THE RELATIONSHIP BETWEEN ISLAMIC INDICES AND COMMODITY MARKETS IN TURKEY: EVIDENCE FOURIER-BASED APPROACHES

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Affecting a significant portion of the world economy, the commodity market is the world's largest "nonfinancial" market. In addition to the other macroeconomic variables, commodity prices have a special importance for Islamic stock indices, which have improved in recent years because Islamic finance is a financial system based on the profit/loss sharing principle and supports the real sector's activities. In this study, cointegration and the causality relationship between commodity markets (the Gold ounce and Brent oil) and the Participation-30 Index established by taking Islamic criteria into account were investigated in Turkey. As a result of the analysis, no cointegration relation was found between the Participation-30 Index and the commodity markets. According to these results, an investor investing in gold or oil will, in addition to the Participation-30 Index, diversify its portfolio with this commodity investment and minimize its risk. The fact that there is no relation between the variables according to the causality results indicates that the Participation-30 Islamic Indices' structure is independent of commodity markets and conventional stock markets.

Keywords: Participation-30 Islamic Indices, commodity markets, Fourier-based approaches, portfolio diversification

INTRODUCTION

The fact that the stock market performance can be affected by commodity markets makes the relationship between commodity markets and stock markets significant. In addition to the other macroeconomic variables, commodity prices have a special importance for Islamic stock indices, which have improved in recent years because Islamic finance is a financial system based on the profit/loss sharing principle and is especially supportive of the real sector's activities. In addition, the quantitative criteria needed in the formation of Islamic stock indices

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require that some ratios related to liquidity, interest rates, indebtedness and undesirable gains should be provided. This situation may force the enterprises included in the index to turn to real markets. Therefore, the relationship between Islamic indices and commodity markets is expected and considered to be important.

After the dot.com bubble burst in 2000, i.e. the collapse of high-tech companies' (mainly Internet companies') shares, commodity prices and commodity investment levels increased significantly. Commodity markets enable investors to benefit more from the commodity markets that have a negative price relationship with bonds and stocks in order to diversify their portfolios and also provide investors with the return they seek (Doyle, Hill & Jack, 2007, 5).

Apart from the low returns obtained from bonds and volatile stock markets, what can make commodity markets advantageous in terms of their attracting investors and preserving the existing investment is a negative correlation between commodities and bonds and stocks, on the one hand, and a positive correlation between commodities and inflation (Doyle *et al*, 2007, 45). Commodity markets affect an important part of the world economy and are considered to be the world's largest "nonfinancial" market (Doyle *et al*, 2007, 15; Junkus, 2010, 89). Each one of the commodities

in these markets includes a wide range of products with specific demand and supply fundamentals (Junkus, 2010, 89). Some important commodities that can be traded in both over-the-counter and organized commodity markets are shown in Table 1.

Amongst the mentioned commodities, petroleum from energy products and gold from precious metals come to the fore, more in terms of their effect on markets. These commodities are of a great interest to researchers and investors in terms of both high price levels and excessive volatility in prices. Crude oil prices affect almost all economic sectors (Abdullah, Saiti & Masih, 2016, 219). Gold is seen as the leading investment instrument and the leading commodity on the metal markets. In addition, gold is seen as a reliable port in order to avoid excessive risk on financial markets and an important risk management tool in hedging and portfolio diversification since it is less sensitive to the exchange rate fluctuations (Hussin, Muhammad, Razak, Tha & Marwan, 2013, 162). In fact, gold is an entity possessing the desired properties of money. This is because, unlike many other commodities, gold is durable, easily distinguishable, storable, portable and divisible and easily standardized (Baur, 2013, 5).

Islamic banks have a share of approximately 73% in the global Islamic finance sector. However, the general

Table 1 The types of commodities

Energy Products	Precious Metals	Other Metals & Minerals	Agricultural Products	Soft Commodities / Other Plants	Animal Products
Brent oil	Gold	Aluminum	Wheat	Coffee	Livestock
Crude oil	Silver	Copper	Corn	Cocoa	Milk
Natural Gas	Platinum	Zinc	Cotton	Sugar	
Electric	Palladium	Lead	Potato		
Kerosene		Tin	Rice		
Heating fuel			Orange juice		
Carbon emissions					

Source: Koy, 2018, 23.

trend in this field is shifting from banking to Islamic capital market instruments with higher growth rates. The most common of these instruments are Islamic stock indices and Islamic investment funds (Buğan, 2016, 250). In short, Islamic stock indices (Buğan, 2016, 251), which can be defined as the indices of the enterprises that meet the determined Islamic criteria, or participation indices with the name used in our country are one of the most important instruments of Islamic capital markets (Hussin *et al*, 2013, 167). The less risky nature of Islamic stock markets and the extraordinary growth rate of these indices increase demand for these indices and are considered as one of the biggest innovations in the financial field (Raza, Ibrahimy & Ali, 2015, 4).

In general, Islamic indices (participation indices) must be in line with the Islamic criteria, unlike conventional indices. These criteria consist of the two stages: as the main activity area criteria and the financial criteria. According to the main activity area criteria, firms' main activities to be included in the index should only be in the areas deemed appropriate by Islam. In order to be able to enter the index according to financial criteria, companies should provide certain financial ratios calculated as Total Interest Loans/Market Value, Interest Income Cash and Securities/Market Value and Income from the Activities Specified in the First Criterion/Total Value (www.katilimendeksi.org). However, these criteria for Islamic indices are not completely standard for each country or each index calculator. The mentioned criteria may differ in terms of the determined values for the activity and the financial ratios (Derigs & Marzban, 2008, 289; Buğan, 2016, 252-255).

The analysis of the linkages between commodities and Islamic capital markets attracts financial actors' attention, especially as commodities are included in many investment portfolios together with a raw material and stock classes (Khan & Masih, 2014, 4). According to the ICD - Thomson Reuters (2017) Interest-Free Finance Development Report, the total assets of the global interest-free finance system grew by almost 10% compared to the previous year, having reached $2.417 billion by the end of 2017. According to the estimates, the total Islamic finance

assets are anticipated to reach $3.8 trillion by 2022. This corresponds to an average annual growth of approximately 10%. The total value of the capital market products in Islamic financial assets was determined to be $509 billion by the end of 2017, and is expected to exceed US $1 trillion by 2022. Demonstrating the interaction between such a fast-growing sector and commodity markets will enable the provision of important information to both investors and portfolio managers.

The first aim of this study is to determine whether the investors who invest in Islamic stock indices in Turkey can invest in gold or Brent oil for the purpose of their portfolio diversification. The other aim of the study is to determine whether Islamic stock index returns can be predicted by using the commodity market data. Thus, whether the Islamic markets operating on the basis of asset-based financing are related to commodity markets will be revealed.

In this context, the hypotheses of the study will be as follows:

H1: An investor investing the Participation-30 Islamic Stock Index in Turkey can invest in gold and Brent oil for the purpose of his portfolio diversification.

H2: Gold and Brent oil price data can be used to predict the Participation-30 Islamic Stock Index in Turkey.

H3: There is a relationship between Islamic markets and the commodity markets operating in accordance with the principle of asset-based financing.

In order to attain the goals of the study, long-term cointegration and the causality relationship between the Participation-30, as one of the Islamic stock indices in Turkey, on the one hand, and commodity markets, on the other, are being tested. The papers on this subject matter have been written in Far-East Asian countries such as Malaysia, which has developed Islamic markets, and in Gulf countries. However, the Turkey's example has not previously been seen in any paper. This situation reveals the specificity of the

study. In terms of the method, the fact that it is the first study to be examining the relationship between the participation indices and commodity markets by using the Fourier form tests that take into account many transient structural breaks with smooth transition reveals yet another unique aspect of the study.

The study consists of five chapters. Following the introduction part, a review of the literature is given in the second section. In the third chapter, the scope and methods of the study are explained. After the findings have been presented in the fourth section, the results and the suggestions are given in the final section.

LITERATURE REVIEW

The relationship between commodity markets and stock markets has never lost its importance and has been included in a wide research area. In the literature, the relationships between oil and conventional stock returns have been researched more heavily than commodity markets (Jones & Kaul, 1996; Sadorsky, 1999; Basher & Sadorsky, 2006; Büyükşahin, Haigh & Robe, 2008; Narayan & Sharma, 2011; Fahami, Haris & Mutalib, 2014). On the other hand, the relationships between the conventional stock market indices and the Islamic stock market indices have been studied in a significant number of studies in terms of portfolio diversification (Saiti, Bacha & Masih, 2014; Nazlioglu, Hammoudeh & Gupta, 2015; Bahloul, Mroua & Naifar, 2017; Jebran, Chen & Tauni, 2017). In this study, the relationships between commodity prices and Islamic indices are discussed. Previous studies of these relationships are presented in this part of the study.

The first studies to have been investigating the relationship between Islamic markets and commodity prices are those conducted by Hussin and his colleagues. M. Y. M. Hussin, F. Muhammad, K. Noordin, N. F. Marwan and A. A. Razak (2012a) focused on the impact of shocks in oil prices and macroeconomic variables on the Islamic stock market in Malaysia. In the study, the VAR model, the Johansen-Juselius Cointegration Test and the

VECM Granger Causality Test were applied to the January 2007 - December 2011 period. According to the findings, cointegration between the Islamic stock prices, the oil price and the selected macroeconomic variables was established. According to the Granger causality, no relation was found between the Islamic stock prices and the crude oil price.

M. Y. M. Hussin, F. Muhammad, M. F. Abu and A. A. Razak (2012b) investigated the relationship between the Islamic stock markets, the oil price and the macroeconomic variables for Malaysia. The VAR model, the Johansen-Juselius Cointegration Test and the Granger Causality Test were used in the study. As a result of the paper, the Islamic stock prices were seen as being cointegrated together with the exchange rate and the oil price variables. Based on the cointegration analysis, the Islamic stock price was positively and significantly correlated with the oil price variable. According to the Granger Causality Test Analysis, the oil price variable was the Granger cause of the Islamic stock market return in Malaysia.

Hussin *et al* (2013) investigated the relationship between the FTSE Bursa Malaysia Emas Shariah Index and strategic commodities (crude oil and Kijang gold). The study covered the January 2007 - December 2011 period, and included the VAR model, the Johansen-Juselius Cointegration Test and the Granger Causality Test. According to the findings, no cointegration relationship was found between the FTSE Bursa Malaysia Emas Shariah Index and strategic commodities. Moreover, a two-way causality relationship between this index and crude oil prices was established, whereas no causality among the Kijang gold prices was found.

A. Khan and M. Masih (2014) investigated the relationships between energy indices, precious metals, agricultural products, non-ferrous metals and soft products spot indices with the Dow Jones Islamic Index. In addition, the Dow Jones Spot Commodity Index was included as the total commodity price index. The MGARCH-DCC model was used in the study covering the period from January 3, 2001 to March 28, 2013. According to the findings of the study, the relations between the commodity and the Islamic

stock markets were seen to have developed over time and to have been quite variable, especially since the 2007-2008 global financial crisis. While an uncertain level of speculation was highlighted for the energy sector (oil), the safe haven role of the precious metal (gold) sector was proven.

The main purpose of the study conducted by S. H. M. Rithuan, A. M. Abdullah and A. M. M. Masih (2014) was the examination of the causal nexus between the crude oil price and the Islamic Stock Index in the Gulf Cooperation Council member countries (the UAE, S. Arabia, Qatar, Kuwait, Bahrain and Oman). The prices of the other commodities, such as corn and gold prices, were also included in the study as the control variables and the robustness tests. According to the results of the study, cointegration between the Islamic stock indices and commodities was identified by applying the Vector Error Correction Model (VECM), the Johansen Cointegration Test and the Wavelet (Wavelet) Approach. The Islamic stock indices and the crude oil prices in Saudi Arabia and Oman were found to lead to the other Islamic stock indices and commodities. According to the Discrete Wavelet Transform (MODWT) technique, the crude oil price leads to the other Islamic indices in the short run. According to the Continuous Wavelet Transform (CWT) technique, if the investor's investment period is less than 128 days, they will benefit from portfolio diversification.

T. Chebbi and A. Derbali (2015) investigated the links between Islamic capital markets (the QE Al Rayan Islamic Index) and strategic commodities (crude oil and natural gas). The GARCH-DCC method was used in the study and the results showed that the volatility in commodity returns was strongly related to the QE Al-Rayan Islamic Index, and this result affected the financialization of commodity markets.

While investigating the role of safe-haven assets in the fields of time and frequency, N. Raza, A. Ibrahimy and A. B. Ali (2015) compared gold and the Dow Jones Islamic World Emerging Market Index for two different crisis periods. Kao Panel Cointegration Tests, the Pooled Mean Group (PMG) Estimator, and the Wavelet Approach were applied

in the study. According to the findings, the Islamic emerging markets and the BRICS stock markets were cointegrated and gold would be the portfolio diversifier of the Islamic stock markets.

The main purpose of the study conducted by A. M. Abdullah, B. Saiti and M. Masih (2016) was to investigate the dynamic causal relationship between commodity prices (crude oil, corn and gold) and the Islamic Stock Indices in Southeast Asian countries (Singapore, Philippines, Indonesia, Thailand and Malaysia). Gold and corn prices were included in the study as the control variables and the robustness tests. In the study, the Johansen Cointegration Test, the VECM-Granger Causality Test, the Wavelet Technique (MODWT and CWT), and the MGARCH-DCC model were applied. According to the findings, the Islamic stock indices and the commodity prices in the Southeast Asian countries were moving together in the long run. The Malaysian Islamic stock market indices had the lowest volatility.

M. K. Nejad, F. Jahantigh and H. Rahbari (2016) investigated the relationship between the oil price risk and the Tehran stock return for the January 2003-October 2014 period. The Gregory-Hansen, Saikkonen-Lütkepohl and Johansen-Juselius Cointegration Tests were done and a long-term relationship between Tehran Stock Index and the oil price was found.

In their study, K. M. Kisswani and M. I. Elian (2017) used the non-linear ARDL (NARDL), the Johansen-Juselius Cointegration Test, the Error Correction Model and the Granger Causality Tests to investigate the relationship between the Kuwait Stock Market (10 main sectors) and oil prices (West Texas and Brent). According to the study's findings, the oil prices and some Kuwaiti sectoral stock prices showed asymmetric long-term effects. In addition, while the empirical results for these sectors demonstrated a short-term asymmetric effect in the case of the WTI price measure, no evidence of an asymmetric effect was found, but there was a symmetric effect in the case of the price of Brent oil.

The studies mentioned are summarized in Table 2.

Table 2 The literature review

Source	Data (Frequency)	Variables		Econometric Method	Empirical findings	
		Stock exchange	Commodity		Cointegration	Causality
Hussin et al, (2012a)	January 2007 - December 2011 (Monthly)	FTSE Bursa Malaysia Emas Shariah Index	Crude Oil	Johansen-Juselius cointegration test VECM Granger causality test	=	No relationship
Hussin et al, (2012b)	January 2007 - December 2011 (Monthly)	FTSE Bursa Malaysia Emas Shariah Index	Crude Oil	Johansen-Juselius cointegration test Granger causality test	=	EP $\rightarrow$ ISP
Hussin et al, (2013)	January 2007 - December 2011 (Monthly)	FTSE Bursa Malaysia Emas Shariah Index	Crude Oil Kijang Gold	Johansen-Juselius cointegration test Granger causality test	≠	ISP $\leftrightarrow$ EP (Petrol)
Khan and Masih (2014)	03.01.2001-28.03.2013 (Daily)	DJ Islamic Price Index	DJ Commodity Indices	MGARCH-DCC	This analysis has not been conducted.	This analysis has not been conducted.
Rithuan, Abdullah and Masih (2014)	01.01.2000-28.02.2014 (Daily)	Gulf Cooperation Council Members Islamic Markets	Crude Oil Gold Corn	Johansen cointegration test, Wavelet approaches (MODWT and CWT)	=	ISP (S. Arabia and Oman) and EP (Petroleum) $\rightarrow$ Other ISP and EP
Chebbi and Derbali (2015)	15.03.2011 - 25.12.2014 (Daily)	Qe Al Rayan Islamic Index	Crude Oil Natural Gas	GARCH-DCC	This analysis has not been conducted.	This analysis has not been conducted.
Raza, Ibrahimy and Ali (2015)	01.01.1996 - 31.12.2014 (Daily)	DJ Islamic World Emerging Market Index, BRICS Commodity Exchanges	Gold	Kao Panel cointegration tests Wavelet approach	=	This analysis has not been conducted.
Abdullah, Saiti and Masih (2016)	01.06.2007-28.02.2014 (Daily)	Southeast Asian Islamic Stock Markets	Crude Oil Gold Corn	Johansen cointegration test, Granger causality test, Wavelet approaches (MODWT and CWT), MGARCH-DCC method	=	EP $\rightarrow$ ISP (Singapore, Philippines and Thailand)
Nejad, Jahantigh and Rahbari (2016)	January 2003-October 2014 (Daily)	Tehran Stock Market	OPEC Oil Basket	Cointegration tests (GH, Saikkonen-Lütkepohl and Johansen)	=	This analysis has not been conducted.
Kisswani and Elian (2017)	03.01.2000-09.11.2015 (Daily)	Kuwait Stock Exchange (10 Main Sector)	Crude Oil	N-ARDL Granger causality tests	=	There are different results according to the sector.

Note: ISP represents Islamic stock prices and EP represents commodity prices. In addition, "$\rightarrow$" sign indicates one-way causality relationship, "$\leftrightarrow$" sign indicates two-way causality relationship, "=" sign indicates cointegration relationship, and "≠" sign indicates that there is no cointegration.

Source: Authors

According to the report presented in Table 2, the studies of commodity markets and Islamic markets or Islamic indices are quite limited. In addition, there is almost no study regarding this issue in Turkey. In this context, the fact that it is the first study to examine these relations in Turkish markets reveals the originality of the paper. Almost all of the studies have identified the cointegration relationship between commodity markets and Islamic markets or Islamic indices. The findings of causality were found to vary according to the country and the indices examined.

ECONOMETRIC METHODOLOGY

Structural changes are very important in a time series analysis. Structural improvements in time series can be caused for various reasons, such as economic crises, wars and political changes. The important issue at this point is that the structural changes cannot be determined by conventional econometric methods. For example, serious structural changes in time series are ignored when the ADF, the PP and the KPSS Unit Roots, the Johansen Cointegration, Granger and Toda-Yamamoto causality tests are applied. This situation may lead to false or inaccurate findings (Çil Yavuz, 2015, 308).

In this context, the literature shows us that both the unit root and the cointegration applications that take structural breaks into consideration are used. Thus, serious structural changes in data will not be overlooked. However, the disadvantage of these tests reflects in their not being capable of accounting for a large number of smooth-transition structural breaks. The authors identified shortcomings in the literature, and developed the Fourier unit root, cointegration and causality tests (Becker, Enders & Lee, 2006; Enders and Jones, 2015; Tsong, Lee, Tsai & Hu, 2015).

A Fourier series is an expansion of a periodic y_t function in the form of an infinite sum of cosines and sinuses. The Fourier KPSS tests developed by R. Becker *et al* (2006) use trigonometric functions to capture changes larger than the mean of the dependent variable. The advantage of this test is that it

takes into account many smooth-transition structural breaks with smooth transition. The econometric model of this test, which is the Fourier extension of the KPSS (1992) Unit Root Test, can be explained in the following manner:

$$y_t = \lambda_0 + \lambda_1 \sin(\frac{2\pi kt}{T}) + \lambda_2 \cos(\frac{2\pi kt}{T}) + v_t$$

where T represents the sample size, λ_1 and λ_2 are the Fourier coefficients, π is 3.11416, and k is the frequency used to find the optimal value that makes the sum of the residual squares the smallest.

In order to carry out this test, it is first necessary that k, which is the total of the smallest residual squares, should be determined. After determining the appropriate frequency (k), whether the F statistic obtained from this model is meaningful or not is decided by making comparisons with the critical values given by R. Becker *et al* (2006). In the final stage, the residual series of the selected model k is created and the traditional KPSS test is applied to the residual series of the series. In this way, the Fourier KPSS test is performed. According to this test, the null hypothesis indicates that the series is stationary and the alternative hypothesis indicates the existence of the unit root in the series (Beşel & Uygun, 2017).

The second method used in the study is the Fourier Cointegration Test developed by C. C. Tsong *et al* (2015). This method uses the same mathematical structure as the FKPSS Unit Root Test. In this context, in the absence of the independent variable and the Fourier function, the results of the FKPSS Unit Root Test are obtained. In the absence of the Fourier function when there is an independent variable, the results of the Y. Shin (1994) Cointegration Test will appear. According to the test, the null hypothesis indicates the existence of cointegration and the alternative hypothesis shows that there is no cointegration (Yılancı, Aslan & Özgür, 2017).

The last method used in the study was the Fourier Causality Test developed by W. Enders and P. Jones (2015). As the name implies, this test is the Fourier form of the traditional Granger Causality Test. While

almost all of the causality tests in the literature fail to take into account structural breaks, this method takes such structural breaks into consideration in a smooth transition form. This test also operates in the same econometric logic as the Fourier Unit Root and the Fourier Cointegration Tests. The difference between the Fourier methods used in the study is in terms of the hypotheses. The null hypothesis indicates that there is no causality between the series, whereas the alternative hypothesis indicates the existence of such causality.

DATA AND EMPIRICAL FINDINGS

Data

The Participation-30 Index, which has the longest time interval amongst the Islamic indices in Turkey, was used in the study as a data set representing the Islamic indices, whereas the other variables were the Brent oil price expressed in dollars per barrel and the gold ounce as the basis of dollars. As can be seen in the literature in Table 2, oil and gold were generally used to represent the commodity variable. Therefore, the commodities mentioned in the literature were preferred in this study.

The data set ranges between 7th Jan. 2011 and 4th June 2018, on a daily basis. When the studies in the literature are examined, it is determined that the observation frequency is mostly used on a daily basis. The data for the Participation-30 Index were obtained from the Foreks website (www.foreks.com), the Brent oil data were available on the US Energy Information Management's website (www.eia.gov), whereas the gold ounce basis data were obtained from the World Gold Council's website (www.gold.org). In order to keep the data range broad, the other İstanbul Stock Market (Borsa İstanbul) Islamic Indices, the Participation-50 and the Participation Model Portfolio, whose historical data reach back in the year 2014, were not included in the study.

The logarithmic transformations of the series data were taken so as to prevent return volatility prior to performing the analysis. Moreover, during the Fourier Causality Tests, the findings were obtained by a 10,000 Monte Carlo Bootstrap Simulation.

The logarithmic time series graphs in the data ranges studied for the Participation-30, Brent Oil and Golden Ounce series are presented below (Figures 1, 2 and 3).
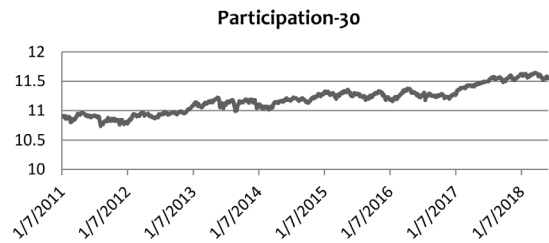

Figure 1 Participation-30 Index (Logarithmic)
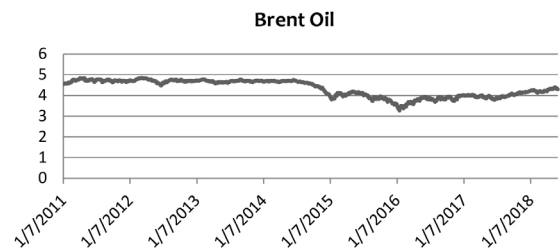
Source: Authors

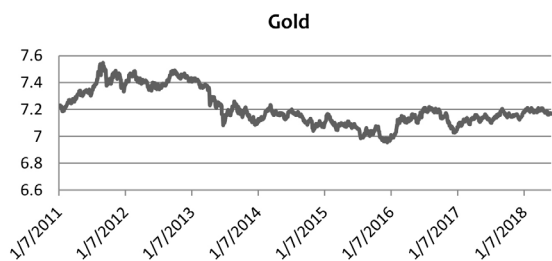**Figure 2** Brent Oil (Logarithmic)

Source: Authors

Figure 3 Gold Ounce (Logarithmic)

Source: Authors

Empirical Findings

Following the disclosure of the data used, the first procedure is to determine the stationary order of the series. According to the results in Table 3, it is seen that all the three indices have the unit roots in the level forms and become stable as a result of the first difference-taking process. Because the level-value test statistics are higher than the critical values in R. Becker *et al* (2006), the test statistics obtained as a result of the first difference are lower than those critical ones.

Table 3 The Fourier KPSS Unit Root Test results

Variables	F (k)	Level	1st Difference
Participation-30	3	5.00	0.014***
Brent Oil	1	4.64	0.029***
Gold Ounce	1	3.49	0.014***

Note: The critical values were obtained from R. Becker *et al* (2006).

Source: Authors

It would be appropriate to investigate the cointegration relationship in such a case where the series are stationary in the first differences. The results of the Fourier SHIN Cointegration Test performed in this context are accounted for in Table 4. The H1 hypothesis, which indicates that there is no cointegration relationship for both matches, is accepted. In this context, an investor investing in the Participation-30 Index can invest in gold or Brent oil while diversifying its portfolio in order to reduce its risk.

Following the analysis of the unit root and the cointegration tests in the Fourier form, the causality test in the Fourier form is appropriate to use. According to the results of the Fourier Causality Test presented in Table 5 and developed by W. Enders and P. Jones (2015), no evidence of causality was found.

Table 4 The Fourier SHIN Cointegration Test results

	MinSSR	F (k)	Fm (k)	Tm (k)
Gold Ounce and Participation-30	19.98	2	14.80	0.67
Brent Oil and Participation-30	38.91	3	3.55	2.39

Note: The critical values for the Participation-30 and the gold ounce mapping were 0.078, 0.099 and 0.163, at the level of significance of ％1, 5 and 10, respectively. The critical values for the Participation-30 and the Brent oil mapping were 0.090, 0.114 and 0.170 at the level of significance ％1, 5 and 10, respectively. These values were obtained from C. C. Tsong *et al* (2015).

Source: Authors

Table 5 The Fourier Granger Causality Test results

The Direction of Causality	Wald Statistics	Asymptotic p-value	Bootstrap p-value
Participation-30 → Brent Oil	0.068	0.795	0.800
Brent Oil → Participation-30	1.239	0.266	0.263
Participation-30 → Gold Ounce	2.679	0.102	0.103
Gold Ounce → Participation-30	1.340	0.246	0.236

Source: Authors

CONCLUSION

The commodity market is the largest non-financial market in the world affecting a significant part of the world economy. The fact that the stock market performance can be affected by commodity markets makes the relationship between commodity markets and stock markets important. In addition to the other macroeconomic variables, commodity prices have

been bearing special importance to the Islamic stock indices or the participation indices in our country in recent years because Islamic finance is a financial system based on the profit/loss sharing principle and is supportive of the activities carried out in the real sector in particular.

In this study, long-term cointegration and the causality relationships between the Islamic indices and the commodity markets in our country were investigated. Financial cointegration reveals the long-term relationships of the variables and provides investors with important pieces of information for their portfolio diversification. By means of the causality tests, the important other financial assets or market data forecasting clues are possible to obtain from a particular financial asset or market data. The daily data covering the period between 7th Jan. 2011 and 4th June 2018 were used in the study. In terms of the methodology, the relationship between the Participation-30 Index and commodity markets was examined by performing the Fourier form tests. In this context, the stability structures of the time series were examined through the Fourier KPSS Unit Root Test; the long-term relationships between the variables were investigated by applying the Fourier SHIN Cointegration Test, whereas the causality relations between the variables were examined by doing the Fourier Granger Causality Test.

According to the Fourier KPSS Unit Root Test used in the study, all of the three series (the Participation-30, Brent Oil and Ounce Gold) evidently have the unit roots in the level values and become stable as a result of the first difference-taking process. According to the Fourier SHIN Cointegration Test results, there is no long-term relationship between the Participation-30 Index and the ounce gold and Brent oil. In other words, an investor investing in the Participation-30 Index will be able to invest in gold or Brent oil while diversifying its portfolio in order to reduce its risk because an investor can diversify its portfolio by investing in the financial assets that do not act together in the long run. According to these results, the H1 hypothesis, assuming a portfolio diversification benefit amongst the variables, is accepted. The Fourier Granger Causality Test indicates no causality relationship to

have been found between the Participation-30 Index and the ounce gold and Brent oil commodities. Thus, these variables will not be used together in making revenue estimates among financial assets. According to these results, the H2 and H3 hypotheses, assuming a relationship between the variables, are rejected. The results obtained by the Fourier SHIN Cointegration Test were compatible with Hussin *et al* (2013). On the other hand, the results obtained by the Fourier Granger Causality Test were in line with Hussin *et al* (2012a) and Hussin *et al* (2013) only for the gold ounce.

The study's most important result is that an investor investing in the Participation-30 Islamic Stock Indices in Turkey will be able to invest gold and Brent oil for his portfolio diversification. Another important result of the study is that, although the gold and the oil commodity markets are the world's largest nonfinancial markets, there is no causal relationship between the Islamic markets operating in the context of asset-based financing and the commodities mentioned. Thus, the gold and Brent oil price data cannot be used in the prediction of the Islamic Participation-30 Stock Index in Turkey.

There are several limitations of this study. First, as Islamic markets, especially so the Islamic Stock Indices, are relatively new in Turkey, the number of the observations that can be used in analysis is limited. On the other hand, the fact that the market is still very new also raises the question of the effectiveness of the market. For this reason, similar studies can be done again in subsequent periods, when these restrictions have been eliminated. Moreover, the relationship between the two other indices in our country (the Participation-50 and the Participation Model Portfolio) or the international Islamic indices and other commodities other than gold and Brent oil or international commodity indices can be investigated in future studies. In addition, the causality test performed in this study is related to causality in the mean. Future studies, however, may generate important pieces of information about the analysis of causality in variance or causality in frequency tests.

ENDNOTE

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