DYNAMIC CAUSALITY RELATIONSHIP BETWEEN BITCOIN AND GLOBAL ISLAMIC EQUITY MARKETS: A PRE- AND POS- COVID-19 VECM ANALYSIS

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Abstract

This study explores the dynamic interactions between Bitcoin (BTC), the Dow Jones Islamic Market Index (DJIMI), and the FTSE SGX Shariah 100 Index (FTSGS100) from 2015 to 2025, employing the Vector Error Correction Model (VECM) to analyze both short- and long-term relationships. The Johansen cointegration test indicates a long-term equilibrium among the three variables, with DJIMI showing a stronger connection to Bitcoin compared to FTSGS100. In the short run, Bitcoin exhibits a strong response to its own shocks, whereas the Sharia indices are more stable and less responsive to short-term fluctuations in Bitcoin's volatility. The findings underscore the weak integration between global Sharia equity markets and digital assets, positioning Bitcoin as a speculative asset largely independent of Sharia-compliant markets. These results suggest the importance of enhanced risk management and portfolio diversification strategies for investors navigating the rapidly changing financial landscape. Additionally, this research enhances our understanding of the interactions between cryptocurrency markets and traditional financial markets, particularly Sharia-compliant indices, during times of global financial uncertainty.

Keywords: Bitcoin, Global Sharia Stock Market, VECM, Cointegration, Risk Management

INTRODUCTION

The rise of digital assets such as Bitcoin (BTC) has introduced significant shifts in the global financial system over the past decade, challenging traditional financial institutions and altering investment paradigms. Its extreme volatility and decentralized nature make Bitcoin a key subject in financial research, particularly as it influences investment strategies during global economic crises or pandemics. (Zghal et al., 2025; Shnaishel, 2025).

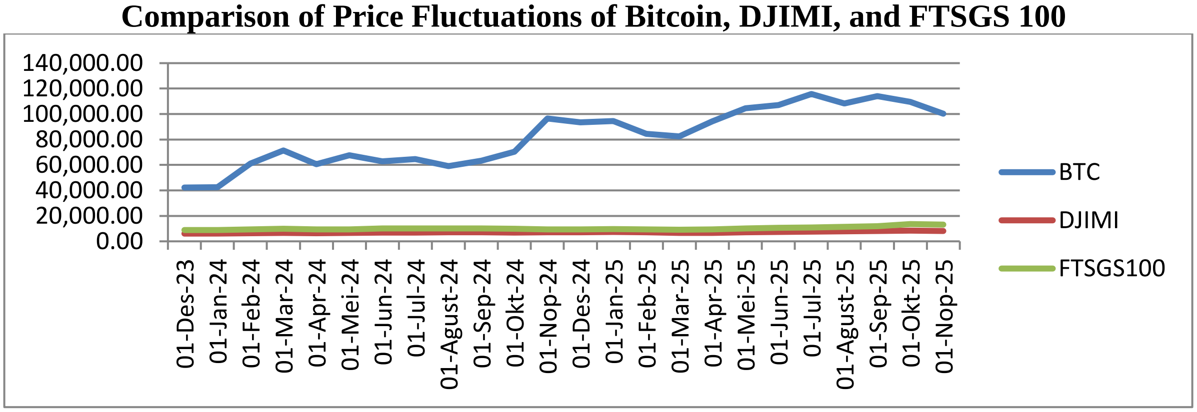
As a form of financial innovation, Bitcoin has not only stimulated debates regarding its function as a medium of exchange and a store of value, but has also opened new avenues of inquiry into its linkages with traditional market instruments and Sharia-based financial markets. Its sharp price fluctuations and globally distributed adoption raise questions about Bitcoin's role in shaping financial market stability and its interactions with other investment instruments.

The study by Izadin and Mohd Yusof (2025) identifies spillover effects and volatility transmission between the cryptocurrency market and Islamic equity markets, particularly during periods of crisis, although the magnitude of these effects remains more limited than those observed for traditional assets such as gold. Earlier research has also documented dynamic correlations and volatility contagion among cryptocurrencies, gold, and equities during episodes of global uncertainty (Ibrahim et al., 2024; Zghal et al., 2025).

With the growing attention to modern Islamic finance, global Sharia-compliant equity indices such as the Dow Jones Islamic Market Index (DJIMI) and the FTSE SGX Asia Shariah 100 Index (FTSGS100) have become essential benchmarks for assessing the performance of Sharia-compliant stock markets. DJIMI is widely used in empirical studies as an indicator of Islamic financial performance and has been shown to influence the Indonesian Sharia Stock Index (Halim, 2021).

Meanwhile, the FTSGS100, developed by FTSE Russell and the Singapore Exchange (SGX), screens companies in the Asia Pacific region based on Sharia-compliant business activities and financial ratio criteria, thereby reflecting the integration of Islamic financial principles within global markets (FTSE Russell, 2025). Consequently, the index serves not only as a measure of Sharia-compliant equity performance but also as an indicator of how Islamic financial principles are embedded in broader global market mechanisms.

Figure 1.
Comparison of Price Fluctuations of Bitcoin, DJIMI, and FTSGS 100



Source: Investing.com (Processed Data by Author, 2025)

Bitcoin's (BTC) price in Figure 1 exhibits substantially higher volatility compared with the two global Sharia-compliant equity indices, the Dow Jones Islamic Market Index

(DJIMI) and the FTSE SGX Asia Shariah 100 Index (FTSGS100). Between December 2023 and October 2025, BTC experienced a sharp increase from roughly 40 million USD to more than 120 million USD before undergoing a correction in the final quarter of 2025.

In contrast, DJIMI and FTSGS100 display a relatively stable and sideways movement with limited fluctuations, reflecting the tendency of Sharia-compliant equity markets to remain resilient to external shocks. These findings are consistent with Utami et al. (2025), who report the presence of long-term integration between ASEAN Sharia indices and global markets, although with lower volatility compared with their conventional counterparts.

Although several studies have examined the relationship between Bitcoin and Sharia-compliant indices, the existing evidence remains mixed. Abdul Razak et al. (2024) report that the long-term correlation between Sharia indices and Bitcoin in Turkey and Malaysia is limited and shifts during periods of market turbulence. In contrast, Eldomiaty and Khaled (2024) find that cryptocurrency volatility is negatively associated with stock market volatility in emerging economies.

Moreover, previous research has largely concentrated on national Sharia indices, leaving studies on the linkages between Bitcoin and cross-regional Sharia indices such as DJIMI and FTSGS100 relatively limited. This gap highlights the need to reassess volatility spillovers and long-term dynamics between Bitcoin and global Sharia equity markets using a longer and more representative dataset.

This study aims to fill the gap by examining the dynamic relationship between Bitcoin and cross-regional Sharia equity indices, particularly the Dow Jones Islamic Market Index (DJIMI) and the FTSE SGX Asia Shariah 100 Index (FTSGS100). Unlike previous studies that focus on national Sharia indices, our research employs a global dataset from 2015 to 2025, providing a more comprehensive understanding of the interactions between digital assets and Sharia-compliant equity markets.

The Vector Error Correction Model (VECM) is chosen for its ability to analyze both short-term and long-term relationships between Bitcoin and Sharia-compliant equity markets. By using this model, the study will not only identify long-term equilibrium relationships but also capture the speed of adjustments when deviations from equilibrium occur, making it ideal for understanding market dynamics in the context of Bitcoin's price fluctuations and Sharia equity movements.

This study's findings will contribute to the ongoing evolution of Islamic finance, especially in the context of integrating digital assets like Bitcoin with traditional Sharia-compliant equity markets. By offering insights into portfolio diversification strategies, the research can inform Islamic financial institutions, investors, and policymakers in navigating the complexities of digital assets within the rapidly changing landscape of global financial technologies.

REVIEW OF LITERATURE

The Bitcoin Market

The Bitcoin market has shown increasing efficiency, reflecting a shift from a speculative asset toward a more structured financial instrument (Skwarek, 2023). During the COVID-19 pandemic, global investor attention was found to influence Bitcoin's volatility and price movements, indicating its sensitivity to broader macroeconomic conditions (Wan et al., 2023).

At the same time, Bitcoin has begun to be viewed as an investment asset and a potential safe-haven alternative within modern portfolios, although this role remains inconsistent (Ali et al., 2025). However, its high volatility and the growing correlation with equity markets demonstrate that risk and regulatory needs remain central challenges (Ibrahim et al., 2024).

Dynamics of the Global Sharia Equity Market

The dynamics of the global Sharia equity market over the past five years show increasing integration and a more complex response to global economic conditions. Recent studies highlight that Sharia-compliant markets are becoming more efficient and more closely linked to global economic uncertainties (Aslam et al., 2023). Cross-regional analyses also identify correlations and volatility spillovers between Sharia equity markets in the United States and Southeast Asia, indicating a rising level of global market interconnectedness (Hidayat et al., 2023).

Recent empirical findings further indicate that global risk factors such as VIX volatility and geopolitical tensions influence the stability and performance of major Sharia-compliant indices. These results show that Sharia equity markets have increasingly become part of the broader international financial system (Asutay et al., 2022; Kazak et al., 2025).

Financial Market Dynamics Theory

Financial market dynamics explain how asset prices adjust in response to new information, investor behavior, and macroeconomic conditions (Mishkin, 2016). Within this framework, prices reflect the interaction between supply and demand, and continuously move toward new equilibrium levels when information shocks occur. The sharp price movements seen in digital assets such as Bitcoin reflect rapid responses to shifts in global expectations and investor sentiment.

Risk Contagion Theory

Risk transmission theory explains how shocks in one financial sector can spread to other markets through various channels, such as capital flows, investor expectations, and the structural linkages between markets. Goutte et al. (2022) highlight that the pandemic crisis amplified volatility contagion across global markets via psychological channels (investor sentiment) and monetary policy channels, which impacted cross-border investment behavior.

Further expanding on this, Pacelli (2025) builds on this theory with the financial network theory, viewing the global market as a complex system where each asset or index serves as an interconnected node. According to Pacelli, risk transmission depends not only on the magnitude of the initial shock but also on the connectivity and market centrality of each node within the network.

Additionally, Darolles & Gourieroux (2015) explain that risk transmission can be identified through changes in cross-market correlations, which fluctuate over time, especially during crisis periods. In the context of Bitcoin, DJIMI, and FTSGS100, Bitcoin can be considered a new node with high transmission potential due to its extreme volatility and global character, which transcends national financial regulatory boundaries.

Global Market Integration Theory

According to Alami (2020), financial globalization has broadened the impact of international liquidity on domestic markets, creating conditions where price changes in one major market can quickly spill over to other markets, particularly in developing countries.

Furthermore, Čaušević (2020) argues that global financial market integration forms a hierarchical structure where major financial centers drive global volatility.

Bonizzi et al. (2021) add that global financial integration creates transmission channels that accelerate cross-market price adjustments, meaning that global Sharia-compliant equity indices cannot be fully insulated from the fluctuations in digital asset markets. Changes in high-risk assets like Bitcoin can influence the stability and efficiency of global Sharia-compliant markets through liquidity transmission mechanisms and investor risk perceptions.

Previous Research

Research on the relationship between cryptocurrencies and global stock markets shows a dynamic interconnection, influenced by market conditions. Wang et al. (2022) found that Bitcoin behaves as a high-risk asset, increasingly positively correlated with global stock indices during periods of high volatility. In contrast, Caporale et al. (2024) reported that cryptocurrencies do not have a long-term correlation with U.S. stock markets.

Regarding Sharia-compliant markets, the relationship between cryptocurrencies and Islamic capital markets presents more complex characteristics and is not always strong. Mezghani et al. (2024) identified that Bitcoin has a negative to neutral correlation with global Sharia equity indices, making it a potential instrument for risk diversification. Ashraf et al. (2023) found that the relationship between Sharia stock markets, Bitcoin, and precious metals strengthened during crises such as the COVID-19 pandemic and the Russia–Ukraine conflict.

Abdul Razak et al. (2024) added that Bitcoin volatility does not significantly affect Sharia equity indices in Malaysia and Turkey, indicating a relatively stable risk separation. Meanwhile, Devabe (2025) reported that Islamic stock markets maintained structural resilience against global macroeconomic shocks.

Husodo et al. (2025) in their study stated that conventional and DeFi cryptocurrencies have a positive relationship with stable risk performance, whereas Sharia-compliant gold-based cryptocurrencies correlate with higher risk and negative returns due to liquidity constraints and regulatory uncertainties. Mnif and Jarboui (2021) concluded that conventional and green cryptocurrency markets tend to be inefficient and exhibit multifractal behavior, whereas Islamic cryptocurrencies such as HelloGold are relatively more efficient and do not show herding behavior, even post-COVID-19.

RESEARCH METHOD

This study employs a quantitative research method with a causal research design. According to Sekaran and Bougie (2016), causal research design is used to identify cause-and-effect relationships between two or more variables. In this study, the researcher aims to illustrate the relationships and changes occurring between variables and measure the extent to which the independent variable influences the dependent variable.

Types and Data Sources

The research data consists of secondary monthly data on the global Sharia stock indices, Dow Jones Islamic Market Index (DJIMI), FTSE SGX Asia Shariah 100 Index (FTSGS100), and Bitcoin prices obtained from investing.com for the period from January 2015 to November 2025. Data processing was performed using EViews 10 on time-series data. The processed data were then analyzed using statistical tests, including the Vector Error Correction Model (VECM).

Empirical and Theoretical Models

The Vector Error Correction Model (VECM) is a constrained version of the Vector Autoregression (VAR) model, which is used when time series variables are non-stationary but have cointegration relationships between them (Gujarati & Porter, 2009; Ghozali, 2021). The first step in applying the VECM is to conduct a stationarity test using unit root tests, such as the Augmented Dickey-Fuller (ADF) test, to ensure that all variables are integrated at the first difference I(1). Following this, Johansen cointegration tests are performed to determine the number of cointegration vectors (r) using the trace and maximum eigenvalue statistics.

$$LR_{trace} = -T\sum_{i=r+1}^{n}\ln(1-\lambda_i),\ LR_{max} = -T\ln(1-\lambda_{r+i})$$

If the results show $0 < r < n$, the VECM model can be formulated as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i-1}^{k-1}\Gamma_i\,\Delta y_{t-1} + \mu + \varepsilon_t\ ,$$

Where $\Pi = \alpha\beta'$ epresents the long-run relationship between variables (Kilian & Lütkepohl, 2017).

In this model, $\beta' y_{t-1}$ is the error correction term (ECT) indicating the long-term equilibrium, while α represents the speed of adjustment to deviations from equilibrium (Gujarati & Porter, 2009). The next step is to test the model's stability through characteristic analysis and Granger causality tests.

A model is considered stable if all the roots of the characteristic polynomial lie within the unit circle. The Granger causality test is used to examine short-term and long-term cause-and-effect relationships. These steps are essential to ensure that the VECM model is valid both econometrically and substantively (Ghozali, 2021; Kilian & Lütkepohl, 2017).

$H_0 : \Gamma_i = 0$ (No short-run causality)

$H_0 : \alpha_j = 0$ (No long-run adjustment)

Mathematically, the Vector Error Correction Model (VECM) can be written as follows, according to Engle and Granger (1987):

$$\Delta X_t = \mu_t + \prod X_{t-1} + \sum_{i=1}^{k-1}\Gamma_i \Delta X_{t-i} + \varepsilon_t$$

Where X_k represents the vector of endogenous variables, which in this study includes Bitcoin prices, the Dow Jones Islamic Market Index (DJIMI), and the FTSE SGX Asia Shariah 100 (FTSGS100), so it can be written as:

X_k = [Bitcoin(BTC), Dow Jones Islamic Market Index (DJIMI), FTSE Shariah Global Select 100 (FTSGS100)].

Meanwhile, ε_k (atau ε_t) represents the error or disturbance term, reflecting external factors outside the model, with the assumption of zero expected value and constant variance-covariance (Chen, 2022; Brillet, 2015).

This specification aims to analyze the long-term cointegration relationship between digital asset prices and global Sharia equity indices, as well as the short-term adjustment mechanisms, using EViews software as the econometric estimation tool (Brillet, 2015).

Model Stability and Causality

Once the VECM model is estimated and deemed stable, the next step to understand the dynamics between variables is through the Impulse Response Function (IRF), Variance Decompositions (VD), and Historical Decompositions (Kilian & Lütkepohl, 2017; Enders, 2014).

Empirically, the IRF shows the direction, magnitude, and duration of the economic variable responses, such as how Bitcoin price changes affect financial indices like DJIMI or FTSGS100 (Gujarati & Porter, 2009; Ghozali, 2021). The IRF value is derived using the formula: $IRF_{ij}(h) = \frac{\partial y_{i,t+h}}{\partial \varepsilon_{j,t}} = \Psi_{h,ij}$, This represents the response of variable *i* to a shock in variable *j* after *h* periods.

This analysis is typically complemented with Variance Decomposition (VD) and Historical Decomposition (HD). Variance Decomposition (VD) is used to separate the relative contributions of each variable to the prediction error variance, providing a comprehensive understanding of the dominance and transmission dynamics between markets (Enders, 2014; Kilian & Lütkepohl, 2017). Meanwhile, Historical Decomposition (HD) is used to explain why a variable moves in a certain pattern based on the contribution of shocks from each variable over a historical period (Zhou et al., 2024).

If the IRF shows forward responses and variance decomposition explains the proportion of variance in general, then historical decomposition focuses on past dynamics to identify the sources of shocks that shaped the actual behavior of a variable (Lütkepohl, 2013).

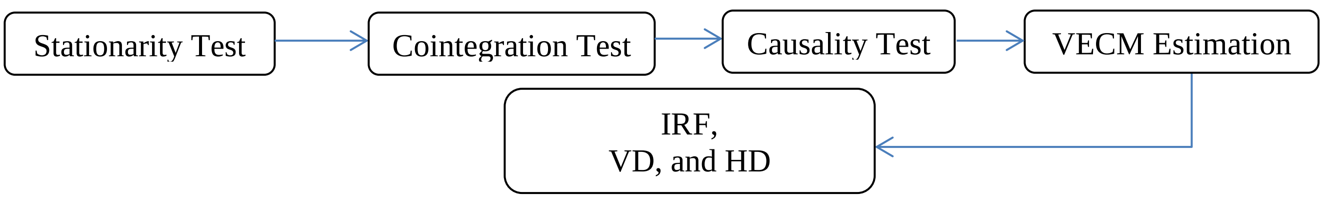


Figure 2.
Research Stages
Source: Processed Data by Author (2025)

Research Hypothesis

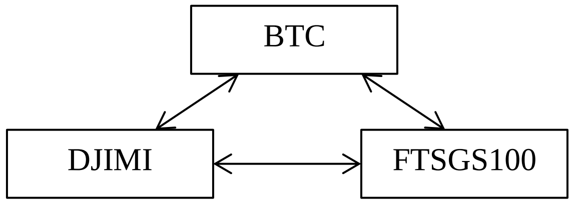
This study aims to analyze the dynamic interactions and the impact between the volatility of Bitcoin and global Shariah-compliant stock markets, specifically the Dow Jones Islamic Market Index (DJIMI) and the FTSE SGX Asia Shariah 100 (FTSGS100), both in the long-term and short-term

Based on theoretical foundations and previous research findings, the following hypotheses are formulated:

- H1: There is a long-term relationship (cointegration) between Bitcoin prices, the Dow Jones Islamic Market Index (DJIMI), and the FTSE SGX Asia Shariah 100 Index (FTSGS100).
- H2: Changes in Bitcoin prices significantly affect short-term movements in the DJIMI index.
- H3: Changes in Bitcoin prices significantly affect short-term movements in the FTSGS100 index.
- H4: There is a dynamic causality relationship between Bitcoin, DJIMI, and FTSGS100 within the integrated global financial market system.

Research Model

The model aims to capture these dynamic interactions, analyzing both the long-term relationships, where cointegration exists between the variables, and the short-term dynamics, where adjustments occur in response to market shocks. VECM is an ideal method to examine bidirectional relationships, as it allows for the modeling of feedback effects between variables, capturing both the immediate and lasting impacts of changes across the system(Gujarati & Porter, 2009; Kilian & Lütkepohl, 2017). This model can be illustrated as follows:



The image of the model of this study shows that the three variables are interconnected and influence each other in a bidirectional manner. Bitcoin's high volatility has the potential to affect the stability of global Sharia-compliant stock markets, such as DJIMI and FTSGS100, while shifts in these indices can also influence Bitcoin's price movements.

RESULTS AND DISCUSSION

Vector Error Correction Model Serial Test

1. **Stationarity Test**

Table.1
Stationarity Test Result

VARIABLE	ADF Value		Mc Kinnon Critical Value (5%)	
	Level	1st Diff	Level	1st Diff
BTC	0,145399	-9,854905	-2,883753	-2,883930
DJIMI	0,433787	-11,55814	-2,883753	-2,883930
FTSGS100	0,005662	-10,70667	-2,883753	-2,883930

Source: EViews 10, Processed Data by Author (2025)

The results of the stationarity test indicate that all variables became stationary after the first differencing. The ADF values were smaller (more negative) than the critical values from McKinnon at the 5 percent significance level. This suggests that all three variables are integrated at the first difference, or I(1), meaning that while the data follows a long-term trend, it can be stabilized by differencing.

2. **Optimum Lag Test**

Table 2.
Optimum Lag Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2795,442	NA	7,97e+16	47,43121	**47,50165**	**47,45981**
1	-2784,589	20,96901	**7,73e+16**	**47,39982**	47,68158	47,51422
2	-2776,825	14,60784	7,89e+16	47,42076	47,91384	47,62096
3	-2769,485	13,43480	8,13e+16	47,44890	48,15331	47,73491
4	-2766,281	5,702583	8,98e+16	47,54713	48,46287	47,91895
5	-2762,352	6,792355	9,81e+16	47,63309	48,76014	48,09070
6	-2752,884	15,88761	9,76e+16	47,62515	48,96353	48,16857
7	-2745,045	12,75465	1,00e+17	47,64483	49,19453	48,27405
8	-2733,438	18,29570	9,63e+16	47,60064	49,36167	48,31567
9	-2725,586	11,97790	9,90e+16	47,62010	49,59245	48,42093

10	-2722,737	4,201024	1,11e+17	47,72435	49,90803	48,61099
11	-2710,250	**17,77759**	1,06e+17	47,66526	50,06025	48,63770
12	-2703,754	8,917768	1,12e+17	47,70770	50,31402	48,76595

Source: EViews 10, Processed Data by Author (2025)

The results in the table display the variation of the optimal lag based on five criteria, ranging from 0 to 12. According to the findings, the LR criterion suggests the optimal lag is at lag 11, while the SC and HQ criteria point to lag 0. In contrast, both the AIC and FPE criteria consistently identify lag 1 as the optimal lag for the model.

AIC is widely regarded as one of the most reliable criteria for determining the optimal lag in a VECM model. Based on the results, the optimal lag is selected based on the lowest AIC value, which corresponds to lag 1. This criterion is considered the most suitable as it strikes a balance between the model's accuracy and the efficiency of the parameters.

3. VAR Stability Test (Roots of Characteristic Polynomial)

Table 3.
VAR Stability Test Result

Root	**Modulus**
0,267733	0,267733
-0,030967 – 0,178667i	0,181331
-0,030967 + 0,178667i	0,181331

Source: EViews 10, Processed Data by Author (2025)

The results from the VAR model stability test with a (1,1) lag specification reveal that all characteristic roots have moduli less than 1 (0.267733; 0.181331; 0.181331). This suggests that the model is dynamically stable, indicating that the relationships between the variables in the system do not exhibit explosive behavior. Therefore, this VAR(1) model can be used for further analysis, such as cointegration tests, IRF, VD, and HD, without causing structural stability issues.

4. Cointegration Test

Table 4.
Johansen Cointegration Test Result

Trend assumption: Linear deterministic trend
Series: D(BTC) D(FTSGS100) D(DJMI)
Lags interval (in first differences): 1 to 1

Hypothesized No, of CE(s)	**Eigenvalue**	**Unrestricted Cointegration Rank Test**			
		Trace		**Maximum Eigenvalue**	
		Trace Statistic	**Critical Value 0,05**	**Max-Eigen Statistic**	**Critical Value 0,05**
None *	0,445813	168,3666	29,79707	75,55231	21,13162
At most 1 *	0,359030	92,81424	15,49471	56,93094	14,26460
At most 2 *	0,244472	35,88330	3,841466	35,88330	3,841466

Trace test & Max-eigenvalue indicates 3 cointegrating eqn(s) at the 0,05 level

Source: EViews 10, Processed Data by Author (2025)

The Johansen cointegration test results in Table 4 reveal that there are three significant cointegration relationships between BTC, FTSGS100, and DJIMI at a 5 percent significance level. This is confirmed by the Trace Statistic and Max-Eigen Statistic values, all of which are higher than the critical values at the 0.05 significance level for each hypothesis.

In particular, for the "None" hypothesis, the Trace Statistic (168.3666) and Max-Eigen Statistic (75.55231) greatly surpass the critical values (29.79707 and 21.13162), leading to the rejection of the null hypothesis that suggests no cointegration. A similar outcome is observed for the "At most 1" and "At most 2" hypotheses, where both statistics also exceed the corresponding critical values. As a result, the three variables demonstrate three stable cointegrating equations over the long term.

5. **Granger Causality Tests**

Table 5.
Granger Causality Test Result

Pairwise Granger Causality Tests
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob,
DJMI →BTC	130	2,99655	0,0859
BTC → DJMI		2,78860	0,0974
FTSGS100 → BTC	130	0,41797	0,5191
BTC → FTSGS100		8,25395	0,0048
FTSGS100 → DJMI	130	0,61024	0,4362
DJMI → FTSGS100		2,78682	0,0975

Source: EViews 10, Processed Data by Author (2025)

The results of the Granger causality test show a one-way relationship between BTC and FTSGS100, where BTC significantly influences FTSGS100 with a probability value of 0.0048 < 0.05, thus the null hypothesis is rejected. Conversely, FTSGS100 does not influence BTC, as its probability value is 0.5191 > 0.05.

Meanwhile, the relationship between BTC and DJIMI indicates a weak two-way causality, as both are only significant at the 10 percent level (p = 0.0859 and 0.0974). In contrast, no significant causality was found between DJIMI and FTSGS100, with probability values above 0.05 in both directions.

Vector Error Correction Model (VECM) Result

1. **Estimasi VECM**

Table. 6
VECM Long-Run Equation

Cointegrating Eq:	CointEq1
BTC(-1)	1,000000
FTSGS100(-1)	-1,483054 (4,53829) [-0,32679]
DJMI(-1)	-18,40598 (4,78031) [-3,85038]
C	71527,88
t-table = 1,978671	

Source: EViews 10, Processed Data by Author (2025)

The long-run VECM results show that BTC serves as the reference variable with a value of 1.000000. The coefficient for FTSGS100(-1) is -1.483054, with a t-statistic of -0.32679, which is smaller than the t-table value of 1.978671. Therefore, this variable is statistically insignificant and does not have a meaningful impact on BTC in the long run.

In contrast, DJIMI(-1) has a coefficient of -18.40598 with a t-statistic of -3.85038, which exceeds the significance threshold, indicating a negative and significant relationship. This means that when DJIMI increases, BTC tends to decrease in the long-run equilibrium. The constant of 71,527.88 represents the baseline equilibrium point of the model. In other words, in this long-term relationship, only DJIMI plays a significant role in influencing BTC movements.

Table 7.
VECM Short-Run Equation

Error Correction:	**D(BTC)**	**D(FTSGS100)**	**D(DJMI)**
CointEq1	-0,113668	0,006258	0,002114
Standard errors	(0,04240)	(0,00319)	(0,00169)
t-statistics	[-2,68054]	[1,96417]	[1,25099]
D(BTC(-1))	0,335507	0,009378	0,004658
Standard errors	(0,09576)	(0,00719)	(0,00382)
t-statistics	[3,50372]	[1,30345]	[1,22089]
D(FTSGS100(-1))	4,642419	-0,045812	-0,039315
Standard errors	(2,03667)	(0,15302)	(0,08115)
t-statistics	[2,27942]	[-0,29939]	[-0,48445]
D(DJMI(-1))	-15,94792	0,161033	-0,009807
Standard errors	(4,14731)	(0,31159)	(0,16526)
t-statistics	[-3,84537]	[0,51681]	[-0,05934]
C	908,0079	40,94487	39,38185
Standard errors	(474,610)	(35,6581)	(18,9117)
t-statistics	[1,91316]	[1,14826]	[2,08241]
R-squared	0,157269	0,066204	0,037507
Adj, R-squared	0,130084	0,036081	0,006459
t-table = 1,978671			

Source: EViews 10, Processed Data by Author (2025)

The short-term VECM results reveal that the error correction term for Bitcoin (D(BTC)) is -0.113668, with a t-statistic of -2.68054, which exceeds the t-table value, indicating its statistical significance. This suggests that Bitcoin is capable of returning to long-term equilibrium with an adjustment rate of about 11% per period whenever deviations occur. On the other hand, the error correction terms for FTSGS100 and DJIMI are not significant, as their t-statistics fall below the critical threshold, indicating no short-term adjustment to equilibrium shocks.

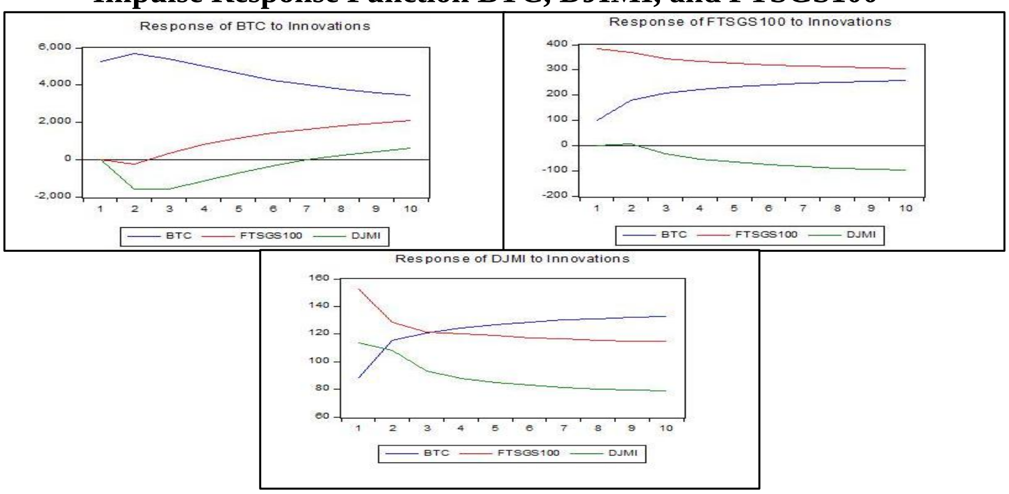
The previous changes in Bitcoin have a positive influence on its current movement, as seen in the significant coefficient of 0.335507, which points to a momentum effect in its short-term dynamics. Additionally, the model shows that changes in the FTSGS100 index in the previous period positively impact Bitcoin's movement, with a coefficient of 4.642419 and a significant t-statistic of 2.27.

In contrast, the previous period's changes in DJIMI have a negative and significant effect on Bitcoin, with a coefficient of -15.94792 and a t-statistic of 3.84. However, no significant short-term relationships were found in the FTSGS100 and DJIMI equations, as all their t-statistics are below the critical value. Therefore, Bitcoin is the only variable exhibiting responsive short-term dynamics in this system.

The R-squared value for Bitcoin's equation is 0.157269, and the adjusted R-squared is 0.130804, suggesting that approximately 13-16% of Bitcoin's change can be explained by the model's variables. While the explanatory power is relatively low, it still holds relevance for short-term analysis. In contrast, the FTSGS100 equation, with an R-squared of 0.066204 and adjusted R-squared of 0.036081, along with the DJIMI equation, with an R-squared of 0.037507 and adjusted R-squared of 0.006459, shows minimal explanatory power.

2. Impulse Response Function

Figure 3.
Impulse Response Function BTC, DJIMI, and FTSGS100



Source: EViews 10, Processed Data by Author (2025)

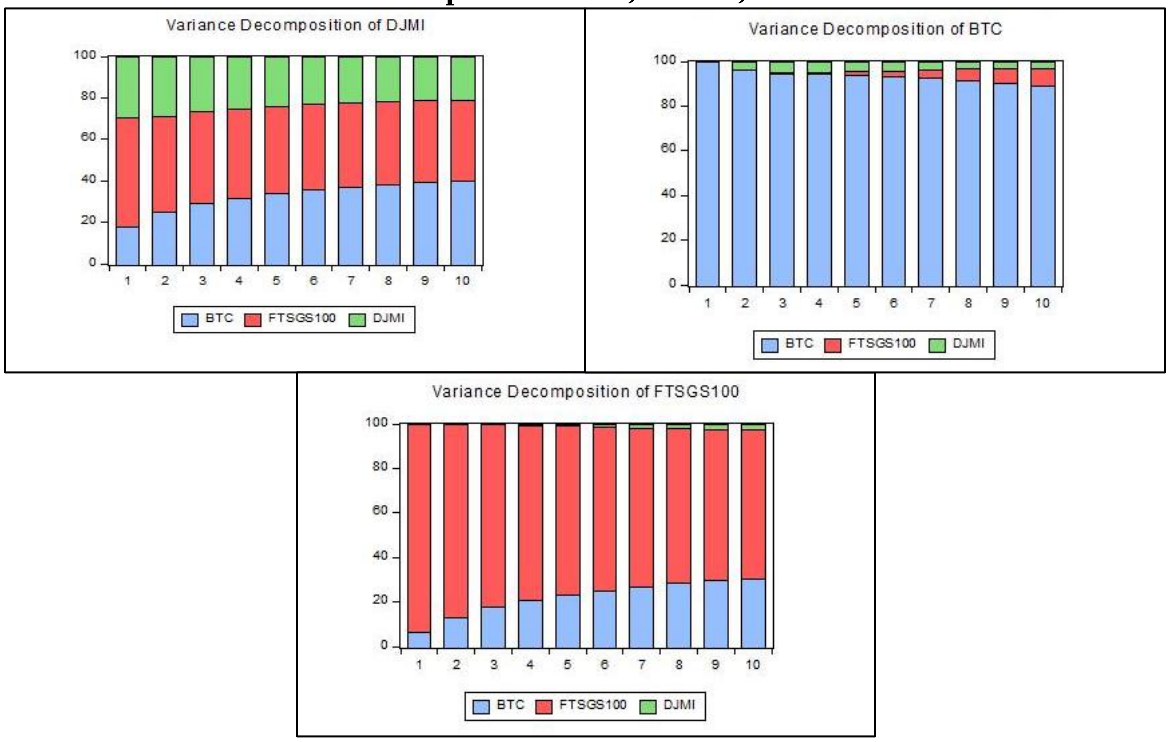
Bitcoin's response to its own shock shows a sharp initial spike approaching 6,000, which then gradually declines but remains positive until the 10th period. This pattern indicates that Bitcoin's internal shock is persistent and has a medium-term impact. A shock from FTSGS100 produces a positive effect that steadily increases, reaching around 2,000. In contrast, a shock from DJIMI triggers an initial negative reaction in Bitcoin before recovering to a positive direction, suggesting a short-term pressure that is not permanent.

FTSGS100 responds positively and continuously to Bitcoin's shock, with an upward trend reaching around 300. A shock from FTSGS100 itself strengthens the index steadily, reflecting strong internal dynamics. However, a shock from DJIMI exerts significant negative pressure, decreasing to around -150. These findings suggest that FTSGS100 tends to be a substitute for the market dynamics reflected in DJIMI.

DJIMI responds positively to Bitcoin's shock, with an increase from around 100 to a range of 125 before stabilizing. This pattern indicates DJIMI's moderate sensitivity to the dynamics of the cryptocurrency market. However, a shock from FTSGS100 produces continuous negative pressure, lowering DJIMI from about 140 to around 110. DJIMI's own internal shock results in an initial spike but quickly fades to a stable value around 70, indicating that its internal effects are temporary.

3. Variance Decomposition

Figure 4.
Variance Decomposition BTC, DJIMI, and FTSGS100



Source: EViews 10, Processed Data by Author (2025)

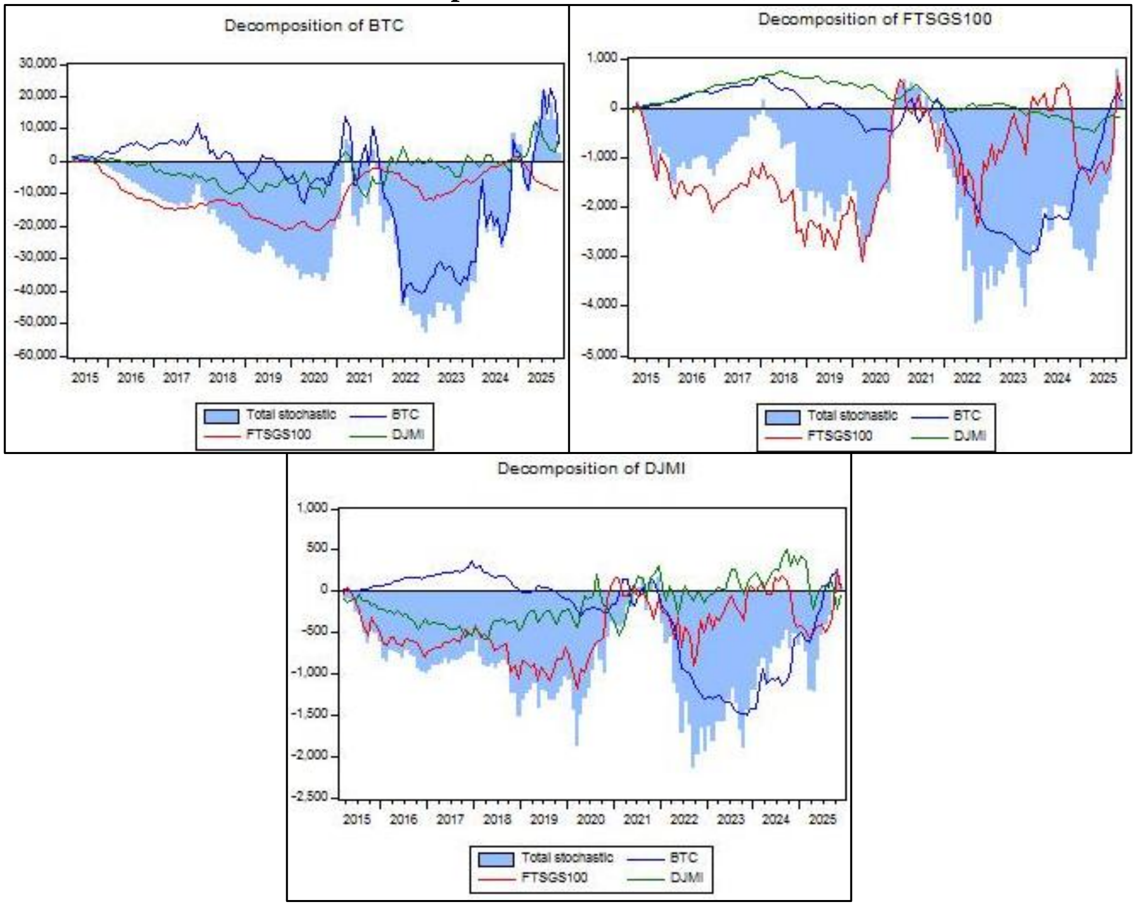
Variance Decomposition results show that Bitcoin’s movement is primarily driven by its own shocks, consistently accounting for over 90% of the variation. This highlights Bitcoin's strong internal dynamics, independent of Sharia financial markets. The influence of FTSGS100 slightly increases to around 5%, while DJIMI has a minimal impact, indicating a weak connection between Bitcoin and the global Sharia index.

FTSGS100 is initially driven by its own shocks, reaching over 95% in the first period. However, Bitcoin’s influence grows significantly to 30% by the 10th period, reflecting a stronger connection to the cryptocurrency market. DJIMI shows a stable, yet minor, influence, remaining below 10% throughout. This suggests FTSGS100’s volatility is more sensitive to crypto-based factors than Sharia market factors.

DJIMI shows a more balanced impact, with an initial internal shock contribution of 70%, gradually declining. The influence of FTSGS100 increases to around 40%, making it the largest external factor for DJIMI. Bitcoin’s contribution rises to 25%, indicating a transmission of volatility from the crypto market to the Sharia market. Overall, DJIMI is more responsive to external shocks than Bitcoin and FTSGS100.

4. Historical Decomposition

Figure 5.
Historical Decomposition BTC, DJIMI, dan FTSGS100



Source: EViews 10, Processed Data by Author (2025)

The Historical Decomposition shows that Bitcoin's movement is primarily driven by its own shocks from 2017 to 2025. The large blue area in the graph indicates that Bitcoin’s volatility stems from the cryptocurrency market, especially during the periods of 2020–2021 and 2023–2024. The contributions from FTSGS100 and DJIMI are minimal and stable around zero, leaving Bitcoin as a self-driven asset.

FTSGS100 also shows dominance from internal shocks, although Bitcoin’s influence increased after the 2020 pandemic. DJIMI is primarily influenced by its own internal shocks, with limited contributions from Bitcoin and FTSGS100 after 2021. Both indices are more responsive to external shocks than Bitcoin, but their internal dynamics remain stronger. Overall, HD confirms that cross-market relationships exist, but their strength is moderate, without displacing the dominance of internal shocks.

Cointegration and Long-Term Relationships

The results of this study offer an in-depth look at the relationship between Bitcoin (BTC), the Dow Jones Islamic Market Index (DJIMI), and the FTSE SGX Shariah 100 Index (FTSGS100) over the span of 2015 to 2025. Through the Johansen cointegration test, the study reveals three important cointegration vectors, highlighting that these three variables share a long-term equilibrium, moving in sync over time.

However, when the cointegration equations are estimated using VECM, only DJIMI has a significant long-term impact on BTC, while FTSGS100 does not. The discrepancy between the existence of cointegration and the significance of the long-term coefficients is a common phenomenon in multivariate financial market studies (Caporale et al., 2024; Anser et al., 2024), where the system exhibits structural relationships but the contributions of individual variables are not always significant.

This finding is consistent with the research by Mezghani et al. (2024), who found that the long-term integration between cryptocurrency markets and global Sharia equity indices is weak and heterogeneous. Similarly, Ashraf et al. (2023) showed that the sensitivity of Sharia indices to digital assets tends to increase during global turmoil periods, such as the COVID-19 pandemic, but this relationship is not stable over time. This study’s findings strengthen the argument that global Sharia markets are not fully integrated with digital asset markets, despite the presence of structural cointegration channels.

FTSGS100's lack of significance in the long run aligns with the findings of Abdul Razak et al. (2024), who stated that Bitcoin's volatility does not significantly impact Sharia equity indices in Malaysia and Turkey. Devabe (2025) also emphasizes the structural resilience of Islamic stock markets in the Asia-Pacific region to global macroeconomic shocks. Therefore, DJIMI appears to have a stronger financial connection with Bitcoin’s dynamics compared to FTSGS100.

Short-Term Dynamics and Adjustment Mechanisms

In the short run, the market adjustment mechanism (error correction term) shows that only BTC demonstrates the ability to return to long-term equilibrium after a deviation occurs. The correction of 11% per period indicates the responsive nature of BTC's price to internal system pressures.

These findings strengthen the studies by Wan et al. (2023) and Skwarek (2023), which emphasize that cryptocurrency markets are highly sensitive to both internal and external shocks and react quickly to changes in market information. In contrast, DJIMI and FTSGS100 do not show significant short-term corrections, supporting the research by Asutay et al. (2022), who found that Sharia equity markets tend to be stable, defensive, and less responsive to short-term volatility from high-risk assets like cryptocurrencies.

Other short-run findings show that previous changes in BTC significantly affect future BTC changes, confirming the presence of a short-run momentum effect as found by Ibrahim et al. (2024). Additionally, changes in FTSGS100 and DJIMI each have a significant impact on BTC in the short run, although the direction of influence differs.

The positive influence of FTSGS100 on BTC supports the research by Hidayat et al. (2023), which states that the Asia Sharia index has a moderate response to global market dynamics. In contrast, the negative influence of DJIMI on BTC in the short run is consistent with the findings of Eldomiaty and Khaled (2024), who noted that Sharia equity markets in developed countries exhibit anti-cyclical or substitutive characteristics towards high-risk assets, including cryptocurrencies.

Impact of External Shocks and Market Interdependence

The dominance of Bitcoin's internal shocks aligns with the literature from Shnaishel (2025), Zghal et al. (2025), and Pacelli (2025), which states that Bitcoin functions as a high-volatility node in the global market network, but its volatility transmission is not always symmetric or strong to other markets. In contrast, DJIMI and FTSGS100 appear more open to external shocks, particularly after 2020, reinforcing the findings of Aslam et al. (2023) regarding the increased integration of global markets post-pandemic.

Implications for Market Integration

Overall, the findings of this study reveal a pattern where the relationship between BTC, DJIMI, and FTSGS100 is weakly integrated, with structural cointegration present but the transmission mechanisms being weak, asymmetric, and applicable only to certain variables. This pattern aligns with the theory presented by Goutte et al. (2022), which asserts that risk transmission is not always uniform across markets but depends on market structure, liquidity levels, and investor sensitivity.

From the researcher's perspective, these results suggest that Bitcoin is not yet fully integrated with global Sharia equity markets. BTC remains a high-risk speculative asset with its own dynamics, while DJIMI and FTSGS100 retain their conservative characteristics as Sharia-compliant indices.

CONCLUSION

This study concludes that there is a long-term relationship between Bitcoin (BTC), the Dow Jones Islamic Market Index (DJIMI), and the FTSE SGX Asia Shariah 100 Index (FTSGS100) during the period from 2015 to 2025, although the strength of integration varies across the indices. The cointegration results show that DJIMI has a stronger structural linkage with Bitcoin's dynamics compared to FTSGS100. This indicates that the Asian Sharia market is more isolated from the volatility of digital assets. These findings strengthen previous literature that emphasizes the higher vulnerability of global Sharia markets to cryptocurrency spillover risks, as compared to the more defensive regional Sharia markets in Asia.

On the other hand, the short-term analysis reveals that the relationship between BTC and the two Sharia indices is weak and unsustainable, confirming that cryptocurrency risk transmission is asymmetric and does not always occur within daily or weekly horizons.

The limitations of this study lie in the use of only three main variables, which do not capture macroeconomic factors such as interest rates, inflation, the volatility index (VIX), or global economic uncertainty indices. Additionally, the study focuses on the 2015–2025 period, so sensitivity to major shocks occurring outside this range may differ. The VECM model used also does not incorporate non-linear approaches or time-frequency methods that could uncover more complex dynamics in the relationships.

Recommendation

Future research is recommended to include macroeconomic variables and global risk indices to gain a more comprehensive understanding of the risk transmission between cryptocurrency assets and Sharia markets. The use of advanced methodologies such as Wavelet Coherence, TVP-VAR, or Nonlinear ARDL could also provide a more detailed understanding of the dynamic, non-linear, and time-variant nature of the relationship.

For regulators and Sharia market managers, the results of this study emphasize the importance of strengthening risk mitigation systems against digital asset volatility, particularly for global Sharia indices like DJIMI, which show stronger integration with Bitcoin. Meanwhile, the relatively defensive nature of the Asian Sharia market still requires attention to the developments in digital assets as part of an early-warning system for potential spillover risks in the future. Lastly, for Sharia portfolio managers, cross-regional and cross-asset class diversification strategies are becoming increasingly important in managing volatility originating from the cryptocurrency market.

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