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COMPARATIVE ASSESSMENT OF ECO-FRIENDLY AND HIGHEST TRADING CRYPTOCURRENCIES

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ABSTRACT:*Because of global warming, problems such as climate change and the destruction of natural resources have reached such a level that individuals, institutions, and states cannot remain indifferent. At this point, taking only technical measures are not sufficient and it is necessary to use sustainable methods in all areas of life. In this context, financial systems have also become sensitive to environmental awareness by following environmentally friendly policies and developing sustainable products. It has been included in the environmentally friendly approaches that are maintained globally. This study examined environmentally friendly cryptocurrencies with a very recent history, a limited number of trades, and the seven most valuable classical cryptocurrencies listed on the crypto money exchange between July 2019 and April 2022. As a result, a statistically significant and strong correlation was found between the values of the two groups of cryptocurrencies. In this case, it has been concluded that investors use the investment reflexes acquired in classical cryptocurrencies in their approach to environmentally friendly cryptocurrencies, which are a relatively new investment tool. In addition, environmentally-friendly crypto money users and investors will increasingly continue to be interested in these currencies. With the increase in such a demand, the crypto money used today will inevitably be energy and environment-friendly.*

KEYWORDS:*Cryptocurrencies, environmentally friendly crypto currencies, green finance, sustainable finance*
JEL Classification:*E40, E42, E44, F36, G00, O3*

I. INTRODUCTION

Cryptocurrencies have entered human life as the invention of the twenty-first century. These coins are a means of exchange that can be produced, bought, sold, and used for investment purposes [1]. The first cryptocurrency used was Bitcoin. It is blockchain technology that enables the use of this money. Blockchain and Bitcoin were first introduced to the literature by Nakamoto, who prepared the study called Bitcoin: A Peer-to-Peer Electronic Cash System in 2008[2]. The technologies from which cryptocurrencies originate are advanced technologies. One of these technologies is cryptocurrency mining. In this system, the ledger requires a large amount of processing power for its secure algorithm and proof of work. This results in high electricity consumption. The heat generated by cryptocurrency mining and the carbon emissions from high electricity consumption from fossil fuels harms national and global eco-friendly efforts on the environment. In this direction, various solutions are possible to reduce the damage to the environment during cryptocurrency mining. All non-green cryptocurrencies, which are at the forefront of world crypto lists, especially Bitcoin and Ethereum, use the proof-of-work (PoW) system. It seems inevitable that many cryptocurrencies will switch to an energy-friendly system called proof-of-stake (PoS)[4], reducing energy consumption. Also, based on the assumption that Bitcoin mining is inevitable, encouraging the equipment to be used in these efforts to be more energy efficient will greatly reduce carbon emissions. Additionally, introducing an extra carbon tax for high-energy consumers could help reduce the environmental cost.

When eco-friendly crypto users invest in green cryptocurrencies, their carbon emissions will continue to decrease drastically. As the world turns its direction toward sustainable nature, it is inevitable that cryptocurrencies will continue to turn greener in the same way.

Cardano (ADA), Holo (HOT), IOTA (MIOTA), Ripple (XRP), Signum (SIGNA), Stellar Lumens (XLM), and TRON (TRX), which are currently traded in limited numbers, have been evaluated in the study. Bitcoin (BTC), Ethereum (ETH), BNB (BNB), XRP (XRP), Dogecoin (DOGE), Wrapped Bitcoin (WBTC), and Polygon (MATIC) cryptocurrencies with the highest transaction value in the markets and the aforementioned environmentally friendly coins. A comparative evaluation was made. The study showed that the demand for environmentally friendly cryptocurrencies with a very recent history is increasing.

Limitations of this study; The historical background of environmentally friendly cryptocurrencies is quite recent. For this reason, the data between July 2019 and April 2022 could be examined as the common intersection date range to examine the synchronous periods for environmental and classical cryptocurrencies.

II.LITERATURE REVIEW

Studies in the literature are very limited, as environmentally friendly cryptocurrencies are traded in the markets recently. Most of the studies in the literature are about the damage of cryptocurrencies to the environment. One of the early examples of these studies is the study of Loviscach (2012). The study discusses the negative effects of Bitcoin on the environment. Kane (2018) compared cryptocurrencies with other available payment methods, including banknotes and debit cards. He emphasized that paper banknotes are more environmentally friendly than cryptocurrencies because they are easy to recycle. He also stated that mining cryptocurrencies is not environmentally friendly because it requires significant energy use.

In his study, Blinder (2019) stated that Bitcoin, Ethereum, and other cryptocurrencies require a large amount of energy consumption. In addition, in 2018, blockchain consumed more energy than in 159 countries. He also stated that this is a substantial environmental problem threatening the Paris climate change agreement. While advocating the need for an urgent fix, he also emphasized the need for mining operations to provide incentives to use solar or other green energy sources. Blinder also suggested that businesses using Blockchain should switch to "Proof of Stake" systems to protect the ecological effects and provide energy reserves.

John et al. (2021) emphasized that with the bans imposed by the Chinese cabinet on Bitcoin mining, the value of Bitcoin decreased by 30% in May 2021. In the same period, immediately after the ban, the USA linked the increase in energy consumption related to crypto mining with the ban in China. However, the study also stated a decrease in the shares related to the blockchain in this period.

Laurent (2021), emphasizing that cryptocurrencies cause more and more energy consumption to solve their algorithms and that fossil fuels should be used in many parts of the world to provide this energy, pointed out that in some countries, there are problems due to the excess energy spent for mining.

In her study, Sigalos (2021) emphasized the need to accurately read the carbon emissions of cryptocurrencies, especially knowing the energy mix used to produce the electricity used by the Bitcoin mining operation.

The study by Lobo (2022) and John et al. (2021) state that Bitcoin mining causes great costs and has taken decisions to ban this mining in China. As a result, the energy consumption of the cryptocurrency is greatly reduced. Following this ban, the United States also pointed out that there has been a serious increase in crypto-related energy consumption, emphasizing the importance of cryptocurrencies becoming environmentally friendly in the future.

Yeong et al (2022), used the survey method in their study on the sustainability of cryptocurrencies in the case of Malaysia and estimated partial least squares structural equation modeling with the partial least square structural equation modeling (PLS-SEM) (PLS-SEM) approach. As a result, it has been determined that Malaysians are highly interested in cryptocurrency use.

Lahmiri, &Bekiros (2019) analyzed the prices, returns, volume, and volatility of Islamic and green cryptocurrencies compared to traditional cryptocurrencies in their study. The study found that the price volatility of Islamic and green cryptocurrencies is high compared to conventional cryptocurrencies. In addition, it was stated in the study that green cryptos exhibit deeper and more stable price behavior compared to traditional cryptos.

Sori et al. (2020) emphasized in their study that one of the challenges with cryptocurrencies is high energy consumption. The same study explained that this situation is not only a problem for Bitcoin but also for other cryptocurrencies. IOTA energy consumption modeling and measurement of the IOTA control mechanism (Proof-of-Work), which causes high energy consumption today, were made in the study. As a result, they pointed out that cryptocurrencies should be greener.

Lacey (2021) pointed out in his study that the future of crypto money is open to technological developments, and the prerequisite for this is that it must be environmentally friendly. He also stated that one way to make traditional cryptocurrencies more environmental-friendly is for investors to invest in environmentally friendly coins.

Mnif and Jarboui (2021) evaluated the efficiency of the Islamic, green and traditional cryptocurrency market during the COVID-19 pandemic using the generalized Hurst exponent as an evaluation measurement of fractality and employing the multifractal detrended fluctuation approach. As a result, they determined that there is no herd behavior in the Islamic and green cryptocurrency markets.

Mnif et al. (2021) took the study data from the Google Trends search engine and Twitter application between 2015 and 2020. To visualize investor attitudes towards BITG, normality (JarqueBera) and Kruskal-Wallis rank-sum tests were applied in the study. As a result, they emphasized that users' use of BITG creates a positive perception of a sustainable blockchain.

Pham et al. (2021) examined the time-varying spreads between cryptocurrencies, green and fossil fuel investments using the TVP-VAR network connectivity model, and the diffusions between cryptocurrencies, green and fossil fuel assets. They found that negative return spreads are greater than positive return spreads among these assets and that asymmetric spreads are also present.

Sori et al. (2021) emphasized that as a global technology in the future, cryptocurrencies should also consider energy efficiency and sustainability issues for daily use. In the study, a model has been proposed in terms of the energy consumption of Cryptocurrencies.

Badea and Mungiu-Pupăzan (2021) examined the economic and environmental effects of Bitcoin in the literature. They explained that despite Bitcoin's high energy consumption and negative environmental impact, it remains an evaluated tool in the economy.

Pham et al. (2022), considering the period from 2017 to 2021, evaluated the daily closing prices of green and non-green cryptocurrencies within the framework of quantitative correlation and found a strong asymmetrical link. They found that it has a weak link to Bitcoin and Ethereum with green cryptocurrencies.

Ren and Lucey. (2022) examined traditional and environmentally friendly cryptocurrencies according to their energy consumption levels, which are called "dirty" and "clean" energy indices. Statistical evidence of the study; is that the use of clean energy makes a big difference. The study states that cryptocurrencies using clean energy can be a safe haven for investors during periods of economic uncertainty.

There are many studies in the literature on cryptocurrencies and blockchain. These studies can be divided into three groups. In the first group, there are blockchain and cryptocurrencies, in the second group, specific cryptocurrencies, and in the last group, the legal dimension of cryptocurrencies and comparative evaluations with economic values are included.

The first study to pioneer blockchain and cryptocurrency is the article by Nakamoto (2008). Some of the other studies on this subject are as follows; King and Nadal, (2012), Grinberg (2012), Ahamad et al. (2013), Doran, (2014), Guadamuz and Marsden (2015), Yıldırım (2015), Vigna and Casey, (2016), Tama et al. (2017), Keskin and Köylü (2017), Vujičić et al (2018), Hassani et al. (2018), Fenwick and Vermeulen (2019), Isler et al. (2019), Zhou et al. (2020), Baur and Hoang (2021), Frankenfield (2021), Bossler and Kroenung (2022), and Halaburda et al. (2022).

Among the studies with specific cryptocurrencies; Suarez (2009), Elven (2011), Ortega (2012), King (2013), Bohr, and Bashir (2014), Farell (2015), DeVries (2016), Chohan (2017), Keskin (2018), Fang, et al. (2022) and Keskin (2022).

The legal dimension of cryptocurrencies and their comparative studies with economic values are frequently found in the literature. Some of the studies conducted in this context are as follows: Güring and Grigg (2011), Catalina and Florentin (2012), Dyhrberg (2015), Atik et al. (2015), Szetela et al. (2016), Décourt et al. (2017), Li and Wang (2017), Oktar and Salihoğlu (2018), Bağcı and KöylüKeskin (2019), Limba et al. (2019), Dere (2019), Dayanan (2021), Balcı&Çakır (2021), Atici et al. (2022) and Perez &Mazzuchelli (2022).

III.DATA SET

For the analysis of the study, the variables included in the analysis were created to cover the environmental crypto coins with the highest market value and the classical crypto coins with the highest market value for July 2019 and April 2022. The reason for choosing these dates is that environmental coins are relatively new in global markets. The data showing the daily value change amounts of the most environmentally friendly and classical cryptocurrencies used in this study were obtained from different sources. The sources from which the data are provided are given in Table: 1 and Table: 2.

TABLE 1. Data source portals (Most valuable eco-friendly cryptocurrencies - USD$)

1	Cardano (ADA)	https://tr.investing.com/crypto/cardano
2	Holo (HOT)	https://tr.investing.com/crypto/holo
3	IOTA (MIOTA)	https://tr.investing.com/crypto/iota
4	Ripple (XRP)	https://tr.investing.com/crypto/xrp
5	Signum (SIGNA)	https://tr.investing.com/crypto/signum
6	StellarLumens (XLM)	https://tr.investing.com/crypto/stellar
7	TRON (TRX)	https://tr.investing.com/crypto/tron

TABLE 2. Data source portals (Top cryptocurrencies - USD$)

1	Bitcoin BTC	https://coinmarketcap.com/currencies/bitcoin/
2	Ethereum ETH	https://coinmarketcap.com/currencies/ethereum/
3	BNB BNB	https://coinmarketcap.com/currencies/bnb/
4	XRP XRP	https://coinmarketcap.com/currencies/xrp/
5	Dogecoin DOGE	https://coinmarketcap.com/currencies/dogecoin/
6	WrappedBitcoin WBTC	https://coinmarketcap.com/currencies/wrapped-bitcoin/
7	Polygon MATIC	https://coinmarketcap.com/currencies/polygon/

The collected data covers 34 months, from 1 July 2019 to 30 April 2022. The monthly averages of the data were included in the analysis.

IV.FINDINGS OF THE STUDY

34 rows of data for one currency, mid-month. Bitcoin, Wrapped Bitcoin, Ethereum, and BNB is the average highest value cryptocurrency. It is seen that the Kurtosis values are small in size and depressed from the left compared to the depictions. These four currencies are predicted to have a high-value acceleration in this situation.

TABLE 3. Descriptive statistics

Variables	N	Ort.	Med.	Min.	Max.	Var.	Std.S.	Skew.	Kurto.
Bitcoin	34	2,72E+04	1,93E+04	6,79E+03	5,83E+04	3,65E+08	1,91E+04	0,35	-1,57
Ethereum	34	1,46E+03	5,51E+02	1,39E+02	4,25E+03	1,99E+06	1,41E+03	0,58	-1,26
BNB	34	1,95E+02	3,13E+01	1,41E+01	5,95E+02	4,46E+04	2,11E+02	0,58	-1,42
XRP	34	0,54	0,38	0,19	1,38	0,13	0,37	0,88	-0,44
Dogecoin	34	0,09	0,00	0,00	0,41	0,01	0,11	1,08	0,18
Wrapped Bitcoin	34	2,72E+04	1,93E+04	6,79E+03	5,81E+04	3,65E+08	1,91E+04	0,35	-1,58
Polygon	34	0,58	0,02	0,01	2,32	0,57	0,75	0,88	-0,82
Cardano	34	0,69	0,14	0,03	2,43	0,58	0,76	0,81	-0,64
Holo	34	0,00	0,00	0,00	0,02	0,00	0,00	1,37	1,40
IOTA	34	0,66	0,35	0,16	1,96	0,26	0,51	0,89	-0,35
Ripple	34	0,53	0,36	0,18	1,28	0,12	0,35	0,79	-0,78
Signum	34	0,01	0,00	0,00	0,02	0,00	0,00	1,34	0,94
Stellar Lumens	34	0,19	0,14	0,04	0,54	0,02	0,15	0,82	-0,39
TRON	34	0,05	0,03	0,01	0,12	0,00	0,03	0,81	-0,59

When we consider Kurtosis and Skewness values together, it is understood that while XPR and Polygon currencies have a balanced distribution, Dogecoin currency decreased with low acceleration. Most data on environmentally friendly cryptocurrencies have been created in the last 2-3 years. On the other hand, data on other cryptocurrencies are available for a longer period. It has been observed that environmentally friendly currencies generally have lower values due to their newer nature. Besides the signum currency showing a small decrease, environmentally friendly currencies have generally balanced distributions. Descriptive statistics for all currencies are given in Table 3.

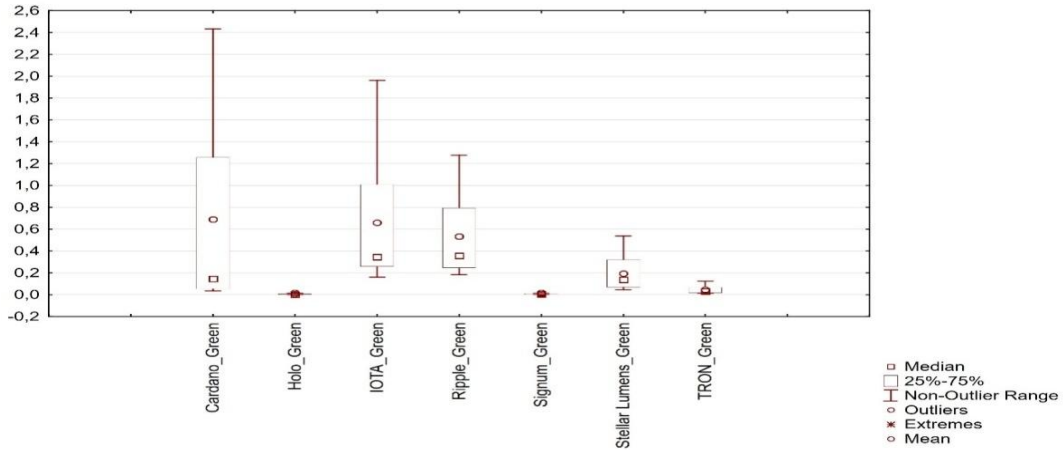

Figure 1. Box Chart

The box chart showing the data distributions of the most valuable environmentally friendly cryptocurrencies is presented in Figure 1. It has been observed that Holo and Signum currencies have a gap close to zero. Besides, the Tron currency has a narrow opening. The median values of Cardano, IOTA, Ripple, and Stellar Lumens were below average. Accordingly, it can be concluded that these currencies started to increase with a higher acceleration after the second half of the 34 months. At this point, it has been concluded that the currency with the greatest difference between the median and average values is Cardano. Therefore, this currency has the highest increase momentum among environmentally friendly cryptocurrencies.

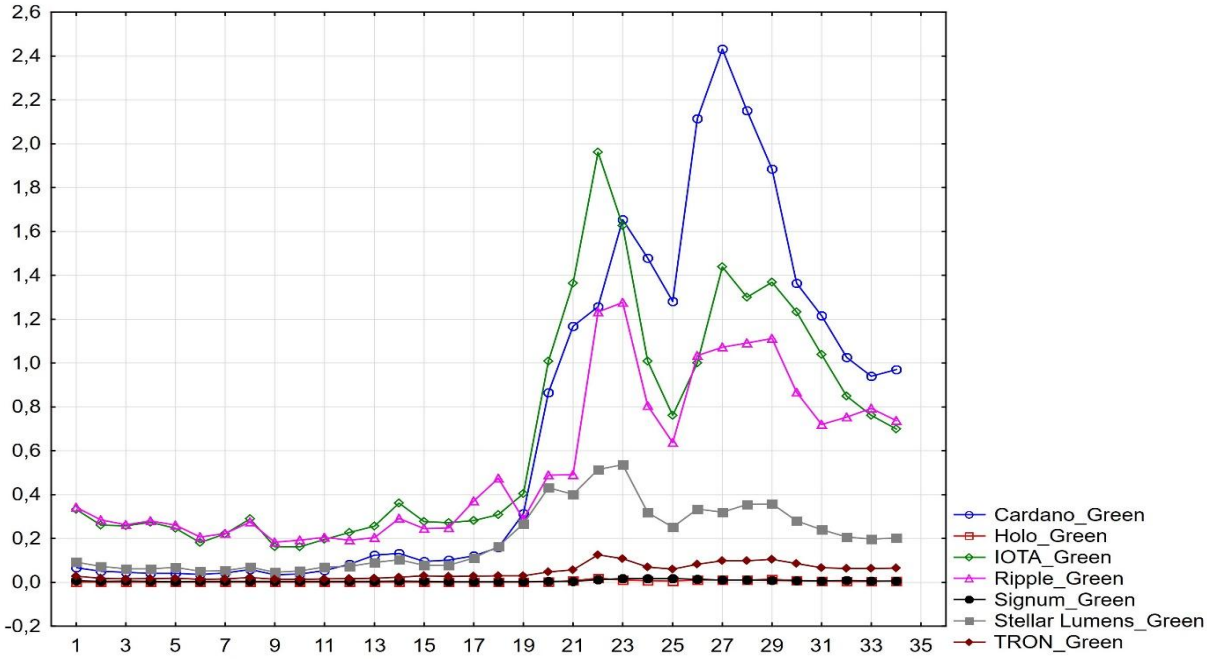

Figure 2. Line Graph

The line chart of environmentally friendly cryptocurrencies is presented in Figure 2. In particular, it is observed that Cardano, IOTA, and Ripple currencies have a distribution similar to each other and show an increase in value in the second half of the 34 weeks. The boxplot showing the data distributions of the most valuable cryptocurrencies other than environmentally friendly cryptocurrencies is presented in Figure 3.

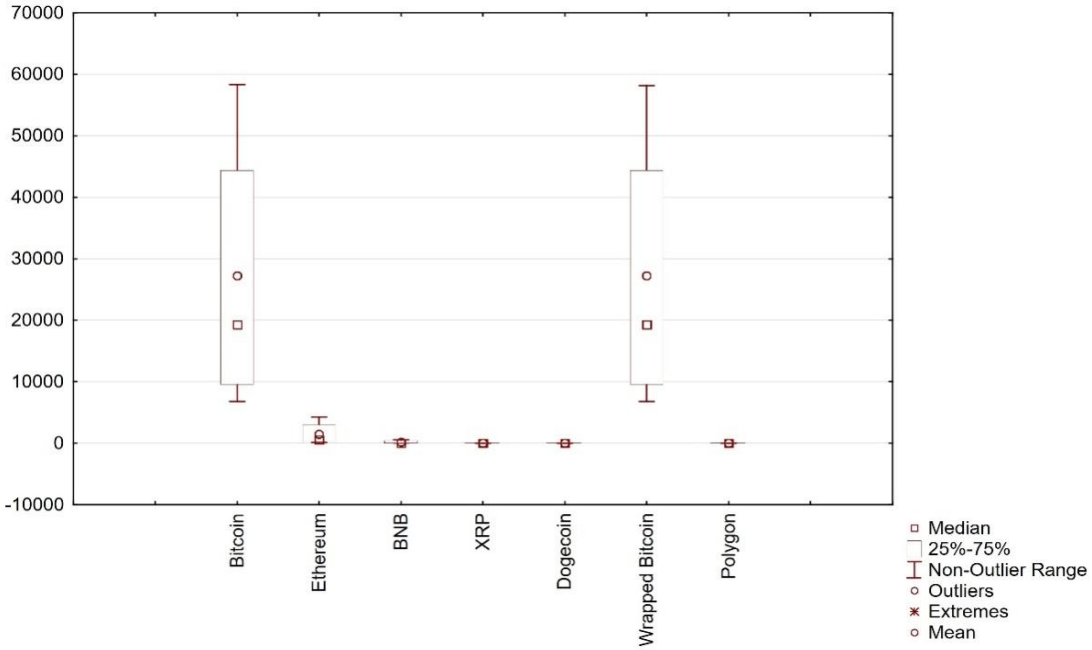

Figure 3. Box Chart

It has been observed that the currencies BNB, XRP, Dogecoin, and Polygon have a gap close to zero. Besides, the Ethereum currency has a narrow opening.

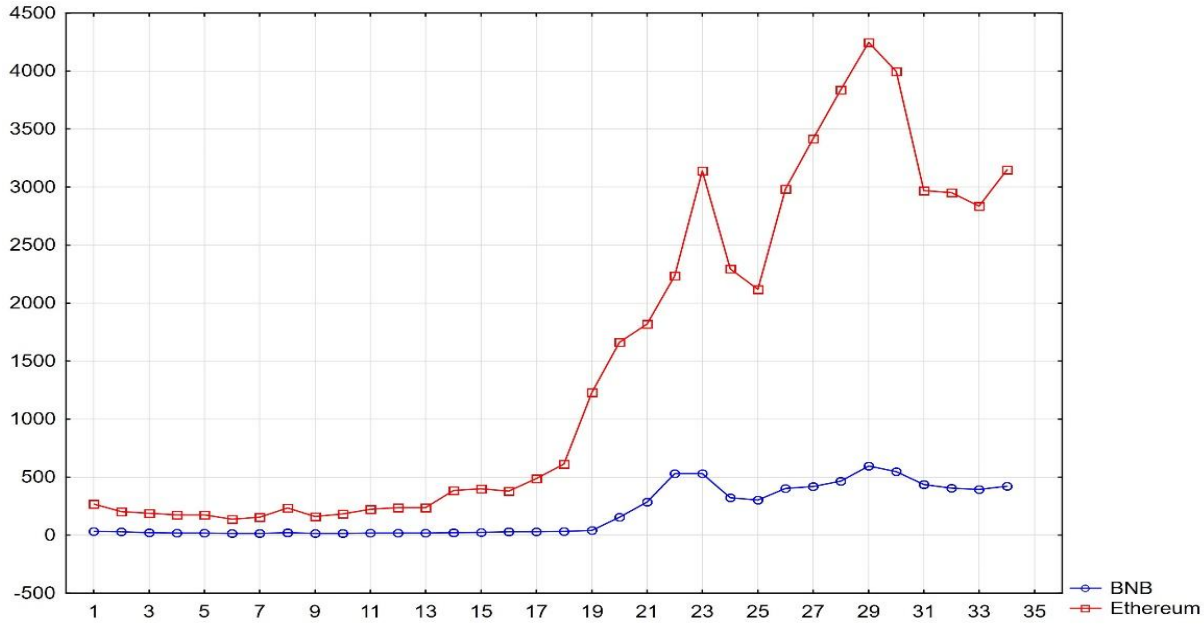

Figure 4. Line Graph

Although Ethereum and BNB currencies have a fairly wide gap compared to environmentally friendly currencies, they appear narrow on the same chart as a result of the large value range of Bitcoin and Wrapped Bitcoin currencies, which are in the same cluster. Figure 4 shows the line chart of Ethereum and BNB currencies. My Ethereum has increased with a higher momentum in the second half of the 34 weeks compared to BNB, and BNB has value movements at a level of 500 points and in a narrow band.

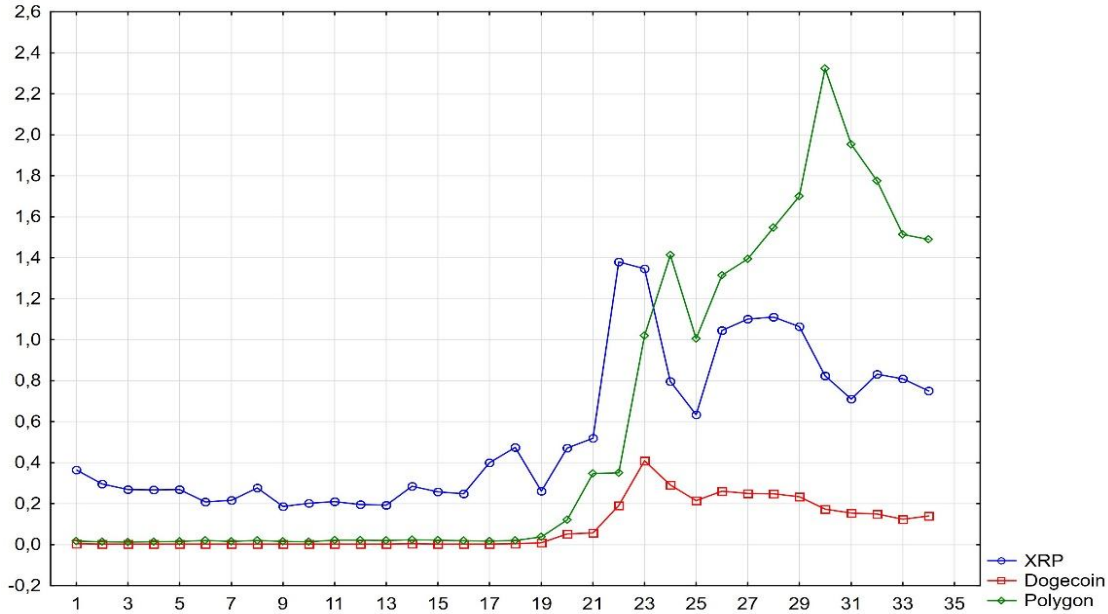

Figure 5. Line graph

Figure 5 shows the line chart of Ripple, Dogecoin, and Polygon cryptocurrencies. In the first half of the thirty-four weeks, while the cryptocurrencies progressed steadily, they seemed to diverge in the second half. Polygon showed the highest acceleration in this period.

It is observed that Bitcoin and Wrapped Bitcoin currencies have a similar distribution. In Figure 6, the line graph of these two currencies is given. In addition, the median values of these currencies remained below the average.

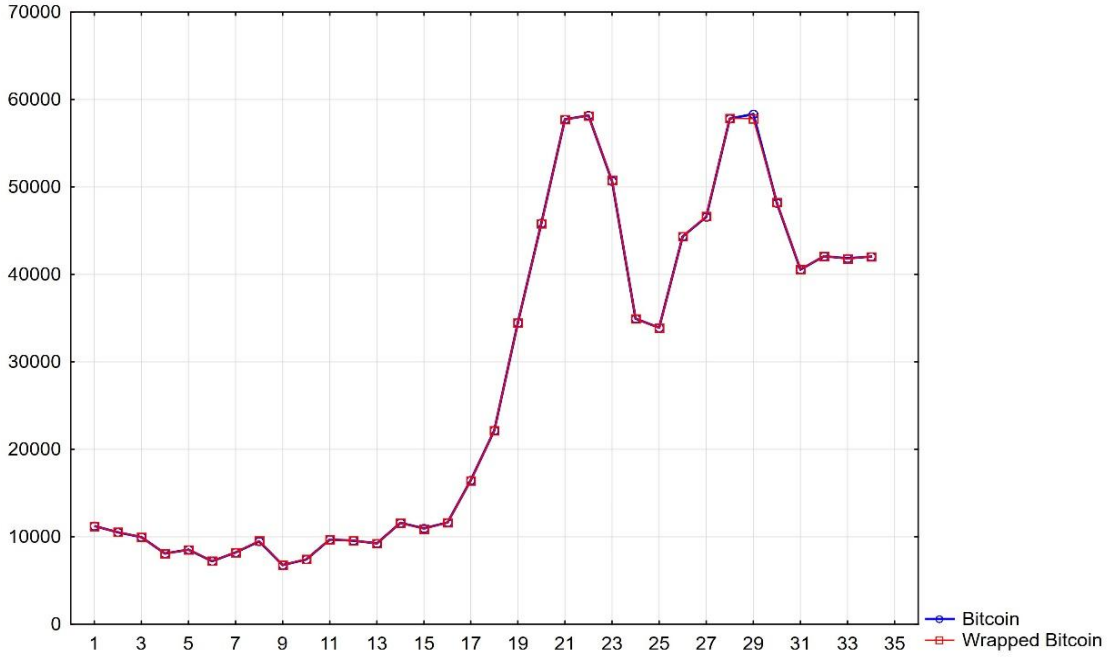

Figure 6. Line graph

Table 4 shows the correlation values between environmentally friendly cryptocurrencies and other standard cryptocurrencies. XRP and Ripple have a 100% correlation. In addition, XRP has a 98% correlation with Tron, 94% with Holo, 92% with IOTA, and 90% with Cardano. The strongest cryptocurrency, Bitcoin and Wrapped Bitcoin, strongly correlate with all currencies except the environmentally friendly currencies Signum.

Table 4. Environmental friendly and traditional cryptocurrency correlation

	Cardano	**Holo**	**IOTA**	**Ripple**	**Signum**	**Stellar Lumens**	**TRON**
Bitcoin	0,89	0,86	0,93	0,89	0,57	0,92	0,92
Ethereum	0,93	0,82	0,85	0,91	0,62	0,77	0,91
BNB	0,91	0,91	0,91	0,95	0,69	0,81	0,96
XRP	0,90	0,94	0,92	1,00	0,76	0,85	0,98
Dogecoin	0,91	0,85	0,84	0,93	0,89	0,80	0,90
Wrapped Bitcoin	0,89	0,86	0,93	0,89	0,58	0,93	0,92
Polygon	0,82	0,67	0,67	0,78	0,57	0,54	0,76

Polygon generally has a weak correlation with eco-friendly currencies. Another strong currency, Ethereum, has the strongest correlation with Cardona of any eco-friendly currency. Besides, Ethereum has a strong correlation with currencies other than Signum and Stellar Lumens.

V. CONCLUSION

Green energy means less air pollution by not emitting less fossil fuel and carbon to nature. Wastes that occur while producing energy cause damage to nature and the environment. Today, an unprecedented increase in the demand for cryptocurrencies is characterized. The energy consumption of cryptocurrencies during the production and approval processes with high energies increases the environmental damage. For this reason, environmentally friendly cryptocurrencies that use green energy, produce their own energy or consume very little have started to take their place in the markets.

This study examined the data of the most valuable environmentally friendly cryptocurrencies and other most valuable classical cryptocurrencies covering 34 months. An evaluation was made by taking the monthly averages of the data. According to the preliminary findings, it is understood that all cryptocurrencies have a left-verted distribution. Since eco-friendly cryptocurrencies are new to the crypto market, it has been observed that eco-friendly cryptocurrencies in general have lower values. While the Signum currency shows a small decrease, eco-friendly cryptocurrencies have a balanced distribution. In general, there is a statistically significant and strong correlation between both groups of cryptocurrencies. In this case, it has been concluded that the crypto money investor uses the investment reflexes he has acquired in classical cryptocurrencies in his approach to environmentally friendly cryptocurrencies, which are new investment tools. It is thought that inversely

proportional to the earnings and confidence levels that currencies will provide, the correlation between clusters will weaken and investment decisions will be based on more independent arguments.

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