The Relationship between the Stock Price and the Energy Index: A Research on the Energy Company with the Highest Brand Value in Turkey

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ABSTRACT

The energy sector is one of the main drivers for the activity of other sectors. In this study, the causality between the BIST energy index values and the stock prices of Enerjisa, the energy company with the highest brand value in Turkey, in the period between January 2011 and June 2022, using the Granger causality test, was examined. Before proceeding to the Granger method, a series of necessary tests were carried out in accordance with the methodology, and appropriate lag lengths were determined. As a result of the study, a bilateral causality relationship was determined between the stock prices of Enerjisa company and the BIST energy index values. In other words, these variables become the Granger cause of each other.

Keywords: Stock Price, Energy Index, Brand Value, Turkey
JEL Classifications: O13, Q40, L16

1. INTRODUCTION

Energy is one of the most important inputs of the economy and is one of the main drivers of today's world politics. However, energy is one of the main determinants of socio-economic factors in the world.

Energy, which is a very important and critical input for the social and economic development of countries, has a huge share in the Gross National Product of most industrialized countries (Altin and Bilir, 2013). In addition, there has been an increase in energy demand due to historically increasing agricultural and industrial activities. A country should not only have energy and export it, but also obtain energy cheaply and minimize the damage it causes to the environment while obtaining it (Huseynli, 2022b). However, it is seen that there are price movements in the energy market on a global scale. The ultimate goal of every investor is to get a high return on investment and to achieve this, investing in the stock market is always a better option. It is equally true that although the stock market deals with high returns, it also involves high risk (Bagh and Das, 2017).

There are also studies on energy and stocks in Turkey. Namely, in a study conducted in Turkey by Ergun and Ibrahim (2013), the effects of global crude oil and global natural gas prices on the stock price movements of energy companies were examined using multivariate regression and impulse response function analysis. Altınay and Karagöl (2004) conducted a study covering the 1950–2000 period in Turkey and found that there is no relationship between energy consumption and economic growth. Jobert and Karanfil (2007) examined the relationship between sectoral energy consumption and economic growth in Turkey in the period of 1960–2003 according to the sources and stated that there was no relationship between energy consumption and economic growth. Erdal et al. (2008) examined the relationship between energy consumption and real GDP in Turkey during the 1970–2006 period

and found a two-way relationship between energy consumption and real GDP. In a study conducted by Lise and Van Montfort (2007) using monthly data for the period 1970-2003, it was concluded that energy consumption and GDP are cointegrated.

In a study conducted by Al-Fayoumi (2009), using monthly data of Tunisia, Jordan and Turkey for the period of December 1997-March 2008, the relationship between oil prices, interest rates, industrial production and share earnings, using VECM (Vector Error Correction Model); Aydogan and Berk (2012) examined the relationship between changes in oil prices and stock market earnings using daily Brent crude oil prices and the Istanbul Stock Exchange (ISE)-100 index. However, a study by Gorus et al. (2019) examined the possible effects of changes in oil prices and income on crude oil import demand in Turkey, using monthly data over the period 1996–2017. Parallel to this, developments in the world also affect financial markets (Oberndorfer, 2009). Energy companies are characterized by large-scale and long payback periods with higher risks than other industries (Wang and Kong, 2021). For this reason, there are many studies in the literature on the effect of changing energy prices on financial markets. The depth and complexity of financial markets is increasing, and the interaction of markets with each other increases in parallel with rapid technological developments (Guliyeva, 2016).

Considering all these, the causality between the energy index values and the stock prices of an energy company has been examined. The theoretically prepared model was analyzed on the BIST energy index values and the stock prices of Enerjisa, the energy company with the highest brand value, in the case of Turkey.

2. LITERATURE REVIEW

2.1. Energy and Energy Index
Energy is the lifeblood of the country's economy and national security. Countries attach great importance to the creation of an energy economy strategy (Wang and Kong, 2021). It has an important place in the efficient and effective use of energy production factors and therefore in economic growth. Therefore, the development potential of countries that produce more energy is also high (Huseynli, 2022a). Energy independence of the state as a component of energy security is a complex socioeconomic category characterized by a complex set of statistical indicators, the level of state independence in carrying out an energy policy that can withstand external and internal challenges through intensive measures of economic development. Without harming society and national production as a whole (Tutar et al., 2022).

In general, the determinants of energy demand consist of price, economic growth, income, technology, productivity and demographic effects. The demand elasticity of energy goods is low. As a result of energy being a compulsory input to the economy, countries become dependent on foreign sources if they do not have sufficient energy resources and there is no substitute for that energy source. The importance of energy has increased due to the fact that energy is a mandatory input in all sectors, insufficient energy resources, increasing population and accelerating technological progress. Energy is the driving factor and one of the most basic

requirements of the social, economic and development of societies (Yıldırım, 2019).

Energy plays a very important role in today's economies since it, directly and indirectly, affects the productivity of labor and capital input used in production processes. In this context, the relationship between economic growth and the supply and use of energy has attracted the interest of researchers for a long time (Orhan et al., 2020).

It has been determined that short-term stock price changes lead to positive changes in oil prices (Lee et al., 2012).

Since crude oil acts as one of the crucial primary energies for the economic activities of various countries, its price has an impact on new energy markets (Shi and Sun, 2017; Cheng et al., 2019). The complex interconnection mechanism for crude oil prices and new energy markets has always been a concern in various countries (Zhou and Geng, 2021).

In a study by Chen and Hamori (2009), the world energy price index and China's international competitiveness were examined. A study by Sathyanarayana and Gargesha (2017) examined the impact of major political events and their impact on the stock market, based on the BSE Sensex, Nifty fifty and BSE100 index.

2.2. Energy Stock Market and Economic Development
Economic growth is an important factor in the stability of macroeconomic factors such as increasing the level of output in terms of the country it represents, tourism income, controlling the unemployment level or increasing the welfare of the country (Huseynli, 2022a). The realization of economic growth is among the main goals that almost every country wants to achieve. For this reason, economic growth is affected by many positive or negative factors (Huseynli, 2022).

In a study by Ferson and Harvey (1991), it was stated that the most important determinants in explaining the return of American oil stocks are real interest rates and market returns. Manning (1991), on the other hand, conducted a study on the prices of oil company stocks registered in London during the 1986-1988 period, using the market model and oil price changes.

Yang (2000) studied the relationship between energy prices and economic growth in Taiwan during the 1954–1997 period, and Paul and Bhattacharya (2004) in India during the 1950–1996 period. In a study by Sadorsky (2012), the correlations and volatility spillovers between oil prices and the stock prices of clean energy and technology companies were examined, while Cong and Shen (2013) examined the interactive relationships between energy price shocks, stock market and macroeconomics in China.

Soytaş and Sarı (2003) examined the causality relationship between the two series in the top 10 emerging markets and the G-7 countries, excluding China, due to the lack of data on the causality between energy consumption and income. In a study by Lee (2005), energy prices and economic growth of 18 developing countries were examined in the 1975–2001 period. In a study by Oberndorfer (2009), the relationship between energy market

developments and the pricing of European energy stocks was examined.

In a study by Managi and Okimoto (2013), they analyzed the link between crude oil prices, new energy and technology stocks. Reboredo and Ugolini (2018) contributed to the literature by analyzing the quantile effect of crude oil, natural gas, coal and electricity on new energy stocks, while Pham (2019) analyzed whether the link between crude oil prices and different categories of new energy stocks was homogeneous. Studies have also been carried out in terms of the stock market. Namely, Horng and Tsai (2016) examined the relations of Thai and Malaysian stock markets in their study. Dutta (2017), on the other hand, analyzed the impact of the crude oil volatility index on a new energy market.

When the studies conducted in recent years are examined, it is seen that a study by Zhou and Geng (2021) examined the differences in the time-varying effect of different types of structural shocks on the new energy markets in China, Europe and the United States during the 2009–2018 period. In a study by Wang and Kong (2021), the relationship between China's economic policy uncertainty and the energy market was examined based on monthly data for the 2007–2021 period. The interconnectedness of renewable energy, common stock, oil and technology markets is examined.

3. RESEARCH METHODOLOGY

3.1. Data Set and Procedure
The data required for analysis in this study were obtained from ivesting.com. The data to be used in the analysis were included in the analysis on a monthly basis. The data includes the time period from 2011 to 2022 (first 6 months). The main purpose of the study is to measure whether there is any causality between the BIST energy index and the stock prices of Enerjisa company, which has the highest brand value in Turkey's energy market. The Granger method was used to measure causality. Before proceeding to the Granger analysis, tests such as the ADF test and the VAR model were applied.

The change trend of BIST energy index by years is given in Figure 1.

The trend of change in the stock value of Enerjisa energy company by years is given in Figure 2.

3.2. Analysis Method
In the study, the causality between the BIST energy index and the stock prices of Turkey's company with the highest brand value in this sector has been examined. Within the scope of the study, the BIST energy index traded in Borsa Istanbul is taken as a basis. The data used in the study were analyzed monthly between 2011 and 2022 (first 6 months). The data required for the analysis were obtained from the investing.com platform, which is a data disclosure platform. Vector Auto Regression (VAR) analysis, one of the time series analysis methods, was preferred in the study. In this analysis, cointegration analysis, causality analysis and variance decomposition techniques were used.
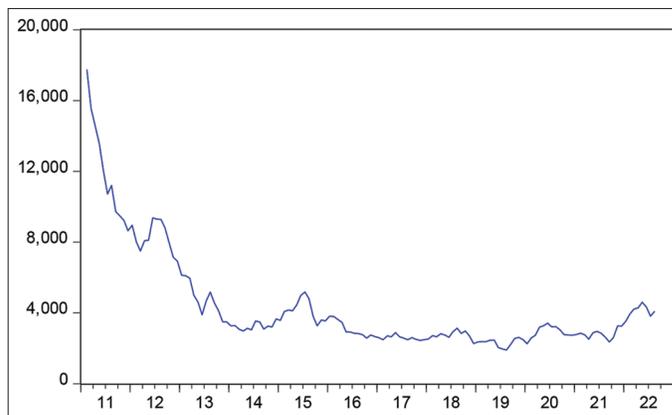

Figure 1: BIST energy index trend
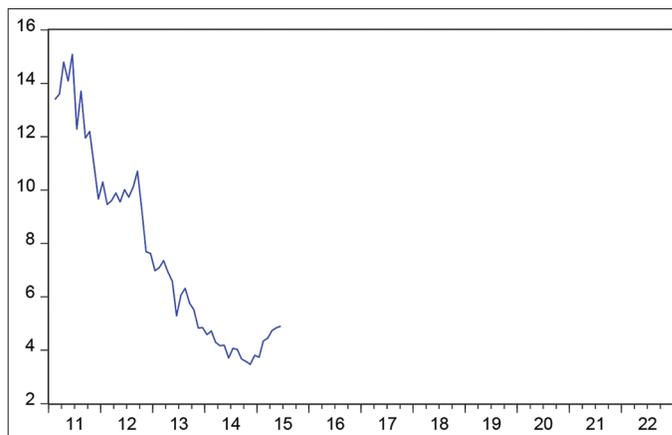

Figure 2: Enerjisa stock price trend

Table 1: Level values of series

	BIST energy index		Enerjisa stock price	
	t-statistics	Possibility	t-statistics	Possibility
ADF testing statistics	−10.23062	0.0000	−10.88532	0.0000
Test critical values				
%1	−4.026429		−4.148465	
%5	−3.442955		−3.500495	
%10	−3.146165		−3.179617	

Granger Causality, which is used to assess the extent of dependency between time series, has become one of the traditional methodologies. The Granger Causality test's premise is that two time series may be causally related if one of them can explain the other better.

4. ANALYSIS AND RESULTS

Before performing econometric analysis, stationarity test was applied to the data. If the variables used in the series are not stationary, the relationship between the data will give false results. In other words, this situation may cause the estimation of spurious regression and result in obtaining relationships that do not exist between the variables (Tarı and Bakkal, 2017, p. 7-8).   AQ1

As a result of the stationarity test used before the analysis, both

Table 2: Appropriate delay length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−473.4080	NA	2093581.	20.23013	20.30886	20.25975
1	−377.9818	178.6704	42797.88	16.33965	16.57584	16.42853
2	−369.4228	15.29699*	35295.52*	16.14565*	16.53930*	16.29378*
3	−369.1791	0.414653	41531.44	16.30550	16.85660	16.51288
4	−365.7153	5.601070	42707.56	16.32831	17.03688	16.59495
5	−359.7644	9.116248	39625.14	16.24530	17.11132	16.57119
6	−357.6359	3.079637	43423.74	16.32493	17.34842	16.71008

*Indicates the appropriate lag length for the relevant test

Table 3: Granger causality test

Hypotheses	F-value	Probability value (p)	Decision at 5% significance level
The change in BIST energy index is the reason for the stock price of Enerjisa company	10.45408	0.0054	Acceptable
It is the reason why the stock price of Enerjisa company changes. It is the reason for the BIST energy index	29.38182	0.0000	Acceptable

variables; It has been determined that the stock price values of BIST energy index and Enerjisa company are stationary from the level degrees. The fact that both the t statistics values are less than the test critical values and the probability values are <0.05 show that there is stationarity between these data. This is true for both variables. According to the stationarity test result, the H1 hypothesis is accepted. This is also evident from Table 1.

After it was determined that the variables were stationary at the same order, the VAR model was used. Then, appropriate delay numbers were determined with the help of Akaike (AIC), LL, LR, FBE, SC and HQ information criteria. Appropriate delay numbers are given in Table 2. It is clear from Table 2 that the appropriate lag length for these data is two.

After the necessary tests were applied, the transition to the important causality test was made. Causality was measured by applying the Granger method. The causality relationship between the BIST energy index index and the stock prices of Enerjisa company, which belongs to the Granger result, is given in Table 3.

According to the result of Granger analysis applied to measure causality, a causal relationship was determined between both variables. In other words, a bidirectional causality relationship has been determined between the BIST energy index and the stock prices of Enerjisa company. In other words, the changes in these variables affect each other. According to the result, BIST energy index and Enerjisa company's stock prices are the Granger cause of each other.

5. DISCUSSION AND CONCLUSION

The energy sector is one of the main factors for the operation of other sectors. The main purpose of this study is to measure whether there is any relationship between the energy index and stock prices. For this purpose, using the Granger causality test, the causality relationship between the BIST energy index values and the stock values of Enerjisa, which is the energy company with the highest brand value in Turkey, in the period between 2011:01 and 2022:06 was examined. Before proceeding to the Granger method, a series of necessary tests were carried out, the data were determined to be stationary at the same order, and appropriate lag lengths were determined. As a result of the study, it was concluded that there is a bilateral causality relationship between stock prices and BIST energy index values. In other words, these variables become the Granger cause of each other.

Similarly, in studies conducted by Al-Fayoumi (2009), it was determined that the hypothesis that oil prices cause a change in share earnings is invalid for Tunisia, Jordan and Turkey. As a result of a study conducted in Turkey by Ergun and Ibrahim (2013), the market index is the most important factor in energy stock price movements, a shock in the market index has a permanent positive effect on the energy stock price, while global crude oil and global natural gas prices are positive effect for 1 year and negative effect after 1 year. As a result of Aydogan and Berk's (2015) study, only a few cases were found that the impact of oil price shocks on the Turkish stock market is rationally evaluated. According to the results of the study by Gorus et al. (2019), energy conservative policies do not have a negative effect on real economic activity in Turkey.

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