Bitcoin Economy: Cryptocurrency Ecosystem Analysis and Long-Term Projections

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Abstract

Bitcoin is an innovative digital currency that came out in 2009 and prepared the scene afterwards for numberless cryptocurrencies to circulate in the market. Bitcoin had become an asset used by more individual thanks to its market capitalization, increasing number and volume of transactions day by day and more stabilized market price in this period. Technically, Bitcoin uses an infrastructure called block-chain that includes all transaction logs and let the user to confirm the validity of these transactions. In financial terms, Bitcoin is an asset that has regular fiatmoney functions such as being a medium of exchange, measure of value, standard of deferred payment and store of value in some way. At the same time, Bitcoin constitutes a new economy consisting mining firms in the process of minting new currencies, e-wallet applications that keeps the currency securely in individual and institutional accounts, financial services that focus on technical infrastructure and/or provide technical analysis service on market value, exchange markets that serves as a market that ensures the exchange transactions and trades, payment processors that allow usage of the currency as medium of payment in purchase and sale processes and lastly firms that operates at least two of these sub-sectors or more. This new economy brought along new opportunities and has been attracted the venture capital to itself. This study aims to acquaint about Bitcoin and the related new economy formed by sub-sectors. This study therewithal intends to develop a perspective about the future of this new economy and might serve as a premise study for forthcoming researches.

Keywords: *Bitcoin*, *Bitcoin Economy*, *Cryptocurrency.*

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A. INTRODUCTION

Economy; In its simplest sense, it can be defined as a holistic network of producers, distributors and individuals consuming goods and services on a local, regional or national scale (Narayanan et al., 2016; Greenspan, 2017). Based on this definition, it would not be wrong to define the Bitcoin economy, which is the subject of the study, as a network of Bitcoin producers, users and companies that provide services necessary for Bitcoin to function in the market. The aim of this study is to discuss the position of cryptocurrencies among the types of money currently used in the market (Yamada et al., 2016). However, it is to make a prediction about the current situation and future of this new economy by examining the service provider companies that provide the services necessary for the Bitcoin system to work and that have emerged with the existence of Bitcoin, in general terms and at the sub-sectors level.

Cryptocurrency is the currency that uses cryptography in its structure. (Gandal and Halaburda, 2014) Cryptology is used in the process of creating money and ensuring the reliability of transactions made with it. The theoretical

infrastructure of cryptocurrencies was introduced by Wei Dai in 1998 (Amanzholova & Teslya, 2018; Kosov et al., 2021). Cryptocurrencies, the mechanisms and algorithms by which they perform the transactions, the computer software and hardware that ensure the continuity of the system are the subject of examination of the science of mathematics and the discipline of information technologies. On the other hand, it is also in the field of interest of economic sciences because it has the feature of a currency and creates an economic system that includes the service providers necessary for the sustainability of the system.

Table 1. ECB Monetary Matrix

Legal Status	**Unregulated**	Different types of local currencies	Virtual currency
	Regulated	Banknotes and coins	Electronic money, Savings in commercial banks
		Physically	**Digital**
		Currency Format	

Source: European Central Bank

Cryptocurrencies can be considered in the category of virtual currencies in digital format, which are not regulated according to the money matrix set forth by the European Central Bank. Accordingly, non-regulation states that the currency is not in a structure that is regulated by any central bank, government or similar official institution, while having a digital format means that money does not need to be represented theoretically by any physical material. (Plassaras, 2013) Although it does not need any central authority for printing, it does not need the presence of a commercial bank for storage and an electronic money transfer company for its transfer (Jothi & Oswalt, 2022).

Although Bitcoin is also a cryptocurrency, it is the leading and most well-known cryptocurrency within the framework of criteria such as market capitalization, number of transactions, and number of users. Therefore, Bitcoin stands out among other cryptocurrencies in terms of creating an economic structure (Lapina et al., 2020).

As can be seen in the table, Bitcoin is quite dominantly ahead in terms of market capitalization. In addition, when we look at the trading volume figures for the last month, an obvious advantage stands out and it is seen that Bitcoin alone creates more trading volume than the sum of all its followers.

Table 2. Table Showing Market Capitalization, Current Value and Last 1 Month Transaction Volume of the Top 10 Cryptocurrencies in the Market

No.	Crypto Currency	Symbol	Market capitalization (USD)	Current value (USD)	Last 1 month trading volume (USD)
1	Bitcoin	BTC	9.134.392.188	577,55	8.788.295.676
2	Ethereum	ETH	926.548.572	11,16	966.359.759
3	Ripple	XRP	219.002.011	0,006159	26.289.585
4	Litecoin	LTC	170.874.307	3,63	51.248.355
5	Steem	STEEM	165.848.527	1,43	17.843.992
6	Ethereum Classic	ETC	153.374.725	1,85	810.920.226

7	Dash	DASH	82.178.149	12,32	24.646.164
8	NEM	XEM	55.760.580	0,006196	9.626.257
9	MaidSafeCoin	MAID	45.990.639	0,101625	21.273.121
10	NXT	NXT	28.992.279	0,029021	12.152.879

It is not easy to classify virtual currencies as it is possible to use many criteria to make such an assessment (European Central Bank, 2012). In order to evaluate the economy in terms of real money and its relationship with the real economy as a criterion, we come across three types of virtual currency schemes:

1. Closed virtual currency scheme: In this scheme, virtual currencies have almost no connection with the real economy. The money obtained is used, at least in theory, only for the purchase of virtual goods and services on closed systems. In this respect, virtual currencies with this scheme can be defined as "in-game" (Stolarski & Lewoniewski, 2019).
2. Virtual currency scheme with one-way flow: In this scheme, virtual currencies are obtained with real money at fixed or floating rates, but cannot be converted into real money afterwards. Although virtual goods and services are generally purchased with such currencies, it is also possible to use them to purchase real goods and services.
3. Virtual money scheme with two-way flow: In this scheme, it is possible to obtain virtual money with fixed or variable rates, but it is possible to convert these virtual currencies into real money. In terms of mutual transactions with the real economy, virtual currencies with this scheme are no different from any real currency with convertibility.

Bitcoin has a money scheme with two-way flow from these schemes. Bitcoin can be bought online through various exchanges and then converted into real money through the same exchanges. These exchanges exchange Bitcoin with real or other virtual currencies through certain commission fees (Aliye, 2022).

Bitcoin, which is not produced by any central authority, exhibits a peer-to-peer distributed network feature. Money transfers that take place in this network reach other points instantly, so that the payment from which account to which account is recorded. Thus, the collected records are located in structures called the blockchain. By applying a hash algorithm that requires a high number of transactions on each block, it is desired to find the expression that starts with a certain zero number. By solving complex mathematical equations that are thus solved using sophisticated computer clusters, Bitcoin is released. (Lee et al., 2015:24) This process is called "mining". In order to do these operations, individuals in the Bitcoin network who download the provided Bitcoin software and perform operations that require intensive processing power on their hardware are called "miners".

Miners have two important tasks in terms of the functioning of the system, such as checking the accuracy of previous transactions and inserting new money into the system (Zhu et al., 2019; Hughes et al., 2019). The more mining power one has, the greater the chance for the equality to be resolved. This reward system provides

an incentive for miners to use their resources to make the system work, and this is critical to maintaining the decentralized nature of Bitcoin (Chornous et al., 2019; Thuy & Khai, 2020). At the same time, records of transactions are recorded openly to every user, with records kept over a public network. Each block contains the hash expression of the last block before it.

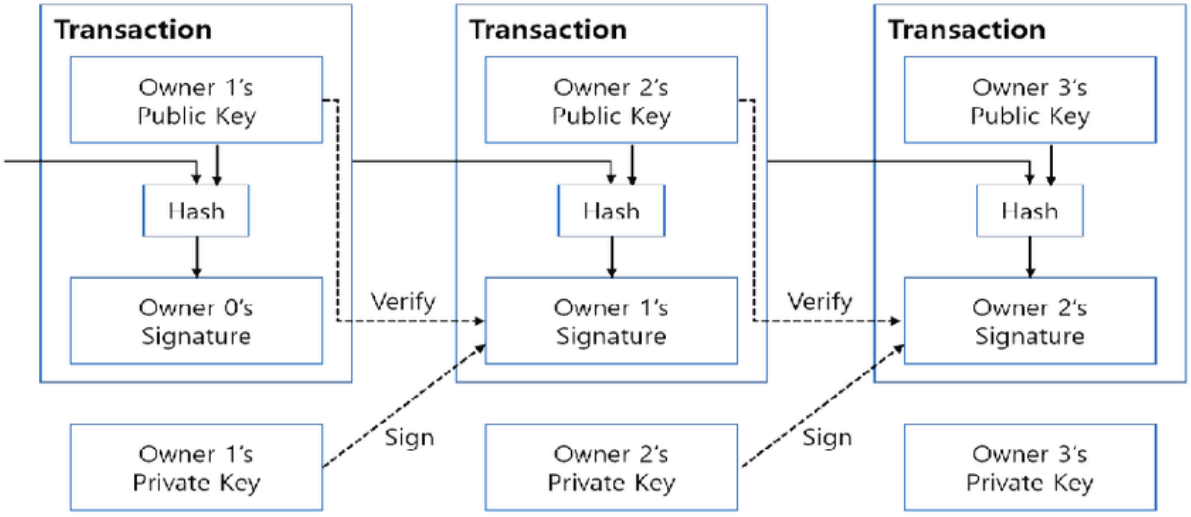

Figure 1. Bitcoin transaction Çeması (Nakamoto, 2008)

The blockchain acts as a general ledger where transactions made with Bitcoin are recorded. In an innovative solution, this process is carried out over the blockchain by a network of computers running Bitcoin software (Iik et al., 2021; Kudashina & Sminorva, 2021). The message 'Person A sends X amount of Bitcoin to Person B' is transmitted to every unit connected to the network through ready-made software applications. Units connected to the network can evaluate transactions, add the message they receive to their own registry copies and share these registry plug-ins with other units connected to the network (Fauzi et al., 2020). Accordingly, all users connected to the Bitcoin network have their own copy of the data chain, and any Bitcoin user can access the transaction history and ownership information of any randomly selected Bitcoin at any time.

The hash function is a function that maps variable-length datasets to fixed-length datasets. Hash functions are generally used in the database for operations such as quickly finding a data searched in a table or speeding up data comparisons, detecting the same or similar records in a large file (Wang et al., 2018; Hassan et al., 2018). The cryptographic hash function is used to easily determine whether an input data is mapped to a given hash value. However, if the input data is unknown, it is very difficult to find input data or equivalent alternatives by knowing only the stored hash expression, so that the integrity of the transmitted data is not compromised. The most common way of constructing a hash function is to repeat a compressed function in the input data (Nath, 2020; Mnif et al., 2021).

Table 3. Table of Complexities of Some Hash Functions

Algoritma	Output size (bits)	Collision calculation complexity (bits)	Complexity in practice (bits)
MD5	128	< 64	128
SHA-1	160	< 80	160
SHA-224	224	112	224
SHA-256	256	128	256

Bitcoin uses an algorithm called SHA-256. (Rosen et al., 2014) As can be seen from the table, the algorithm used by Bitcoin is the most complex algorithm among the algorithms in general use. The critical factor in using the hash algorithm in the Bitcoin system is that it ensures that the input data is transferred over time without deterioration and that it is closed to outside interference.

The problem of working in the light of the information given is to determine the basic working principles of Bitcoin, especially for cryptocurrencies, the effect of which is felt day by day in the field of business and finance, and beyond, to determine the elements of the sub-systems that make up the eco-system that gives Bitcoin a function, to use these elements in transactions with real currencies. It is to determine which classical institution or service provider is used. The main purpose of the study is to make a prediction about the future by centering these new economic elements, which are outlined, and to lead the time-spatial (longitudinal) studies in the future with other cryptocurrencies or in the changing Bitcoin eco-system.

B. METHOD

Literature review method was used in the study. Literature review is one of the first steps that should be applied not only in academic studies but also in every field that includes innovation (Köroğlu, 2015). Evaluation of a study on Bitcoin and cryptocurrencies in this context is inevitable in terms of the nature of the concepts. It has been determined that the literature review contributes to determining the boundaries of the research problem, revealing new research topics, eliminating useless methods, determining what future studies might be, and gaining an idea about the methods that can be used (Zivanovic & Vitomir, 2022).

In the study, firstly, keywords (“bitcoin economy”, “bitcoin system”, “bitcoin banking system”, “bitcoin sub-sectors”, “bitcoin ecosystem”) were determined for the conduct of the research, and these keywords were both Google's academic data search engine Google. It was searched with the help of Scholar as well as Google's main data search engine. The sectoral reports, articles, book chapters and original academic studies that emerged as a result of the searches were examined and thus both the theoretical part of the study was determined and the effect it had on the real economy, in other words, it was tried to be determined.

C. RESULT AND DİSCUSSİON

As a result of the literature review, it has been seen that it is possible to classify the Bitcoin system as six sub-systems. These six subsystems are:

1. Mining companies: Thanks to their batch processing power, these companies both provide computational power for the mathematical operations required for the verification of the security of transactions, and also act as a mint for adding the rewarded Bitcoins to the system. An important point to consider here is that it is theoretically known in advance how much Bitcoin is or will be in the market at any given moment. Accordingly, new Bitcoins are released to the market at a decreasing rate as a result of the mining process.
2. Firms providing e-wallet services: E-wallets are applications that allow a person to store the personal keys necessary to transact with their own Bitcoins. The e-wallet can be found in many different formats. The critical point is that the asset stored here is not the money itself, but the data that provides valid confirmation of transactions and allows access to public Bitcoin addresses. Wallets; It can be found in desktop, mobile, online, paper and finally hardware format.
3. Financial service providers: Financial services provided in the classical sense are also provided as a result of transactions made through Bitcoin. Companies that provide services such as financial asset trading, forex transactions, contract trading, stock trading, future exchanges, option trading and that pay interest in return for Bitcoin invested in them constitute this subgroup.
4. Money markets (exchanges): Markets that undertake the task of providing the exchange of only Bitcoin or, in some cases, all previously determined cryptocurrencies with all other currencies in the classical sense. These companies receive a commission as a result of the exchange, and users have the opportunity to exchange their crypto money and classical money with each other whenever they want.
5. Payment processors: These companies are companies that allow parties who want to trade with Bitcoin or other cryptocurrencies to make and receive payments. While companies provide their individual customers with the exchange of goods and services using Bitcoin, they minimize possible transaction risks by offering online sales points to their corporate customers and by offering instant exchange of cryptocurrencies in the currency of their choice.
6. Multi-purpose (universal) companies: These companies are companies that offer more than one of the above-mentioned services in different variations. For example, a multi-purpose firm serves both as an e-wallet service and as a payment processor at the same time.

On the other hand, companies in the Bitcoin ecosystem are also an attractive investment area for venture capital investors.

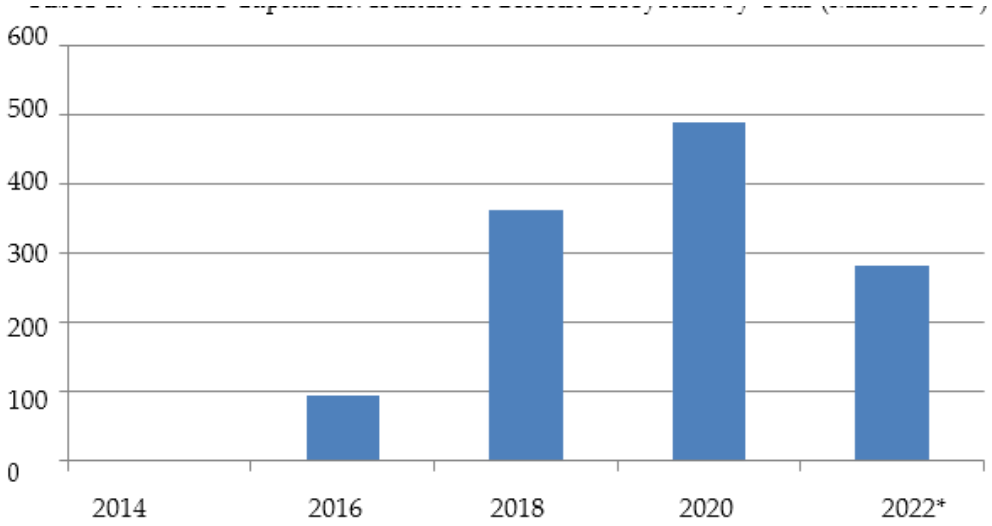

Figure 2. Venture Capital Investment of Bitcoin Ecosystem by Year (Million USD)

As it can be seen in Table 4, after the first venture capital investment of $2.13 million in 2012, investments continued with increasing numbers each year and were 95.05 in 2013, 361.53 in 2014, 489.48 in 2015, and finally 280.61 million dollars in the first 8-month period of 2016. venture capital investment has been made.

In addition, examining which elements of the ecosystem the venture capital investments are made will make the situation more understandable. Accordingly, a regular increase has been observed in the investments made since 2012 in general. The reason for this is that the Bitcoin economy naturally grows simultaneously with the use of Bitcoin. At the same time, it can be concluded from this simultaneous growth movement that the investments made are not manipulative investments. Mining investments have started to decline after peaking in 2014, from which it can be deduced that for the last two years, existing mining companies seem to be sufficient within the ecosystem. In correlation with this, e-wallet investments have also become stagnant for the last two years after peaking in 2014. Another point worth noting here is that payment processor investments show a similar pattern. These figures may lead to the conclusion that certain sub-elements of the ecosystem have reached the saturation point in terms of investment. In addition, the fact that these elements are investments related to the technical side of cryptocurrencies rather than the financial side can be seen as an important factor in this differentiation. While making all these evaluations, it should be taken into account that the figures for 2016 roughly show the investments made in the first 8 months (Kurt et al., 2021.

On the other hand, financial services investments are increasing steadily and attract more venture capital investments every year without exception than the previous year. Although money markets generally increase the investment made in them regularly, it is observed that investments are made in similar amounts every year. The fact that the investment in multi-purpose firms differs from year to year and does not follow any pattern can be explained by the fact that the conglomeration activities in the ecosystem are the result of strategic decisions taken at different times

rather than being regular. The growth of the entire ecosystem from year to year and the infrastructure investments showing a similar pattern in connection with this situation indicate the existence of a normal and healthy ecosystem.

D. CONCLUSION

Bitcoin is a currency that has pioneered other cryptocurrencies since its emergence in 2009 and has survived to this day. Bitcoin, which is not regulated by any central authority, has built its entire system on the joint work of its users. In this direction, miners who verify the transactions made with Bitcoin and keep the public transaction record jointly are effective in the printing process of money. Bitcoin is distinguished from other cryptocurrencies in terms of the number of daily transactions and market capitalization, in direct proportion to the number of users and the recognition it has among cryptocurrencies, the number of which is increasing day by day in the market.

The Bitcoin economy, which is growing day by day, is gaining a structure that allows the eco-system it has created to be sustainable and reach more people. In this direction, companies that operate in different areas of the eco-system and only in systematically connected with each other have emerged. Mining pools, which have the processing power that cannot be owned individually in the money printing process, e-wallet applications that allow individuals to store the private keys that enable them to access the Bitcoins they own, financial service providers that enable the purchase and sale of all kinds of financial assets and the use of Bitcoin as a financial asset. are available. Money markets that determine the value and conversion of Bitcoin and other currencies in terms of each other, payment processors that enable the purchase and sale of goods and services by transacting with Bitcoin in the real economy, and finally, multi-purpose companies that offer more than one of all the services listed under the same roof.

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