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Testing Safe Haven Assets for Türkiye in the Covid-19 Period[1]

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Güvenli Liman Varlıkların Covid-19 Döneminde Türkiye İçin Test Edilmesi	**Testing Safe Haven Assets for Türkiye in the Covid-19 Period**
Öz	**Abstract**
Bu çalışmanın amacı krizler döneminde güvenli liman olarak bilinen varlıkların hisse senedi yatırımcıları açısından Covid-19 pandemi döneminde Türkiye'de bu vasıflarını yerine getirip getirmediklerini incelemektir. GJR-GARCH (1,1) hata terimleri varsayımı altında elde edilen sonuçlara göre hiçbir varlık, hisse senedi piyasası karşısında güvenli liman özelliği gösterememiştir. Fakat BİST100 endeksi %5 değer kaybettiği dönemlerde Ethereum, gümüş ve devlet tahvili güçlü düzeyde, ABD doları ve Euro ise zayıf düzeyde güvenli liman özelliği göstermiştir. Yine BİST100 %2,5 değer kaybettiğinde Bitcoin, altın ve DJIMTR zayıf düzeyde bu özelliği gösterirken, %1'lik değer kayıplarında ise altın ve devlet tahvili güçlü düzeyde, Bitcoin, Ethereum, gümüş, ABD doları ve Euro zayıf düzeyde güvenli liman özelliği göstermişlerdir.	The aim of this study is to examine whether the assets known as safe-haven assets during crises fulfill these qualities for equity investors in Turkey during the Covid-19 pandemic. According to the results obtained under the assumption of GJR-GARCH (1,1) error terms, no asset has shown safe-haven characteristics against the stock market. However, when the BIST100 index depreciates by 5%, Ethereum, silver and Government Bonds show strong safe-haven characteristics, US dollar and Euro show weak safe-haven characteristics. When the BIST100 index depreciates by 2.5%, Bitcoin, gold and DJIMTR show weak safe haven asset characteristics. If BIST100 depreciates by 1%, gold and Government Bonds show strong safe-haven characteristics, and Bitcoin, Ethereum, Silver, the US dollar and Euro show weak safe-haven characteristics.
Anahtar Kelimeler: Güvenli Liman Varlıklar, Covid-19, BİST100 Endeksi, GARCH Analizi	**Keywords:** Safe Haven Assets, Covid-19, BIST100 Index, GARCH Analysis
JEL Kodları: G01, G11, G15	**JEL Codes:** G01, G11, G15

Araştırma ve Yayın Etiği Beyanı	Bu çalışma bilimsel araştırma ve yayın etiği kurallarına uygun olarak hazırlanmıştır.
Yazarların Makaleye Olan Katkıları	Yazar 1'in makaleye katkısı %60 Yazar 2'nin makaleye katkısı %40'dir.
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1. Introduction

The spread of the Covid-19 pandemic has created a strong contagion effect in financial markets around the world. At the same time, it is still not possible to calculate the social and economic consequences of this pandemic. This crisis, which was initially health-related, gradually turned into an economic crisis. The increase in the number of cases and deaths all over the world has led most governments to take a number of strict measures. Some of these include quarantine measures, travel restrictions and telecommuting. While these measures have prevented the virus from spreading further, they have also caused great damage to the economy. In addition to disrupting world trade and supply chains, it also created serious panic in financial markets. In this process, with production coming to a standstill and a serious decline in demand, central banks started to implement monetary policies harshly to prevent a global recession.

While some experts compare the economic crisis caused by the Covid-19 pandemic to the 2008 global financial crisis, others compare it to war, terrorist attacks, natural disasters and other pandemics. Others refer to this process as an unprecedented situation called the "Black Swan" (Yarovaya et al., 2022: 1). The term "Black Swan" coined by Taleb (2007) refers to the impact of unexpected or unprecedented events on financial markets.

Human beings have always faced crises. Crises can sometimes arise from many events such as health, as in Covid-19, and sometimes from political or social events. Crises always have an impact on the economy and, consequently on financial markets. In terms of the stock market, financial markets crash during a crisis and the stock market suffers accordingly. When there is a crisis situation in the economy, investors, especially stock investors, shift their investments from risky assets to risk-free assets to protect themselves from negative situations and seek ways to minimize negative conditions. Generally, diversification and hedging strategies that investors have made in their portfolios fail to hedge risk during crises. Investors invest in some financial assets in order to be minimally affected by crisis periods and sometimes to turn crisis periods into opportunities. These investment assets are called safe haven assets in the finance literature.

Safe-haven assets are defined as assets that are not related or negatively related to another asset or portfolio during crisis periods. Stock investors compensate for losses in stocks during the crisis by investing in safe-haven assets. Because there is either no relationship or a negative relationship between these assets and the stock market. This means that while there are losses in the stock market, these assets either do not experience any losses or gain value unlike the stock market.

The purpose of this study is to examine whether financial assets known as safe havens really show the characteristics of safe haven assets during the Covid-19 pandemic period for stock investors. Answers were sought to the questions of whether these assets are safe haven assets against the stock market in times of crisis or just provide hedging or diversification in normal periods. In the study, the Covid-19 period was considered as the crisis period. The safe haven assets used in the study are gold and silver from precious metals, the US dollar and Euro from currencies, Government bonds from Government domestic debt securities, Bitcoin and Etherum from cryptocurrencies, and Dow Jones Islamic Markets Turkey Index from participation indices. The BIST 100 index was used to represent the stock market in Turkey.

In the study, whether safe-haven assets have a safe-haven characteristic against the stock market has been examined by GARCH analysis. As it is known, due to the increase in the possibilities of investors to invest in different assets simultaneously, it both accelerates the fund pass-through between assets and causes positive or negative shocks in any investment instrument to affect other assets. Especially in times of crisis, escapes from risky assets to risk-free assets increase this volatility interaction. The development of volatility forecasting models based on high-frequency data has led to great advances in measuring the volatility of financial assets. In this respect, the GARCH model, which is one of the best methods to model the volatility interaction, was used in the study.

2. Conceptual Framework

Due to the nature of science, a concept can have different definitions. The concept of safe haven is one of them. In the early definitions, attention was drawn to the fact that a safe-haven asset usually moves in the opposite direction from another asset. For example, Gulko (2002) defined a safe haven asset as an asset that has a negative relationship with stock returns during the turmoil in the financial markets. Similarly, Hartmann et al. (2004) drew attention to the possibility of a safe-haven asset rallying when there is a crisis in the stock market, while Ranaldo and Söderlind (2007) stated that when there is a significant loss in the portfolio, the safe-haven asset does not lose and has a negative correlation with the portfolio. Kaul and Sapp (2006), on the other hand, make a more concise definition and say that a safe-haven asset is an asset where money is parked and investors buy during uncertainty.

Baur and Lucey (2010) revealed the differences between a safe-haven asset and a hedge asset. Accordingly, the hedge asset; “An asset that, on average, is uncorrelated or negatively correlated with the portfolio or any other asset”. The hedge asset does not have any hedging feature during the turbulent times of the market. During these periods, these assets usually have positive correlations with the portfolio or another asset. To summarize, while these assets provide protection against possible risks in normal periods, they cannot provide this protection against risks in crisis periods. The safe haven asset is; “An asset that is unrelated or negatively correlated with another asset or portfolio in times of market turbulence or crisis”. Whether an asset is a safe haven depends on its performance during times of economic crisis or market turbulence. At such times, these assets differ from the portfolio in which they are included, while the portfolio is losing, these assets are either not affected by the losses at all, or vice versa. In normal times or when the market is booming, the relationship between the portfolio and the safe haven can be positive.

3. Literature Review

Gold is undoubtedly one of the assets known as a safe haven. While the research on gold initially focused more on the efficiency of the gold market or gold as an investment instrument (Sherman, 1982; Jaffe, 1989; Hillier et al., 2006), in later periods, studies on gold's hedging feature against both exchange rate risk and inflation risk (Capie et al., 2005; McCown and Zimmerman, 2006; Van Hoangh et al., 2016) have gained weight.

Studies on the safe-haven properties of gold are quite widespread. In particular, gold has been shown to be a safe haven asset against different stock market indices of different countries (Coudert and Raymond, 2011; Baur and Lucey, 2010; Ciner et al., 2013; Klein, 2017; Beckmann et al., 2014, Shahzad, 2020).

Similarly, studies conducted in Turkey have mostly focused on gold as a safe haven. For example, Nagayev and Dinç (2018) examined the safe-haven and hedging properties of gold against the general index and participation index. Using the Wavelet Coherence technique, this study revealed that gold has both hedging and safe-haven properties with zero or very limited correlation. Similarly, Tomak (2013) found that gold is a hedge for equities on average and also a safe haven for the 5% and 2.5% extreme negative stock return brackets. Gürgen and Ünalmış (2014) test both the safe haven and hedging properties of gold for emerging economies and find that gold is a strong safe haven against stock markets in nine countries including Turkey. However, in the same study, gold was a weak hedging asset in Turkey between 2008 and 2013. Gencer and Musoğlu (2014) show that gold acts as a hedge for stocks (BIST100 index) and bonds (10-year maturity) but is not a safe haven. Akkoç and Civcir (2019) showed that the dynamic conditional correlation of the gold price with the BIST100 is significantly high. Therefore, gold cannot be considered a safe haven against volatility risk.

Research on silver, which is highly preferred both in industry and trade, has increased in recent years. When the studies on the safe-haven asset feature of silver in the literature are analyzed, it is seen that silver has shown safe-haven features in some crisis periods, while it has not shown this feature in other periods. In most of the studies, it is stated that silver exhibits both hedge and safe haven asset characteristics (Lucey and Li, 2015; Li and Lucey, 2017; Bouoıyour, 2019; Hillier et al., 2006; Sakemoto, 2017; Kliber, 2022). However, some studies have also pointed out that silver does not exhibit safe-haven characteristics. Klein (2017), who investigated the relationship between developed markets and precious metals, stated that silver exhibited safe-haven characteristics, but this feature weakened after 2013.

Studies on the safe haven feature of the US dollar, which attracts attention as a safe-haven asset, are abundant in the literature. In most of the studies, it is seen that the dollar fulfills its safe-haven characteristics (Kaul and Sapp, 2006; Wen and Cheng, 2018; Baur and McDermott, 2016; Liu et al., 2016). There are also studies that test the safe-haven property of the dollar against other currencies and gold. Grisse and Nitschka (2015) investigated the safe-haven property of the Swiss franc against different currencies. While the Swiss franc exhibited safe-haven properties against some currencies, it failed to do so against the US dollar. However, in the same study, they underline that the dollar is a weaker hedging instrument against global risks than the Swiss franc. In another study on the Swiss franc and the dollar, Chemma et al. (2020) found that the Swiss franc exhibited safe-haven characteristics both during the 2008 global financial crisis and the Covid-19 period, while the dollar exhibited this feature only during the 2008 global financial crisis. Grisse and Nitschka (2015) also find that the Swiss franc exhibits safe-haven characteristics against many currencies when global risk increases. They also find that the dollar, yen and sterling are weaker hedging instruments than the Swiss franc.

Studies on the Euro as a safe-haven asset are available in the literature (Scheiber and Stix, 2009; Todorova, 2020; Shahzad et al., 2021). However, there are also many crisis periods in which the Euro did not fulfill this characteristic. Studies (Cho and Han, 2020; Ranaldo and Soderlind, 2010; Lee, 2017) have shown that the Euro does not exhibit safe-haven characteristics. In another study, Beckmann and Scheiber (2012) examined the safe-haven role of the Euro by surveying households in European countries and found that households in European countries trust the Euro more than local currencies. However, they also stated that this confidence decreased with the 2008 global financial crisis.

The debates on Bitcoin, which first emerged after the 2008 financial crisis and whose reason for emergence was to be an alternative to financial institutions that caused economic crises, are still ongoing. One of the issues under discussion is whether Bitcoin, which emerged as a "Safe Haven Asset" in a sense, fulfills the function of money in the classical sense. One of the focal points of the debate is whether Bitcoin is a currency, an investment instrument or a speculative asset. Yermack (2015) argues that Bitcoin fails to fulfill the functions of money as a unit of account, store of value and medium of exchange. Baur et al. (2018) argue that Bitcoin is a speculative investment instrument, while Foley et al. (2018) argue that it is an asset where illegal activities take place.

There are many studies showing that cryptocurrencies are safe havens during crises (Stensas et al., 2019; Chan et al., 2018; Dyherberg, Urquhart and Zhang, 2019, Guesmi et al., 2019). In some studies, the opposite is the case and it has been pointed out that cryptocurrencies are not a safe haven and are also very volatile (Bouri et al., 2017; Smales, 2019; Conlon and McGee, 2020).

The history of cryptocurrencies is not very old and the Covid-19 pandemic, the first global crisis since its emergence, provided an opportunity to test these assets. With this pandemic, studies in this field have also gained weight. Cryptocurrencies, which have been tested as a safe haven against the stock market, have been shown to exhibit safe haven characteristics in some studies (Corbet et al., 2020; Mariana et al., 2020; Aysan et al., 2021), while some studies have shown that they do not exhibit this feature (Conlon and McGee, 2020; Dişli et al., 2021; Chemma et al., 2020; Raheem, 2021; Kasammany et al., 2022). Ustaoğlu (2022) tested the safe-haven and hedging properties of Bitcoin and Ethereum against emerging stock market indices during the Covid-19 period. According to the results, Bitcoin showed strong safe-haven properties only against the Malaysian stock market index. It showed weak safe-haven properties against fourteen country indices. Ethereum, on the other hand, did not show strong safe-haven properties against any stock market index, while it showed weak safe-haven properties against twelve country indices. Both cryptocurrencies were neither weak nor strong safe haven assets against the stock market index in Turkey. In another study conducted for Turkey during the Covid-19 period, Serttaş (2022) tested whether the cryptocurrencies BTC, ETH, XRP and LTC exhibit safe-haven characteristics against the BIST. According to the results, Litecoin emerged as a weak safe-haven for the whole sample, while Bitcoin and Etherium were weak hedges in the pre-Covid-19 period, and Etherium was a weak safe-haven during the Covid-19 pandemic.

Research on the safe-haven properties of participation indices is very limited and the results may differ from one another. For example, Hkiri et al. (2017) tested the safe-haven properties of nine regional stock indices against traditional indices. According to their results, participation indices exhibited both hedge and safe-haven asset characteristics. Akhtar and Jahromi (2017) examined the situation of participation and traditional stocks and bonds during the 2008 global financial crisis. According to the findings, especially in the early stages of the crisis, stocks in the participation index positively diverged from conventional stocks and benefited their investors. The reason for this was that Islamic institutions had banned mortgages and derivatives. Finally, they concluded that although participation index stocks played a risk-reducing and stabilizing role during a crisis, they did not fulfill this role much during a global recession. At the onset of the pandemic, stock markets showed severe declines. At the peak of the decline, according to the S&P Dow Jones report, the Dow Jones

participation index performed very well in the first quarter of 2020 compared to traditional stock markets (Welling, 2020).

Habib and Stracca (2015) investigate the global safe haven assets and find that US short-term government securities are the best safe haven asset. In another study on US Treasury bonds, Krondahl and Lindahl (2012) argue that these instruments are an excellent safe haven compared to other assets. Robiyanto (2018) investigated the safe-haven characteristics of gold and bonds against the Indonesian and Malaysian money markets. According to their results, Indonesian and Malaysian government bonds are not safe haven assets. Kopyl and Lee (2016), on the other hand, seek an answer to the question of which investment instruments protect their investors during periods of financial instability and find that US Treasury bonds are a strong safe-haven asset during turbulent periods in the markets.

4. Methodology of the Research

4.1. Purpose and Scope of the Research

The aim of this study is to examine whether assets known as safe havens during crises fulfill these qualities for equity investors in Turkey during the Covid-19 pandemic. In this study, gold, silver, US dollar, Euro, Bitcoin, Ethereum, Government Domestic Debt Securities and Participation Index, which are the most widely accepted safe haven assets in the literature, are analyzed. The 5-year government bonds representing government bonds and the Dow Jones Islamic Markets Turkey index representing the participation index are used in the study. The safe-haven characteristics of these assets in the Covid-19 period are tested against the stock market. BIST100 index is used to represent the stock market.

The daily closing prices of the assets and the index between 02.01.2019 and 31.12.2022 are used in the study. As explained in the methodology section below, the start date of the dummy variable is 02.01.2020. Although the first coronavirus case in Turkey was observed on 11 March 2020, the date of 02.01.2020 was chosen as the date when the crisis started to show its effect since the international stress started to be experienced and the period in which the markets priced it started before this date.

4.2. Method of the Research

In the study, whether safe-haven assets have a safe-haven characteristics against the stock market has been examined by GARCH analysis. As it is known, due to the increase in the possibilities of investors to invest in different assets simultaneously, it both accelerates the fund pass-through between assets and causes positive or negative shocks in any investment instrument to affect other assets. Especially in times of crisis, escapes from risky assets to risk-free assets increase this volatility interaction. The development of volatility forecasting models based on high-frequency data has led to great advances in measuring the volatility of financial assets. One of the best models for measuring volatility is the GARCH model. The GARCH model takes into account more past period effects by incorporating a moving average structure into the ARCH model. The error term of the GARCH model depends on past error terms and past conditional variance values. Accordingly, it takes into account the past period error and conditional variance.

Whether the assets used in the study exhibit safe-haven characteristics against the stock market is revealed by the following models (Hasan et al., 2021; Baur and McDermott, 2010);

$$R_{it} = \alpha + b_t r_{stock} + \varepsilon_t \quad (1)$$

$$b_t = c_0 + c_1 D(COVID - 19) \quad (2)$$

$$\sigma_t^2 = \omega + \left(a + \gamma l_{t-1}\right)\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \quad (3)$$

The model in the first equation captures the relationship between safe haven asset returns and stock market returns. α and b are the estimated parameters while ε_t is the error term. The second equation is the equation with dummy variable. The third equation is the GJR-GARCH (1,1) model. The GJR-GARCH (1,1) model is suggested, based on the minimum Akaike information criterion (AIC) and Schwarz information criterion (SIC). All equations are estimated by maximum likelihood criteria. This model is constructed to capture the asymmetric effect in stock returns where bad news leads to higher volatility and good news leads to lower volatility. The effect of stock market volatility on safe haven assets is revealed with this model (Hasan et al., 2021).

The parameters in the equations are interpreted as follows. If the assets move with the stock market, all parameters (c_0, c_1) are positive, indicating that these assets do not meet the safe haven or hedge asset criteria. c_0 estimates the average hedge asset characteristic of all assets. If c_0 is negative and statistically significant, this indicates that the asset is a strong hedge asset in the selected period, while if it is not significant, it is a weak hedge asset. Similarly, the c_1 parameter estimates the safe-haven properties of assets during crisis periods. If the c_1 parameter is negative and statistically significant in the covid period, this indicates that the asset is a strong safe haven asset, if not significant, it is a weak safe haven asset.

In this study, another approach is used to test the hedging and safe-haven asset characteristics of these assets in the event of equity market downturn (Hasan et al., 2021). This model is as follows;

$$b_t = c_0 + c_1 D(r_{stock} q_5) + c_2 D(r_{stock} q_{2.5}) + c_3 D(r_{stock} q_1) \quad (4)$$

The dummy variables are represented by D, capturing extreme stock market turbulence, defined as follows;

$$D(r_{stock}\ \ q_x) = 1\ if\ r_{stock_i} < (r_{stock} q_x)$$

$$D(r_{stock}\ \ q_x) = 0\ if\ r_{stock_i} \geq (r_{stock} q_x)$$

The effect of the 1%, 2.5% and 5% downturn in the stock market during the entire selected period on the return of the selected safe haven asset has been examined. The equation is interpreted as follows: if the parameter c_0 is negative and significant, the tested asset is a strong hedge asset, and if it is not significant, it is a weak hedge asset. Similarly, if the parameters c_1, c_2 and c_3 are negative and significant, the asset is a strong safe-haven asset for 1%, 2.5% and 5% stock market downturn, and a weak safe-haven asset if not significant. Finally, equation is estimated by maximum likelihood method.

The data used in the study are time series and were obtained from the websites www.investing.com.tr, www.evds.gov.tr and www.tcmb.gov.tr. The data were analyzed with the 13th version of EViews package program.

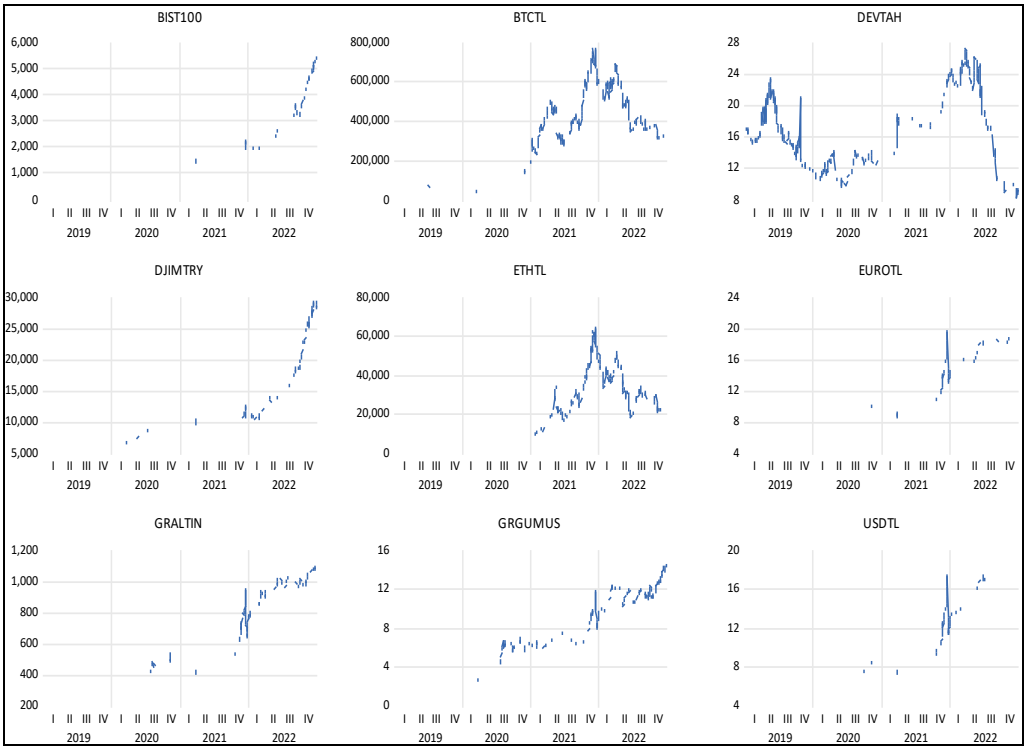
4.3. Findings of the Research

The graphs and tables of the data of the safe haven assets used in the study and the results regarding the safe haven feature of the assets are presented below.

4.3.1. Findings on Data

Both the price charts and the natural logarithm return charts of the safe haven assets used in the study for the selected period, descriptive statistics, correlation coefficients and unit root test results are presented below.

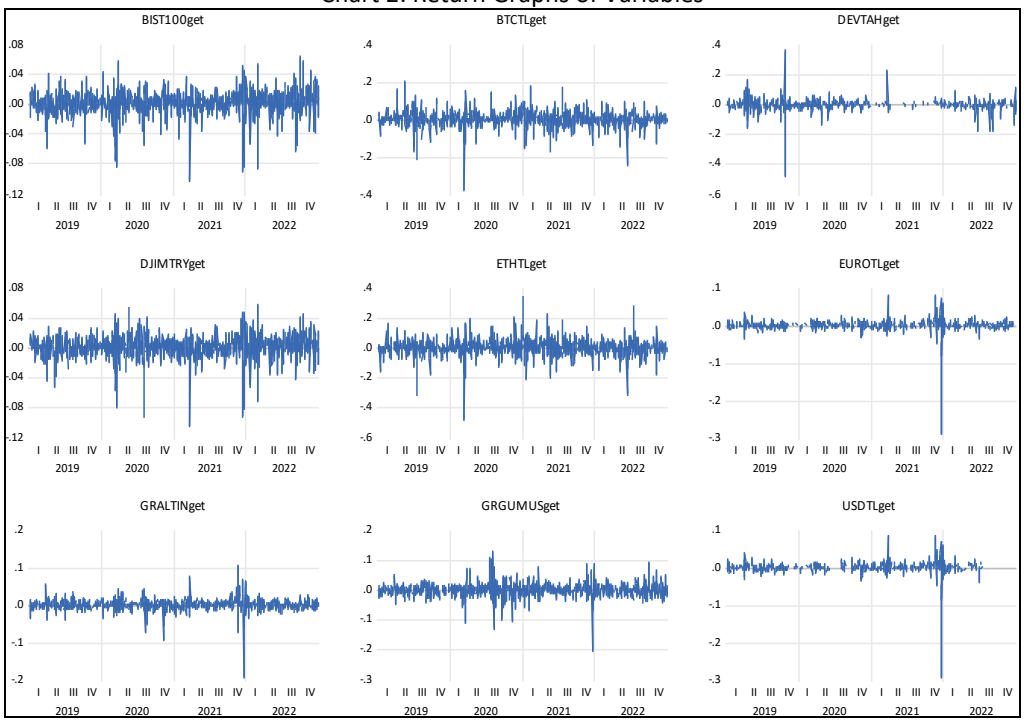
Chart 1: Price Graphs of Variables



The time series of the prices of the BIST100 index and safe haven assets are presented above. In general, it is noticeable that all assets except Government Bonds are on an upward trend. The impact of the Covid-19 outbreak on the BIST 100 index seems to be more temporary. Especially in Turkey, the index fell sharply in January 2020 and then started to recover. On the date of the first case in Turkey and on the dates of the second, third and fourth coronavirus waves, a decline occurred but did not have a long-lasting effect. The impact of these declines on selected assets is presented below.

The natural logarithm return graphs of the price series are presented below. In particular, these graphs provide a general framework for the volatility and stationarity of returns.

Chart 2: Return Graphs of Variables



When the time series graphs of returns are analyzed, it is noteworthy that the BIST100 index is highly volatile. In addition, volatility clustering is observed in Bitcoin, Ethereum and DJIMTR series. The volatility of the BIST 100 index and its volatility interaction with other assets are revealed by GJR-GARCH analysis. In addition, both price and return graphs of the variables of the study are given below.

Table 1: Descriptive Statistics of Variables

	BIST100	BTCTL	GOVBOND	DJIMTR	ETHTL	EUROTL	GOLD	SILVER	USDTL
Mean	1665.212	252107.4	15.87979	10215.75	15395.88	10.56935	533.6601	6.590987	9.545748
Median	1372.235	221505.5	15.30000	8852.450	6618.000	9.121050	461.4915	6.292900	7.676000
Maximum	5509.160	779500.0	27.25000	29517.46	64614.00	19.90870	1096.929	14.45990	18.69660
Minimum	836.7500	17662.00	8.200000	5531.420	544.0000	5.932800	217.0380	2.508100	5.194500
Std. Dev.	955.7458	211846.1	4.393915	4900.117	16239.43	4.404649	273.3524	3.386855	4.444860
Skewness	2.076569	0.506075	0.515813	2.182457	0.821351	0.797575	0.747059	0.512267	1.004693
Kurtosis	7.186866	1.937459	2.383271	7.757667	2.560544	2.150165	2.127537	1.990134	2.474217
Jarque-Bera	1451.998	89.90620	60.31228	1740.468	120.7240	136.3857	124.9819	86.40161	180.1129
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	1668543.	2.53E+08	15911.55	10236186	15426673	10590.49	534727.5	6604.169	9564.839
Sum Sq. Dev.	9.14E+08	4.49E+13	19325.80	2.40E+10	2.64E+11	19420.33	74796246	11482.26	19776.54
Observation	1002	1002	1002	1002	1002	1002	1002	1002	1002

Table 2: Descriptive Statistics of Returns of Variables

	BIST100	BTCTL	GOVBOND	DJIMTR	ETHTL	EUROTL	GOLD	SILVER	USDTL
Mean	0.001823	0.002718	-0.000683	0.001572	0.003314	0.001190	0.001570	0.001648	0.001263
Median	0.002769	0.002664	0.000000	0.001983	0.002759	0.000630	0.001652	0.001665	0.000494
Maximum	0.064580	0.203683	0.364453	0.057817	0.338703	0.083121	0.106602	0.128029	0.084451
Minimum	-0.103068	-0.383130	-0.478220	-0.105114	-0.484476	-0.291531	-0.193217	-0.201782	-0.293976
Std. Dev.	0.016241	0.042395	0.033337	0.015592	0.056409	0.014029	0.015410	0.022931	0.013964
Skewness	-1.169246	-1.062489	-1.918684	-1.152757	-0.673996	-8.560130	-2.029496	-0.608394	-8.917831
Kurtosis	9.393510	13.70636	65.10937	9.742116	13.09911	195.8555	35.33749	13.87343	206.6445
Jarque-Bera	1932.995	4969.196	161507.1	2117.596	4329.704	1563492.	44302.13	4992.989	1742957.
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	1.824464	2.720313	-0.683768	1.573961	3.317099	1.191026	1.571157	1.649697	1.264226
Sum Sq. Dev.	0.263775	1.797371	1.111347	0.243122	3.181982	0.196811	0.237468	0.525837	0.195006
Observations	1001	1001	1001	1001	1001	1001	1001	1001	1001

Both price and return statistics above give clues about the volatility of assets. It can be stated that the volatility of cryptocurrencies among assets is very high. The difference between the minimum and maximum values and the high standard error are the main indicators of this.

When the skewness coefficients are analyzed, it is observed that all variables in the price series contain positive asymmetry and are therefore skewed to the right. The opposite is the case in the return series. The returns of all variables contain negative asymmetry and are skewed to the left. In kurtosis coefficients, BIST100 and DJIMTR are pointed compared to normal. Other variables are flat. In the return series, it is observed that all variables are kurtotic compared to normal.

The correlation coefficients between the variables used in the study are presented in the table below.

Table 3: Correlation Coefficients of Variables

	BIST100	BTCTL	GOVBOND	DJIMTRY	ETHTL	EUROTL	GOLD	SILVER
BIST100	1.000000							
BTCTL	0.094899	1.000000						
GOVBOND	-0.166700	-0.018569	1.000000					
DJIMTRY	0.782896	0.093981	-0.134835	1.000000				
ETHTL	0.134246	0.801922	-0.017041	0.121514	1.000000			
EUROTL	0.059989	0.000460	0.008230	0.050991	0.003059	1.000000		
GOLD	-0.085591	0.216971	0.118827	-0.034628	0.192789	-0.039970	1.000000	
SILVER	0.018822	0.257526	0.071760	0.037678	0.260022	-0.019559	0.782884	1.000000
USDTL	0.068996	-0.002999	0.012727	0.060929	0.009063	0.953035	-0.043317	-0.028429

When the correlations between the variables are analyzed, it is seen that the two variables with the highest correlation are the US dollar and the Euro, which are currencies. The correlation between the two variables is 95% and there is a positive correlation. The two variables with the second highest correlation are cryptocurrencies. The correlation between Bitcoin and Ethereum is 80% and positive. Similarly, the correlation between BIST100 and DJIMTR is positive and 78%.

Another noteworthy point in the correlation analysis is that Government Bonds have a negative correlation with BIST100, Bitcoin, DJIMTR and Ethereum. It moves inversely with the returns of these assets. It is also seen that gold has a negative correlation with both BIST100 and DJIMTR. There are also negative correlations between dollar-silver, dollar-Bitcoin, Euro-silver, Euro-gold.

In time series analysis, the series should be stationary. That is, it should not contain a unit root. In other words, the return of the variable is expected to move around a certain average within the selected period. Whether the series moves around this average or not can be found out both with the help of graphs and unit root test analysis. Above, information was obtained about the stationarity of the series in the return graphs of assets. In the following, whether the assets are stationary or not is revealed by unit root tests. There are many unit root tests in practice. Of these, the most preferred Augmented Dickey-Fuller Test (ADF) and Phillips-Perron (PP) tests are applied in this study.

Table 4: Unit Root Test Results of Safe Haven Assets Series

Variables	Unit Root Tests	t-Statistics	Test Critical Values		Probabilities
Bitcoin	Augmented Dickey Fuller	-19.78393	%1	-3.436676	0.0000
			%5	-2.864222	
			%10	-2.568250	
	Phillips-Perron	-31.51269	%1	-3.436670	0.0000
			%5	-2.864219	
			%10	-2.568248	
Ethereum	Augmented Dickey Fuller	-31.60545	%1	-3.436670	0.0000
			%5	-2.864219	
			%10	-2.568248	
	Phillips-Perron	-31.61652	%1	-3.436670	0.0000
			%5	-2.864219	
			%10	-2.568248	
Gold	Augmented Dickey Fuller	-29.623130	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	
	Phillips-Perron	-29.67960	%1	-3.436670	0.0000
			%5	-2.864219	
			%10	-2.568248	
Silver	Augmented Dickey Fuller	-31.054366	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568243	
	Phillips-Perron	-31.068544	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	

DJIMTR	Augmented Dickey Fuller	-30.65425	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	
	Phillips- Perron	-30.65969	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	
Goverment Bond	Augmented Dickey Fuller	-39.62361	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	
	Phillips-Perron	-39.51448	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	
Dollar	Augmented Dickey Fuller	-19.40956	%1	-3.436682	0.0000
			%5	-2.864224	
			%10	-2.568251	
	Phillips-Perron	-28.96978	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	
Euro	Augmented Dickey Fuller	-19.77632	%1	-3.436682	0.0000
			%5	-2.864224	
			%10	-2.568251	
	Phillips-Perron	-28.75462	%1	-3.436669	0.0000
			%5	-2.864218	
			%10	-2.568248	

In Chart 2, the return graph of the variables was presented. As can be seen from the graph, the returns of the assets move around a certain average. This gives a clue that the series are stationary. Statistically, as shown in Table 4, all series are stationary according to both ADF and PP unit root test results. In other words, they do not contain unit root.

4.3.2. Findings on Safe Haven Characteristics of Assets

Below, it is examined whether the safe haven assets discussed in the study exhibit the characteristics of both safe haven assets during the Covid-19 period and hedge assets during the pre-Covid 19 period. The safe-haven properties of assets are tested with regression analysis under the assumption of GJR GARCH(1,1) error terms.

Table 5. Test Results for Safe Haven Characteristics of Assets

Assets	**Hedge (c_0)**				**Safe Haven (c_1)**			
	Coeff.	**Std. Errors**	**z-Stat.**	**Prob.**	**Coeff.**	**Std. Errors**	**z-Stat.**	**Prob.**
BTC	-0.371182	0.105621	-3.51428	0.0004	0.472010	0.115245	4.09570	0.0000
ETH	-0.436943	0.149716	-2.91848	0.0035	0.652762	0.164993	3.95628	0.0001
Gold	-0.222011	0.043340	-5.12256	0.0000	0.181465	0.047579	3.81394	0.0001
Silver	-0.242238	0.066799	-3.62639	0.0003	0.336165	0.074529	4.51055	0.0000
DJIMTR	0.634152	0.035347	17.94084	0.0000	0.203227	0.038978	5.21390	0.0000
Goverment Bond	-0.310172	0.018234	-17.0109	0.0000	0.310172	0.018243	17.0025	0.0000
Dollar	-0.020408	0.013681	-1.49166	0.1358	0.018264	0.013623	1.34064	0.1800
Euro	0.004415	0.029259	0.15090	0.8801	0.008878	0.031428	0.28247	0.7776

Hedge and safe haven characteristics of assets are presented in Table 5. Hedge (c_0) characteristics of assets are tested for the period 02.01.2019-31.12.2022. In this date range, Covid-19 period is selected as a dummy variable, which takes a value of one when the trading day is during the Covid-19 period and zero otherwise, and safe haven (c_1)characteristics of assets are tested. When the results presented in Table 5 are interpreted, none of the assets have shown safe-haven characteristics against the stock market during the Covid-19 period. Considering the pre-pandemic period, Bitcoin, Ethereum, gold, silver and government bonds showed strong hedge asset characteristics, while the dollar showed weak hedge asset characteristics.

In the other model in which quantiles are taken into account, which is a second approach in the study, Table 6 below shows how the selected assets reacted in the periods when the BIST100 return depreciated by 1%, 2.5% and 5%.

Table 6. Test Results for Safe Haven Characteristics of Assets by Quantiles

Assets	**Hedge**		**%5 quantile (c_1)**		**%2,5 quantile (c_2)**		**%1 quantile (c_3)**	
	Coeff.	**Prob.**	**Coeff.**	**Prob.**	**Coeff.**	**Prob.**	**Coeff.**	**Prob.**
Bitcoin	0.044274	0.7445	0.540807	0.0001	-0.04172	0.8606	-0.016816	0.9427
Ethereum	0.075752	0.3318	-0.339827	0.0829	0.140364	0.3458	-0.005277	0.9081
Gold	-0.07870	0.0012	0.097098	0.0712	-0.03069	0.6925	-0.124704	0.0899
Silver	0.012937	0.7900	-0.183346	0.0784	0.026717	0.8295	-0.073476	0.5327
DJIMTR	0.757696	2.0711	0.095922	0.0357	-0.08809	0.1338	0.099603	0.0910
Goverment Bond	-1.06005	0.0000	-0.255642	0.0000	0.030432	0.1126	-0.127859	0.0000
Dollar	-0.00369	0.0199	-0.00110	0.8065	0.010080	0.0880	-0.006085	0.2672
Euro	0.01441	0.3981	-0.00116	0.9735	0.018163	0.6852	-0.01927	0.6514

The effect of 1%, 2.5% and 5% quantile in the stock market during the Covid-19 period was examined on the return of the selected safe haven asset. When the results are interpreted; Ethereum, silver and Government Bonds showed a strong level of safe haven, but the US dollar and Euro showed a weak level of safe-haven characteristics during the periods when the BIST100 index depreciated by 5%. When BIST100 depreciated by 2.5%, Bitcoin, gold and DJIMTR showed this feature at a weak level, in 1% depreciation, gold and Government Bonds showed a strong level, Bitcoin, Ethereum, silver, US dollar and Euro showed a weak level of safe haven characteristics.

Taking all the results together, the hedge and safe-haven status of assets are presented in the table below.

Table 7: General Assessment of Assets

Assets	Hedge Assets		Safe Haven Assets		Safe Haven (1% Quantile)		Safe Haven (2,5% Quantile)		Safe Haven (5% Quantile)	
	Strong	Weak	Strong	Weak	Strong	Weak	Strong	Weak	Strong	Weak
Bitcoin	+	-	-	-	-	+	-	+	-	-
Ethereum	+	-	-	-	-	+	-	-	+	-
Gold	+	-	-	-	+	-	-	+	-	-
Silver	+	-	-	-	-	+	-	-	+	-
DJIMTR	-	-	-	-	-	-	-	+	-	-
Goverment Bond	+	-	-	-	+	-	-	-	+	-
Dollar	-	+	-	-	-	+	-	-	-	+
Euro	-	-	-	-	-	+	-	-	-	+

To summarize the results again, considering the pre-pandemic period, Bitcoin, Ethereum, gold, silver and government bonds showed strong hedge asset characteristics, while the dollar showed weak hedge asset characteristics. Considering the Covid-19 period, none of the assets showed safe haven characteristics against the stock market. However, when the BIST100 index lost 5%, Ethereum, silver and Government Bonds showed strong safe-haven characteristics, and the US dollar and Euro showed weak safe-haven characteristics. When the BIST100 index depreciated by 2.5%, Bitcoin, gold and DJIMTR showed weak safe-haven characteristics. Gold and Government Bonds showed strong safe-haven characteristics, and Bitcoin, Ethereum, silver, dollar and Euro showed weak safe-haven characteristics in 1% depreciation.

5. Conclusion

In recent years, financial markets and financial instruments have grown significantly in value and volume. This growth is accompanied by a number of financial risks. In the face of these risks, investors need safe haven assets to protect their investments. Especially when a crisis occurs, investors invest in safe-haven assets to minimize the impact of the crisis and sometimes to turn the crisis into an opportunity. These assets are defined as assets that are uncorrelated or negatively correlated with other assets or portfolios during crisis periods. In terms of equity investors, investors shift their assets from equities to these assets. Because there is either no relationship or a negative relationship between these assets and the stock market. This means that while there are losses in the stock market, these assets either do not experience any losses or gain value contrary to the stock market.

The aim of this study is to examine whether the assets known as safe havens during crises fulfill these qualities for equity investors in Turkey during the Covid-19 pandemic. In this study, gold, silver, US dollar, Euro, Bitcoin, Ethereum, Government Domestic Debt Securities and Participation Index, which are the most widely accepted safe haven assets in the literature, are analyzed. The 5-year government bonds representing Government Bonds and the Dow Jones Islamic Markets Turkey index representing the participation index are used in the study. The BIST100 index is used to represent the stock market. The daily closing prices of the assets and the index between 02.01.2019-31.12.2022 are used in the study.

According to the results, considering the pre-pandemic period, Bitcoin, Ethereum, gold, silver and government bonds showed strong hedge asset characteristics, while the dollar showed weak hedge asset characteristics. Considering the Covid-19 period, none of the assets showed safe haven characteristics against the stock market. However, when the BIST100 index lost 5%, Ethereum, silver and Government Bonds showed strong safe-haven characteristics, dollar and Euro showed weak safe-haven characteristics. When the BIST100 index depreciated by 2.5%, Bitcoin, gold and DJIMTR showed weak safe-haven characteristics. Gold and Government Bonds showed strong safe-haven characteristics, and Bitcoin, Ethereum, silver, dollar and Euro showed weak safe-haven characteristics at 1% depreciation.

One of the striking points of the results is undoubtedly that no asset has shown safe-haven characteristics when the entire Covid-19 period is taken into account. In fact, it is seen that most assets gained value in this period. However, the reason why these assets do not exhibit safe haven characteristics is that the BIST 100 index, which represents the stock market, also appreciated during this period. Although it has experienced occasional declines, especially during the Covid-19 period, the index has generally moved upwards. Underlying this upward movement is undoubtedly the demand for stock investments by individual investors. Because in the two-year period between the beginning of 2020 and the end of 2022, the number of investors increased from approximately one million to four million. In addition, the portfolio value of Borsa Istanbul investors increased five times (Takasbank, 2023). In this respect, a topic that can be suggested for further studies is to find out why this demand for the stock market arose during this period. If these studies are conducted, it is thought that they will make important contributions to the literature. In addition to the assets used in this study, studies can also be conducted on other safe haven assets accepted in the literature. In addition, in this study, safe haven assets are only considered for the Covid-19 period. The safe-haven properties of assets can also be tested for other crisis periods in Turkey.

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