Analyzing the integration of Organization of Islamic Cooperation (OIC) countries before and during Rusian-Ukraine war

Daffa Aqomal Haq[*], Asep Nurhalim, Ranti Wiliasih

Faculty of Economics and Management, IPB University, Jl. Agatis. Dramaga Campus IPB, Bogor, West Java, 16680, Indonesia

ABSTRACT

Co-movement of integrated stock market is causing economic shocks and global crises. A typical example of this crisis was the Russia-Ukraine war in 2022, which impacted the stock market. Therefore, this research aimed to examine the development, integration, and response of the five Islamic stock market in Organization of Islamic Cooperation (OIC) countries during the Russia-Ukraine war. Vector Autoregressive/Vector Error Correction Model (VAR/VECM) was used to analyze DJIMMT25, SPSADS, SPSUUAEDS, JII, DJIMT, SPBMIR, and SPBMIU indices. The results showed that the United Arab Emirates (UAE) and Saudi Arabia stock market had the same movement, while Turkey experienced a positive trend during the war. The Islamic stock market was also cointegrated but Malaysia influenced the other four OIC countries. Meanwhile, IRF reported a permanent effect on the volatility of the market due to the shocks experienced. The volatility response was relatively small since the stock market dominated the contribution of shocks.

1 Introduction

1.1 Background

Significant changes are experienced in economic and financial systems, resulting in increased reliance and competitiveness among countries (Tiwang *et al.* 2020). However, this changes have made stock market more vulnerable to economic shocks (Musrizal 2013). Several factors, such as increasing capital flows and the opportunity for asset diversification, were identified by Royfaizal *et al.* (2009) as promoting stock market integration. In this context, shocks in a country can affect another due to economic power supremacy, investor equity, and multiple stock listings (Janakiramanan & Lamba 1998). Meanwhile, Russia has a dominant economic power as the third-largest oil exporter of the world and ninth-highest GDP country. The most recent shock has been the Russia-Ukraine war, which has disrupted energy pricing and market confidence, relating to international sanctions imposed on Russia (Cifuentes-Faura 2022; Susetio *et al.* 2022).

The Russia-Ukraine war has a significant effect on global economic indicators such as growth, inflation, debt, and poverty (Orhan 2022). As the world's primary energy supplier, Russia has played a major role in inflation, as evidenced by the increase in rates in the United States, and the United Kingdom (Khudaykulova *et al.* 2022). The stock market experienced a general decline at the beginning of COVID-19 pandemic but recovered and continued to rise until late 2021. However, there was a decline in 2022 due to the Russia-Ukraine war, which started in February. This decline in share prices was observed across various regions, including Europe, China, Russia, Ukraine, and the United States, with Ukraine experiencing the most significant decrease. Therefore, economic shocks, such as war, can have a substantial impact on the traditional stock market (Figure 1).

Based on the above description, the research focuses on the portrayal and integration of Islamic stock market within the 57 member countries of the Organization of Islamic Cooperation (OIC). The aspect is not analyzed despite the significance of Islamic stocks as a method of diversifying shock-resistant portfolios (Arshad & Rizvi 2014). However, the representation and incorporation of Islamic stock market in OIC countries were examined (Nomran & Haron 2021) (Figure 2).

The Islamic stock market of the five countries with the strongest economic ecosystems in 2021 has been subjected to volatility due to the global impact of the pandemic and the Russia-Ukraine war crisis. There have been similar fluctuations in share prices at various times, indicating the integration of stock market (Nomran & Haron 2021). However, there were considerable differences in the response of each market to the shock, and some countries experienced significant pre-war reductions.

According to globalization and integration, there is a domino effect in the economic sector, including the stock market (Masteikiene & Venckuviene 2015; Royfaizal *et al.* 2009; Surugiu & Surugiu 2015; Tiwang *et al.* 2020). Therefore, this research aimed to investigate the integration of Islamic stock market in OIC countries and the response to the Russia-Ukraine war issue. The impacts of wars and other crises on Islamic stock market are also examined.
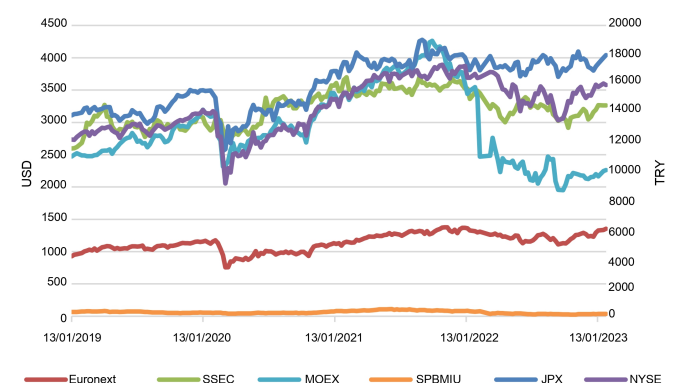
Figure 1: Movement of world stock market indices (Source: Investing.com, yahoofinance, dan S&P global indices 2023); SSE (Shanghai stock exchange), MOEX (Moscow exchange), SPBMIU (Saint Petersburg International Mercantile Exchange–International Unit), JPX (Japan exchange group), and NYSE (New York stock exchange)

*Corresponding author.
E-mail addresses: daffaaqomalhaq@gmail.com
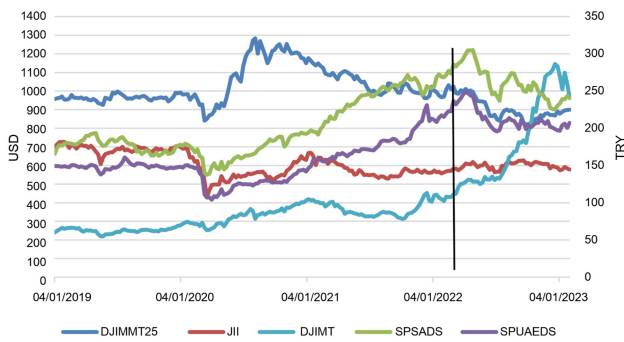
Figure 2: Movement of Islamic stock markets in Organization of Islamic Cooperation countries (Source: Investing.com, yahoofinance, dan S&P global indices 2023); DJIMMT25 (Malaysian Islamic stock market), JII (Indonesian sharia market), DJIMT (Turkish Islamic stock market), SPSADS (Saudi Arabian Islamic stocks), SPUAEDS (United Arab Emirates stock market)

1.2   Literature Review
1.2.1   Sharia Shares and Shares
Dividends and capital gains can be generated by owning shares in a business (Darmarmadji & Fakhruddin 2011). Shares are classified into conventional and Islamic. In addition, Sharia stocks must adhere to principles and are governed by Indonesian Financial Services Authority (OJK) rules Number 35/POJK.04/2017. This suggestion corresponds to Islamic doctrines that forbid usury, *gharar*, and *maysir* (QS Al Baqarah verse 275). Sharia stocks are created to avoid forbidden items in Islam while also growing wealth (Adam *et al.* 2017).

1.2.2   Index of Stock Prices
The stock index is a statistical metric used to describe stock price changes. Historical price movement data might be important information when considering stock investing selections. Stock exchanges and financial institutions create indexes to help investors and observers identify price movements with certain features.

1.2.3   Stock Market Integration
Stock market integration was first proposed by Engle & Granger (1987) as an equal movement with high correlation. The benefits include increased market efficiency and trade cooperation. However, there is also a risk of losing potential arbitrage opportunities and experiencing domino effects between countries (Chen *et al.* 2002; Masteikiene & Venckuviene 2015; Surugiu & Surugiu 2015). Economic integration in the stock market is closely related to portfolio diversification and market efficiency (Abbes & Trichilli 2015).

1.2.4   Portfolio Diversification
According to Baur and Lucey (2010), diversification is the process of incorporating assets with a low positive correlation with others to minimize risk. Markowitz (1952) reported that the concept used various investment instruments. However, diversification can become complex and risky in an interconnected stock market since the benefits are decreased during significant declines.

1.2.5   Efficiency Market Hypothesis
Fama *et al.* (1970) presented the idea of an efficient market, where the financial market responds to new information. According to the hypothesis, market prices reflect available information (Dewandaru *et al.* 2014; Haugen 2001; Ntim *et al.* 2015). In terms of integration, Bekaert & Harvey (1997) reported that assets in a fully integrated market had similar expected returns, signifying the absence of diversification benefits.

1.2.6   OIC Countries Sharia Stock Market
The stock market in Islamic countries plays a significant role in the economies of the member countries. Capitalization reflects the total value of shares issued and serves as a crucial indicator. Stock market with large capitalizations are typically considered mature and liquid. The OIC countries with the largest capitalization are Saudi Arabia (2.4 trillion dollars, 345.35% of GDP), Indonesia (496 billion dollars, 46.85% of GDP), Malaysia (436 billion dollars, 129.40% of GDP), UAE (294 billion dollars, 84.36% of GDP), and Turkey (237 billion dollars, 32.97% of GDP). These countries support economic growth and stability, confirming the critical role in the global economy.

2   Methodology

The time series data used were related to Sharia stock indexes of the OIC countries featured in DinarStandard's top five Islamic Economy Ecosystem in the State of the Global Islamic Economy Report 2022. The analyzed countries comprised Malaysia, Saudi Arabia, the United Arab Emirates, Indonesia, and Turkey, as well as Russia and Ukraine, currently experiencing turmoil. Meanwhile, the use of daily stock price index data provided more in-depth insights.

Secondary data in the form of time series was used in this investigation. The research started on February 24, 2021, and ended on February 24, 2023. The timing was selected to reduce the bias effect of COVID-19 pandemic. The sources employed included S&P Dow Jones Indices, Investing.com, and Yahoo Finance. The pre-crisis period runs from February 23, 2021, to February 23, 2022, while the crisis-era spanned between February 24, 2022, to February 24, 2023.

This research used both descriptive and quantitative methods to examine the Islamic stock market in Malaysia, Saudi Arabia, the United Arab Emirates, and Indonesia. Descriptive analysis included the use of images and graphs to provide a clear understanding of the topic and associated factors. In contrast, quantitative analysis used the Vector Autoregressive/Vector Error Correction Model (VAR/VECM) to determine the impact of independent variables on the dependent variable. The VAR model was used when the data was stationary at the level, while the VECM model was used when the data was not stationary. The VECM model was a subset of the VAR model, and the use was restricted to cases where the data were not stationary but contained cointegration information. The analysis phase started with several tests, including stationarity, optimum lag, VAR model stability, cointegration, and Granger Causality to determine the relationship between previous changes. Impulse Response Function (IRF) was used to analyze the response of an endogenous variable to a specific shock. Meanwhile, Forecast Error Variance Decomposition (FEVD) forecasted the contribution of each variable to shocks or changes. The model used to examine the integration of Islamic stock market in OIC countries is as shown in equation below.

$$\begin{bmatrix} \Delta LNDJIMMT \\ \Delta LNSPSADS \\ \Delta LNSPUAEDS \\ \Delta LNJII \\ \Delta LNDJIMT \\ \Delta LNSPBMIR \\ \Delta LNSPBMIU \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \\ \alpha_{30} \\ \alpha_{40} \\ \alpha_{50} \\ \alpha_{60} \\ \alpha_{70} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \cdots & \alpha_{17} \\ \vdots & \ddots & \vdots \\ \alpha_{1} & \cdots & \alpha_{77} \end{bmatrix} \begin{bmatrix} \Delta LNDJIMMT_{t-1} \\ \Delta LNSPSADS_{t-1} \\ \Delta LNSPUAEDS_{t-1} \\ \Delta LNJII_{t-1} \\ \Delta LNDJIMT_{t-1} \\ \Delta LNSPBMIR_{t-1} \\ \Delta LNSPBMIU_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \\ \varepsilon_{7t} \end{bmatrix}$$

Where:
$\Delta LNDJIMMT$: Natural logarithm of Malaysian Islamic stock price index
$\Delta LNSPSADS$: Natural logarithm of Saudi Arabia's syaria stock price index
$\Delta LNSPUAEDS$: Natural logarithm of United Arab Emirates sharia stock price index
$\Delta LNJII$: Natural logarithm of Indonesian sharia stock price index
$\Delta LNDJIMT$: Natural logarithm of Turkish Islamic stock price index
$\Delta LNSPBMIR$: Natural logarithm of Russian stock price index
$\Delta LNSPBMIU$: Natural logarithm of Ukrainian stock price index

3   Results

3.1   Overview of the Movement of Islamic Stock Markets in OIC Countries
From 2019 to 2023, the Islamic stock market of OIC countries experiences fluctuating movements (Figure 3). The conditions that occurred were similar to 2019–2020. The four country stock price indices experienced a simultaneous decline in the first quarter of 2020 but increased from April 2020.
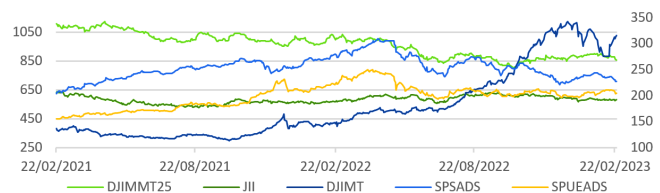
Figure 3: Movement of Islamic stock markets in Organization of Islamic Cooperation countries (Source: Investing.com, yahoofinance, dan S&P global indices 2023); DJIMMT25 (Malaysian Islamic stock market), JII (Indonesian sharia market), DJIMT (Turkish Islamic stock market), SPSADS (Saudi Arabian Islamic stocks), SPUAEDS (United Arab Emirates stock market)

3.2   Islamics Stock Market Integration Before and During the Russia-Ukraine War Crisis
The VAR/VECM analysis shows the connection between the integration of stock market. Before estimating the VAR/VECM, various pre-estimation tests were performed. For stationary test, the variables in the periods did not experience movement after the first difference, as reported in Table 1.

The results in Table 2 show lag one as the optimum lag length, and the stability test reports a modulus value of less than one. Lag one was the ideal length, and the stability test reported a reduced modulus value, suggesting that the VAR model was stable. The Granger causality test analyzed the one-way, two-way, or independent causal relationship between the stock market over time. The relationship is not direct but previous changes in one variable are needed for prediction in the future.

Table 1: Stationarity test of variables

	Before war period			During war period			
	Level		First difference		Level		First difference	
Variable	Prob.	Variable	Prob.	Variable	Prob.	Variable	Prob.
SPSADS	0.375	SPSADS	0.000**	SPSADS	0.8564	SPSADS	0.000**
JII	0.052	JII	0.000**	JII	0.2313	JII	0.000**
DJIMMT25	0.283	DJIMMT25	0.000**	DJIMMT25	0.3988	DJIMMT25	0.000**
SPSUAEDS	0.903	SPSUAEDS	0.000**	SPSUAEDS	0.6067	SPSUAEDS	0.000**
DJIMT	0.822	DJIMT	0.000**	DJIMT	0.7171	DJIMT	0.000**
SPBMIR	0.922	SPBMIR	0.000**	SPBMIR	0.4879	SPBMIR	0.000**
SPBMIU	0.895	SPBMIU	0.000**	SPBMIU	0.3659	SPBMIU	0.000**

Note: **) Stationary at the 5% significance level; Source: Own estimation; SPSADS (Saudi Arabian Islamic stocks), JII (Indonesian sharia market), DJIMMT25 (Malaysian Islamic stock market), SPSUAEDS (United Arab Emirates stock market), DJIMT (Turkish Islamic stock market), SPBMIR (Russian stocks), and SPBMIU (Ukrainian stock market)

Table 2: Optimum lag test and Vector Autoregressive stability before and during war period

				Before war period				
Lag	LogL	LR	FPE	AIC	SC	HQ	Range	Modulus
0	2553.5	NA	2.08e-19	-23.15	-23.042	-23.107	Max	0.9926
1	4657.6	4055.11	1.60e-27*	-41.83*	-40.96*	-41.48*	Mid	0.9515
2	4695.1	69.841*	1.78e-27	-41.728	-40.108	-41.074	Min	0.7619
				During war period				
Lag	LogL	LR	FPE	AIC	SC	HQ	Range	Modulus
0	1948.2	NA	2.27e-18	-20.76	-20.64	-20.71	Max	0.9954
1	3779.2	3505.29	1.20e-26*	-39.82*	-38.85*	-39.42*	Mid	0.9654
2	3822.8	80.221*	1.27e-26	-39.76	-37.94	-39.02	Min	0.8301

*) indicates lag order selected by the criterion, Source: Own estimation; LogL (Log-Likelihood), LR (Likelihood ratio), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz criterion), HQ (Hannan-Quinn criterion), NA (Not available).

Table 3: Causality test of variables

	SPSADS	JII	DJIMMT25	SPSUAEDS	DJIMT	SPBMIR	SPBMIU
SPSADS						→	→
JII						→	→
DJIMMT25			→				
SPSUAEDS					→	→	→
DJIMT					→		
SPBMIR							
SPBMIU					↔		

Source: Own estimation; SPSADS (Saudi Arabian Islamic stocks), JII (Indonesian sharia market), DJIMMT25 (Malaysian Islamic stock market), SPSUAEDS (United Arab Emirates stock market), DJIMT (Turkish Islamic stock market), SPBMIR (Russian stocks), and SPBMIU (Ukrainian stock market)

Table 4: Contegration test of pre-war and during war period

	Pre-war period				During war period		
Hypothesized no. of CE(s)	Eigen-value	Trace statistic	0.05 critical value	Hypothesized no. Of CE(s)*	Eigen-value	Trace statistic	0.05 critical value
None	0.127	103.623	125.615	None	0.188	148.122	125.615
At most 1	0.109	72.854	95.754	At most 1	0.152	103.057	95.754
At most 2	0.084	46.797	69.819	At most 2	0.133	67.153	69.819

Note: Trace test indicates 2 cointegrating eqn(s) at the 0.05 level, *) denotes rejection of the hypothesis at the 0.05 level; Source: Own estimation; CE (Cointegration)

The Granger causality test is presented in Table 3, with red and black indicating causality before and after the wars. The table features one-way and two-way arrows for one-way and two-way links. The results showed that stock market was capable of predicting future shifts during the pre-war period.

A cointegration test was carried out, where Islamic stock market of OIC countries were cointegrated during the war period (Table 4). This result shows that there is a long-term relationship during crisis. However, the stock market was not cointegrated during the prewar period. Due to cointegration or long-term relationships between Islamic stock market in OIC countries, the benefits of portfolio diversification for global investors decrease. During the Chinese stock market crisis and the US-China trade war, several cointegration relationships existed. Based on the results, VAR and VECM models estimated the period before and during the war between Russia and Ukraine, respectively.

Based on Table 5, the movement of the Malaysian Islamic stock market (DJIMMT25) was positively influenced by Russian stocks (SPBMIR) in the previous period. Turkish Islamic stock market (DJIMT) was negatively affected by the movement of the United Arab Emirates Islamic stock market (SPUAEDS). Meanwhile, the Indonesian sharia market (JII) movement was not significantly influenced by other variables. The Russian stock market (SPBMIR) was positively influenced by the previous period and negatively affected by Indonesian sharia stocks (JII). The Ukrainian stock market (SPBMIU) movement was not significantly influenced by variables. The movement of the United Arab Emirates stock market (SPSUAEDS) was positively influenced by Turkish Islamic stock market (DJIMT) in the previous period and affected by Malaysian Islamic stock market (DJIMTT25). Finally, Saudi Arabian Islamic stocks (SPSADS) were positively influenced by the

movement of Russian stocks (SPBMIR) in the previous period.

During the Russia-Ukraine war, the research variables were stationary at the first difference and cointegrated. Therefore, the model used was VECM with an optimum lag length of 1. The model shows the relationship between variables in the short and long term (Table 6).

Based on Table 6, a crisis can lead to co-movement in several Islamic stock market. This is shown by the influence exerted by certain Islamic stock market on others. For instance, the previous period's Indonesian Islamic stock market (JII) had a positive impact on the Turkish (DJIMT) and Russian stock market (SPBMIR). Therefore, an increase in the Indonesian Islamic stock price index (JII) is followed by Turkish (DJIMT) and the Russian stock market (SPBMIR). The strengthening of trade cooperation between Indonesia, Turkey, and Russia supports a unidirectional relationship between the stock market. Turkish Islamic stock market (DJIMT) in the previous period also had a positive impact on the United Arab Emirates Islamic stock market (SPSUAEDS). Therefore, an increase in the previous period will improve the United Arab Emirates Islamic Stock Price Index (SPSUAEDS).

During the Russia-Ukraine war, the Indonesian (JII) and Malaysian Islamic stock market (DJIMMT25) were influenced by Russia (SPBMIR). This suggests that an increase in the Russian stock price index (SPBMIR) enhances Indonesian (JII) and Malaysian Islamic stock index (DJIMMT25). A decrease in the Russian stock price index (SPBMIR) may affect Indonesian (JII) and Malaysian Islamic stock index (DJIMMT25). However, Turkish Islamic stock market (DJIMT) was not significantly affected by Russia (SPBMIR).

The relationship between Malaysian and the United Arab Emirates Islamic stock market can be observed in Table 6. By comparing the

t-tables and t-statistics, there is a long-term connection between the stock market. The Malaysian Islamic stock market, represented by DJIMMT25, had a negative influence on the Indonesian (JII), the United Arab Emirates (SPREADS), Saudi Arabia (SPSADS), and the Ukrainian conventional stock market. The use of British English is maintained, with proper spelling, specific terms, and phrases. The previous period's increase in Malaysian Sharia stock prices led to a decrease in Indonesia, the United Arab Emirates, Saudi Arabia, and Ukrainian stocks. In contrast, Turkish (DJIMT) and Russian conventional stock market (SPBMIR) experienced a positive influence. This suggests that Malaysian Islamic stock prices in the previous period increased Turkish and Russian conventional stock prices.

The VECM model contains the Error Correction Term (ECT) value to achieve long-term balance. Based on the estimation results in Table 10, significant ECT values with t count > t table (1.97) level of 5% and negative ECT coefficients are found in the DJIMMT25 model. The ECT value on DJIMMT25 is -0.000175, hence deviation from the long-term balance is corrected at 0.0175% in the following period.

Table 5: Stationarity test result before war period

	VAR estimation result before war period						
	D(DJIMMT25)	D(DJIMT)	D(JII)	D(SPBMIR)	D(SPBMIU)	D(SPSUEADS)	D(SPSADS)
D(DJIMMT25(-1))	-0.01581	0.043229	0.00448	0.021694	0.093319	-0.199906	-0.10704
	-0.06896	-0.15715	-0.0873	-0.1728	-0.19681	-0.08338	-0.07335
	[-0.22940]	[0.2751]	[0.051]	[0.12554]	[0.47415]	[-2.39742]**	[-1.45931]
D(DJIMT(-1))	-0.013578	-0.003742	0.02211	-0.027427	-0.038878	0.138642	0.044875
	-0.03095	-0.07053	-0.0392	-0.07755	-0.08833	-0.03742	-0.03292
	[-0.4387]	[-0.053]	[0.564]	[-0.35366]	[-0.44014]	[3.7047]***	[1.36317]
D(JII(-1))	-0.072029	-0.012304	-0.1054	-0.250006	-0.154479	0.039095	-0.051741
	-0.05523	-0.12588	-0.06996	-0.13841	-0.15765	-0.06679	-0.05875
	[-1.30405]	[-0.0977]	[-1.507]	[-1.8062]*	[-0.97987]	[0.58532]	[-0.88064]
D(SPBMIR(-1))	0.120437	0.0149	0.03544	0.197122	0.144062	0.028119	0.058633
	-0.03167	-0.07218	-0.0401	-0.07937	-0.0904	-0.0383	-0.03369
	[3.80263]***	[0.2064]	[0.883]	[2.4837]**	[1.59363]	[0.73421]	[1.74035]*
D(SPBMIU(-1))	-0.010603	-0.09304	0.00437	-0.073058	-0.067917	-0.028838	0.026957
	-0.0294	-0.06701	-0.03724	-0.07368	-0.08392	-0.03556	-0.03128
	[-0.36059]	[-1.3884]	[0.117]	[-0.99151]	[-0.80926]	[-0.81106]	[0.86186]
D(SPUEADS(-1))	-0.026593	0.410085	-0.05844	-0.140905	-0.086703	0.077097	0.017351
	-0.05634	-0.1283	-0.07136	-0.14118	-0.1608	-0.06813	-0.05993
	[-0.47203]	[3.19]***	[-0.819]	[-0.99807]	[-0.53920]	[1.13169]	[0.28953]
D(SPSADS(-1))	-0.044797	0.061016	0.08097	-0.260431	-0.236437	-0.037507	-0.053867
	-0.06469	-0.14742	-0.08194	-0.16211	-0.18464	-0.07822	-0.06881
	[-0.69250]	[0.4139]	[0.988]	[-1.60654]	[-1.28055]	[-0.47947]	[-0.78282]
C	-0.000189	-0.000135	-0.00045	-0.000278	-0.00059	0.001432	0.001327
	-0.00054	-0.00124	-0.00069	-0.00136	-0.00155	-0.00066	-0.00058
	[-0.34884]	[-0.1094]	[-0.659]	[-0.20479]	[-0.38102]	[2.18361]**	[2.3013]**

***), **), and *) significant at the significance level of 1 percent, 5 percent and 10 percent; DJIMMT25 (Malaysian Islamic stock market), DJIMT (Turkish Islamic stock market), JII (Indonesian sharia market), SPBMIR (Russian stocks), SPBMIU (Ukrainian stock market), SPSUEADS (United Arab Emirates stock market), and SPSADS (Saudi Arabian Islamic stocks)

3.3 The Stock Market Response Of The OIC Countries Before and During the Russia-Ukraine War

The stock market response of OIC countries before and during the Russia-Ukraine war can be seen by analyzing the IRF. The FEVD analysis provided information regarding the contribution of variables to transmitting shocks (Figure 4). IRF test results before and during the war period showed a significant difference. The pre-war period of response to the Russia-Ukraine shock was varied and returned to the initial balance. The war showed a positive response in Islamic market, and there was a new balance due to the Russia-Ukraine shock.

FEVD estimation was carried out to determine the variance contributing to changes in other variables (Figure 5). In the period before or during the war, the variance of the variable had the highest contribution. In this context, SPSADS and the shocks in the five countries were dominated by the contribution of the Islamic stock market. Additionally, shocks in the JII, SPSADS, and SPUAEDS market were also caused by DJIMMT25. The insignificant effect showed that IRF had a permanent effect on the volatility of the Islamic stock market during the crisis.

3.4 Implication

In the era of globalization, stock market integration is an important issue. Economic shocks such as the Russia-Ukraine war can create challenges and opportunities for investors and policymakers. Based on the results, investors need to manage risk in designing hedging mechanisms to maintain the stability of the Islamic stock market (Hassan & Girard 2010). During the crisis, the Islamic stock market showed increased integration, confirming market efficiency in line with the hypothesis but with reduced portfolio diversification benefits (Fama *et al.* 1969). Economic dominance, geography, and trade relations factors influence the integration. Meanwhile, portfolio diversification by considering geographical factors provides benefits (Al-Khazali *et al.* 2014). OIC countries must improve regional trade cooperation to minimize the impact of international shocks. These steps are important for market strategy, capital budgeting by investors, and policy reforms.

4 Discussion

During Period I, which preceded the Russia-Ukraine War, the Islamic stock price index in Malaysia showed short-term fluctuations without discernible trends. The highest and lowest prices were attained on April 26, 2021 and March 31, 2021, at RM 1124.27 and RM 1054.16, respectively. At the outset of the war period, the stock index experienced a slight increase of 2% on March 25, 2022. However, the stock index witnessed significant fluctuations and declined by 7% on May 6, 2022. Even though the stock index reported a marginal inclusion on May 31, 2022, a decline of 4% was recorded on June 9, 2022. The stock index continued to decrease and reached nadir on June 13, 2022, before rebounding.

Before the war, the Saudi Arabian stock market showed a positive trend. However, a decline of USD 243.07 was recorded before rebounding and reaching the peak at the end of April 20, 2022, or the first two months of the Russia-Ukraine war. The highest share price was USD 307.23, which decreased to USD 239.36 on July 17, 2022. Additionally, the stock price experienced significant fluctuations to USD 221.09 on December 12, 2022.

In the stock market of the United Arab Emirates, comparable events took place. Before the Russia-Ukraine war, the fluctuations were favorable, with slight volatility in the third week of December 2021. However, the share prices rebounded and remained stable until the end of the period. During the war, the prices increased to USD 249.85 on April 11, 2022, but a decline of USD 194.64 was recorded on July 13, 2022. Subsequently, the movement fluctuated up and down over the next few months.

During the initial seven months of the pre-war period, the Indonesian Sharia stock market (JII) experienced a decline. The lowest price was recorded at IDR 527.5 on August 10, 2021. However, the share price increased towards the end of September 2021, reaching IDR 583.84 on October 18, 2021. The movement was volatile until war was declared on February 24, 2022. During the war era, which lasted until April 28, 2022, the stock market witnessed a price increase of IDR 619.2. In addition, a period of upheaval resulted in negative changes, causing the price to decrease to IDR 558.76 on July 7, 2022. The market began to rebound and reached the peak price of IDR 631.99 on September 13, 2022, but there was a minor downward trend in share prices.
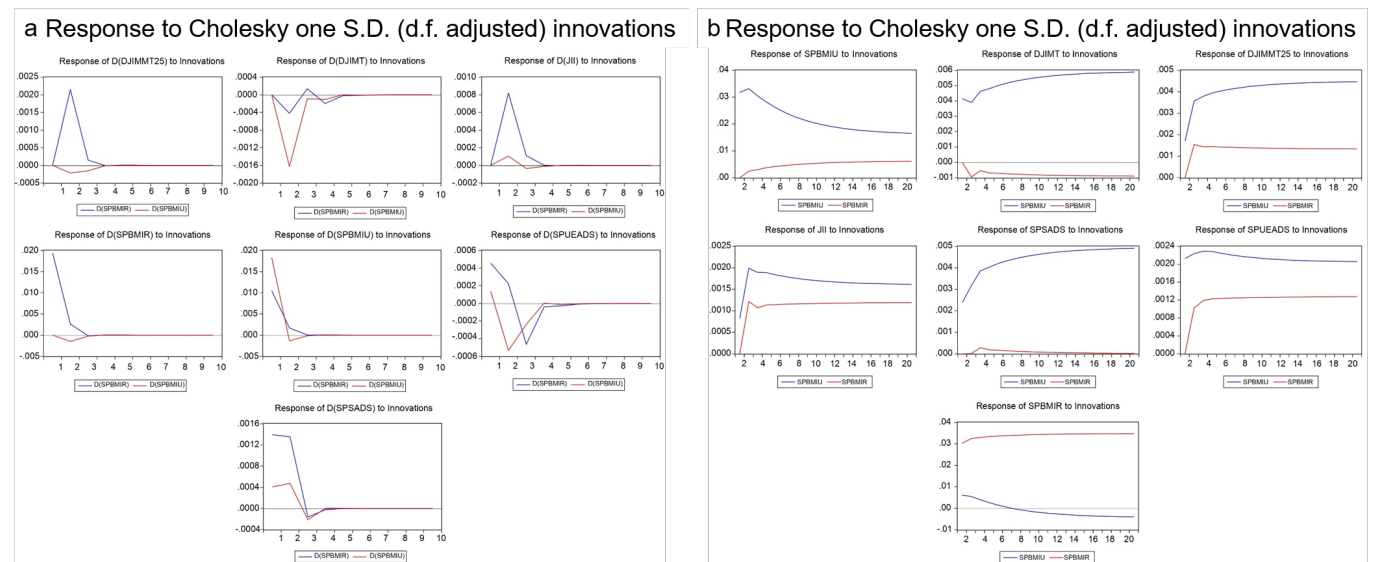
The Turkish Islamic stock market shows a range of stock price movements. A positive trend was reported despite the dips and oscillations experienced by Malaysia, Saudi Arabia, the United Arab Emirates, and Indonesia. On February 13, 2023, the stock price decreased to TRY 23,203.73 before recovering. The fresh share price reduction started on January 2, 2023, and continued to fluctuate. The Granger causality test analyzes the causality between two stock market over time. The one-way, two-way or independent relationship are useful for predicting other changes in the future.

Table 6: Vector error correction model result during war period

			Short-term period				
Error Correction:	D(DJIMT)	D(DJIMMT25)	D(JII)	D(SPUEADS)	D(SPSADS)	D(SPBMIR)	D(SPBMIU)
CointEq	-0.000078	-0.000175	-0.000031	0.0000393	-0.000119	0.00075	0.001263
	[-0.5546]	[-2.41865]**	[-0.4837]	[0.44954]	[-1.30477]	[3.151]***	[5.211]***
D(DJIMT(-1))	0.057518	0.039461	0.060628	0.085969	0.031621	0.124879	0.133988
	[0.82868]	[1.11112]	[1.91284]	[2.00657]**	[0.70568]	[1.07145]	[1.12919]
D(DJIMMT25(-1))	0.171461	-0.044949	-0.024366	0.054699	0.155198	-0.409455	-0.191327
	[1.09935]	[-0.56325]	[-0.34211]	[0.56817]	[1.54138]	[-1.56341]	[-0.71756]
D(JII(-1))	0.334472	-0.052423	-0.108789	0.083636	0.167909	0.649042	-0.109835
	[2.0314]**	[-0.62226]	[-1.44691]	[0.82293]	[1.57968]	[2.3475]**	[-0.39021]
D(SPUEADS(-1))	-0.056922	-0.047636	-0.045097	0.011941	-0.10772	0.025702	0.078334
	[-0.42784]	[-0.69974]	[-0.74227]	[0.14540]	[-1.25414]	[0.11504]	[0.34440]
D(SPSADS(-1))	-0.147494	0.006865	0.028162	-0.001125	-0.052096	0.13495	0.285755
	[-1.21316]	[0.11035]	[0.50725]	[-0.01499]	[-0.66375]	[0.66102]	[1.37485]
D(SPBMIR(-1))	-0.030694	0.052214	0.040343	0.033435	0.001188	0.066015	0.074
	[-0.79026]	[2.6272]**	[2.274]*	[1.39456]	[0.04739]	[1.01217]	[1.11445]
D(SPBMIU(-1))	-0.018694	0.034948	0.023364	-0.016806	0.009055	0.008277	0.105563
	[-0.46513]	[1.69947]	[1.27303]	[-0.67743]	[0.34898]	[0.12264]	[1.53641]
C	0.003063	-0.000744	-0.000255	-0.000577	-0.001169	0.000715	0.000928
	[2.36349]	[-1.12119]	[-0.4304]	[-0.72099]	[-1.39715]	[0.32856]	[0.41900]

			Long-term period				
	D(DJIMT(-1))	DJIMMT25(-1)	JII(-1)	SPUEADS(-1)	SPSADS(-1)	SPBMIR(-1)	SPBMIU(-1)
DJIMT(-1)	1	0.002314	-0.069554	-0.008616	-0.06814	0.16406	-0.010047
		[0.09914]	[-0.1336]	[-0.10006]	[-0.14982]	[0.10992]	[-0.09910]
DJIMMT25(-1)	432.1941	1	-30.06079	-3.723872	-29.44962	70.90581	-4.342206
	[5.04]***		[-5.34]***	[-6.1375]***	[-5.2060]***	[5.185]***	[-6.866]***
JII(-1)	-14.37734	-0.033266	1	0.123878	0.979669	-2.358748	0.144448
	[-0.247]	[-0.19407]		[0.18427]	[0.23349]	[-0.19748]	[0.1829]
SPUEADS(-1)	-116.0604	-0.268538	8.072454	1	7.908333	-19.04088	1.166046
	[-1.87959]	[-2.2664]**	[1.8724]		[2.0166]**	[-1.88676]	[1.86521]
SPSADS(-1)	-14.67571	-0.033956	1.020753	0.126449	1	-2.407699	0.147445
	[-0.4033]	[-0.27553]	[0.3401]	[0.28903]		[-0.26641]	[0.27048]
SPBMIR(-1)	6.095327	0.014103	-0.423954	-0.052519	-0.415334	1	-0.061239
	[0.52981]	[0.49125]	[-0.5148]	[-0.48409]	[-0.47691]		[0.53533]
SPBMIU(-1)	-99.53332	-0.230298	6.92293	0.857599	6.78218	-16.32945	1
	[-5.55]***	[-7.55781]***	[5.54]	[5.5601]	[5.6256]	[-6.2196]***	

***), **), and *) significant at the significance level of 1 percent, 5 percent and 10 percent; DJIMT (Turkish Islamic stock market), DJIMMT25 (Malaysian Islamic stock market), JII (Indonesian sharia market), SPSUEADS (United Arab Emirates stock market), SPSADS (Saudi Arabian Islamic stocks), SPBMIR (Russian stocks), SPBMIU (Ukrainian stock market), CointEq (cointegration equation), and C (constant term)
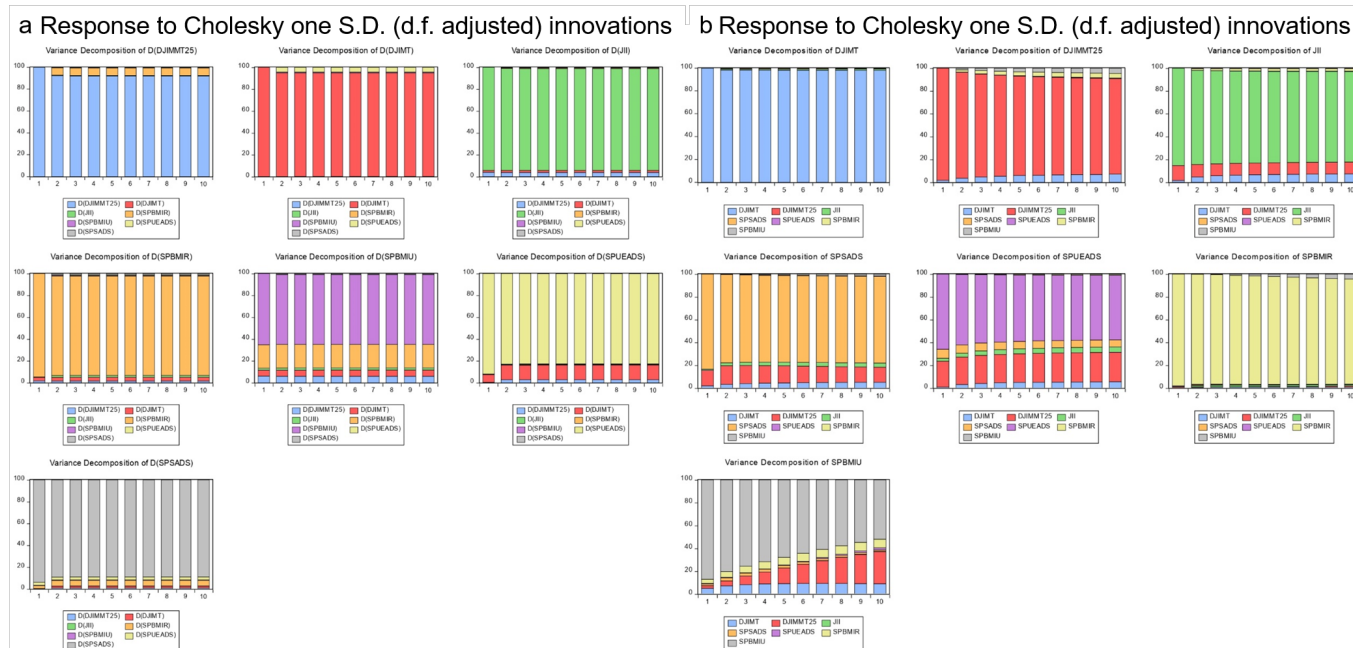

Figure 4: Impulse response function estimation results before war (a) and during war (b); DJIMMT25 (Malaysian Islamic stock market), DJIMT (Turkish Islamic stock market), JII (Indonesian sharia market), SPBMIR (Russian stocks), SPBMIU (Ukrainian stock market), SPSUEADS (United Arab Emirates stock market), SPSADS (Saudi Arabian Islamic stocks)

Stock market can predict future changes during the prewar period. Cointegration is carried out to enable a long-term relationship when a crisis occurs. In contrast, the stock market was not cointegrated during the prewar period. Due to the long-term relationships between Islamic stock market in OIC countries, the benefits of portfolio diversification for global investors are decreased. This result is consistent with Almohamad *et al.* (2018) and Siswara *et al.* (2021), where stock market becomes cointegrated during crisis. Almohamad *et al.* (2018) examined the long-term and short-term relationships between the MENA, China, United States, and the United Kingdom stock market over the global financial crisis. Siswara *et al.* (2021)

analyzed the integration and response in several OIC countries before and during the Chinese crisis as well as the US-China trade war. The results showed no cointegration before the Chinese crisis but several relationships existed.

Based on Table 5, the Islamic stock market of OIC countries before the Russia-Ukraine war were cointegrated to feel the benefits of investment portfolio diversification (Endri 2009). According to Lütkepohl (2005), the estimated coefficients represented the simultaneous relationship between the variables in the simultaneous VAR/VECM model. Therefore, direct interpretation of the coefficients results in errors in attributing the correct causal relationship.

Figure 5: Forecast error variance decomposition estimation results before war (a) and during war (b); DJIMMT25 (Malaysian Islamic stock market), DJIMT (Turkish Islamic stock market), JII (Indonesian sharia market), SPBMIR (Russian stocks), SPBMIU (Ukrainian stock market), SPSUEADS (United Arab Emirates stock market), SPSADS (Saudi Arabian Islamic stocks)

Lütkepohl (2005) recommended using methods such as IRF and FEVD to provide an accurate interpretation of the relationships between variables. IRF evaluated the long-term and short-term impact of shocks in the model. Meanwhile, FEVD was used to understand the effect of changes in one variable on others in a certain period. During the Russia-Ukraine war, the research variables were stationary at the first difference and cointegrated. Therefore, the model used was VECM with an optimum lag length of 1. The model shows the relationship between variables in the short and long term.

According to Table 6, Arshad and Rizvi's (2014) assertion regarding Islamic stocks was supported as an alternative portfolio. The Indonesian and Malaysian Islamic stock market were significantly influenced by the shocks received. Chowdhury *et al.* (2023) investigated the spillover risk of the impact of the Russia-Ukraine war on Asian Islamic stocks and cryptocurrency using the dynamic quantile connectedness method. The results showed that war and oil prices transmitted risks to Asian Islamic stocks, Bitcoin, and gold. De Long *et al.* (1990) proposed a theory to explain the phenomenon, where investors showed crowding behavior in situations of uncertainty. In addition, investors tend to avoid losses due to irrationality in investing. This spillover risk also manifested in the decline of Indonesian and Malaysian Islamic stock prices due to the Russia-Ukraine war.

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In the Financial Times 2022, Samson & Yackley (2022) reported Turkey's inflation rate. This decreased the Lira exchange rate against the USD by 29%. High inflation, low Lira exchange, and low interest rates prevented people from investing in assets with fixed returns. Therefore, people prefer to invest in assets with high returns and risks, including stocks to protect savings from high inflation.

The Russia-Ukraine war has benefitted several countries, such as Georgia, Armenia, and Turkey. These three countries refuse to apply Western sanctions that have isolated Russia from the international world. The flow of immigrants into these countries also increased. Turkey has granted licenses to 118,626 citizens of Russia, which has positively impacted the country's financial flows. In this context, the Russian side made a fifth of Turkiye's foreign property sales in 2022, which increased by 5%. Meanwhile, Armenia experienced an increase of 11% due to support from large inflows of funds, income, capital, and labor (Kurniawan 2022). The data are only relevant for the period included in this research and the results may change depending on the length.

5 Conclusion

In conclusion, the trends shown by Islamic stock market were diverse before the Russia-Ukraine war. The market in the UAE and Saudi Arabia reported an upward trajectory, while Malaysia experienced a decline. Indonesia was characterized by instability but Turkey showed improvement. During the war, the UAE and Saudi Arabia initially registered growth. Malaysia's market continued to decrease but recovered in July 2022. Indonesia attained a significant increase in September 2022 before experiencing another decline, while Turkey remained positive but became unstable in 2023.

Before the war, there was no cointegration between the Islamic stock market of OIC countries. However, close integration was reported to reduce the benefits of diversification. An integrated market showed efficiency, and new information was reflected in stock prices. In the long term, the Malaysian Islamic stock market influenced the entire variables, with the UAE also impacting Malaysia and Saudi Arabia. Meanwhile, Russia's market affected both Malaysia and Indonesia in the short term. During the war, Islamic stock market responded positively to the events in Russia-Ukraine war. This response was sustained, indicating a lasting impact on volatility.

OIC countries were recommended to fortify infrastructure and mitigate the consequences of global market disruptions. Domestic and foreign investors were attracted by implementing proactive policies. Therefore, global investors should consider key economic, geographical, and trade

factors since market integration could compromise the benefits of diversification. Different stock price indices and methods could also be explored to provide deeper insights into integration.

Conflict of Interest

The authors declare no conflict of interest.

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