



RETURN AND VOLATILITY INTERACTION BETWEEN ISLAMIC INDICE AND BITCOIN: A COMPARISON OF TÜRKİYE AND MALAYSIA

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ABSTRACT

With technology development, investment tools also vary. Money and capital market instruments are at the forefront of these, and virtual currencies have become investment tools. Because virtual currencies are not religiously permissible by many organizations causes the devout people to stay away from them. This study investigates the return and volatility interaction between *Islāmic* Indices and Bitcoin in Türkiye and Malaysia. The study uses weekly data for the period 24 November 2013 – 2 January 2022 obtained from investing.com. Multivariate Dynamic Conditional Correlation (DCC-GARCH) and multivariate dynamic stochastic volatility models were used to determine the volatility dispersion between *Islāmic* indices and Bitcoin. Results show that the volatilities of Türkiye *Islāmic* Index, Malaysia *Hijrah Sharī'ah* Index and Bitcoin are permanent. Volatility of Bitcoin, however, has no effect on the return of the Türkiye *Islāmic* Index and the Malaysian *Hijrah Sharī'ah* Index. Likewise, the volatility of *Islāmic* indices does not affect the return of Bitcoin. According to the results of the DC-MSV model, the volatility of *Islāmic* indices and

the volatility of Bitcoin do not affect each other. This indicates that *Islāmic* index investors and Bitcoin investors differ.

JEL Classification: E42, F21, F31, G11, G21

Keywords: Bitcoin, *Islāmic* Index, DCC-GARCH, Stochastic volatility

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1. INTRODUCTION¹

New investment tools have entered our lives with technological advancement. One product of this development is the stock market while another one is virtual currency. Data of Malaysian and Turkish stock markets are discussed in this study. While Malaysia Stock Exchange was established in 1964 (<https://www.bursamalaysia.com>), the establishment of Istanbul Stock Exchange dates back to 1985 (www.borsaistanbul.com). With the development of the stock market, several indices have also entered the stock market, one of which is *Islāmic* Indices. *Islāmic* Indices are called by various names around the world. They are called the *Hijrah Shari'ah* Index in Malaysia and the Participation Index in Türkiye. The index, which is referred to as the *Islāmic* Index in world literature, is expressed as the Participation Index in Türkiye. This index has been prepared in accordance with international *Islāmic* Index standards. Therefore, *Islāmic* index and Participation Index mean the same thing. In our study, the *Islāmic* index was used for compliance.

'Standard of Share Certificate Issuance and Trade' has been prepared by the Participation Banks Association of Türkiye (TKBB) in 2020. Thus, *Islāmic* stock indices have become official (tkbbdanismakurulu.org.tr). In Malaysia, *Islāmic* indices were included in the stock market with the establishment of the Malaysian Stock Exchange (www.quantilia.com). According to the participation banks standard, it is acceptable to form and issue share certificates for firms whose activities are in accordance with *Islāmic* principles and rules. The companies dealing with the following transactions are excluded in these indices: Finance based on interest, production and trade of alcoholic drinks and tobacco, media which is against morals and *Islāmic* principles, gambling and gambling-like occupations, pig production and trading in pig products, entertainment contradicting

Islāmic moral standards, and forward gold, silver and currency trading (tkbbdanismakurulu.org.tr).

Another variable of the study is Bitcoin. Looking at the historical development process of money, it is stated that the first metallic coins were introduced by the Lydians in VII. century BC. It is stated that the first leather money was used in 118 BC., and paper notes in 806 AD. by the Chinese. The printing of paper money started very late in the West by the USA and England in 1690 (Turkan, 2018, 328). The records of money ownership and movements, which were kept in a physical ledger in the past, have now begun to enter bank accounts electronically with the financial markets becoming more technological day by day. Since money exists in electronic environment rather than being kept in cash, it is called bank money and preferred more in today's financial world (Uzer, 2017, 7). In 2009, with technology development, new money models, called virtual money, were created. Virtual currencies are defined by the European Central Bank (ECB) (2015) as “the virtual representation of an asset that has not been issued by any central bank, credit institution or e-money institution and can be used as an alternative to money in some cases” (ECB, 2015, 6). As of April 2022, over 10,000 cryptocurrencies are seen to be traded (<https://coinmarketcap.com>). Today, the cryptocurrency with the highest market value is Bitcoin with 887 billion dollars. It is followed by Ethereum with \$423 billion and Tether with \$82 billion (<https://tr.investing.com>).

The decentralized currency Bitcoin emerged following the article “Bitcoin: A Peer-to-Peer Electronic Cash System” written by Satoshi Nakamoto in 2008 (<https://Bitcoin.org/Bitcoin.pdf>). Since cryptology is used in the security and production of Bitcoin transfers, it is also defined as crypto-currency (cryptocurrency). Bitcoin is neither owned by a company nor institution, nor does it have a headquarters. Since it is not associated with the central bank of any country, it is unaffected by the economic situation of any country (<https://www.mahfiiegilmez.com>). Although the theories on which Bitcoin is based are quite technical, it is stated that it is very comfortable to use. Bitcoin trading or transfer can be performed by installing any of the wallet programs. Bitcoin wallets are programs that store Bitcoins owned by individuals and allow transactions on them; Bitcoin can be divided up to eight digits, so a transaction of 0.00000001 Bitcoin can be made. The smallest unit is called the Satoshi. In other words, 100 million Satoshi is equivalent to one

Bitcoin. The Bitcoin system is designed to produce a total of 21,000,000 Bitcoins (Carkacioglu, 2016, 13).

As the number and value of virtual currencies increase day by day, they are also discussed from an *Islāmic* perspective. In the international *Islāmic* literature, virtual currencies are approached cautiously because they involve risk and uncertainty and are subject to speculation. Both *Islāmic* jurists and economists talk about the definition and properties of money in parallel with each other. The most important point emphasized is that money must either be valuable on its own and used (such as gold and silver) or it must have a generally accepted nominal form that is valued by the state and similar authorities (Turkan and Yasar, 2018, 1157). The Presidency of Religious Affairs of Türkiye states: “The use of digital cryptocurrencies, which have serious uncertainties in their essence, have a high risk of being deceived and deception, therefore do not have any assurance, and lead to unfair and unjustified enrichment of certain segments, such as practices known as the Ponzi scheme in the public, is not permissible.” (<https://kurul.diyenet.gov.tr>).

All *fatwas* that do not allow the use of virtual currencies are based on almost the same grounds. Cryptocurrencies are not seen as a means of exchange, there is no return if they are deleted in the virtual environment or the password is forgotten; they are not issued by central banks; they are very open to speculative movements; they rise and lose value quickly; they resemble gambling, contain ignorance and lack of security; moreover, it is stated that they are used for illegal purposes such as smuggling and drug trade, and their taxation is difficult (Turkan, 2019, 90-91). Considering all these explanations, this study aims to examine the relationship between virtual currencies such as Bitcoin, which is not considered religiously appropriate, and *Islāmic* stocks, which are considered Islamically appropriate. Further, whether religious sensitivity affects investment instruments or not is revealed.

It has been determined in many studies that there is a relationship between Bitcoin and conventional indices. Bitcoin is considered an alternative investment tool for conventional indices. However, since no study reveals the relationship between Bitcoin and *Islāmic* indices and whether Bitcoin's *Islāmic* indices are included in the portfolios of investors, it is thought that this study is important in terms of finance literature. For this reason, in this study, the relationship between Bitcoin and *Islāmic* indices in Türkiye and Malaysia was investigated with Dynamic Conditional Correlation

(DCC-GARCH) and Dynamic Stochastic Volatility (DC-MSV) models.

2. LITERATURE REVIEW

When the literature is searched, it is seen that the studies are handled from two different perspectives. In the studies, firstly, the causality between Bitcoin and conventional indices was investigated. Then, the relations between Bitcoin and *Islāmic* indices were examined. It is seen that the studies carried out mostly coincide with the period before the covid crisis. In this study, analyzes were carried out considering the effect of the covid crisis on *Islāmic* indices and Bitcoin. This study is carried out considering that the studies in this field in Türkiye are not up-to-date and sufficient.

When the studies conducted in recent years are examined, Tuncel and Gursoy's (2020) study comes first among the studies examining the relationships between Bitcoin and conventional indices. In this study, there is an Empirical Application study on the Causality Relationship Between Fear Index, Bitcoin Prices and Bist100 Index. In the study, the causality relationship between Bitcoin prices and the BIST100 and VIX fear index in Türkiye was tested. While it is seen that Bitcoin prices do not have a significant relationship on both variables, it has been determined that there is a one-way causality effect from the VIX index to the BIST100 index.

At the same time, Soyaslan (2020) examined whether the Bitcoin currency has a relationship with BIST 100, BIST Bank and BIST Technology index in the short and long term by using time series analysis methods. According to the findings of the study, while there is a balance relationship between the Bitcoin price and the BIST 100 index in the long run at the 5% significance level, no relation has been found with the BIST Bank and BIST Technology index. In addition, when the Bitcoin price and the BIST 100, BIST Bank and BIST Technology indices are evaluated at a 5% significance level in the short term, no causality relationship has been found. Korkmazgöz, Şahin, and Ege (2022) examined the relationships between Bitcoin and the BIST 100 (XU100), BIST Financial (XUMAL) and BIST Technology (XUTEK) indices, which are among the leading Borsa Istanbul (BIST) indices among emerging markets, with the ARDL bounds test approach. In this study, it has been shown that there is a long-term relationship between Bitcoin price and Borsa Istanbul Financial Index. However, no evidence has been found for the existence of a long-term

relationship between Bitcoin price and other index prices. The short-term findings show that there is no significant relationship between Bitcoin price and Borsa Istanbul Financial price index.

Finally, Ustaoglu's (2022) study investigates the return and volatility dynamics and conditional correlations between Borsa Istanbul Stock Exchange 100 Index (BIST100) and Bitcoin (BTC), Ethereum (ETH), Ripple (XRP) and Litecoin (LTH) with the VAR-DCC-GARCH model. No two-way return spillover has been detected between BIST100 and cryptocurrencies. In line with the volatility spillover results of the study, it has been determined that there is a one-way shock transmission from BIST100 to BTC, XRP and LTH, and a one-way transfer of volatility from BIST100 to BTC and ETH. In addition, in the study, it has been determined that the dynamic conditional correlations between BIST100 and four cryptocurrencies have a highly variable structure over time and their average is very close to zero. However, the situation is reversed during possible panic periods.

Considering the relations between *Islāmic* Indices and Bitcoin, it is seen that the studies in this field in Türkiye are insufficient and should be reconsidered in the rapidly advancing time periods. This study, which examines the effect of the covid period, will maintain its currency. When the studies are examined, Rehman, Asghar and Kang (2020) investigated the risk dependence between Bitcoin and *Islāmic* stock markets. VaR, CoVaR and Δ CoVaR have been applied as risk measures to examine the spillover between Bitcoin and *Islāmic* stock markets. It has been found that VaR of Bitcoin exceeds from VaR of *Islāmic* indices and CoVaR of both *Islāmic* and Bitcoin exceeds their respective VaR. It has been stated that this situation shows the existence of risk spillover among each other. Moreover, *Islāmic* equity market serves as an effective hedge in a portfolio along with Bitcoin. Mensi et al. (2020) examine the joint movements between Bitcoin (BTC) and the Dow Jones World Stock Market Index, regional *Islāmic* stock markets, and Sukuk markets. Cross wavelet transform and wavelet coherence analysis with a wavelet-based measure of value at risk are applied.

As a result of the analysis, it has been stated that the risk between Bitcoin and *Islāmic* stock markets will be avoided through investment diversification in the short run. The causality test shows that there is a short-run causality flow from Bitcoin to the Asia-Pacific *Islāmic* market and the Sukuk markets. It has also been stated that Bitcoin is the cause of the Asian-Pacific *Islāmic* stock markets in the long run. In the same year, Güçlü's (2020) study, the volatilities

of *Islāmic* and conventional stock indices in Türkiye, Malaysia, USA and the United Kingdom are estimated using GARCH, EGARCH and GJR-GARCH models. As a result of the analyzes made, while the volatility of the Turkish *Islāmic* stock index is lower than its conventional counterpart, the volatility in Malaysia is very close to each other. The volatility of the *Islāmic* stock index is estimated higher than the conventional index in the USA and the UK.

Among the *Islāmic* stock indices, the index with the lowest volatility belongs to Malaysia. Ahmed (2021) explores the differential sensitivity of Shariah compliant stocks to the positive and negative intraday return volatility of Bitcoin in bear, normal and bull market situations. For developed markets, the results indicate that upside volatility tends to exert contemporaneous and lagged negative influences on *Islāmic* stocks more in bear than in bull market conditions, whereas the downside counterpart positively affects returns when Sharia-compliant equities are in bear and bull phases. Finally, Yousaf and Yarovaya (2022) examined the return and volatility between *Islāmic* gold-backed cryptocurrencies (Onegram and X8X) and global *Islāmic* stock indices. They have shown that investors can increase their allocations in the Onegram gold-backed cryptocurrency to reduce the risk of the equity sector portfolio during the COVID-19 pandemic. They stated that *Islāmic* Sharia-based cryptocurrencies can reduce the risk of *Islāmic* sectoral stock portfolios.

3. RETURN AND VOLATILITY INTERACTION BETWEEN BITCOIN AND ISLAMIC INDICES IN TÜRKİYE AND MALAYSIA

3.1 DATA SET AND METHOD

The main purpose of the study is to investigate the return and volatility interaction between Bitcoin and *Islāmic* indices in Türkiye and Malaysia. Weekly data, which were taken from investing.com, for the period of 24 November 2013 – 2 January 2022 were used in the study. Multivariate Dynamic Conditional Correlation (DCC-GARCH) and multivariate dynamic stochastic volatility (DC-MSV) models were used to analyze the volatility spillover between *Islāmic* indices and Bitcoin. In addition, the multivariate DCC GARCH model was used to analyze the return interaction between *Islāmic* indices and Bitcoin, and the multivariate stochastic volatility model

was used to determine the spillover of volatility between the variables.

The study was limited to considering only Bitcoin, one of the cryptocurrencies, and only the *Islāmic* indices in Türkiye and Malaysia, among the *Islāmic* indices. In addition, another limitation of the study was created by considering the data for the period of 24 November 2013 – 2 January 2022.

The Dynamic Conditional Correlation (DCC-GARCH) model was developed by Tse and Tsui (2002) and Engle (2002) (Hepsag and Akcali, 2016, 58).

$$(1) \quad r_t = \alpha + \sum_{i=1}^k \beta r_{t-i} + y_t$$

The k term in the equation describes the averaging model following a vector autoregressive (VAR) process at the k level.

$$(2) \quad \gamma_{A,t} = \sqrt{h_{A,t}} \varepsilon_{A,t}$$

$$(3) \quad \gamma_{B,t} = \sqrt{h_{B,t}} \varepsilon_{B,t}$$

$$(4) \quad \rho_t = COV(\beta_{A,t}, \beta_{B,t}) = (1 - \theta_1 - \theta_2)\rho + \theta_1\rho_{t-1} + \theta_2\rho_{t-2}$$

ρ_t represents the correlation coefficient that changes with time. For this parameter to be meaningful, the equality of $0 \leq \theta_1, \theta_2 < 1$ and $\theta_1 + \theta_2 \leq 1$ must be met.

$$(5) \quad \begin{bmatrix} h_{A,t} & h_{B,t} \end{bmatrix} = \begin{bmatrix} y_1 & y_2 \end{bmatrix} + \begin{bmatrix} \phi_{1,1} & \phi_{1,2} & \phi_{2,1} & \phi_{2,2} \end{bmatrix} \begin{bmatrix} y_{A,t-1}^2 & y_{B,t-1}^2 \end{bmatrix} \\ + \begin{bmatrix} \delta_{1,1} & \delta_{1,2} & \delta_{2,1} & \delta_{2,2} \end{bmatrix} \begin{bmatrix} h_{A,t-1} & h_{B,t-1} \end{bmatrix}$$

The parameters in Equation (5), ϕ_{11} ve δ_{11} explain whether the volatility of the first financial asset is permanent or not. The parameters must be statistically significant, the coefficients must be positive, and their sum must be less than 1. The parameters explaining the volatility of the second financial asset ϕ_{22} ve δ_{22} must be statistically significant, their coefficients positive, and their sum must be less than 1. It explains the interaction of the second financial asset on the returns of the first financial asset with parameters ϕ_{12} ve δ_{12} . The parameters describing the effect of the first financial asset on the returns of the second financial asset, ϕ_{21} ve δ_{21} , must be statistically significant.

Yu and Meyer (2006) multivariate stochastic volatility model is not constant. DC-MSV model is

$$(6) \quad r_t = a + \beta r_{t-1} + y_t$$

a model with more than one variable and takes first-order vector autoregressive processes into account.

$$(7) \quad y_{A,t} = \exp(h_{A,t}/2)\varepsilon_{A,t}$$

$$(8) \quad y_{B,t} = \exp(h_{B,t}/2)\varepsilon_{B,t}$$

$$(9) \quad \rho_t = \text{cov}(\varepsilon_{A,t}, \varepsilon_{B,t}) = \frac{\exp \exp(q_t) - 1}{\exp \exp(q_t) + 1}$$

$$(10) \quad q_{t+1} = \Psi_0 + \Psi_1(q_1 - \Psi_0) + \sigma_q v_t$$

$$(11) \quad h_{A,t+1} = \mu_A + \phi_A(h_{A,t} - \mu_A) + \phi_{AB}(h_{B,t} - \mu_B) + \eta_{A,t}$$

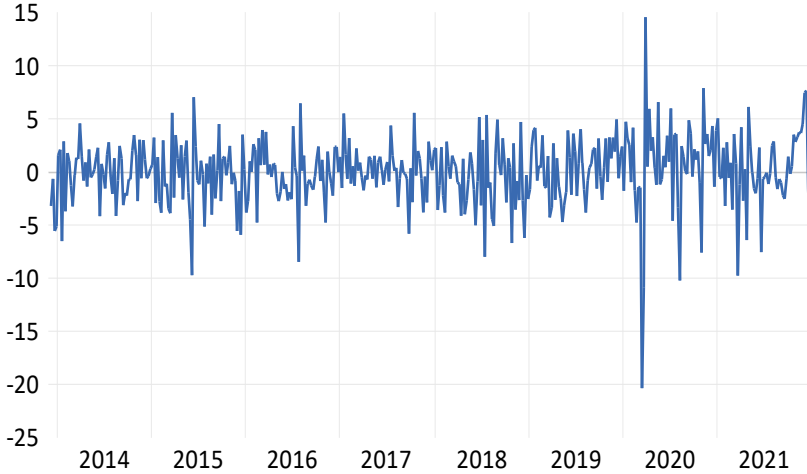
$$(12) \quad h_{B,t+1} = \mu_B + \phi_B(h_{B,t} - \mu_B) + \phi_{BA}(h_{A,t} - \mu_A) + \eta_{B,t}$$

The terms μ_A ve μ_B in Equations (11) and (12) represent constant coefficients. The term ρ_t in Equation (9) represents the time-varying dynamic correlation. The term $h_{A,t}$ in Equation (11) represents the volatility of the first financial asset, while the volatility of the second financial asset is explained by the term $h_{B,t}$ in Equation (12). The term ϕ_A in Equation (11) describes the persistence of volatility to the first financial asset. In order to be able to say that the volatility of the first financial asset is permanent, the term ϕ_A must have a value close to 1, in addition to being significant at the 5% significance level. The volatility persistence of the second financial asset is explained by the term ϕ_B in Equation (7). When the term ϕ_{AB} in Equation (11) is significant at the 5% significance level, it will explain the effect of the volatility of the second financial asset on the volatility of the first financial asset. The term ϕ_{BA} in Equation (12) explains whether the volatility of the first financial asset has an effect on the volatility of the second financial asset. It is possible to say that the volatilities of the first and second financial assets are predictable if the terms $\eta_{A,t}$ and $\eta_{B,t}$ in Equations (11) and (12) are statistically significant and their squares are close to 0.

3.2 FINDINGS AND COMMENTS

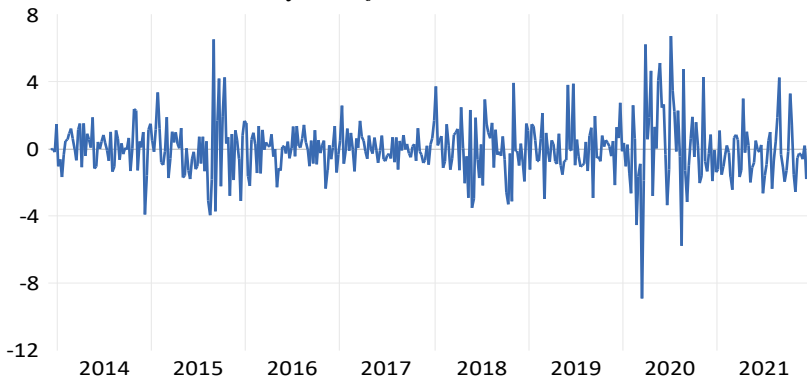
In the study, firstly, the graphs of the variables were examined. The resulting graphs are as follows.

FIGURE 1
Turkey Participation Index



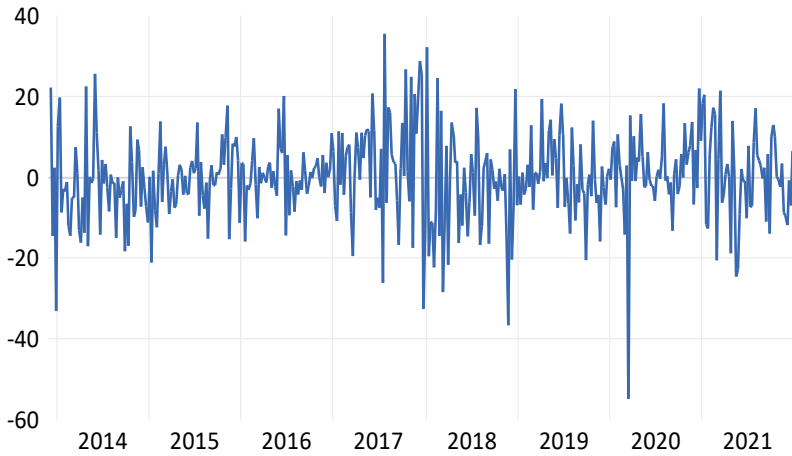
In Figure 1, the return series of the Turkey Participation Index is presented. Volatility clustering has occurred in Turkey's Participation Index. Sharp movements are observed at the beginning of 2020.

FIGURE 2
Malaysia *Hijrah Sharī'ah* Index



When examining the return series figure of the Malaysia *Hijrah Sharī'ah* Index in Figure 2, it is evident that volatility clustering has occurred in Malaysia *Hijrah Sharī'ah* Index. It is possible to state that sharp movements were present at the beginning of 2020.

FIGURE 3
Bitcoin



When examining the return series figure of the Bitcoin variable in Figure 3, it is evident that there is volatility clustering. It can be stated that sharp declines occurred at the beginning of 2020.

TABLE 1
Descriptive Statistics of the Variables

	Türkiye <i>Islāmīc</i> Index	Malaysia <i>Hijrah</i> <i>Sharī'ah</i> Index	Bitcoin
Average	0.3335	-0.0206	1.0970
Median	0.3399	-0.0056	0.7113
maximum	13.9246	6.6371	53.3432
Minimum	-20.3450	-8.8949	-53.6040
SD	3.2061	1.6802	11.0675
Skewness	-0.8879	0.1742	-0.0095
Kurtosis	8.1917	6.3939	5.6758
Jarque-Bera	530.6485	205.1578	126.2037
Probability	0.0000	0.0000	0.0000

Türkiye *Islāmīc* Index, Malaysia *Hijrah Sharī'ah* Index and Bitcoin variables are given in Table 1. While Bitcoin is the investment instrument with the highest volatility, the volatility of the *Islāmīc* index in Türkiye is higher than the volatility of the *Hijrah Sharī'ah* Index in Malaysia. According to the Jarque-Bera test, the variables do not show normal distribution.

TABLE 2
ARCH LM Testi

Lags	LM-Stat	Prob
1	13.66732	0.1347
2	11.13921	0.2663

In Table 2, the lag lengths of the series were determined as 1 according to the information criteria of AIC, SC and HQ. According to the ARCH LM test performed later, it was determined that there was no ARCH effect in the series.

TABLE 3
DDC-GARCH Model Results of Türkiye *İslāmīc* Index and Bitcoin Returns

	Coefficients	SD	t - Statistics	Probability Values
γ Türkiye Islamic Index	4.5511	2.3423	1.9430	0.0520
γ Bitcoin	20.2544*	9.9906	2.0274	0.0426
\emptyset Türkiye Islamic Index, Bitcoin	-0.0012	0.0030	-0.3992	0.6898
\emptyset Türkiye Islamic Index, Türkiye Islamic Index	0.0317	0.0436	0.7288	0.4661
\emptyset Bitcoin, Bitcoin	0.1545*	0.0719	2.1489	0.0316
\emptyset Bitcoin, Türkiye Islamic Index	-0.5150*	0.2458	-2.0958	0.0361
δ Türkiye Islamic Index, Bitcoin	-0.0030	0.0066	-0.4578	0.6471
δ Türkiye Islamic Index, Türkiye Islamic Index	0.4665*	0.2305	2.0242	0.0429
δ Bitcoin, Bitcoin	0.6894*	0.0977	7.0530	0.0000
δ Bitcoin, Türkiye Islamic Index	0.2780	0.7755	0.3586	0.7199
Θ Türkiye Islamic Index	0.1928	0.1088	1.7721	0.0764
Θ Bitcoin	-0.0006	0.0736	-0.0079	0.9937
DCC(A)	0.0000	0.0206	0.0000	1.0000
DCC(B)	0.7282*	0.0000	0.0000	0.0000

Note: * represents 5%.

The Türkiye *İslāmīc* Index and the DCC-GARCH model results of Bitcoin returns are given in Table 3. In ARCH and GARCH \emptyset Türkiye Islamic Index, Türkiye Islamic Index and δ Türkiye Islamic Index, Türkiye

Islamic Index parameters, only GARCH parameter is significant at 5% significance level. In this case, it is possible to say that the volatility in the Turkish *Islāmic* index is permanent. $\emptyset_{\text{Bitcoin, Bitcoin}}$ and $\delta_{\text{Bitcoin, Bitcoin}}$ are both statistically significant and positive according to the 5% significance level. The sum of these parameters has been determined as 0.8439, in this case it has been determined that the volatility of Bitcoin is permanent. Of the ARCH and GARCH parameters that explain whether the Türkiye *Islāmic* Index has an effect on Bitcoin returns, only ARCH $\emptyset_{\text{Bitcoin, Türkiye Islamic Index}}$ parameter is statistically significant. The 1% shock from the Türkiye *Islāmic* Index reduces Bitcoin returns by 0.5150. It has been determined that both of the ARCH and GARCH parameters, which explain the effect of Bitcoin on Türkiye *Islāmic* Index returns, are not statistically significant.

TABLE 4
DDC-GARCH Model Results of Malaysia *Hijrah Shari'ah* Index and Bitcoin Returns

	Coefficients	SD	t - Statistics	Probability Values
γ Malaysia Hijrah Sharia Index	0.0190	0.0783	0.2433	0.8078
γ Bitcoin	22.1112*	10.0680	2.1962	0.0281
\emptyset Malaysia Hijrah Sharia Index, Bitcoin	-0.0006*	0.0003	-1.9636	0.0496
\emptyset Malaysia Hijrah Sharia Index, Malaysia Hijrah Sharia Index	0.0656*	0.0323	2.0328	0.0421
\emptyset Bitcoin, Bitcoin	0.2261*	0.0915	2.4710	0.0135
\emptyset Bitcoin, Malaysia Hijrah Sharia Index	-2.2201*	0.5199	-4.2703	0.0000
δ Malaysia Hijrah Sharia Index, Bitcoin	0.0015	0.0008	1.8743	0.0609
δ Malaysia Hijrah Sharia Index, Malaysia Hijrah Sharia Index	0.7957*	0.0423	18,8146	0.0000
δ Bitcoin, Bitcoin	0.5566*	0.1040	5.3505	0.0000
δ Bitcoin, Malaysia Hijrah Sharia Index	3.7931*	1.5617	2.4288	0.0151
Θ Malaysia Hijrah Sharia Index	0.1946*	0.0503	3.8667	0.0001
Θ Bitcoin	-0.0050	0.0975	-0.0511	0.9593
DCC(A)	0.0082	0.0161	0.5087	0.6110
DCC(B)	0.9846*	0.0396	24.8837	0.0000

Note: * represents 5%.

Malaysia *Hijrah Sharī'ah* Index and the DCC-GARCH model for Bitcoin are reported in Table 4. Among ARCH and GARCH parameters explaining the persistence of Malaysian *Hijrah Sharī'ah* Index volatility, \emptyset Malaysia Hijrah Sharia Index, Malaysia Hijrah Sharia Index and δ Malaysia Hijrah Sharia Index, Malaysia Hijrah Sharia Index both were statistically significant, their coefficients were positive, and their total was 0.8613. According to these results, it is possible to say that the volatility of the Malaysian *Hijrah Sharī'ah* Index is permanent. It has been determined that \emptyset Bitcoin, Bitcoin and δ Bitcoin, Bitcoin parameters are both statistically significant, their coefficients are positive, and their sum is 0.7827. In this case, the volatility of Bitcoin is permanent. ARCH and GARCH parameters, which provide information on the impact of the Malaysian *Hijrah Sharī'ah* Index on Bitcoin returns, \emptyset Bitcoin, Malaysia Hijrah Sharia Index and δ Bitcoin and the Malaysian Hijrah Sharia Index, are both statistically significant at the 5% significance level. The 1% shock in the Malaysian *Islāmic* index increases Bitcoin returns by 1.5730. Of the ARCH and GARCH parameters that explain the effect of Bitcoin on the returns of the Malaysian *Hijrah Sharī'ah* Index, only the ARCH parameter \emptyset Malaysia Hijrah Sharia Index, Bitcoin is significant at the 5% significance level. In this case, the 1% shock in Bitcoin reduces the Malaysian *Hijrah Sharī'ah* Index returns by -0.0006.

The return interaction between Bitcoin and *Islāmic* indices was analyzed with the DCC-GARCH model. The volatility interaction between Bitcoin and *Islāmic* indices was investigated using the dynamic stochastic volatility model.

TABLE 5
DC-MSV Model Results of Türkiye *Islāmic* Index and Bitcoin

	Average	SD	MC Error	Confidence Interval (95%)	
μ Türkiye Islamic Index	2.0810*	0.1916	0.0061	(1.7090	2.4730)
μ Bitcoin	4.5540*	0.2551	0.0091	(4.1300	5.1570)
\emptyset Türkiye Islamic Index	0.9125*	0.0487	0.0026	(0.7911	0.9816)
\emptyset Türkiye Islamic Index, Bitcoin	0.0139	0.0295	0.0013	(-0.0453	0.0746)
\emptyset Bitcoin	0.9098*	0.0469	0.0025	(0.7971	0.9802)
\emptyset Bitcoin , Türkiye Islamic Index	-0.0505	0.0481	0.0020	(-0.1512	0.0394)
σ Türkiye Islamic Index	0.2538*	0.0697	0.0043	(0.1397	0.4179)
σ Bitcoin	0.3227*	0.1028	0.0065	(0.1514	0.5546)

Note: * represents 5%.

In Table 5, the volatility transfer between Türkiye *Islāmīc* Index and Bitcoin was analyzed with DC-MSV model. According to the results obtained $\hat{\theta}_{\text{Bitcoin}}$ and $\hat{\theta}_{\text{Since}}$ the parameters of the Türkiye *Islāmīc* Index are statistically significant at the 5% significance level and the shocks in the Bitcoin and Türkiye *Islāmīc* Index are permanent since they have a value close to 1. $\hat{\theta}_{\text{Bitcoin}}$, Türkiye Islamic Index and $\hat{\theta}_{\text{Türkiye Islamic Index, Bitcoin}}$ parameters are not statistically significant. In this case, Bitcoin and *Islāmīc* index investment instruments do not affect each other's volatility. The predictability of their volatility is determined by the square of the parameters σ_{Bitcoin} and $\sigma_{\text{Türkiye Islamic Index}}$. The square of these parameters was calculated as 0.1041 and 0.0625, and since these values are close to zero, we can say that the volatility of Bitcoin and Türkiye *Islāmīc* Index is predictable.

TABLE 6
DC-MSV Model Results of Malaysia *Hijrah Sharī'ah* Index and Bitcoin

	Average	SD	MC Error	Confidence Interval (95%)	
μ Malaysia Hijrah Sharia Index	0.2895	0.4222	0.0183	(-0.7539	0.9373)
μ Bitcoin	4.6590*	0.3268	0.0130	(4.1590	5.4900)
$\hat{\theta}$ Malaysia Hijrah Sharia Index	0.9610*	0.0223	0.0010	(0.9086	0.9937)
$\hat{\theta}$ Malaysia Hijrah Sharia Index, Bitcoin	0.0031	0.0263	0.0011	(-0.0477	0.0572)
$\hat{\theta}$ Bitcoin	0.9044*	0.0494	0.0026	(0.7897)	0.9780)
$\hat{\theta}$ Bitcoin, Malaysia Hijrah Sharia Index	-0.0337	0.0293	0.0011	(-0.0999	0.0188)
σ Malaysia Hijrah Sharia Index	0.2460*	0.0543	0.0032	(0.1582	0.3685)
σ Bitcoin	0.3309*	0.1065	0.0068	(0.1355	0.5538)

Note: * represents 5%.

The DC-MSV model results for the Malaysia *Hijrah Sharī'ah* Index and Bitcoin are presented in Table 6. $\hat{\theta}_{\text{Bitcoin}}$ and $\hat{\theta}_{\text{Malaysia Hijrah Sharia Index}}$ parameters are statistically significant and have a value close to 1. In this case, it has been determined that the shocks in Bitcoin and Malaysia *Hijrah Sharī'ah* Index are permanent. Because the parameters $\hat{\theta}_{\text{Bitcoin, Malaysian Hijrah Sharia Index}}$ and $\hat{\theta}_{\text{Malaysia Hijrah Sharia Index, Bitcoin}}$ are not statistically significant, there is no volatility transfer between Bitcoin and the Malaysian *Hijrah Sharī'ah* Index.

Squares of parameters σ_{Bitcoin} and $\sigma_{\text{Malaysia Hijrah Sharia Index}}$ are 0.1095 and 0.0605. Since these values are close to zero, it has been determined that Bitcoin and Malaysia *Hijrah Sharī'ah* Index volatility are predictable.

4. CONCLUSION

Coins, which were first used as a means of exchange by the Lydians in the 7th century BC, are now considered as an investment tool in the virtual environment. Coins with its own and nominal value have led to the formation of different fatwas in the historical process. It is stated by many organizations that the virtual currencies, which have been moved to a different dimension with the effect of technological developments, are not permissible at the moment. However, virtual currencies, which have been the favorite of many investors in recent years, are also closely followed by the religious sector. Companies included in *Islāmic* indices are the primary preference of the religious people who want to invest according to *Islāmic* methods. Nonetheless, it is certain that there are investors who plan to invest in such virtual currencies, if approved by the fatwa institutions.

For this reason, in this study, considering the historical process we are in, the interaction of return and volatility between *Islāmic* indices in Türkiye and Malaysia and Bitcoin, one of the most valuable virtual currencies, is investigated. In the study, which used weekly data for the period 24 November 2013 – 2 January 2022, multivariate DCC-GARCH model and multivariate dynamic stochastic volatility model were used to analyze the return and volatility interaction between variables. According to the DCC-GARCH model results, it has been determined that the volatility of Türkiye *Islāmic* Index, Malaysia *Hijrah Sharī'ah* Index and Bitcoin variables are permanent. Another result obtained with the DCC-GARCH model is that there is no return interaction between *Islāmic* indices and Bitcoin. According to the results of the DC-MSV model, it has been determined that the volatility in Bitcoin has no effect on the volatility of Türkiye and Malaysia *Islāmic* indices. Likewise, the volatility in Türkiye and Malaysia *Islāmic* indices has no effect on the volatility of Bitcoin. In addition, Türkiye *Islāmic* Index, Malaysia *Hijrah Sharī'ah* Index and the volatility of Bitcoin variables have been determined predictable by the DC-MSV model. According to the findings obtained from the results of the analysis, it is possible to say that the *Islāmic* index investor and the Bitcoin investor are different from each other.

Islāmic indices are preferred by investors with *Islāmic* sensitivity, as they are businesses that meet certain form requirements in terms of fiqh rules. Bitcoin, on the other hand, is not considered to be preferred by devout investors since it is not considered permissible at the moment. Therefore, the opinion that there should be no return and volatility interaction between virtual currencies and *Islāmic* indices is dominant. It is seen that the results obtained in the study also support this idea.

According to the results of the analysis, it is not possible to say that Bitcoin is a risk-free investment preference for portfolio diversification for investors, since there is no relationship between Bitcoin and *Islāmic* indices. For this reason, it cannot be mentioned that Bitcoin can be an alternative product to *Islāmic* indices. Bitcoin investors need to evaluate their *Islāmic* index investments and Bitcoin investments independently. In future studies, cointegration tests between Bitcoin and other digital currencies can be conducted to guide the creation of digital currency portfolios. In terms of international investors, examining the relationship between different indices and Bitcoin will be useful in terms of commenting on portfolio diversification.

Islāmic indices are investment instruments that investors with *Islāmic* sensitivities prefer intensely. Since Bitcoin is an investment tool that does not have *Islāmic* sensitivity, it is thought that *Islāmic* indices are not preferred by investors.

ENDNOTES

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