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Analyzing the Connection between Energy Prices and Cryptocurrency throughout the Pandemic Period

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ABSTRACT

Today's discussion centers on whether cryptocurrencies may be used to pay for products and services in developed and underdeveloped nations. The role of cryptocurrencies as investment and speculative trading vehicles is also expanding. The cryptocurrency bitcoin serves as an illustration of such use. The first cryptocurrency to develop value without initially satisfying requirements and carrying any type of collateral in the form of traditional currencies is bitcoin. The analysis of the variables influencing the price of bitcoin is one of the most hotly debated subjects in the financial literature. The purpose of this study is to look into the connection between the price of natural gas and crude oil and the cryptocurrency Bitcoin. In this study, the effect of Brent oil, crude oil and natural gas prices on Bitcoin was examined. For the data containing the weekly time series for the period January 05, 2020-December 26, 2021, FMOLS and DOLS tests were conducted, which show the coefficient of cointegration, causality and relationship. According to the findings of the study, according to the FMOLS test, 1% Bitcoin in brent oil price increases 0.000176% (probability values according to DOLS do not confirm the effect). Likewise, when we look at crude oil, according to FMOLS test, 1% Bitcoin in crude oil price increases 0.000180% (the probability values according to DOLS do not confirm the effect). When we look at the changes in the Bitcoin price, according to the DOLS test, a 1% increase in the Bitcoin price increases the Brent oil by 77.86132% (the probability values according to FMOLS do not confirm the effect).

Keywords: COVID-19, Coronavirus SARS Cov-2, Natural Gas, Oil, Crypto
JEL Classification: M21, E31, F31

1. INTRODUCTION

The popularity of cryptocurrencies has increased significantly since Nakamoto[1] introduced the concept of Bitcoin to the world in 2008. Cryptocurrencies embody innovative technology, highly secure architecture, well-being in functionality and investment opportunity as an asset that makes them attractive to computer scientists, venture capitalists and investors. However, decentralization and unregulated markets add an additional layer of uncertainty to its pricing and execution projection. An example is the closure of stock markets in China due to the changing legal situation that has caused massive price reactions around the world. Especially in recent years, big shocks and a balloon-like price movement have been observed (Klein et al., 2018).

The market capitalization of cryptocurrencies reached a historical peak of approximately US$2.6 trillion on October 27, 2021. With this capitalization value, the cryptocurrency market has become comparable to the market valuation of the world's largest companies such as Apple or Alphabet. In the cryptocurrency market, which has a total of 13,200 variants on October 27, 2021, approximately 63.6% of the total market value is dominated by Bitcoin and Ethereum (https://coinmarketcap.com/). Beginning as an experiment by decentralized management enthusiasts, cryptocurrencies are becoming a core business model as an investment vehicle for investors and a new and innovative form of payment for companies.

1 Satoshi Nakamoto is the name used by the people or groups known as the creator of Bitcoin.

Cryptocurrencies, especially Bitcoin, have been labeled New Gold by some media, banks and data providers in recent years. While this view can be motivated by fast and high returns in a gold rush-like environment, it compares Gold and Bitcoin from an econometric perspective and directs it to focus on the economic aspects of cryptocurrencies as an investment tool. Thus, the question of how cryptocurrencies can be classified according to their volatility behavior and how they relate to already established asset classes must be addressed. Cryptocurrencies are not directly linked to any monetary policy tool or basis. Therefore, it is difficult to analyze the common factors between these virtual currencies and other financial asset classes (Syzdykova, 2021:45).

In the US, the Commodity Futures Trading Commission (CFTC) has officially declared cryptocurrency a commodity, just like crude oil or gold. The Commission states that Bitcoin as a virtual currency is a digital representation of value that functions as a medium of exchange, a unit of account and/or a store of value, but does not have legal tender status in any jurisdiction (CFTC, 2021).

Indeed, since the beginning of 2020, the whole world has been gripped by the coronavirus, which has already slowed down the growth rate of the global economy.

The severity of the impact of coronavirus depended on the level of the proportion of the diseased population and the mortality rate. The new conditions are often compared to previous influenza pandemics, of which the Spanish flu of 1918-1920, the Asian flu of 1957-1958, the Hong Kong flu of 1968-1969, and severe acute respiratory syndrome (SARS) of 2003 are most commonly cited. and bird flu 2004-2006.

Globally measured infection and death rates vary widely between these episodes, reflecting the nature of the condition and the speed at which vaccines can be produced.

The coronavirus hit China during the Lunar New Year, a period when households tend to spend more on travel, entertainment and gifts. Even if the virus is defeated quickly enough, the initial stages of high uncertainty have weighed on costs. In addition to Wuhan, other large population centers, including major Tier 1 cities, have begun to report cases. To date, the coronavirus with new stamps has swept the whole world.

The current state of the world economy, including the stock market, can be described as a "catastrophic collapse and recession."

Governments of all countries have made incredible efforts to contain the coronavirus epidemic. The economies of countries that experienced certain difficulties even before the epidemic were faced with severe trials.

In this context, firstly, theoretical information on the subject is given and the literature is explained. Then, the relationship between Brent oil (BRENT), Crude oil (WTI) and Natural gas (NG) and Bitcoin (BTC) is examined. In the last part, the data set and method used are introduced and empirical findings are given.

2. LİTERATURE REVİEW

It is very important for the development of the financial structure, the conversion of savings into investments and economic growth. Especially in the financial crises, the loans provided by the financial sector were critical in the nation's recovery from the crisis and the process of manufacturing their products. In this paradigm, a rise in the loan volume of the banks increases the money supply, increasing production, employment and thus economic growth (Kamaci et al., 2017: 401).

Schumpeter is recognized for establishing a framework for the relationship between loan volume and economic development. By directing the finances of financial intermediaries to initiatives involving technological advancements, Schumpeter (1912) predicted that economic development would be enhanced (Becsi & Wang, 1997: 51). With this statement of Schumpeter, it is concluded that a well-functioning economic system increases economic growth because it increases savings and investments in the economy and encourages entrepreneurs to the innovation process. Later, Gurley & Shaw (1955) added the financial development process to Schumpeter's views. According to Robinson (1952), the link between economic and financial development expansion might be seen entirely differently. Patrick (1966) was inspired by Robinson's ideas and established demand- and supply-following theories. He looked at the relationship between financial development and economic growth from a different perspective than Robinson had before. The link among financial development and economic growth has been a source of debate for quite some time now.

Using data from 80 nations between 1960 and 1989, King and Levine (1993) performed a panel regression study on the money supply, bank loans, and GDP variables. The researchers concluded that the expansion of financial markets had a favorable impact on economic growth and credit availability. Luintel and Khan (1999) 10 countries (1951-1995) Panel VAR model Total bank deposits and GDP A bidirectional causal relationship has been identified between the two variables. Kar and Pentecost (2000) Turkey (1963-1995) Analysis of causation Volume of domestic loans and economy development A one-way correlation was found between growth and financial development. Arestis et al. (2001) 5 countries (1968:Q2-1997:Q4) Causation and cointegration tests GDP and bank loans Financial development has been shown to boost economic growth, according to researchers. Jalilian and Kirkpatrick (2002) found that 42 nations were included in their study (26 developing, 16 developed countries). The study of regression panels GDP and bank loans Economic growth is increased by 0.4% for every 1 percent improvement in financial development, according to the study's findings. Shan and Jianhong are a couple (2006), and the People's Republic of China is a country in East Asia (1978-2001). According to the results of the VAR study, bank loans, financial development, and economic growth all have a bidirectional causal influence on the economy. According to Akinlo and Egbetunde (2010), several countries in Sub-Saharan Africa were classified as in need of help (1980-2005). Data from a panel is being analyzed. The link between bank lending and the economy has demonstrated that the development

of financial markets helps economic growth, consistent with previous findings. Ceylan and Durkaya are a couple from Turkey (2010). Turkey is a nation with a lengthy history of civil wars and revolutions (1998-2008). The relationship between the amount of domestic credit and the economic growth rate is shown by a one-way causal relationship between economic growth and loan volume. Türedi and Berber are two languages spoken in Morocco (2010). Turkey is a country with a long history of conflict (1970-2007). Cointegration and causality tests are performed. The amount of domestic credit, the ratio of international trade to GDP, and economic growth are all critical indicators. It has been shown that there is a unidirectional causal link between financial development and economic growth. The characters' names are Özcan and Ari (2011). Turkey is a country with a long history of conflict (1998-2009). Özcan and Ari (2011) Turkey (1998-2009) Causality analysis Domestic credit volume and real GDP A unidirectional causal relationship from economic growth to financial development has been determined. Tuna and Bektaş (2013) Turkey (1998-2012) Cointegration and causality test Domestic credit volume and GDP No causal relationship was determined between the two variables. Vurur and Özen (2013) Turkey (1998:Q1-2012:Q1) Causality analysis Deposits, loans and economic growth Increases in deposit volume increase economic growth and loan amount. Alshammary (2014) is a Saudi Arabian author (1993-2009). VAR analysis is a kind of statistical analysis. Money supply, bank loans, and gross domestic product Historically, there has been a strong and positive correlation among financial development and growth. Göçer and colleagues (2015) Turkey (2000:Q1-2012:Q4) Test of co-integration in structural breach Credit volume and national income are two important variables to consider. Economic growth is increased by 0.28 percentage points for every one percent increase in loan volume. Turkey, according to Çeştepe and Yıldırım (2016) (1986:Q1-2015:Q3) Analysis of causation, Bank loans, money supply, and real GDP are all indicators of economic growth. It was discovered that there is a bidirectional connection among financial development and growth. According to Turgut and Ertay (2016) (2003:Q1-2013:Q4), Turkey, Analysis of causation Bank loans and the gross domestic product. It has been shown that there is a one-way causal link between bank loans and economic development. Umit (2016) is a Turkish author (1989-2014). Cointegration and causality tests are performed. Trade openness, loan volume, and economic development are critical factors to consider. It was discovered that there is a bidirectional causal link between loan volume and economic development. In Turkey (1998-2014), Karamelikli and Keskingöz (2017) conducted a causality analysis among Bank loans and the gross domestic product. It was discovered that there is a bidirectional causal link between loan volume and economic development. Pehlivan and colleagues (2017) Turkey (2002:Q1-2015:Q4) Cointegration and causality tests are performed. Bank loans and the gross domestic product The existence of a bidirectional causal link among bank loans and GDP has been shown. The findings of 12 separate investigations conducted in Turkey are presented. In their respective studies, Kar and Pentecost (2000), Ceylan and Durkaya (2010), and Ozcan and Ari (2011) discovered a one-way causal relationship between economic growth and financial development in Turkey. They tried to argue that the demand-following hypothesis is correct for Turkey in their respective findings. Several researchers, including Türedi and Berber (2010), Vurur and Zen (2013), as well as Turgut and Erday (2016), discovered unidirectional causation extending from financial development to economic growth in Turkey. They concluded that the supply-followed theory is genuine. In Turkey, however, researchers such as Göçer et al. (2015), Cestepe and Yıldırım (2016), Ümit (2016), Karamelikli, and Keskingöz (2017), and Pehlivan et al. (2017) discovered bidirectional causation between financial development and economic growth in the country. In the most recent evaluation of the literature, Tuna and Bektaş (2013) were unable to identify any causal association between the two variables in their investigation and came to the same conclusion that Lucas did. In investigations completed for various nation groupings, researchers came up with various conclusions. Several studies, like those by Arestis et al. (2001), Jalilian & Kirkpatrick (2002), and Akinlo and Egbetunde (2010), discovered unidirectional causation going from development to economic growth, indicating that the supply-followed theory was correct.

Bitcoin has been one of the assets that has attracted the attention of investors and discussed since it was first introduced by Nakamoto (2008). Because of this, experts have given a lot of attention to the connections between bitcoin and other financial assets. Briere et al. (2015), Dyhrberg (2016a, 2016b), Baur et al. (2018), Samah et al. (2018), Bouri et al. (2018), Guesmi et al., (2019), Klein et al. (2018), Selmi et al. (2018), Symitsi and Chalvatzis (2019), Bouri et al. (2020), Zhang and He, (2021), Yu et al. (2022), Chancharat and Butda, (2021), Moussa et al., (2021) and other authors have focused on the relationships between bitcoin and various financial assets to examine whether bitcoin can provide any diversification advantage. According to their findings, studies looking into the connection between Bitcoin and gold are categorized into various groups. According to the first section, there are considerable similarities between the two financial assets' hedging and safe-haven characteristics as well as their abilities to serve as a medium of exchange, a store of value, and a unit of account. Dyhrberg (2016b); Selmi et al. (2018); Shahzad et al. (2019) and Bouoiyour et al. (2019) provided substantial evidence of the common features between these two entities. These studies' findings lend credence to the notion that Bitcoin reduces overall risk and can be used to

Table 1a: Unit root test results table (augmented Dickey-Fuller)

	At level			
	BRENT	**WTI**	**NG**	**BTC**
With constant				
t-statistic	−0.6621	−0.5650	−1.0612	−1.0348
Probability	0.8506	0.8725	0.7287	0.7385
	n0	n0	n0	n0
With constant and trend				
t-statistic	−4.7183	−4.8021	−2.4032	−2.2263
Probability	0.0012	0.0009	0.3758	0.4698
	***	***	n0	n0
Without constant and trend				
t-statistic	0.1849	0.3016	0.2009	0.3013
Probability	0.7379	0.7712	0.7426	0.7710
	n0	n0	n0	n0

* Significant at the 10%; ** Significant at the 5%; *** Significant at the 1% and (no) Not Significant. NG: Natural gas, BTC: Bitcoin, BRENT: Brent oil, sweet oil from the North Sea, WTI: West Texas Intermediate Crude Oil

Graph 1: Unit root test results

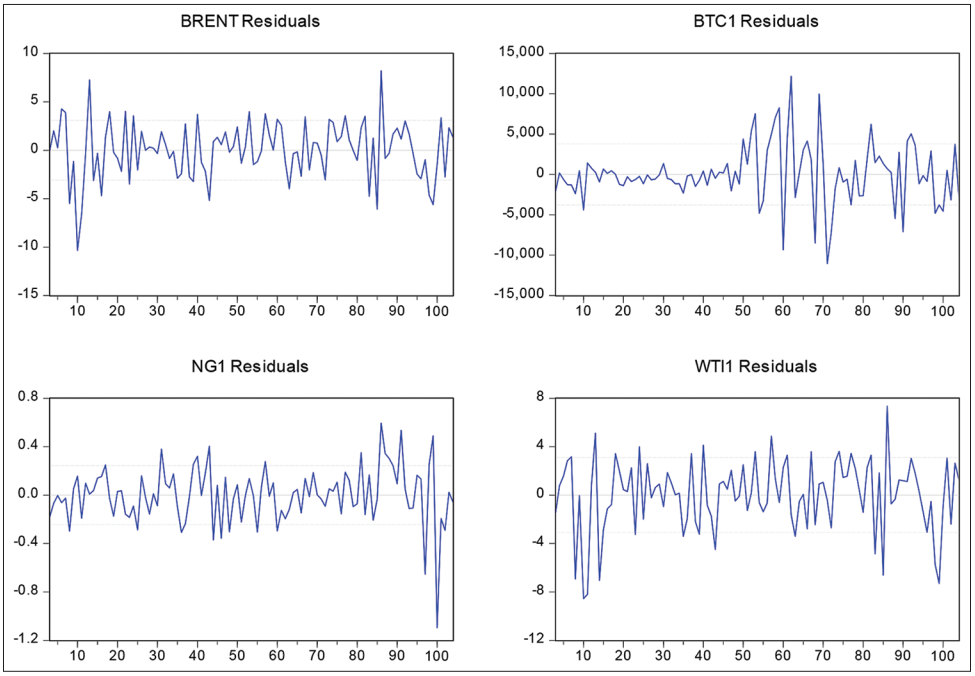

Table 1b: Unit root test results (augmented Dickey–Fuller)

	At first difference			
	d (BRENT)	d (WTI)	d (NG)	d (BTC)
With constant				
t-statistic	−8.6251	−7.9304	−10.5808	−7.7333
Probability	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***
With constant and trend				
t-statistic	−8.7580	−8.0205	−10.5272	−7.6972
Probability	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***
Without constant and trend				
t-statistic	−8.6564	−7.9523	−10.5795	−7.6568
Probability	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***

*Significant at the 10%, **Significant at the 5%, ***Significant at the 1% and (no) Not significant. NG: Natural gas, BTC: Bitcoin, BRENT: Brent oil, sweet oil from the North Sea, WTI: West Texas Intermediate Crude Oil

Table 2: Johansen cointegration test results for brent petrol and bitcoin

Trace test	Eigen value statistic	Trace test	5% critical value	Probability
None*	0.162568	30.32058	15.49471	0.0002
At most 1*	0.123640	12.93384	3.841466	0.0003
Maximum Eigen value test	**Eigen value statistic**	**Maximum Eigen test**	**5% critical value**	**Probability**
None*	0.162568	17.38675	14.26460	0.0155
At most 1*	0.123640	12.93384	3.841466	0.0003

* denotes rejection of the hypothesis at the 0.05 level

Table 3: Johansen cointegration test results for crude oil and bitcoin

Trace test	Eigen value statistic	Trace test	5% critical value	Probability
None*	0.169509	31.80408	15.49471	0.0001
At most 1*	0.129592	13.60173	3.841466	0.0002
Maximum Eigen value test	**Eigen value statistic**	**Maximum Eigen test**	**5% critical value**	**Probability**
None*	0.169509	18.20235	14.26460	0.0113
At most 1*	0.129592	13.60173	3.841466	0.0002

* denotes rejection of the hypothesis at the 0.05 level

Table 4: Johansen cointegration test results for natural gas and bitcoin

Trace test	Eigen value statistic	Trace test	5% critical value	Probability
None*	0.158891	26.68965	15.49471	0.0007
At most 1*	0.094537	9.732315	3.841466	0.0018
Maximum Eigen value test	**Eigen value statistic**	**Maximum Eigen test**	**5% critical value**	**Probability**
None*	0.158891	16.95733	14.26460	0.0183
At most 1*	0.094537	9.732315	3.841466	0.0018

* denotes rejection of the hypothesis at the 0.05 level

hedge portfolios. Panagiotidis et al. (2018) argues in his study that Bitcoin is positively and strongly affected by gold. The results also show that Bitcoin is positively impacted by oil, currency rates, and interest rates. On the other hand, evidence suggests that uncertainty lowers Bitcoin returns. Additionally, information requests produce the anticipated outcomes, whereas exchanges produce inconsistent outcomes.

Bouoiyour et al. (2019) use a dynamic Markov swapping copula methodology and two risk scenarios to test the complementarity or interchangeability between Bitcoin and gold. The scenarios cover

Graph 2: Unit root test results

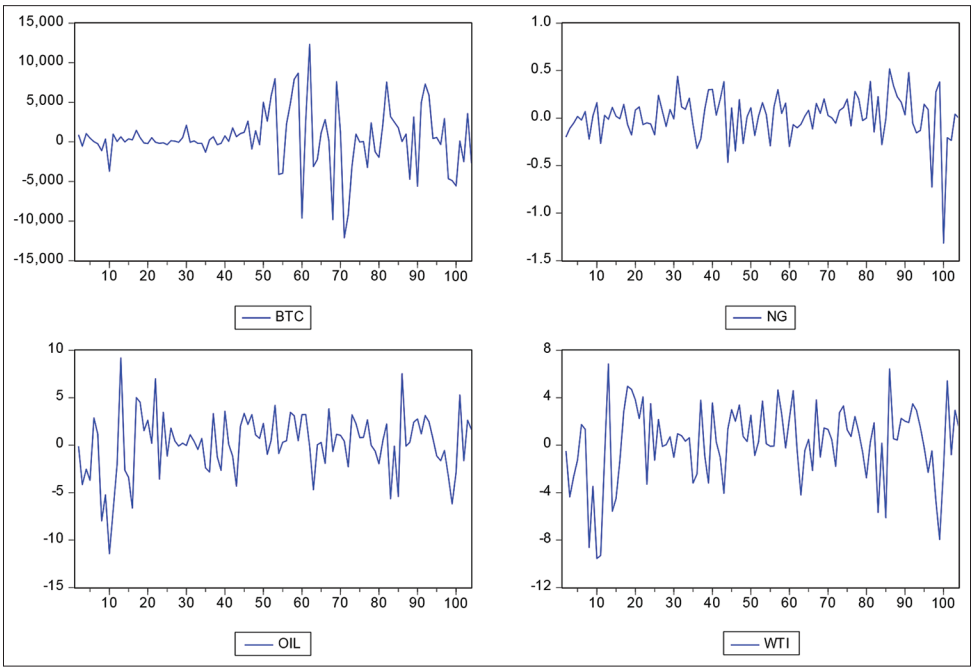

Table 5: FMOLS and DOLS test results

Variables	BTCit = α + β1 BRENTit + εit BRENTit = α + β1 BTCit + εit BTCit = α + β1 WTIit + εit WTIit = α + β1 BTCit + εit BTCit = α + β1 NGit + εit NGit = α + β1 BTCit + εit			
	Katsayı	**SE**	***t*-istatistiği**	**Olasılık Değeri**
FMOLS BTC→BRENT	257.6461	115.7700	2.225499	0.0283
FMOLS BTC→WTI	264.0503	118.4994	2.228285	0.0281
FMOLS BTC→NG	1828.956	1623.013	1.126889	0.2625
FMOLS BRENT→BTC	0.000176	9.78E-05	1.795778	0.0755
FMOLS WTI→BTC	0.000180	0.000104	1.726847	0.0873
FMOLS NG→BTC	6.55E-06	6.32E-06	1.036640	0.3024
DOLS BTC→BRENT	298.6821	212.9151	1.402822	0.1639
DOLS BTC→WTI	284.5795	203.6038	1.397712	0.1655
DOLS BTC→NG	2745.640	3451.817	0.795419	0.4284
DOLS BRENT→BTC	0.000212	0.000190	1.113005	0.2685
DOLS WTI→BTC	0.000209	0.000203	1.026160	0.3074
DOLS NG→BTC	1.06E-05	1.26E-05	0.838600	0.4038

BTC: Bitcoin, NG: Natural gas, SE: Standard error, FMLOS: Fully Modified Least Squares, DOLS: Dynamic Least Squares

low-risk and high-risk regimes. The time frame under consideration begins on July 18, 2010, and ends on March 31, 2018. Econometric findings show a positive and significant link between Bitcoin and gold returns, indicating that they are probably complementary. For investors in digital assets, gold has been found to have benefits related to diversification, but Bitcoin can transfer value more efficiently. Dyhrberg (2016a) explores whether Bitcoin exhibits similar hedging capabilities as gold and whether it is suitable for use as a medium of exchange. The asymmetric Generalized Autoregressive Conditional Variability (GARCH) specification was adopted for the estimates and the review covers the period from 19 July 2010 to 22 May 2015. The econometric findings show that Bitcoin can be used as a hedging asset and is mostly appropriate for economic units that avoid hazardous investments. To be more explicit, Bitcoin shows volatility-related clustering phenomena together with limited convergence to long-term equilibrium. Similar to what is true for gold, there has also been evidence of significant volatility persistence. It has been discovered that the demand for Bitcoin as a means of exchange has a greater impact on its price than shocks. Overall, Bitcoin is a relatively secure asset that, on the scale of pure store-of-value features, can be compared to both gold and the US dollar as means of exchange.

Panagiotidis et al. (2019) examined the effects of shocks on Bitcoin returns from factors such as stock market returns, exchange rates, gold and oil returns, Federal Reserve and European Central Bank rates, and internet trends. The econometric findings show that gold shocks have a favorable impact on Bitcoin returns, but these

conclusions have been found to be inconsistent over a range of time periods. Additionally, it has been discovered that Bitcoin reacts to shocks in the stock market and oil prices, as well as macroeconomic and currency market shocks, but not as strongly as in the past.

Jin et al. (2021) focused on investigating whether Bitcoin, gold or crude oil provides better insight into the volatility of market values of a system of hedging assets. Multivariate GARCH (MV-GARCH) in the study specifications and information sharing (IS) analysis, as well as the multifractal intermittent cross-correlation analysis (MF-DCCA) framework are used. The analyzed period covers the period from May 10, 2013 to September 07, 2018. Empirical results clearly demonstrate the existence of relatively flimsy cross-correlations among Bitcoin, gold, and crude oil. It also shows that Bitcoin is more susceptible to fluctuations in the price of commodities like gold and crude oil. This is also the reason why these markets have disseminated Bitcoin significantly. It is important to note that the dynamic correlation between Bitcoin and gold has been nearly zero for the whole time period under consideration. Overall, gold seems to be a more significant factor in Bitcoin's ability to hedge than Bitcoin itself, and vice versa, information about gold has a greater impact on Bitcoin. In general, it is asserted that gold acts as a better stress hedge than Bitcoin. While there is a wealth of information on bitcoin and gold, there is less research on the spread and connections of bitcoin and crude oil, or bitcoin, gold, and crude oil. Okorie and Lin (2020) investigated the volatility relationship between crude oil and 10 cryptocurrencies using VAR-MGARCH-GJR-BEKK techniques and Wald tests. Their results showed that there is both bidirectional and unidirectional spread from the crude oil market to the cryptocurrency markets. Zeng et al., (2019) also included the dollar rate in their studies that analyzed the relationships between bitcoin, gold and crude oil. The period of the study covers the dates from May 01, 2013 to February 15, 2019. Their findings demonstrated that while there are spreads for returns in the short run, there is a long-run spread across volatility over the specified period. Gkillas et al., (2020) analyzed the spillover effect for higher dispersion moments such as realized volatility, realized skewness and realized kurtosis for bitcoin, gold and crude oil through Granger causality and generalized impulse response analyses. The results of their examination of the high-frequency data showed that they were related to jump components, skewness, and kurtosis in addition to the realized volatility level.

Syzdykova (2021) This research examines the relationship between bitcoin and crude oil and gold prices. Using 128 weeks of data for the period 2019-August 2021, the Vector Autoregressive Model was used to study the relationship between Bitcoin, crude oil, and gold prices. The Granger causality test was performed to establish the direction of the association between the variables.

3. DATA SET, ECONOMETRİC METHODS AND RESULTS

In this section, the data set and econometric method will be introduced and empirical findings will be given.

3.1. Data Set and Econometric Method

In this study, the effect of Energy resources (BRENT, WTI and NG) prices on Bitcoin was examined using weekly data for the period between January 05, 2020-December 26, 2021. All of the Brent oil, crude oil, natural gas and Bitcoin data used in the study were obtained from the address "https://www.investing.com/." The model estimated in this study is shown in equations (1), (2), (3), (4), (5) and (6): $BTCit = \alpha + \beta 1\ BRENTit + \varepsilon it$ (1), $BRENTit = \alpha + \beta 1\ BTCit + \varepsilon it$ (2), $BTCit = \alpha + \beta 1\ WTIit + \varepsilon it$ (3), $WTIit = \alpha + \beta 1\ BTCit + \varepsilon it$ (4), $BTCit = \alpha + \beta 1\ NGit + \varepsilon it$ (5) and $NGit = \alpha + \beta 1\ BTCit + \varepsilon it$ (6) The dependent variable of the model also has independent variables.

3.2. Evaluation of Econometric Methods and Findings

The stationarity analysis of the time series examined in this study was performed using the "Extended Dickey-Fuller (ADF)" unit root test developed by Dickey & Fuller (1981). The following equation is used in the analysis in question.

$$\Delta Y = \beta 1 + \beta 2t + \Delta yT\text{-}1 + \sum k\ i=1\ \alpha i\ \Delta\ Yt\text{-}1 + \varepsilon t \quad (3)$$

In this equation, ΔY is the 1st difference of the variable tested to be stationary, t is the general trend variable, and $\Delta Yt\text{-}1$ is the lagged difference terms. The reason for adding lagged difference terms is to ensure that the error terms are consecutively independent. In order for the ADF test to give a healthy result, there should be no sequential dependency problem in the estimated model. The lag length, expressed as k in the equation, is determined using Akaike or Schwarz information criteria (Gul and Ekinci, 2006: 95). Since it is necessary for the series used to be stationary to perform the cointegration test, the unit root test was performed. Thus, whether the variables are stationary or not will be analyzed. The unit root test results of the variables included in the analysis are given in Table 1.

Table 1a. The variables included in the analysis are not stationary at the level. and it can be seen in Graph 1. It was necessary to make the series stationary by taking the first difference in these series and eliminating the unit root problem in the series. As seen in Table 1b and Graph 2, it is seen that the obtained data are stationary at the 1% significance level at the first difference. When the Enhanced Dickey-Fuller test is examined for Brent oil, crude oil, natural gas and bitcoin series, it is seen that the series are stationary at the first level because both the probability values are "0" and the critical values are absolutely smaller than the ADF test statistics. After the series included in the analysis are tested to be stationary, cointegration analysis is required to determine whether there is a long-term relationship at the next stage. Cointegration analysis is a test that considers whether multiple variables move with each other. If there is cointegration or cointegration in the result of the test in question (if they act together in the long run), the cause-effect relationship is confirmed. Cointegration analysis is a test developed to examine the relationship between two non-stationary time series. If two or more time series are not stationary but their linear combinations are stationary, it can be said that these series are cointegrated (Bal, 2012: 14). The Johansen Cointegration test was used to test the existence of a long-term relationship between the variables. In Table 2, the results of the Johansen Cointegration test between brent oil and bitcoin are given.

When Table 2 is examined, it is seen that there is a cointegration equation between brent oil and bitcoin variables at 1% and 5% significance levels for both Trace and Maximum Eagen values. According to this result, it shows that there is a long-term relationship between brent oil and bitcoin.

As seen in Table 3, it is seen that there is a cointegration equation between the crude oil and bitcoin variables at 1% significance level for Trace values, 1% and 5% significance level for Maximum Eagen value. According to the said result, it is possible to conclude that there is a long-term relationship between crude oil and bitcoin.

When Table 4 is examined, a cointegrated relationship between natural gas and bitcoin is seen at 1% according to Trace value, 1% and 5% according to Maximum Eagen value. This result shows that there is a long-term relationship between natural gas and bitcoin. Since there is a cointegration relationship for the 3 models discussed in the study, FMOLS and DOLS test results are given in Table 5 for the estimation of the long-term coefficients.

When the FMOLS and DOLS test results in Table 5 are examined, the positive coefficients of brent oil, crude oil, natural gas and Bitcoin indicate that there is a positive interaction between the variables. According to FMOLS test, 1% change in Bitcoin price increases Brent oil by 257.6461% (probability values according to DOLS do not confirm the effect). According to the FMOLS test, 1% Bitcoin in brent oil price increases by 0.000176% (probability values according to DOLS do not confirm the effect). Likewise, when we look at crude oil, according to FMOLS test, 1% Bitcoin in crude oil price increases 0.000180% (the probability values according to DOLS do not confirm the effect). When we look at the changes in the Bitcoin price, according to the FOLMS test, a 1% increase in the Bitcoin price increases the crude oil by 264.0503% (the probability values according to DOLS do not confirm the effect).

4. CONCLUSİON

In this research, the effect of brent oil, crude oil and natural gas prices on bitcoin was analyzed. In the study, FMOLS and DOLS tests, which show the coefficient of cointegration, causality and relationship, were performed for the data containing the weekly time series for the period January 05, 2020-December 26, 2021.

According to the FMOLS test, 1% Bitcoin in brent oil price increases by 0.000176% (probability values according to DOLS do not confirm the effect). Likewise, when we look at crude oil, according to FMOLS test, 1% Bitcoin in crude oil price increases 0.000180% (the probability values according to DOLS do not confirm the effect). When we look at the changes in the Bitcoin price, according to the DOLS test, a 1% increase in the Bitcoin price increases the Brent oil by 77.86132% (the probability values according to FMOLS do not confirm the effect).

The result of this study shows that bitcoin investors should carefully follow the price changes of crude oil and gold. Although the results provide some valuable information regarding the relationship between bitcoin, crude oil and gold prices, it may be useful to analyze other periods and compare the results with the findings in this study. An extended analysis will help us see whether these results are specific to the periods used or if they can be generalized. In addition, investors should not forget that the dynamics in financial markets may change, even if the findings of this study are generalized, as financial markets are affected by many factors.

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