Uluslararası İktisadi ve İdari İncelemeler Dergisi
International Journal of Economic and Administrative Studies
https://dergipark.org.tr/tr/pub/ulikidince

UİİİD-IJEAS, 2022 (37) ISSN 1307-9832

THE RELATIONSHIP BETWEEN FAN TOKENS AND CRYPTOCURRENCIES: AN EMPIRICAL EVIDENCE

Mehmet Ali DEMİR[1], Ramazan AKTAŞ[2]

Abstract

In recent years, as a result of the increasing popularity of crypto assets all over the world, an increasing number of innovative crypto assets are coming to the market. In this context, Fan Tokens, which is a type of "utility token", are also discussed in this research as a prominent crypto asset in recent years. As developments in both cryptocurrency and sports sector increase the interest in Fan Tokens Day by day, the financial volume of the system is constantly growing. With the growing volume, the risks taken by those who buy Fan Tokens are also increasing. Although there are studies on the risks of crypto assets in the literature, since the issue is not addressed specifically for Fan Tokens, it is deemed worthy of our review. The relationship between the price movements of Fan Tokens and the movements of the dominant crypto assets has been examined. It has been determined by the regression and correlation analyzes in the research that the movements in the crypto money exchanges have an effect on the Fan Token exchanges. Therefore, the developments in the crypto money exchanges should be followed especially and carefully for those who see the Fan Tokens as an investment tool.

Keywords: *Fan Token, Cryptocurrency, Cryptoasset, Blockchain, Sports*
JEL Classification: *Z23, G23, G19*

FAN TOKENLAR İLE KRİPTO PARALAR ARASINDAKİ İLİŞKİ: AMPİRİK BİR BULGU

Öz

Son yıllarda kripto varlıkların tüm dünya genelinde giderek popülerleşmesi sonucu her geçen gün artan sayıda yenilikçi kripto varlıklar piyasaya çıkmaktadır. Bir “utility token” türü olan Fan Tokenlar da bu kapsamda öne çıkan bir kripto varlık olarak ele alınmıştır. Kripto para ve spor sektöründeki gelişmeler fan tokenlara olan ilgiyi her geçen gün arttırmakta olduğundan sistemin finansal hacmi de sürekli olarak büyümektedir. Büyüyen hacimle birlikte Fan Token satın alanların aldıkları riskler artmaktadır. Literatürde kripto varlıkların risklerine dair çalışmalar bulunmakla birlikte Fan Tokenlar özelinde konu ele alınmadığından tarafımızca incelenmeye değer görülmüştür. Fan Tokenların fiyat hareketleri ile başat kripto varlıkların hareketlerinin arasındaki ilişki irdelenmiştir. Araştırmada yapılan regresyon ve korelasyon analizleri ile kriptopara borsalarındaki hareketlerin, Fan Token borsaları üzerinde etkiye sahip olduğu tespit edilmiştir. Bu nedenle Fan Token alım satım işlemlerinde kriptopara borsalarındaki gelişmelerin özellikle ve dikkatle takip edilmesi gerektiği sonucuna ulaşılmıştır.

Anahtar Kelimeler: *Fan Tokenlar, Kripto Para, Kripto Varlık, Blokzincir, Spor*
JEL Sınıflandırması: *Z23, G23, G19*

[1]*Prof, TOBB University of Economics and Technology, Faculty of Economics and Administrative Sciences, Management, raktas@etu.edu.tr, ORCID: 0000-0002-8884-3357*
[2]*TOBB University of Economics and Technology, Faculty of Economics and Administrative Sciences, Management, mehmetali.demir@etu.edu.tr, ORCID: 0000-0002-3548-4426*

Araştırma Makalesi

Makalenin Geliş Tarihi (Recieved Date): 01.05.2022
Yayına Kabul Tarihi (Acceptance Date): 23.09.2022

Demir, M. A., ve Aktaş, R. (2022). Investigation Of The Relationship Between Fan Tokens And Cryptocurrencies with Regression and Correlation Analyzes. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, 37, 55-70. https://doi.org/10.18092/ulikidince.1112054

1. Introduction

Today, money becomes increasingly electronic with the developing of information technologies. In daily life, we live in a period when money is used and spent more electronically instead of cash. In this transition period, records on money ownership and transfer transactions, which were previously kept in a physical ledger, can be kept electronically in financial institutions such as banks, payment systems and institutions. These structures, in which the financial institution is at the center, are called centralized financial structures. Digital assets used instead of money in finance and economy are called virtual money (Üzer, 2017).

Ownership and transaction records of virtual currencies are kept electronically (Çetinkaya, 2018). Crypto assets come to the forefront with their use of distributed ledger, unlike the usual virtual and electronic money applications. With the increase and widespread use of crypto assets, they have emerged as an alternative to the centralized structures. However, it also includes some handicaps and deficiencies arising from its peculiar structure. One of these handicaps is that it draws an unstable image (IMF, 2018). Since, it is open to speculative and manipulative attacks and seen as an investment tool rather than a means of exchange by users. As a result, crypto assets are a promising financial asset in different application areas, yet the conditions are not ripe for fully functioning as money. Some people even buy these crypto assets with the aim of getting rich quickly and with unrealistic high return expectations. This discredit the crypto-assets and show they are unreliable, high-risk assets.

Blockchain structure provides a technological infrastructure that allows crypto assets to be decentralized. In the structure, a distributed database system is established, and records are kept in a decentralized manner, thanks to the logical structure in the way the blocks are connected to each other. Thus, the functions expected from a payment system can be provided without the need for a specific center point such as a bank, payment institution, main computer (ECB, 2016). The total size of the blocks is such that a person can download and store them on his computer (IMF, 2016).

Crypto assets and their usage areas have become an important part of the agenda around the world. Bitcoin is the first and well-known cryptocurrency on the market. That is why it leads the market with the share of 43%. Bitcoin has inspired the development and launch of thousands of crypto assets. Today, other cryptocurrencies can also be bought and sold via Bitcoin on exchanges and platforms.

In parallel with the innovations brought by crypto assets in finance and technology, the acceptance and use of large masses is also increasing. In addition to the opportunities to create and develop new financial resources for individuals and institutions, conveniences it brings and the added value it provides stand out as the main reasons for this expansion. Since it is not technologically completed and matured, the potential revealed by crypto assets and blockchain technology arouses wide interest in many fields, especially in the finance sector. The sports industry has also been one of them, with the launch of Fan Tokens on the market. Especially with the effect of the size of the sports sector, the Fan Tokens which are offered to the market have reached a significant financial volume. Sports clubs around the world constantly make statements about their success in Fan Token issuance, the financial advantages they provide, and their future projects. In this context, sports clubs aim to provide some benefits by creating a force multiplier to the competitors with Fan Tokens.

The use of Fan Token technology brings some advantages not only for sports clubs but also for sports fans such as the right to choose a goal celebration song, contribute to design for commercial products, participate in special surveys, and take part in club decisions. Such activities, which increase the interaction and loyalty of the fans, are important because the innovative advantages brought by Fan Token technology are within the scope of "customer loyalty". The financial success

achieved by the Fan Token offering clubs and platforms have aroused interest in the sports and finance sectors in a short time.

After the development of blockchain technology, the most important breakthrough in the world of crypto assets has been the development and commissioning of smart contracts. Ethereum cryptocurrency works on the basis of this technology. While the advantages provided by the blockchain infrastructure continue to be used, it is a smart contracts technology in which the working codes are also kept on the blockchain if the pre-programmed conditions are fulfilled. The most important advantage is that processes can be automated. Fan Tokens, which are the main subject of our research, use smart contract technology in addition to blockchain technology. Each created token is traded through a smart contract program code (Ethereum Whitepaper, 2013). Tokens that can use various benefits and advantages if owned, are called "utility tokens". Fan Tokens are predominantly included in this type. When the information and documents shared by technology companies and sports clubs producing and issuing Fan Tokens on their websites, social media accounts and press spokespersons are accessed through open sources.

Total of four big platforms that make Fan Token Offering (FTO) and mediate Fan Token trading were found. They are known by the names/brands Socios, Binance, Bitci and Paribu. These platforms first make agreements with sports clubs and sign contracts for the tokens to be offered to the public. They announce the features, number, technological infrastructure and purpose of the Fan Token to be issued on the basis of this contract with a document called 'whitepaper' and make the first offering on the date of announcement. Initial offerings can be called ICO (Initial Coin Offer), IPO (Initial Public Offer), IFO (Initial Fan Token Offer), FTO (Fan Token Offer). Not all of the tokens which produced are offering initially, some of them being held for later offering or burning. Burning a token means removing it from circulation through sending it to an irreversible address. Thus, tokens that are out of circulation cannot be reused or traded. Such addresses are called "eater addresses". The fact that burning transactions stands out as an important difference between the Fan Token world and the money markets. Burning processes have a direct impact on Fan Token valuation is an inevitable result as it changes the supply-demand balance.

In our research, it is tried to reach conclusions and findings on whether the movements in the Fan Tokens markets are affected by the price changes of crypto money markets such as Bitcoin. In addition, it is thought that this study will fill the gap in this field in addition to the limited number of studies in the literature. Since our article is made using different platforms from different countries, fan tokens from different sectors, national team tokens and different cryptocurrencies, it is more original than the studies in the literature.

The study was carried out according to the following design: in the second part, the existing studies in the literature are included, in the third part the dataset and methodology used are defined, and finally in the fourth part, the results and findings are discussed.

2. Literature Review

In the literature, studies are generally concentrated on crypto money and blockchain. As far as we can see, there are limited number of studies on Fan Tokens empirically.

The use of Fan Tokens in marketing in the context of "customer citizen" behavior is discussed in Fındıklı and Saygın's studies (2021). Evaluations were made using the shares in the "Fan Token" title on Twitter. In the digital transformation of marketing, tools created with virtual assets have been shown to contribute to customer-citizen behavior.

Demir et al. (2022) studied whether Fan Token price movements are affected by sporting success or not. They concluded that while seeing the impact of major international tournament results, local successes did not significantly affect prices, and that losses were more effective than gains.

Mazur and Vega (2022) compared the return of football-specific fan tokens (FFT) with other crypto asset types (NFT, DeFi, Meme, and Bitcoin) on the first day and long-term. They also examined whether the sporting success of football clubs has an effect on fan token prices. In the research, it was concluded that although ffts provide 150 percent return on the first day, they provide less return than other cryptoassets in the long run and they have high volatility (%160 annualized). Since our study also covers other types of fan tokens than football, a more comprehensive approach has been taken than this study.

Vidal-Tomás (2022) did his research on the Socios.com platform and its cryptocurrency Chiliz. For the period he examined, investors did not lose money and there was a weekly correlation between cryptocurrency markets and fan tokens. Since our study also includes platforms different from Socios.com, it contributed to the literature by providing a more comprehensive comparison between platforms.

Scharnowski et al. (2022) examined the relationship between fan tokens and stocks, showed that there was no correlation. Instead, they showed that fan tokens act more together with the cryptocurrencies in which they are released. In addition, they concluded that sportive failures have a greater effect on prices than successes.

It is thought that the lack of literature observed on this subject will be filled with our study.

3. Dataset and Methodology

Within the scope of this research, it has been tried to determine whether the Fan Tokens act in parallel with the crypto money markets rather than the sporting success of the sports organization with which they are associated. The questions that are tried to be answered in the study are listed below:

- Do Fan Tokens have a relationship with the cryptocurrencies issued by the platforms with which they are affiliated?
- Do the changes in the value of the cryptocurrency (if any) of the technology in which the Fan Tokens are created affects the Fan Token's value?

Within the scope of the study, basically three analyzes are made. These:

- Correlation analysis according to the technology and platform used,
- Regression analysis between PSG and BTC,
- Correlation analysis between dominant cryptocurrencies and dominant Fan Tokens according to their market caps.

Analyzes were made with the SPSS program. All of the data used was obtained from "the coinmarketcap.com" website. The data used when performing technology and platform based multi-correlation analysis between BTC (Bitcoin), ETH (Ethereum), CHZ (Chiliz), PSG (Paris Saint-Germain), FB (Fenerbahçe), Bitci and BFT (Brazilian National Team Fan Token) are between February 19, 2021 and February 16, 2022. Exceptionally, due to release dates, BFT data ends on September 8, 2021, and FB data ends on August 20, 2021. The reason for choosing these crypto assets was the difference between them in terms of the technology and platform used.

In the regression analysis between PSG and BTC, one-year data from February 16, 2022 and before was used. These two assets were chosen, because BTC has the highest market cap in crypto assets and PSG has the highest market cap in Fan Tokens.

The data used in the multi-correlation analysis are the highest market share (market cap) cryptocurrencies and Fan Tokens (over 1 million dollars) traded on the world's leading crypto asset exchanges, regardless of technology and platform. The data were taken from March 3, 2022, back to March 5, 2021, if any, covering a maximum of 1 year. In this way, the BNB crypto money and the Lazio, Porto and Santos Fan Tokens issued by this platform were included in the study.

While selecting the dataset, the most effective cryptocurrencies and Fan Tokens were tried to be selected and this was done over market caps. The table below shows the current market caps of the crypto assets studied.

Table 1: **Market Caps of Fan Tokens and Cryptocurrencies (Coin Market Cap, 2022)**

Market Caps of Cryptocurrencies (02 August 2022)							
BTC	$445,625,635,600						
ETH	203,049,998,652						
BNB	$46,740,459,069						
XPR	$18,242,439,177						
LUNA	$290,975,678						
ADA	$17,125,759,687						
CHZ	$845,996,911						
BITCI	$27,750,056						
Market Caps of Fan Tokens (02 August 2022)							
PSG	$29,460,247	**ATM**	$10,372,930	**UFC**	$2,520,814	**EFC**	$841,572
CITY	$20,836,323	**TRA**	$5,026,846	**LUFC**	$1,111,680	**POR**	$25,461,864
BAR	$22,280,488	**GAL**	$8,258,348	**MENGO**	$984,162	**GALO**	$542,520
LAZIO	$25,639,477	**JUV**	$8,154,477	**ARG**	$2,663,315	**SAUBER**	$662,986
PORTO	$25,587,891	**ASR**	$8,206,125	**VCF**	$3,364,585	**SAM**	$471,554
INTER	$9,962,874	**FB**	$4,307,720	**SCCP**	$833,179	**GOZ**	$1,675,632
SANTOS	$19,882,938	**AFC**	$3,539,635	**AM**	$671,579	**SPFC**	$524,131
ACM	$12,313,113	**OG**	$6,343,704	**AVL**	$710,212	**YBO**	$649,560

With the three analyzes above, a total of 41 crypto assets' data sets were studied. All data sets were created by calculating the daily price change rate $\Delta Xt=(Xt-Xt-1)/Xt-1$. Hourly data were not preferred because of excessive volatility which could be found in the initial supply periods.

3.1. Correlation Analysis by Technology and Platform Used

First of all, it was checked by creating a histogram that the data showed normal distribution. Normal distribution was achieved by keep the sample number above 100. For this reason, the Pearson method was used while performing the correlation analysis.

Table 2: **Descriptive Statistics**

	N	Range	Min	Max	Mean	Median	Std. D.	Var.	Skewn.	Kurtosis	J. Bera
BTC	363	,264	-,104	,159	,00120	-,00031	,03911	,002	,465	1,745	59,14
ETH	363	,575	-,202	,373	,00006	-,00485	,05344	,003	1,109	7,042	824,5
CHZ	363	1,090	-,510	,579	-,00010	-,00521	,09334	,009	-,122	8,337	1052,2
PSG	363	1,301	-,366	,934	,00271	,00198	,09121	,008	3,745	39,079	23947
FB	181	,206	-,099	,106	,00861	,00479	,03225	,001	,108	2,057	32,26
Bitci	363	,720	-,432	,288	,00059	,00567	,07818	,006	-1,051	5,945	601,43
BFT	162	,544	-,219	,324	,00380	,00714	,07616	,006	,502	3,348	82,46

When the used data of crypto assets is examined, price movements could be relatively excessive at several times in a year. It has been observed that the amount of volatility is inversely proportional to the market cap. While the price movements in BTC, which has the highest market

cap, are less and smaller, but the number and margin of these movements are higher for the BFT, which has a much smaller market share. These extremities are not excluded from the data set, because they can be considered normal in cryptocurrency markets.

Table 3: **Correlation Analysis Results**

		BTC	ETH	CHZ	PSG	FB	Bitci
ETH	*Corr.*	0.817					
	Sig.	0.000					
	N	363					
CHZ	*Corr.*	0.548	0.541				
	Sig.	0.000	0.000				
	N	363	363				
PSG	*Corr.*	0.4	0.385	0.365			
	Sig.	0.000	0.000	0.000			
	N	363	363	363			
FB	*Corr.*	0.505	0.494	0.464	0.589		
	Sig.	0.000	0.000	0.000	0.000		
	N	181	181	181	181		
Bitci	*Corr.*	0.316	0.332	0.212	0.275	0.34	
	Sig.	0.000	0.000	0.000	0.000	0.000	
	N	363	363	363	363	181	
BFT	*Corr.*	0.107	0.1	0.058	0.11	0.236	0.539
	Sig.	0.175	0.205	0.464	0.165	0.002	0
	N	162	162	162	162	162	162

As depicted in the table above, all relationships between ETH, CHZ, PSG, FB and Bitci are statistically significant (high level) and positive (same-directional) at the ($p<.001$) level. For BFT, only a significant and positive relationship was found between FB and Bitci.

A “very high” correlation with a coefficient of 0.817 was observed between Ethereum and BTC. The reason is that they are both pioneer and well-established cryptocurrencies in the market. Especially as the market leader, it may be evaluated that BTC movements affect ETH movements.

CHZ coin is issued by the Socios platform using ETH technology. Thus, the correlation between CHZ and ETH was looked at and it was found positive. However, the correlation coefficient between CHZ and BTC is almost same. This situation strengthens the idea that the correlation is not due to the use of Ethereum blockchain technology but may be due to the interaction in the cryptocurrency markets. Because the correlation of CHZ and BTC is almost equal (even slightly higher) to CHZ and ETH, though CHZ uses Ethereum blockchain technology.

At the first column from top to bottom, the relationship between BTC and other crypto assets; the correlation decreases as the market cap of crypto assets decreases. At the second line (CHZ line), there is no serious difference in the correlations of CHZ between ETH and BTC.

At the third line (PSG line), there is no significant difference in the correlations of PSG between BTC, ETH and CHZ. Here, BTC is the main cryptocurrency that affects the market, ETH is the cryptocurrency whose blockchain technology is using by PSG and CHZ is the cryptocurrency of the platform in which PSG is issued and traded. When looked at the results, technological similarity and commitment do not make a serious difference for PSG. This result is also valid in FB. Although ETH infrastructure is used technologically, this connection does not make a serious difference in correlation results. From here, it has been concluded that although Fan Tokens using Ethereum infrastructure, ETH price movements do not make a significant difference in Fan Token prices when it compares with other crypto assets’ price movements. Yet, Fan Tokens move together with other crypto assets according to the movements in the market.

At the fourth line (FB line), the correlations with BTC, ETH and CHZ are very close to each other, while the correlation with PSG is higher than these. It is thought that this result turned out because they are both Fan Tokens.

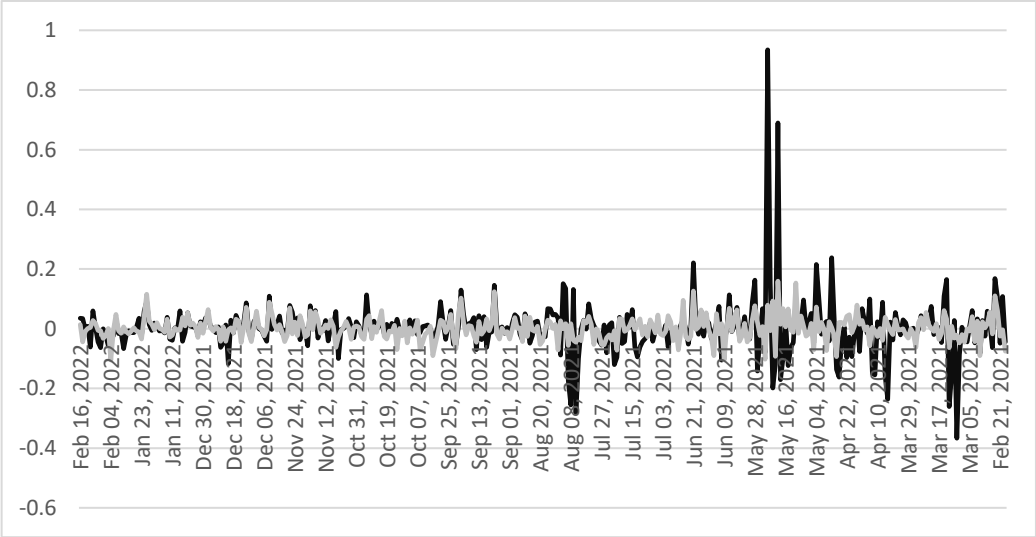
At the fifth line (Bitci line), Bitci has a higher correlation with FB. It can be evaluated as the equal reflection of the movements in the Turkish Lira/Dollar exchange rate on the prices due to the fact that both crypto assets are based in Turkey. From this situation, it can be concluded that the conditions of the country where the crypto asset is released affect the value of the crypto asset.

At the sixth line (BFT line), it is seen that there is a higher correlation coefficient relationship between Bitci and the BFT which is issued by this platform. It can be said that the difference originates from the common platform relationship between them. Although there is no such difference between CHZ, the crypto money of the Socios platform, and PSG, which is the Fan Token of the platform, there is a higher correlation in the relationship between BFT and Bitci. Relatively shallowness of the BFT market could be the reason. When BFT price movements are examined, it has been affected by sudden decreases in Bitci. In addition, it is observed that there are sudden decreases in BFT prices from time to time, independent of Bitci. This may be due to sporting developments, or due to large amounts of trading in relatively shallow market. It can be concluded that when the market cap shrinks, the relationship between Fan Token and platform increases positively.

3.2. PSG & BTC Regression Analysis

In the figure below, data from February 16, 2022 and before, the price volatility between PSG (black line) and BTC (gray line) is quite high, especially in the previous 6 months.

Figure 1: **PSG and BTC Price Actions**



In the regression analysis between PSG and BTC, firstly the last 6 months' data were used. When BTC is taken as independent and PSG as dependent variable, there was a positive high level significant ($p<.001$) linear relationship between them. 30% of the change in PSG price value in the 6-month period before February 16, 2022, is due to the changes in BTC price. With the result it has been revealed that while Fan Tokens are affected by the movements in the crypto money markets, there is a certain amount of cause-and-effect relationship between them.

Before the analysis, the assumptions of normality, linearity, covariance and autocorrelation required for the regression analysis were tested (See Table 4 and 5). The regression analysis was repeated retrospectively for every 180 days at 30-day intervals on February 16, 2022 and the previous year's data (See Table 6).

Table 4. **Tests Before Regression Analysis for PSG & BTC Data**

	16 February 2022 - 22 August 2021		**17 January 2022 - 21 July 2021**		**18 December 2021 - 22 June 2021**		**18 November 2021 - 23 May 2021**	
	BTC	PSG	BTC	PSG	BTC	PSG	BTC	PSG
Mean	0.001	0.005	-0.001	0.003	-0.002	0.001	-0.002	0.006
Median	-0.002	0.004	-0.002	0.006	-0.003	0.003	-0.002	0.004
Standard dev.	0.034	0.039	0.034	0.055	0.035	0.055	0.039	0.092
Skewness	0.480	0.454	0.380	-1.240	0.414	-1.110	0.279	5.500
Std. error skewness	0.182	0.182	0.181	0.181	0.181	0.181	0.181	0.181
Kurtosis	1.820	1.740	0.909	6.900	0.785	6.390	0.952	57.400
Std. error kurtosis	0.361	0.361	0.359	0.359	0.360	0.360	0.360	0.360
Shapiro-Wilk W	0.969	0.971	0.987	0.884	0.987	0.898	0.987	0.604
Shapiro-Wilk p	< .001	< .001	0.087	< .001	0.093	< .001	0.088	< .001
	19 October 2021- 23 April 2021		**19 Septem. 2021- 24 March 2021**		**20 August 2021- 22 February 2022**			
	BTC	PSG	BTC	PSG	BTC	PSG		
Mean	-2.46e−4	0.008	0.002	0.003	0.002	0.005		
Median	-0.002	0.002	-2.51e−4	-0.001	-7.41e−4	0.005		
Standard dev.	0.044	0.113	0.043	0.117	0.034	0.039		
Skewness	0.574	4.220	0.574	3.840	0.469	0.449		
Std. error skewness	0.181	0.181	0.181	0.181	0.178	0.178		
Kurtosis	1.610	32.000	1.890	28.400	1.620	1.580		
Std. error kurtosis	0.360	0.360	0.360	0.360	0.354	0.354		
Shapiro-Wilk W	0.968	0.659	0.965	0.695	0.972	0.973		
Shapiro-Wilk p	< .001	< .001	< .001	< .001	< .001	0.001		

Table 5. **Autocorrelation and DW Statistic Tests for PSG & BTC Data**

	Autocorrelation	**DW Statistic**
16 February 2022 - 22 August 2021	-0.206	2.41
17 January 2022 - 21 July 2021	-0.190	2.37
18 December 2021 - 22 June 2021	-0.114	2.23
18 November 2021 - 23 May 2021	-0.0651	1.56
19 October 2021- 23 April 2021	-0.0138	2.03
19 September 2021- 24 March 2021	0.00204	2.00
20 August 2021- 22 February 2022	-0.205	2.41

Table 6. **PSG & BTC Regression Analysis Results**

Data Start - End Dates (180 days)		**B**	**Beta (β)**	**t Stat**	**p**	**R**	**R^2**
16 February 2022 - 22 August 2021	Intercept	0,004		1,64	0,103	0.548	0.30
	BTC	0.625	0,548	8.72	0.000		
17 January 2022 - 21 July 2021	Intercept	0,004		0.95	0.342	0.429	0.18
	BTC	0.689	0.429	6.35	0.000		
18 December 2021 - 22 June 2021	Intercept	0.002		0.44	0.672	0.396	0.16
	BTC	0.620	0.396	5.75	0.000		
18 November 2021 - 23 May 2021	Intercept			1.24	0.218	0.406	0.16
	BTC	0.967	0.406	5.93	0.000		
19 October 2021- 23 April 2021	Intercept	0.008		1.07	0.285	0.412	0.17
	BTC	1.052	0.412	6.03	0.000		
19 September 2021- 24 March 2021	Intercept			0.20	0.842	0.368	0.14
	BTC	1.009	0.368	5.28	0.000		
20 August 2021- 22 February 2022	Intercept	0.004		1.83	0.069	0.571	0.33
	BTC	0.646	0.571	9.45	0.000		

Figure 2: **Control of Regression Analysis**

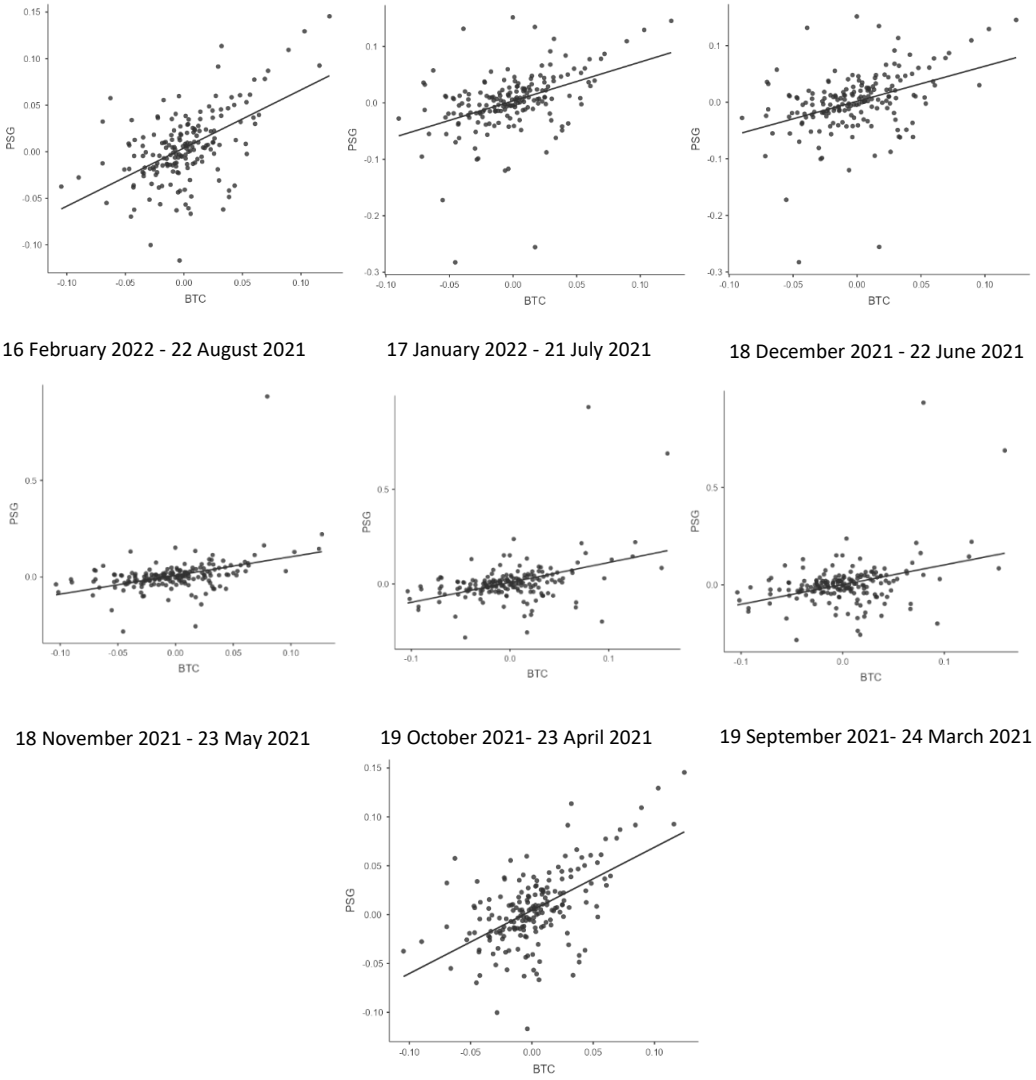
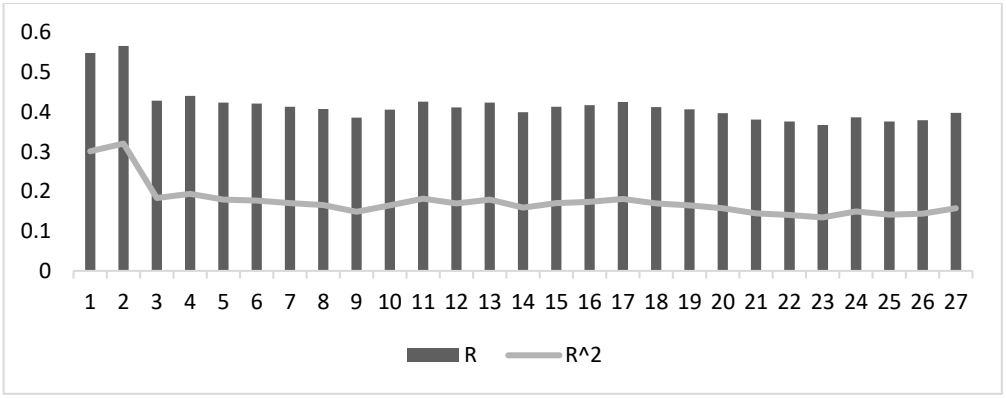


Figure 3: **Result of Analyzes Made with 7-Day Interval and 180-Day Data**



With the same data, regression analysis was performed for each consecutive 180 days at 7-day intervals (See Figure 3). The numbers from 1 to 27 on the horizontal axis in the chart show each week in the analysis made at 7-day intervals.

In all regression analyzes performed respectively, there is a positive high-level significant (p<.001) linear relationship between PSG and BTC, but the R^2 values decreased during periods of higher price volatility.

3.3. Correlation Analysis between Major Cryptocurrencies and Fan Tokens by Market Cap

Unlike the previous correlation analysis according to the technology and platform used, multiple correlation analysis was performed for the cryptocurrencies with the highest market cap and Fan Tokens with the highest market cap without any distinction between technology and platform.

Fan Tokens with the market cap less than one million dollars were not included in the study. Thus, 32 crypto assets under the Fan Token category were included in the listing made on the Coinmarketcap website. 28 of them belong to national and local football clubs from different regions of the world and in different leagues. The others, OG Esports Team belongs to the European-based professional gaming group, the UFC belongs to combat sports league, and two of them belong to Formula 1 (F1) teams operating in the field of motorsports (AM and SAUBER). Data were taken from 3 March 2022 backwards, if any, to 5 March 2021, covering a maximum of 1 year. The data of Fan Tokens, which were offered in 2021, were obtained from the day when they were offered. Although it complies with our criteria in terms of market cap, the ALPINE F1 Team Fan Token, which was released by Binance on February 21, 2022, was not included in our research, considering that there was not enough data. For cryptocurrencies, starting from the highest market cap, BTC (Bitcoin), ETH (Ethereum), BNB (Binance), XPR (Ripple), LUNA (Terra), ADA (Cardano) crypto assets were included in the research. Tether (USDT) and USD Coin (USDC) crypto assets in the "asset-backed stablecoin" category, whose market share is higher than some of the crypto assets listed above, are not included in the research. Our research is based on the last price of the day, which is formed according to the UTC time, over the daily price change. Stablecoins such as Tether and USD Coin can be included while conducting comparative analyzes in the transaction volume and market share research of Fan Tokens that can be made in the future. While the data subject to the multi-correlation analysis prepared according to the market cap, Bitci and CHZ cryptocurrencies were added to these to provide that the results are interpreted separately. CHZ coin is the cryptocurrency of the leading Fan Token platform Socios, where 28 of the 32 Fan Tokens used in the study with a market cap over $1 million were created and released. Fan Tokens from Socios are traded with CHZ. Bitci is a Fan Token supplier and exchange market in Turkey, which has released over 25 Fan Tokens that can be bought and sold through the Bitci blockchain technology developed by itself (Bitci, 2022). Three of the 32 Fan Tokens analyzed were offered by Binance in late 2021. These are Lazio (October 21), Porto (November 16), and Santos (December 1). They were able to rank fourth, fifth, and seventh in the Fan Token market in terms of market cap in a few months after they were issued.

Table 7. **Fan Tokens and Major Cryptocurrencies Correlation Analysis by Market Cap Ranking**

Platform	Organization	Symbol	BTC	ETH	BNB	XPR	LUNA	ADA	Row Average	CHZ
Socios	Paris Saint-Germain	PSG	0.388	0.374	0.439	0.389	0.458	0.342	0.398	0.37
Socios	Manchester City	CITY	0.314	0.314	0.347	0.295	0.198	0.218	0.281	0.39
Socios	FC Barcelona	BAR	0.433	0.423	0.46	0.343	0.424	0.391	0.412	0.53
BNB	S.S. Lazio	LAZIO	0.463	0.426	0.401	0.393	0.159	0.368	0.368	0.34
BNB	FC Porto	PORTO	0.504	0.458	0.458	0.453	0.156	0.447	0.413	0.51
Socios	Inter Milan	INTER	0.405	0.457	0.471	0.458	0.344	0.476	0.435	0.53
BNB	Santos FC	SANTOS	0.444	0.435	0.429	0.412	0.117	0.366	0.367	0.47

Table 7 (Continued). **Fan Tokens and Major Cryptocurrencies Correlation Analysis by Market Cap Ranking**

Platform	Organization	Symbol	BTC	ETH	BNB	XPR	LUNA	ADA	Row Average	CHZ
Socios	AC Milan	ACM	0.481	0.519	0.547	0.495	0.502	0.487	0.505	0.49
Socios	Atletico De Mad.	ATM	0.289	0.339	0.361	0.363	0.38	0.349	0.347	0.36
Socios	Trabzonspor	TRA	0.349	0.348	0.369	0.315	0.317	0.298	0.333	0.4
Socios	Galatasaray	GAL	0.332	0.388	0.358	0.246	0.28	0.255	0.31	0.34
Socios	Juventus	JUV	0.468	0.515	0.528	0.494	0.536	0.458	0.5	0.46
Socios	AS Roma	ASR	0.53	0.568	0.594	0.554	0.475	0.527	0.541	0.52
Paribu	Fenerbahçe	FB	0.509	0.504	0.472	0.48	0.361	0.45	0.463	0.48
Socios	Arsenal AFC	AFC	0.495	0.437	0.456	0.425	0.282	0.41	0.418	0.47
Socios	OG E-sports Team	OG	0.496	0.536	0.557	0.497	0.469	0.492	0.508	0.51
Socios	United F. Cham.	UFC	0.494	0.568	0.568	0.539	0.358	0.511	0.506	0.55
Socios	Leeds United	LUFC	0.673	0.676	0.685	0.57	0.513	0.583	0.617	0.77
Socios	Flamengo	MENGO	0.562	0.512	0.54	0.464	0.285	0.552	0.486	0.6
Socios	Argentine F. Ass.	ARG	0.297	0.316	0.424	0.343	0.308	0.392	0.347	0.44
Socios	Valencia CF	VCF	0.416	0.479	0.553	0.428	0.301	0.494	0.445	0.62
Socios	S.C. Corinthians	SCCP	0.365	0.436	0.496	0.42	0.287	0.338	0.39	0.44
Socios	Aston M. C.F1 T.	AM	0.532	0.534	0.54	0.458	0.325	0.452	0.474	0.66
Socios	Aston Villa	AVL	0.485	0.488	0.513	0.479	0.355	0.412	0.455	0.54
Socios	Everton	EFC	0.524	0.542	0.59	0.51	0.362	0.514	0.507	0.62
Socios	Portugal Nat. T.	POR	0.662	0.644	0.599	0.645	0.456	0.594	0.6	0.67
Socios	C. Atlético Min.	GALO	0.747	0.703	0.724	0.653	0.377	0.632	0.64	0.78
Socios	Alfa Ro. F1 ORLEN	SAUBER	0.327	0.283	0.361	0.276	0.202	0.266	0.286	0.52
Socios	Samsunspor	SAM	0.256	0.235	0.291	0.214	0.237	0.212	0.241	0.3
Socios	Göztepe	GOZ	0.395	0.49	0.516	0.429	0.393	0.442	0.444	0.59
Socios	Sao Paulo FC	SPFC	0.75	0.71	0.71	0.695	0.453	0.645	0.661	0.84
Socios	Young Boys	YBO	0.489	0.526	0.549	0.461	0.473	0.493	0.499	0.6
		Column Average	**0.465**	**0.475**	**0.497**	**0.444**	**0.348**	**0.433**	**0.444**	**0.52**

It draws our attention that although the bitcoin platform entered the market earlier than Binance and uses its own crypto money and blockchain technology, it has not achieved a similar success. Apart from the 3 Binance and 28 Socios Fan tokens that we examined in our research, the remaining Fan Token is the Fenerbahçe Fan Token belonging to the Fenerbahçe sports club supplied by Paribu platform.

There is no significance at $p<0.05$ level between SAM (Samsunspor) Fan Token and 6 Fan Tokens (PORTO, INTER, SANTOS, AFC, ARG, SCCP). There is no significance at the p.05 level between BITCI and 10 Fan Tokens. These are: LAZIO, PORTO, SANTOS, GAL, LUFC, MENGO, ARG, AVL, EFC, SAM Fan Tokens. There is no statistically significant correlation between LUNA and the trio of LAZIO, PORTO and SANTOS, which use only Binance infrastructure out of 40 crypto assets participating in the study and were offered at the end of 2021 by Binance. LUNA has mostly at $p<0.001$ level, and rarely at $p<0.01$ and $p<0.05$ statistical significance levels in the correlation with other crypto assets. Except for the above-mentioned exceptions of LUNA, BİTCİ and SAM, all calculations were found to be significant, and most of them at $p<0.001$ very high significance level. Therefore, the work done in the research is statistically significant.

The correlations of 4 non-football Fan Tokens have very similar results with football Fan Tokens. While the average of the correlation coefficients of 28 football club Fan Tokens from the 32 Fan Tokens in the study with the 6 dominant cryptocurrencies was calculated as 0.444, the average of

the correlations of the other 4 Fan Tokens with the same dominant cryptocurrencies was calculated as 0.443. Even if there are different sports branches, there is almost no difference in the correlation of Fan Tokens with cryptocurrencies on average (the correlation average difference is 0.001). This strongly supports our hypothesis that, apart from sporting success, dynamics related to cryptocurrency exchanges predominantly affect Fan Tokens.

All correlations at the above-mentioned significance level are positive. The average of the correlation coefficient between 6 dominant crypto assets and 32 dominant Fan Tokens was calculated as 0.444. If LUNA (which is in the fifth place according to the market cap of the six major cryptocurrencies and uses a different structure called secret blockchain system) was excluded from the study, the average of the correlation coefficients would change to 0.472 (with 0.028 difference). If only the first three major cryptocurrencies (BTC, ETH and BNB) were taken in the study, and multi-correlation analysis was performed for 32 major Fan Tokens with these, it was calculated that the average result would be 0.479.

The average of 31 correlations calculated between the dominant 32 Fan Tokens, whose market cap is next to each other (neighborhood in the market cap rank order) was 0.544. The average of the correlation coefficients between the same 32 major Fan tokens was calculated as 0.484. Hence, it is concluded that there is a higher correlation between Fan Tokens with close market shares.

Table 8**. Fan Tokens Averages of Correlation Coefficients with 6 Major Cryptocurrencies Based on the Countries They Belong to**

Turkey	Brazil	England	Italy	Spain	Portugal	France	Switzerland	National Team	Non Football
5 tokens	5 tokens	5 tokens	5 tokens	3 tokens	1 token	1 token	1 token	2 tokens	4 tokens
0.358	0.509	0.456	0.47	0.401	0.413	0.398	0.499	0.473	0.443

The average of the correlation coefficients of the 32 Fan Tokens with the 6 major cryptocurrencies on the basis of the countries they belong shown in the Table above. Accordingly, Fan Tokens in Turkey have less correlation with major cryptocurrencies, while Fan Tokens in Brazil have a higher correlation coefficient averages. In this case, it can be concluded that the rate of Fan Tokens have been affected by the fluctuations in the crypto money markets of the country where they are located.

Table 9. **Correlation of Fan Tokens Within the Same Country and Comparison of the Average Results of the Countries**

		LAZIO	INTER	ACM	JUV			SANTOS	MENGO	SCCP	GALO
Italy	INTER	0.287				Brazil	MENGO	0.407			
Italy	ACM	0.568	0.599			Brazil	SCCP	0.286	0.400		
Italy	JUV	0.674	0.580	0.848		Brazil	GALO	0.479	0.635	0.417	
Italy	ASR	0.585	0.646	0.857	0.849	Brazil	SPFC	0.483	0.674	0.417	0.720
Italy Inner Average					**0.709**	**Brazil Inner Average**					**0.530**
		CITY	**AFC**	**LUFC**	**AVL**			**TRA**	**GAL**	**FB**	**SAM**
Britain	AFC	0.639				Turkey	GAL	0.550			
Britain	LUFC	0.578	0.494			Turkey	FB	0.697	0.409		
Britain	AVL	0.401	0.340	0.466		Turkey	SAM	0.235	0.285	0.182	
Britain	EFC	0.436	0.391	0.51	0.843	Turkey	GOZ	0.523	0.424	0.319	0.234
Britain Inner Average					**0.563**	**Turkey Inner Average**					**0.340**
		BAR	**ATM**								
Spain	ATM	0.551									
Spain	VCF	0.565	0.492								
Spain Inner Average					**0.525**						

The Table above draws attention to the correlations of Fan Tokens belonging to football club organizations within the same country and how they vary from country to country. According to the results there could be a high correlation between the Fan Tokens within same country (e.g. The average correlation coefficient of 0.851 between Italian Fan Tokens ACM, JUV and ASR, and 0.843 between British Fan Tokens AVL, EFC).

All the studies mentioned were made with data of at most one year. All analyzes and calculations made during the study with one-year data were repeated with a maximum of six months' data, and it was observed that the correlations calculated are higher at the level of 3-4%. It is considered that the difference is insignificant and cannot affect the general findings and results reached.

4. Conclusion

It has been understood by the regression analysis that there is a cause and effect relationship between BTC, which is the crypto money has the highest market cap, and PSG which is the Fan Token has the highest market cap. It has been concluded that the technology used on Fan Tokens (eg. ETC) and the connection in the associated cryptocurrencies in which the trades are made (eg. CHZ) do not cause a significant difference. So, Fan Tokens which have relatively deep market regarding volume generally act according to the dominant crypto assets (eg. BTC) rather than according to the technology and platforms they use. In shallow markets (Bitci platform, its cryptocurrency BITCI and BFT Fan Token example), there is more correlation between the affiliate cryptocurrency and the Fan Tokens. The correlation between cryptocurrencies and Fan Tokens is higher in periods when the volatility in prices is less. There is a higher average correlation coefficient between Fan Tokens whose market shares are close to each other. Fan Tokens take place in the same league (eg. ACM, JUV and ASR Tokens in the Italian League) can have a higher correlation coefficient with each other. Bitci platform develops and uses its own technology but it is behind Binance and Socios in terms of Fan Tokens' market cap. Similarly; although Socios and Bitci issued Fan Tokens for national football teams, Socios seems to be more successful in market cap and volume.

In the literature, to what extent Fan Token prices are affected by sporting success (with the difference between national or international ones), how much is affected by share prices in the stock market, comparison of first day and long-term returns compared to other crypto assets (NFT, DeFi, Meme, and Bitcoin), the interaction of Fan Tokens on the Socios.com platform with Chiliz has already been studied. In our study, the relationship between cryptocurrencies and fan tokens was investigated, and fan tokens were included in the study not only in the field of football but also from other fields. In addition, football clubs were evaluated according to their countries and whether they were a national team or not. As far as we know, comparisons between platforms were made for the first time by examining different fan token performances of different platforms. In our study, the studies with Bitcoin in the literature were expanded by including other common cryptocurrencies and Fan Tokens were examined. With all this, we believe that our study fills an important gap in the literature.

Cryptocurrency markets, which are known unreliable in the literature due to their high volatility also cause imbalance in Fan Token markets. It has been determined by the regression and correlation analyzes in the research that the developments in the crypto money exchanges should be followed especially and carefully for those who see the Fan Tokens as an investment tool. Because the movements in the crypto money exchanges have an effect on the Fan Token exchanges. Therefore, Fan Token markets carry similar risks with the dominant crypto money markets. Fan Token movements show more parallelism with the dominant crypto assets during periods when the markets are relatively calm and less volatile. If a person who buys Fan Tokens for investment and profit-making purposes, should not choose tokens with close market shares in order to diversify their basket. It is considered that prices may be affected collectively by changes in the general interest in Fan Tokens. In the initial offerings of Fan Tokens (FTO), it has been

concluded that the awareness, recognition and size of the platform are effective in the success of the offering crypto asset. It is thought that success of a relatively small sportive organization offered on a large platform could higher than a large sporting organization offered on a small platform. The reason could be the advertising and promotion budget which allocated by the platforms. Therefore, we predict that the leading platforms in the industry will maintain their leadership, and that the big players such as Binance, which are new to the industry, will be successful. We could see more unsuccessful offerings of small players and platforms in the Fan Token market.

Despite the increasing interest in Fan Tokens and cryptocurrencies, freedom brought by the decentralized structure and libertarian philosophy of crypto assets is not unlimited and it is decreasing day by day with the emerging regulations. With the growth of crypto-asset markets, theft and illegal activities are increasing. Authorities want to prevent illegal money transfers and protecting the financial lives of citizens. Thus, they are introducing more and more effective regulations. So, the conjecture could continue in this way in the near future. Although some models are developed to classify crypto assets, a complete consensus of opinion and discourse has not been achieved yet. New classification models may need to be developed in possible launch scenarios of new types of crypto assets such as decentralized central bank digital currencies, semi-central stablecoins indexed to SDR. Our recommendation is that four important criteria must be included in the models to be put forward regarding classification of digital money. These are; whether blockchain technology is used, whether smart contracts are used, whether there is a decentralized structure, and whether there is an authority (states, ECB, IMF, BIS, etc.) behind the crypto financial assets (fiat money, commodities, stocks, bonds, lease certificates, etc.). It has been thinking that in a classification model that does not have one or more of these four criteria, the differences between; virtual currency (used in gaming platforms), electronic money (Paypal and e-money used in payment systems), convertible certificate (e.g. gold certificate), central bank digital currency, coins (bitcoin, altcoin, stablecoin) and tokens (payment, utility, security, NFT) cannot be fully revealed. Fan Token market has not yet reached maturity and that it may contain many innovative development areas. Fan Tokens are becoming more and more widespread as a result of the search for different alternative income models by sports clubs to compensate their decreasing income during the COVID-19 pandemic period. The number of platforms that offer fan tokens, the number of tokens offered, and the variety of sports branches belonging to tokens are increasing. Considering the supply announcements made by the platforms, no change is expected in this trend in the short and medium term. Although the Fan Token market has reached a size of approximately 350 million dollars and a daily transaction volume of approximately 150-200 million dollars (Coinmarketcap, 2022), it has been observed that it has not received a parallel interest in the national and international academic community. Research on the subject of Fan Tokens is extremely limited. We anticipate that it will attract more attention after the Fan Token market size exceeds the 1-billion-dollar total market share threshold.

The relationship between the sportive achievements of organizations and the Fan Token prices can be evaluated with more detailed and different analyzes in future studies. For example, the effect of a winning, sporting success or championship on Fan Token prices can be examined by different methods and developing detailed models. The relationship between Fan Token price movements and (if any) the stocks of the sportive organization, may also be worth researching. Apart from daily price movements, hourly, weekly and monthly movements can be used as a data set. Volume of Fan Token transactions, time-dependent changes in the volume, size of the market cap and the changes in them, value of the national currency and developments of the economy in where the country the Fan Token exist, can also be the subject of different researches. Prediction models based on machine learning and artificial intelligence algorithms can be developed on Fan Tokens, and various academic research can be done in this way.

References

Binance. (2021). Binance Fan Tokens. Retrieved from https://academy.binance.com/en/articles/what-are-binance-fan-tokens

Bitcoin Whitepaper. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from https://bitcoin.org/bitcoin.pdf

Bitci. (2022). FTO Fan Token Offering. Bitci Teknoloji. Retrieved from https://www.bitci.com/projects/

Coin market cap. (2022, 02 August). Retrieved from https://coinmarketcap.com/

Çetinkaya, Ş. (2018). Kripto Paraların Gelişimi Ve Para Piyasalarındaki Yerinin Swot Analizi İle İncelenmesi. *Uluslararası Ekonomi ve Siyaset Bilimleri Akademik Araştırmalar Dergisi*, 2,5.

Demir, E., Ersan, O., Popesko, B., (2022). Are Fan Tokens Fan Tokens? Finance Research Letters. Retrieved from doi:10.1016/j.frl.2022.102736.

ECB. (2016). Distributed Ledger Technology. Frankfurt. Retrieved from https://www.ecb.europa.eu/pub/pdf/scpops/ecbop172.en.pdf

Ethereum. (2022). Ethereum Whitepaper Retrieved from https://ethereum.org/en/whitepaper/

Fındıklı, S. and Saygın, E.P. (2021). Müşteri Vatandaşlık Bağlamında Taraftar Tokenları. *Üçüncü Sektör Sosyal Ekonomi Dergisi*, 56(1), 57-71.

IMF. (2016). Treatment of Crypto Assets in Macroeconomic Statistics Report. Retrieved from https://www.imf.org/external/pubs/ft/bop/2019/ pdf/Clarification0422.pdf

IMF. (2018). Global Financial Stability Report. Retrieved from https://www.imf.org/en/Publications/GFSR/Issues/2018/04/02/Global-Financial-Stability-Report-April-2018

Mazur, M. and Vega, M., (2022). Football and Cryptocurrencies. Working Paper. Retrieved from doi:10.2139/ssrn.4035558.

Paribu. (2021). Fenerbahçe Fan Token Whitepaper. Retrieved from https://www.paribu.com/files/Fenerbahce_Token_Whitepaper.pdf

Socios. (2022). Partners. Retrieved from https://www.socios. com/partners/

Scharnowski, M., Scharnowski, S. and Zimmermann, L. (2022). Fan Tokens: Sports and Speculation on the Blockchain. Retrieved from https://ssrn.com/abstract=3992430

Üzer, B. (2017). *Sanal Para Birimleri*. Central Bank of the Republic of Turkey Specialization Qualification Thesis, Ankara.

Vidal-Tom_as, D. (2022). Blockchain, sport and fan tokens. Working Paper.