors (corporations), can be utilised as additional capital to stimulate the economy. This study's findings are consistent with the research of Smaoui & Nechi (2017), Yildirim et al. (2020) and Mitsaliyandito et al. (2017).

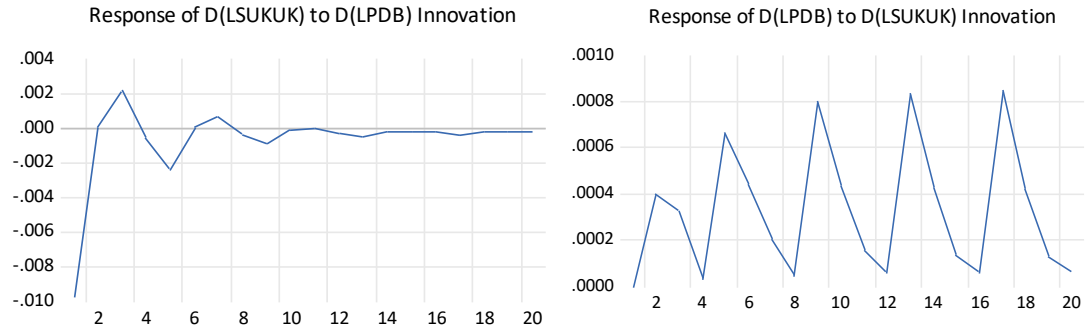

Figure 2. IRF LPDB and LSukuk
Source: The results of the processing with EViews (2023)

The IRF (Impulse Response Function) in Figure 2 indicates how GDP and Sukuk respond to changes in impulses or disturbances within the system. Initially, the Sukuk market responds negatively to shocks in GDP, but later, it shows a positive response. After the sixth period, the impact of the shock on Sukuk's GDP starts to fade, leading to a more stable value. In a time context, it takes about 1.5 years for Sukuk to return to its long-term equilibrium. Conversely, GDP responds positively to shocks in the Sukuk market. This positive response suggests that increasing Sukuk market growth can enhance GDP growth. For example, issuing Sukuk to fund large infrastructure projects can boost economic investment, driving overall economic growth, as reflected in a higher GDP.

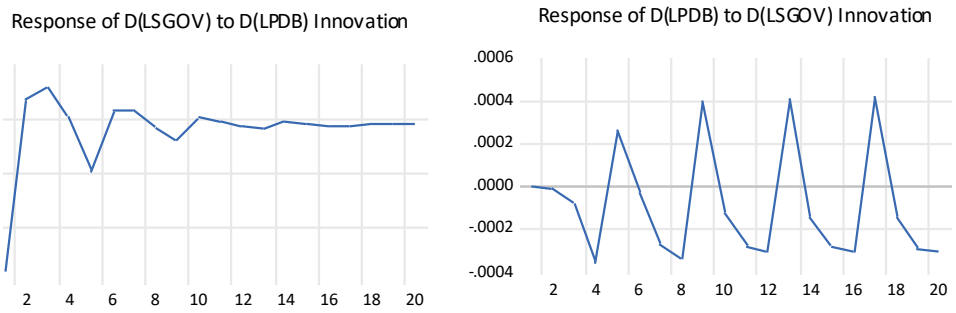

Figure 3. IRF LPDB and LSGovt
Source: The results of the processing with EViews (2023)

The results from the IRF in Figure 3 indicate that the sovereign sukuk market initially responds negatively to economic growth. In the subsequent periods, fluctuations occur, diminishing from the sixth period onward. This negative response in the sovereign sukuk market may be because sovereign sukuk serves as a fiscal financing policy tool, where during economic growth and a shrinking financing gap, the sovereign sukuk market may experience a decline. On the other hand, the response of GDP to shocks in the sovereign sukuk market is initially hostile and fluctuating, indicating that changes in the sovereign sukuk market have short-term effects on GDP.

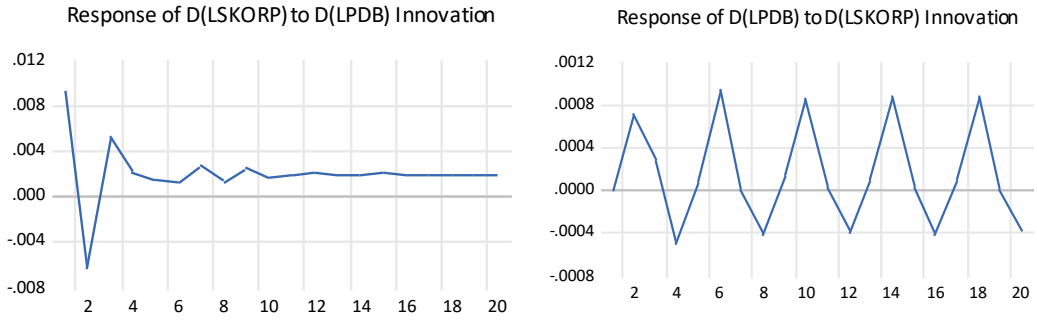

Figure 4. IRF LPDB dan LSKorp
Source: The results of the processing with EViews (2023)

Figure 4 illustrates the fluctuating response of Corporate Sukuk to GDP, returning to equilibrium by the fifth period. In contrast, GDP responds positively and fluctuates in response to shocks in the corporate sukuk market. Strong initial GDP growth can increase fund availability, prompting companies to issue corporate sukuk for business expansion or investment projects, resulting in a positive response from the corporate sukuk market. According to Granger causality, the relationship is unidirectional, meaning that corporate sukuk affects GDP.

Table 6. Variance Decomposition Model 1

Variance Decomposition of D(LPDB):			
Period	**S.E.**	**D(LPDB)**	**D(LSUKUK)**
1	0.004298	100.0000	0.000000
2	0.004318	99.16462	0.835380
3	0.004332	98.61342	1.386577
4	0.004332	98.60926	1.390745
5	0.005974	98.04188	1.958122

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10	0.007272	96.67678	3.323225
20	0.009313	95.85925	4.140748
30	0.011725	95.40603	4.593970
40	0.013091	95.23490	4.765104
Variance Decomposition of D(LSUKUK):			
Period	**S.E.**	**D(LPDB)**	**D(LSUKUK)**
1	0.027510	12.56165	87.43835
2	0.027529	12.54446	87.45554
3	0.028418	12.35471	87.64529
4	0.028448	12.37862	87.62138
5	0.029108	12.53916	87.46084
10	0.029308	12.53596	87.46404
20	0.029342	12.60718	87.39282
30	0.029358	12.69234	87.30766
40	0.029374	12.77148	87.22852

Source: The results of the processing with EViews (2023)

The Variance Decomposition analysis table above provides valuable insights into the extent to which variations in two variables, i.e., DLPDB and DLSukuk, can be explained by each other over different periods. Some key points from the analysis results include: in the initial periods, the GDP growth variable significantly contributes to the variation in itself; over time, the variability in GDP growth starts to be explained by another factor, which in this system is the sukuk market.

Table 6. Variance Decomposition Model 2

Variance Decomposition of D (LPDB)				
Period	**S.E.**	**D(LPDB)**	**D(LSGOV)**	**D(LSKORP)**
1	0.004447	100.0000	0.000000	0.000000
2	0.004511	97.48770	0.000362	2.511937
3	0.004521	97.11008	0.030827	2.859092
4	0.004562	95.36633	0.613812	4.019858
5	0.006306	97.38634	0.493254	2.120405
10	0.007786	94.72525	0.915411	4.359342
20	0.010025	93.89921	1.442689	4.658099
30	0.012630	93.90825	1.493102	4.598653
40	0.014125	93.65445	1.646580	4.698969
Variance Decomposition of D(LSGOV)				
Period	**S.E.**	**D(LPDB)**	**D(LSGOV)**	**D(LSKORP)**
1	0.030269	24.65894	75.34106	0.000000
2	0.030403	25.19169	74.80757	0.000744
3	0.031916	23.14910	72.71987	4.131027
4	0.032309	24.04880	71.00987	4.941336
5	0.034137	26.81803	67.68138	5.500584
10	0.036891	29.52703	59.44493	11.02804
20	0.041712	34.39921	46.69142	18.90937
30	0.046002	37.61192	38.46416	23.92392
40	0.049916	39.83573	32.73067	27.43360
Variance Decomposition of D(LSKORP)				
Period	**S.E.**	**D(LPDB)**	**D(LSGOV)**	**D(LSKORP)**
1	0.035498	6.834340	4.436700	88.72896
2	0.037116	9.140095	7.684373	83.17553
3	0.039362	9.871689	7.438743	82.68957
4	0.042784	8.612635	8.339364	83.04800

5	0.043011	8.643260	8.417480	82.93926
10	0.048946	7.485135	7.726618	84.78825
20	0.057449	6.553098	6.323089	87.12381
30	0.064950	6.004332	5.544597	88.45107
40	0.071660	5.643612	5.042207	89.31418

Source: The results of the processing with EViews (2023)

The interpretation of the above Variance Decomposition Analysis results is as follows. In the initial period (period 1), the GDP variable is fully explained by itself (100%). However, as time progresses, the contribution of the GDP variable to the variation diminishes while the contributions from the other two variables increase. Conversely, shocks to the sovereign sukuk variable are consistently contributed by GDP, showing a continual increase. As for Corporate Sukuk, over time, the contributions of GDP and sovereign sukuk in explaining the variability of corporate Sukuk remain low and fluctuating. The most significant contribution in explaining the variability of Corporate Sukuk comes from Corporate Sukuk itself.

A critical aspect of VECM analysis is the robustness check to ensure the reliability and stability of the model results. The robustness check is conducted by examining sensitivity to the choice of the time horizon in time series data analysis (Hamilton,1994). In this study's robustness check, the period of the COVID-19 pandemic, from 2020 to 2022, will be excluded, limiting the testing period to only 2019. By trimming the research period, both Model 1 and Model 2 from the sensitivity test yield consistent conclusions. Both models indicate a long-term relationship between GDP and Sukuk, with statistically significant coefficients. In the short term, the results from both models show a significant influence of changes in past GDP growth on current GDP growth, also driving the growth of sovereign sukuk. When trimming the Covid-19 pandemic period, the role of sukuk in stimulating long-term economic growth is only 0.10 per cent, but including the pandemic period increases it to 3.35 per cent. These results indicate that sukuk can positively contribute to supporting economic growth during the pandemic. The role of sovereign sukuk also increases from 0.21 per cent to 0.32 per cent, indicating that financing through sukuk issuance in various sectors, such as education, health, and infrastructure, during the pandemic can provide a positive contribution. This reinforces the importance of the role of sukuk in financing.

This study indicates a long-term causal relationship between Sovereign Sukuk and economic growth. Given the larger market share of sovereign sukuk compared to corporate sukuk, this research focuses on understanding the movement of sovereign sukuk, specifically retail and non-retail sukuk, which will be tested using wavelet analysis to identify patterns in data across time or frequency. In this context, wavelet analysis is employed to comprehend the correlation between retail sukuk, non-retail sukuk, and Gross Domestic Product (GDP). The correlation between sukuk and GDP can be observed in more detail over the study period through wavelet analysis. The results of the wavelet analysis indicate that the initial arrow points towards the upper left and then towards the lower right, suggesting that the movement of sovereign sukuk as the first variable can indicate the movement of GDP.

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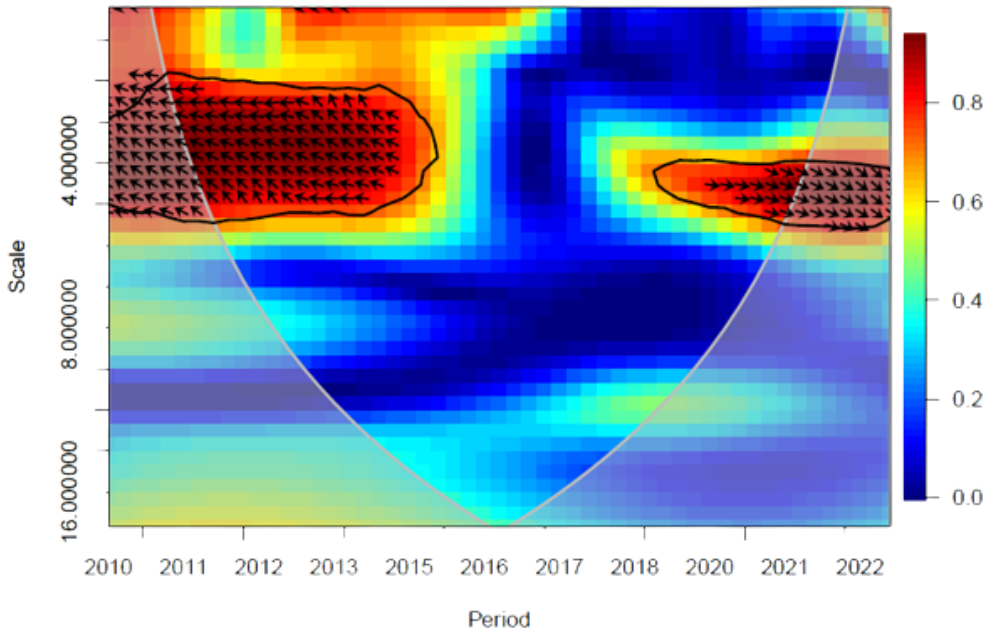

Figure 3. Wavelet Analysis Sovereign Sukuk
Source: The results of processing with RStudio 2023)

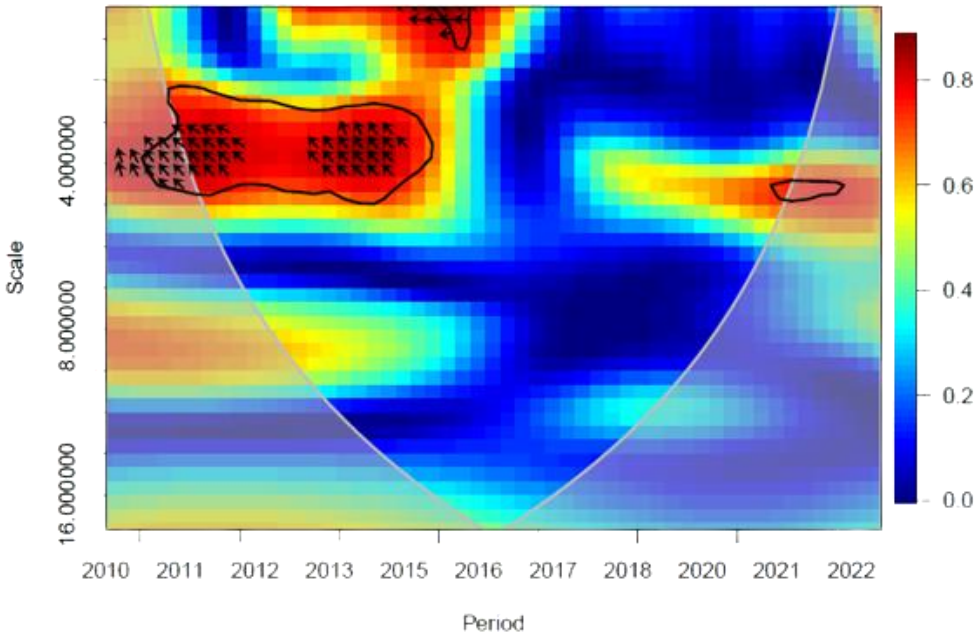

Figure 4. Wavelet Analysis Retail Sovereign Sukuk
Source: The results of processing with RStudio 2023)

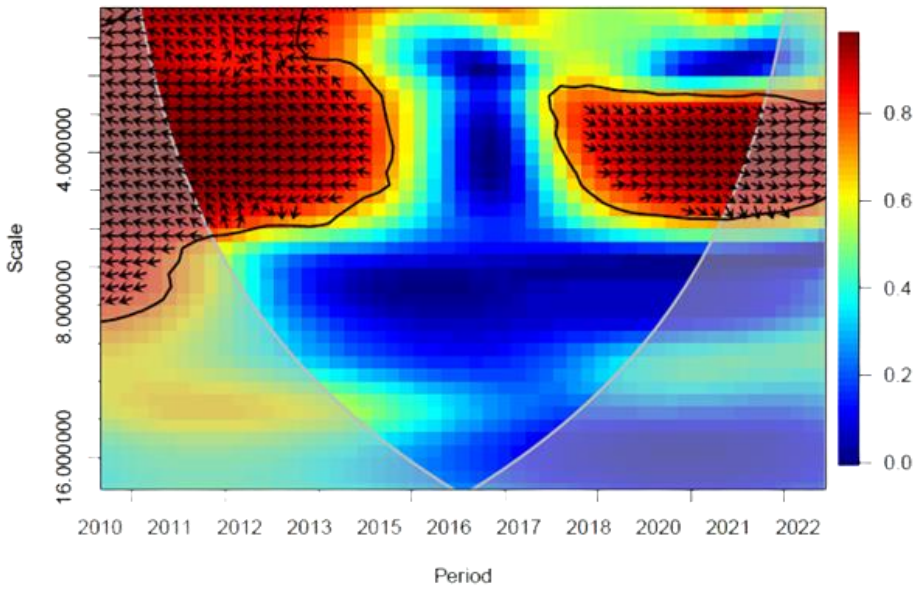

Figure 5 Wavelet Analysis Retail Sovereign Sukuk
Source: The results of processing with RStudio 2023)

From Figure 3, 4 and 5 we can see that until 2016, there was a strong correlation between the growth of non-retail sovereign sukuk and retail sovereign sukuk with the movement of GDP, indicating that changes in non-retail sovereign sukuk and retail sovereign sukuk could serve as indicators of GDP movement. This joint movement occurred on a 4-quarter scale. The use of non-retail sovereign sukuk with PBS series, directed towards infrastructure projects, may have had a negative impact in the short term and only began to be evident over a more extended period. While from 2016 to 2018, this correlation weakened, suggesting the influence of other factors affecting the movement of both sukuk growth and GDP. Wavelet analysis shows a lack of a causal relationship pattern during this period. Looking at the retail sovereign sukuk market, 2016-2017, it had the lowest issuance value and experienced a significant decline from the investor perspective.

Meanwhile, a strong correlation began to show again from the 2018 period. However, for non-retail sovereign sukuk, the wavelet analysis does not indicate a causal relationship pattern, while for retail sovereign sukuk, it shows a very significant correlation. This suggests that changes in the retail sovereign sukuk market can be considered an early indicator or signal that can be used to predict changes in GDP, and this movement is in a phase (joint movement), meaning that the growth in the sovereign sukuk market can also drive GDP growth. The results of this wavelet analysis provide a more detailed picture of the relationship between periods, and the result of the wavelet analysis at the end shows that sovereign sukuk and GDP begin to move in phase, reinforcing the results of the earlier VECM.

Conclusion

This research concludes that the first model involving sukuk in aggregate shows statistical evidence of cointegration supporting the positive contribution of sukuk growth to long-term GDP growth. The second model expands the analysis by separating sovereign sukuk and corporate sukuk, and the results indicate that both significantly influence GDP in the long term. Granger causality tests confirm a causal relationship between aggregate sukuk and sovereign sukuk with GDP. Wavelet analysis on retail and non-retail sovereign sukuk shows that sovereign sukuk can be an early indicator of GDP movement, where initially the movement of

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Sukuk and economic growth is in anti-phase, possibly because the use of sovereign sukuk for financing has not yet provided direct benefits. However, sovereign sukuk, especially retail, positively contributes to GDP growth, emphasising its crucial role as a long-term funding source. These findings can help stakeholders understand the complex dynamics between sukuk and economic growth, highlighting the potential of retail sovereign sukuk as a vital instrument in supporting economic growth.

From these results, policy recommendations include the government playing a crucial role in supporting the sukuk market, especially corporate sukuk, which needs to be promoted for faster development to stimulate economic growth. Diversification of the national financial instruments, particularly the development of the retail sukuk market, must also be considered a vital funding source for long-term economic projects. The government can leverage sukuk as a financing tool for strategic infrastructure projects, positively impacting long-term growth and enhancing financial inclusion. On the societal side, understanding that changes in GDP do not always directly impact sukuk growth, and vice versa, can help manage expectations related to sukuk investments. While only sometimes following short-term GDP trends, state sukuk can be an attractive investment option for long-term growth, supporting the nation's self-sufficiency development.

The findings of this study have not reached the level of optimal perfection; there are still several weaknesses and limitations that could be subject to further research. Some limitations that can be identified include, among others, that this study uses the IRF, Variance Decomposition, and Granger causality methods to estimate the direction and value of the response of endogenous variables to shocks from other variables in the VECM model. In future research, consideration might be given to using alternative analysis methods to measure dynamic changes in the relationships between variables in response to shocks from other variables, or by incorporating exogenous variables into the VECM model. Additionally, limitations in the amount of research data on sukuk, especially sovereign sukuk, should be acknowledged. The scarcity of this data prevents researchers from conducting more detailed estimations of the specific roles of each sovereign sukuk series, potentially limiting the depth of information obtained.

Author Contribution

Elva Novitasari : Creating and designing analyses, Collecting data and perform analysis, Contributing data or analysis tools, and Writing paper.

Tika Arundina : Creating and designing analyses, Contributing data or analysis tools, and Writing paper.

All authors have read and agreed to the published version of the manuscript

Declaration of Competing Interest

We declare that we have no conflict of interest.

References

Abitaha, A. P., & Soelistyo, A. (2021). Analisis Pengaruh Sukuk Terhadap Pembiayaan Pembangunan Infrastruktur Di Indonesia Tahun 2014 – 2018. *Jurnal Ilmu Ekonomi JIE*, *5*(1), 86–102. https://doi.org/10.22219/jie.v5i2.13883

Al-Raeai, A. M., Zainol, Z., & Khilmy, A. (2018). The Role of Macroeconomic Factors on Sukuk Market Development of Gulf Cooperation Council (GCC) Countries. *International Journal of Economics and Financial Issues*, *8*(3), 333–339. http:www.econjournals.com

Al Fathan, R., & Arundina, T. (2019). Finance-growth nexus: Islamic finance development in Indonesia. *International Journal of Islamic and Middle Eastern Finance and Management*, *12*(5), 698–711. https://doi.org/10.1108/IMEFM-09-2018-0285

Bella, F. I., & Inas. (2023). The Influence of Islamic Banks and Sovereign Retail Sukuk on Economic Growth in Indonesia. *Al-Tijary Jurnal Ekonomi Dan Bisnis Islam*, *8*(2), 139–155. https://doi.org/:http://dx.doi.org/10.21093/at.v8i2.4406

Boukhatem, J., & Ben Moussa, F. (2018). The effect of Islamic banks on GDP growth: Some evidence from selected MENA countries. *Borsa Istanbul Review*, *18*(3), 231–247. https://doi.org/10.1016/j.bir.2017.11.004

Direktorat Jenderal Pengelolaan Pembiayaan dan Risiko (DJPPR). (2023). *Posisi Outstanding Surat Berharga Negara*. https://www.djppr.kemenkeu.go.id/posisisbn

Direktorat Pembiayaan Syariah. (2023). *Laporan Perkembangan Kinerja Penyerapan Dana Proyek SBSN*.

Echchabi, A., Aziz, H. A., & Idriss, U. (2018). The impact of Sukuk financing on economic growth: the case of GCC countries. *International Journal of Financial Services Management*, *9*(1), 60. https://doi.org/10.1504/ijfsm.2018.089920

Grinsted, A., Moore, J. C., & Jevrejeva, S. (2004). Application of the cross wavelet transform and wavelet coherence to geophysical time series. *Nonlinear Processes in Geophysics*, *11*(5/6), 561–566.

Gustina, N. (2021). Performa Sukuk Ritel: Sebelum Dan Saat Terjadi Pandemi Covid-19. *Jurnal Akuntansi*, *10*(2), 369–386. https://doi.org/10.37932/ja.v10i2.415

Hamilton, J. D. (1994). Time Series Analysis. In *Princeton University Press*. https://doi.org/10.1016/B978-008044910-4.00546-0

Kammer, A., Norat, M., Pinon, M., Prasad, A., Towe, C., & Zeidane, Z. (2015). Islamic Finance: Opportunities, Challenges, and Policy Options. *Staff Discussion Notes*, *15*(5), 1. https://doi.org/10.5089/9781498325035.006

Kartini, E., & Milawati, M. (2020). How Sukuk and Conventional Bond Affect Economic Growth? Evidence From Indonesia. *International Journal of Economics and Financial Issues*, *10*(5), 77–83. https://doi.org/10.32479/ijefi.10223

Kusuma, K. A., & Silva, A. C. (2014). Sukuk markets: a proposed approach for development. *World Bank Policy Research Working Paper No 71133*, *December*. https://ssrn.com/abstract=2534637

Ledhem, M. A. (2022). Does Sukuk financing boost economic growth? Empirical evidence from Southeast Asia. *PSU Research Review*, *6*(3), 141–157. https://doi.org/10.1108/PRR-09-2020-0028

Levine, R. (2004). Finance Growth Theory Evidence. *Nber Working Paper Series*, *September*, 1–118. http://www.nber.org/papers/w10766

Lina Nugraha Rani, Nisful Laila, Dian Filianti, & Dwi Wulan Ramadani. (2022). Analysis of Sukuk Research in Indonesia Bibliometric Approach. *Al-Muzara'Ah*, *2022*, 43–56. https://doi.org/10.29244/jam.specialissue2022.43-56

Mankiw, N. G. (2008), Principles of macroeconomics. Toronto: Thomson Nelson.

Marsi, G. G., & Wardani, D. T. K. (2020). The Influence of Sharia Capital Market, Sharia Bonds (Sukuk), and BI Rate on Gross Domestic Products (GDP) in Indonesia. *Journal of Economics Research and Social Sciences*, *4*(2), 149–162. https://doi.org/10.18196/jerss.v4i2.10156

Mitsaliyandito, R. Q., Arundina, T., & Kasri, R. A. (2017). Impact of sukuk market development on Indonesian Economic Growth. *International Journal of Applied Business and Economic Research*, *15*(24), 537–549.

ISSN: 2548-3544 (online), 2549-0850 (print)
DOI: https://doi.org/10.26740/aluqud.v7n2.p243-258

Mulyani, R., & Setiawan, I. (2020). Sukuk Ritel Negara, Instrumen Investasi Halal Untuk Membangun Negeri. *IQTISADIYA: Jurnal Ilmu Ekonomi Islam*, *7*(14), 75–92. http://journal.uinsgd.ac.id/index.php/iqtisadiya/article/view/10170

Prabowo, P. S. (2017). If the Variable Retail Sukuk Issuance of Government Influence Macroeconomic Variables. *Spirit Pro Patria*, *III*(1), 68–77. https://jurnal.narotama.ac.id/index.php/patria/article/view/413

Ramadhani, A. (2020). Pengaruh Sukuk Langsung Dan Tidak Langsung (Belanja Pemerintah) Terhadap Pertumbuhan Ekonomi Indonesia. *Jurnal Ilmiah : FEB Universitas Brawijaya Malang*, *2020*.

Salem, M. Ben, Fakhfekh, M., & Hachicha, N. (2016). Sukuk and economic growth malaysia case. *Journal of Islamic Economic, Banking and Finance*, *12*(2).

Santoso, H. E., & Nurzaman, M. S. (2020). Asesmen Kontribusi Keuangan Syariah Terhadap Pertumbuhan Ekonomi di Indonesia. *Al-Mashrafiyah : Jurnal Ekonomi , Keuangan Dan Perbankan Syariah*, *4*(1), 1–15. https://doi.org/10.24252/al-mashrafiyah.v4i1.12304

Schumpeter, J. A. (2011). *The Theory of Economic Development*. Harvard Economic Studies.

Smaoui, H., & Nechi, S. (2017). Does sukuk market development spur economic growth? *Research in International Business and Finance*, *41*(February), 136–147. https://doi.org/10.1016/j.ribaf.2017.04.018

Suriani, Majid, M. S. A., Masbar, R., & Wahid, N. A. (2018). Macroeconomic Determinants of the Capital Market in Indonesia: A Comparative Analysis between Sukuk and Bonds Markets. *International Journal of Academic Research in Economics and Management Sciences*, *7*(2), 1–17. https://doi.org/10.6007/ijarems/v7-i2/4112

Suriani, S., Abd. Majid, M. S., Masbar, R., A. Wahid, N., & Ismail, A. G. (2021). Sukuk and monetary policy transmission in Indonesia: the role of asset price and exchange rate channels. *Journal of Islamic Accounting and Business Research*, *12*(7), 1015–1035. https://doi.org/10.1108/JIABR-09-2019-0177

Tanjung, H., & Windiarto, A. (2021). Role of Cash Waqf Linked Sukuk In Economic Development and International Trade. *Signifikan: Jurnal Ilmu Ekonomi*, *10*(2), 275–290. https://doi.org/10.15408/sjie.v10i2.20493

Yildirim, S., Yildirim, D. C., & Diboglu, P. (2020). Does Sukuk market development promote economic growth? *PSU Research Review*, *4*(3), 209–218. https://doi.org/10.1108/PRR-03-2020-0011