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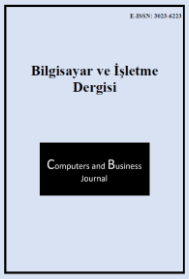

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Araştırma Makalesi / Research Article

The Effect of Bitcoin on The Financial Instruments*

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Abstract
From the past to the present, there have been various investment tools available to investors. While gold is one of the oldest and most reliable investment tools, investors began to utilize stock markets and foreign exchanges as a means of investment in the course of time. In the wake of the digital revolution, a new generation of competitors has emerged. One of the most popular investment tools among them is Bitcoin. This digital currency, which has been in existence for approximately fifteen years, has attracted the attention of young investors. In this study, Bitcoin is considered an independent variable and its correlation with other investment instruments is examined. The regression tests of the Nasdaq stock market index and the Wall Street stock market index, which exhibited a strong correlation value with Bitcoin, were examined. It has been demonstrated that it possesses a high predictive power, with estimates of these stock markets presented in graphs. Consequently, the price of Bitcoin is found to be an effective predictor of the price of international stock market values.
Keywords: *Bitcoin, Financial Instruments, Correlation, Regression, Stock Exchange.*

Bitcoin'in Finansal Enstrümanlar Üzerindeki Etkisi

Öz
Geçmişten günümüze yatırımcılar için her zaman farklı yatırım araçları olmuştur. Altın en eski ve en güvenilir yatırım araçlarından biri iken yatırımcılar zamanla yatırım yapmak için borsaları ve dövizleri kullanmaya başladı. Sonrasında hızla dijitalleşen yeni dünya, rakipler açısından yeni araçları da beraberinde getirdi. Bunlar arasında en popüler yatırım araçlarından biri de Bitcoin'dir. Son on beş yıla damga vuran bu dijital para birimi özellikle genç yatırımcıların ilgisini çekiyor. Bu çalışmada Bitcoin bağımsız bir değişken olarak ele alınmış ve diğer yatırım araçlarıyla ilişkisi incelenmiştir. Bitcoin ile güçlü korelasyon değerine sahip olan Nasdaq borsa endeksi ve Wallstreet borsa endeksinin regresyon testleri incelenmiştir. Tahmin gücünün yüksek olduğu tespit edilmiş ve bu hisse senedi piyasalarına ilişkin tahminler yapılmış ve grafikler halinde sergilenmiştir. Sonuç olarak Bitcoin fiyatları uluslararası borsa değerlerinin fiyatını tahmin etmede oldukça etkili bulunmuştur.
Anahtar Kelimeler: *Bitcoin, Finansal Enstrümanlar, Korelasyon, Regresyon, Borsa*

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1. Introduction

The 21st century has witnessed a remarkable acceleration in the pace of technological advancement, with innovations continuously emerging and evolving. This phenomenon is evident across a range of domains, including education, health, transportation, security, and communication. In light of these developments, it can be observed that the investment instruments of individuals are also affected. In recent years, gold, foreign exchange, and stock market investments have been the most popular investment tools among the public. Nevertheless, the advent of technological developments has led to a growing tendency towards virtualization in the contemporary world. Cryptocurrencies, which are used virtually among investment tools and have become one of the most popular investment tools of recent times, offering an extraordinary experience to investors, entered our world as of 2008 and have had a sensational effect on the world markets. Cryptocurrencies initially attracted attention with the concept of Bitcoin and subsequently evolved into a diverse range of forms. They have since emerged as one of the most preferred investment tools among investors in the financial world. The most distinguishing feature of Bitcoin is that it is an investment option that carries the highest risk but also the highest potential return when compared to other investment instruments.

In addition to the aforementioned investment tools, gold is a preferred long-term investment and one of the most reliable investment tools in history. Gold continues to be a popular choice among investors as a reliable investment tool. Gold is regarded as a secure and tranquil means of assessing one's financial resources in the event of epidemics, wars, economic crises, political events and related circumstances.

In contrast to gold, which is regarded as a relatively safe investment, stock investments are not without risk. However, they represent another alternative that is preferred by many investors and can be useful in the short term, in addition to long-term investment. In the contemporary digitalized world, stock trading transactions can be conducted with relative ease from a multitude of geographical locations. The capacity of investors to analyze and observe, to read the market well, to possess a wide knowledge and experience of the market, and to act accordingly, can be considered a key factor in enabling them to gain an advantage over their competitors in the stock market.

Furthermore, the Euro and Dollar exchange rates have become an indispensable investment tool for those investors who wish to evaluate their money as a foreign currency investment. Foreign exchange investment is subject to fluctuations in the global economy due to the actions of governments, international organizations and major banks. Despite this, it is perceived as a highly profitable option by many, particularly in Türkiye, and is regarded as an additional source of income for investors. This article examines the correlation and regression analysis of Bitcoin with foreign exchange, gold and stock investments.

The initial section provides an overview of the historical development of Bitcoin and other cryptocurrencies, including the life and work of their inventor, the first appearance of Bitcoin, and a brief examination of the historical context surrounding the concept of money. In the second part, the correlation between Bitcoin and various other financial variables was investigated. This included spot

gold, the Nasdaq stock market, the Wall Street stock market, the BIST100 index, and the prices of the US dollar and the euro. The results of the correlation tests are presented below. The regression test yielded strong positive correlation results. Finally, prediction graphics were created.

2. Conceptual framework

Bitcoin, a type of cryptocurrency, first emerged in 2008 and has since undergone a profound transformation of the online financial markets. Despite never having been physically observed, Satoshi Nakamoto is identified as the pioneer of Bitcoin. He initially created 50 bitcoins and subsequently limited the total number of bitcoins to 21 million (Alparslan, 2017).

Although the concept of crypto money is a relatively recent phenomenon, it is thought that the history of money extends to the 24th century Mesopotamia (BC). However, the metallic currency known today, which contains the first precious metals, can be traced back to BC. It was printed by the Lydians, a civilization in Anatolia in the 7th century (Çakın, 2019). In the ancient era, seashells, dried fish, and various spices were used as a form of currency (Alptekin, 2018). From the historical record, it is evident that humans have devised a system of exchange whereby goods and services are traded for one another.

In the contemporary era, cryptocurrencies have emerged as a novel form of money, characterized by their digital and virtual nature. Cryptocurrencies represent a novel form of decentralized money that facilitates secure transactions using encrypted structures and blockchain technology.

Blockchain technology is a type of software that makes it extremely difficult to alter or erase the data transferred in the digital environment. It plays a significant role in the underlying technology of Bitcoin. Although it is employed by numerous sectors globally, Bitcoin is the most widely recognized blockchain application. Blockchain is a method of recording blocks of transaction data that are linked by cryptography to form an information chain. In conclusion, the transactions of Bitcoin are monitored by the technology of Blockchain (Kanat, 2021).

Although the initial purpose of bitcoin's introduction to the market was to serve as a virtual currency, the digital asset has since attracted significant interest from stock market investors, with its use as an investment tool emerging as a notable phenomenon since 2015. Economic analysts and experts have expressed the opinion that virtual money will replace paper money in the near future. Although the aforementioned views are logically sound, there are instances where they are impeded, such as transfer time, fees and speed. In addition, the cautious approach of many states to virtual currencies represents a significant obstacle to the wider adoption of this technology. The Internet, which is developing at a rapid pace, continues to facilitate connections between individuals through virtual networks in the context of the digitalizing and globalizing world. Although there are currently over 10 million users of virtual currencies worldwide, this figure is rising daily, accompanied by a parallel increase in the number of stock markets (Alparslan, 2017).

The recent financial developments and the globalizing world have led to the emergence of numerous international markets concurrently. The globalization of financial markets has been driven by the varying conditions of countries within the global economy. This is due to imperfect competition

conditions. The reasons why investors prefer to invest in financial global markets are threefold. Firstly, there are economic differences among states. Secondly, there are expectations regarding exchange rates. Thirdly, there is a desire to invest in different markets in order to diversify the investment portfolio risk. In this context, the foreign exchange market, stock markets, gold markets, foreign bond markets, and international foreign bond markets can be identified as prominent investment areas (Gündoğdu, 2016).

Financial markets also serve an important economic function, namely the transfer of funds to citizens, companies, and governments. The significance of transferring these funds from those who have accumulated savings to those who require the funds for investment or other purposes can be idenfied. To illustrate, consider a person who has funds but no investment opportunity and two individuals who do not have funds but have investment opportunities. The probability of these two individuals finding each other is low. However, financial markets can facilitate the matching of these two individuals. Consequently, financial markets play a significant role in maintaining or enhancing economic efficiency (Miskhin, 2007).

In considering the various investment instruments, it is important to note that: Gold is a significant component of the investment landscape. Throughout history, gold has been one of the earliest metals to be used by humankind. Gold has been used as an ornament in various historical periods and subsequently as a medium of exchange. Moreover, gold is a highly valuable resource utilized in a multitude of sectors. Furthermore, the limited supply and chemical properties of gold render it a crucial commodity (İncekara, 2016).

3. Literature review

This section presents a selection of studies that seek to examine the correlation between Bitcoin and various stock markets, as well as between Bitcoin and gold or other currencies, including the Euro, US dollar, and yen. Furthermore, prediction analysis conducted in previous years is included in the studies.

In his 2013 study, Yermack examined the price relationship between Bitcoin and gold, as well as exchange rates (Euro/USD, Yen/USD, Frang/USD, GBP/USD). The daily exchange rates of Bitcoin exhibited a virtually zero correlation with those of widely used currencies and with gold.

In their 2019 study, Akçalı and Şişmanoğlu examined the relationship between Bitcoin and the seven altcoins with the highest market value. The daily closing prices of seven alternative cryptocurrencies in US dollars were utilized. The Toda-Yamamoto causality test was employed in the study. It has been observed that the correlation relationship between cryptocurrencies is generally very strong and positive. Nevertheless, no discernible causal relationship has been identified between Bitcoin and Ethereum, Monero.

In this study, Andi (2021) examined the potential for leveraging the accurate forecast of bitcoin prices via the normalization of a particular dataset. The use of LSTM machine learning has enabled the deployment of a more accurate forecast of the bitcoin price, as a result of the training of the aforementioned dataset. Consequently, the proposed algorithm is demonstrated to be a superior

algorithm for predicting the bitcoin price based on the present global stock market. Consequently, the future value of Bitcoin can be forecast.

In the study by Şahin, etc. (2022), the variables Bitcoin, Ethereum, Binance coin, EUR and Gold were used to analyze the correlation between these variables and the number of Covid-19 cases and deaths. In the initial phase of the pandemic, a positive and robust correlation was identified between cryptocurrencies, foreign currency values and Covid-19 variables. In the second year, it was observed that the direction of the relationship had undergone a change. Upon examination of the level of significance through multivariate regression analysis, it is evident that accurate modelling is achieved for five models exceeding 85%.

4. Methodology

In this section, the aim, scope, limitations, and methodology of the study will be discussed.

4.1. Aim

The objective of this study is to examine the impact of Bitcoin on financial instruments.

4.2. Scope

In order to achieve this objective, correlation and regression analyses were conducted on Bitcoin, gold, exchange rates and stock markets. (Bitcoin as an independent variable).

4.3. Limitations

The study employed data from daily observations. The study employed a range of financial instruments, including the Nasdaq, Wallstreet, BIST100, exchange rates for the US dollar and the Euro, and spot gold data. The opening prices of the stock markets and the days on which they are open were recorded, as were the data for Bitcoin at 10:00. The data for Bitcoin, the Nasdaq stock market, the Wall Street stock market, and the Spot Gold price are expressed in US dollars, while the exchange rate is given in TRY.

4.4. Method

In the application section of the study, Bitcoin was employed as an independent variable. The dependent variable comprised international stock markets, including Nasdaq, Walstreet, BIST 100, gold and the euro/dollar exchange rate. Firstly, the correlation between the variables was investigated. A correlation test was employed to ascertain the nature of the relationship between the variables. Regression tests and estimation graphs were created for the test results that were found to be significant according to the correlation test result. A simple linear regression test was employed for the purpose of effect analysis. Furthermore, estimation graphs were generated from the regression equations.

5. Findings

This section commences with a brief overview of correlation analysis, after which the results of the correlation analysis are presented. Subsequently, the results of regression analysis are presented.

5.1. Correlation test results

The correlation coefficient (r) must lie between -1 and 1. If the correlation coefficient is 1, it can be stated that the relationship is increasing without exhibiting a perfect linear relationship and distribution.

If the r value is between 0 and 1, it can be posited that although there is some distribution between the dependent variable and the independent variable, there is still a linear relationship. The closer the value is to 1, the greater the correlation and the lower the distribution.

If r = 0, it means that there is no correlation between the dependent and independent variable, but the distribution can be interpreted as follows:

If the r value is equal to zero, the distribution should be symmetrical circles, but it is very unlikely that the r value will equal zero in a real measurement.

If r value is equal to a value between -1 and 0; It can be said that the dependent and independent variables act together in the negative direction and the closer it is to -1 in its distribution, the less it decreases. Finally, if it is considered the situation where the r value is equal to -1, it should be noted that the dependent and independent variables move in a negative direction in perfect unison and without any distribution.

In order to discuss the topic of regression analysis, it is necessary to explain that linear regression analysis was applied in this study. This is an analysis that seeks to identify a causal relationship between one dependent variable and the other independent variables, with the objective of predicting the relationship between variables. In essence, it can be described as the extent to which the independent variable accounts for the changes observed in the dependent variable.

Regression results were interpreted by looking at the results of these two values below.

R $^{2:}$ It shows the power of the prediction offered by the regression model, which shows to what extent the amount of change in the dependent variable is explained by the independent variables in the regression model. This value should be in the range of 0-1 and it can be said that the closer it is to 1, the more meaningful the result.

Significance F Test: It is the value that shows whether the regression model is significant or not. It can be said that the closer this value is to zero, the more meaningful it is.

The relationship between Bitcoin and Gold, USD and EUR parities, Nasdaq stock market index, Wallstreet stock market index, BIST100 index data has been exhibited below. Correlation test was used to investigate the relationship. The obtained correlation results are given in the Table 1.

Table 1. Correlation Table of Variables

	BTC
GOLD	-0.314575278
USD/TL Parity	0.0920895
EUR/TL Parity	0.319924767
Nasdaq Stock Market Index	0.926887
Wallstreet Stock Market Index	0.787297231
BIST100 Index	0.0013317

When the Correlation Table is examined, it is seen that according to the relationship between BTC, as an independent variable, Gold, USD, EUR parities, Nasdaq stock market index, Wallstreet stock market index, BIST 100 index, it can be said that Gold has a low correlation. Looking at the USD, EUR

parities, and BIST 100 index, it is seen that there is a very low correlation as well. However, it can be said that the relationship between the Bitcoin and Nasdaq stock market index have high correlation. Its rate %92 and the Wallstreet stock market index also have high correlation at the rate %78.

5.2. Regression test results and forecasting graphs

This section presents the results of the correlation analysis of the variables, which have been grouped according to their degree of correlation. The resulting regression tables and estimation graphs illustrate the relationship between the Nasdaq stock market index and the Wall Street stock market index. It is unnecessary to examine other variables in terms of regression analysis, given their low correlation.

5.3. Regression test results and prediction chart of Nasdaq stock market index

Table 2 shows the regression statistics.

Table 2. Regression statistics

Regression Statistics	
Multiple R	0.926887
R Square	0.85912
Adjustable R Square	0.852411
Standard error	195.8519
Observation	23

Table 3 shows the Anova statistics.

Table 3. Anova statistics

Anova					
	df	**SS**	**MS**	**F**	**Significance F**
Regression	1	4912219	4912219	128.0626	2.13E-10
Difference	21	805517	38357.95		
Total	22	5717736			

Table 4 shows the overall statistical results.

Table 4. General statistics

	Coefficients	**Standard error**	**T Stat**	**P-value**	**Low 95%**	**High 95%**
Intersection	7244,023	638,3112	11,34873	2.02E-10	5916.582	8571.463
BTC	0.166693	0.01473	11.31647	2.13E-10	0.13606	0.197326

The data obtained from the analysis results presented in the Table 2., Table 3. and Table 4. indicate that there is an 85% regression rate between Bitcoin and the Nasdaq stock market index. Furthermore, when the significance F result is considered, it is observed that it is very close to zero. This indicates that the significance of the rate is considerable. In summary, the Bitcoin price exerts a significant influence on the Nasdaq stock market index.

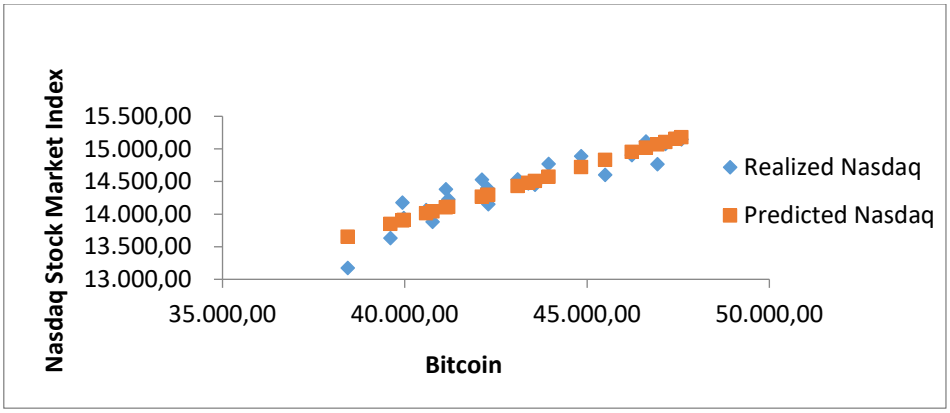

Figure 1. Prediction chart of the Nasdaq stock market index

Figure 1 shows the prediction graph of the Nasdaq Stock Market Index. Realized Nasdaq Stock market index (shown in blue) and the Predicted Nasdaq Stock Exchange Index (shown in orange) were created with the estimation equation obtained as a result of the regression test. The estimation equation is:

$$Y= 0.166693X + 7244.023 \quad (1)$$

5.4. Regression test results and prediction chart of Wall Street stock market index

Table 5 shows the regression statistics. Results are obtained through Excel.

Table 5. Regression statistics

Regression Statistics	
Multiple R	0.787297
R Square	0.619837
Adjustable R Square	0.601734
Standard error	320.9106
Observation	23

Table 6 shows the Anova statistics.

Table 6. Anova statistics

Anova					
	df	**SS**	**MS**	**F**	**Significance F**
Regression	one	3526103	3526103	34,23945	8.28E-06
Difference	21	2162656	102983.6		
Total	22	5688760			

Table 7 shows the general statistical results.

Table 7. General Statistics

	Coefficients	**Standard error**	**T Stat**	**P-value**	**Low 95%**	**High 95%**
Intersection	28438.57	1045,897	27.1906	7.48E-18	26263.5	30613.63
Bitcoin	0.14123	0.024136	5.851449	8.28E-06	0.091037	0.091037

As evidenced by the regression analysis results presented in Tables 5, 6, and 7, the Bitcoin price, considered an independent variable, has the capacity to explain the changes observed in the dependent variable, the Wall Street stock market index, with a value approaching 61 percent. This value indicates that the explanatory power is considerable. Furthermore, the Significance F result indicates that it is very close to zero. It can therefore be concluded that the analysis is meaningful. In summary, the Bitcoin price exerts a significant influence on the Wall Street stock market index.

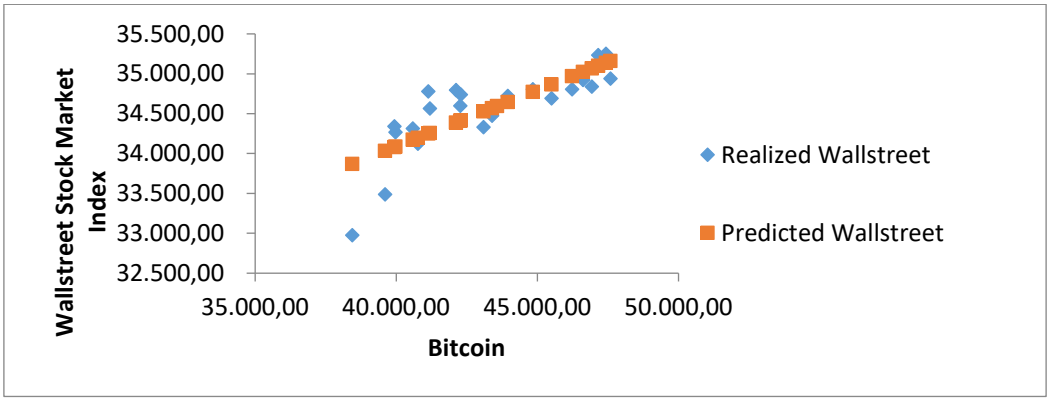

Figure 2. Prediction chart of the Wallstreet stock market index

Figure 2 shows the estimation of the Wallstreet Stock Market Index. Predicted Wallstreet stock market index (shown in orange) and the Realized Wallstreet stock market index (shown in blue) was created thanks to the estimation equation obtained the regression test. The estimation equation composed with the coefficients that founded as a result of the regression test. Equation is:

$$Y = 0.14123X + 28438.57 \quad (2)$$

6. Conclusion

The present study primarily examined the correlation between Bitcoin and stock markets, as well as between Bitcoin and gold, and between Bitcoin and the US dollar, the euro, and the euro's parity with the US dollar. The correlation results indicate that BTC exhibits a low correlation with gold, the BIST100 index, and USD/EUR parities. Consequently, regression tests were not applied to these variables. Nevertheless, the correlation between BTC and the Nasdaq stock market index is notably high, as is the correlation between BTC and the Wall Street stock market index. The regression test results, and forecasting graphs were presented in tables and the regression rate between Bitcoin and the Nasdaq stock market index is 85%. The F-value, which is close to zero, indicates that the analysis is highly meaningful. Consequently, it can be asserted that the Bitcoin price exerts a considerable influence on the Nasdaq stock market index. Furthermore, the regression value observed in the analysis between BTC, and the Wall Street stock market index was 61%, and the significance F value was also found to be close to zero. It can therefore be concluded that the analysis is meaningful. In summary, the Bitcoin price is highly effective on the Wall Street stock market index.

Finally, this study demonstrates that BTC, the largest virtual currency, exerts an influence on internationally renowned stock markets. In future studies, it would be beneficial to examine the effect

of Bitcoin by increasing and diversifying the number of exchanges. Alternatively, it may be the subject of further studies.

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