

Identification of the Variables Effecting the Value of Cryptocurrency

Kripto Paranın Değerini Etkileyen Değişkenlerin İncelenmesi

Abstract

Technically cryptocurrencies often have Distributed Ledger Technology (DLT) and encryption based on infrastructure called blockchain that allows all nodes to verify the validity of a transaction. In terms of monetary theory, cryptocurrencies are currently the most developed virtual currencies that cannot perform all the basic functions of money such as the account, exchange and capital accumulation. The price of cryptocurrency is based on supply and demand, without an intervention of a central authority. Dynamics that affect the value of cryptocurrencies can be classified as internal and external variables. The internal dynamics of cryptocurrencies have been examined under the headings of economic infrastructure and technological infrastructure. External factors that are effective in determining the value are observed as popularity, security, volume, inflation, tax, crypto exchange accidents, perception, speculations / manipulations and news.

Öz

Teknik açıdan kripto paralar; çoğu zaman blokzincir adı verilen, ağ paydaşlarının bir işlemin geçerliliğini doğrulamasını mümkün kılan ve tüm işlemleri kapsayan Dağıtık Defter Teknolojisi (DLT) ile şifrelemeye dayalı bir altyapıya sahiptir. Para kuramı açısından ise; paranın ölçüm, değişim ve değer saklama aracı olmak gibi ana işlemlerini bugün için sınırlı şekilde yerine getirebilen, en gelişmiş dijital para birimleridir. Merkezi bir otoriteye bağlı olmayan kripto paraların değerleri, arz ve talep ile şekillenir. Kripto paranın değer oluşumunda etkili temel dinamikler bu çalışmada içsel ve dışsal etkenlereler olarak sınıflanmıştır. İçsel dinamikler; ekonomik altyapı ve teknolojik altyapı başlıkları altında incelenmiştir. Kripto paranın değerini etkileyen dışsal dinamikler ise; popülerite, güvenlik, hacim, enflasyon, vergiler, kripto borsa kazaları, algı, spekülasyon ve manipülasyon girişimleri ve haberler olarak ifade edilmiştir.

Introduction

Cryptocurrencies, which do not have a legal basis worldwide (Garratt & Wallace, 2018), cannot fulfil the fiat money today (Shahzad et al., 2019). However, the definition and function of money has changed throughout the history (Wu et al., 2019). In this context, the cryptocurrency community claims that cryptocurrencies are / will be more than Money (Birch, 2017). Being decentralized means to eliminate supervisory agencies and intermediaries such as banks. There is a discussion about cryptocurrencies that they can be an international reserve currency in the future, with the prospect of being a new tool of value retention and exchange (Baek & Elbeck, 2015). In theory, the smart contract derivatives take the definition of money a step further. The variables that affect the value of cryptocurrencies exist specifically in the literature. This study aims to gather the variables that affect the price of cryptocurrencies under a single roof. Cryptocurrencies have very high volatility compared to traditional currencies and commodities (Baur et al., 2018a). Indeed, there is no official consensus that crypto assets are money or commodity (Corbet et al., 2018; Alnaçık, 2019). In this study, the internal dynamics of cryptocurrencies have been examined under the main titles of

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economic and technological infrastructure. External factors that are effective in determining the value are the other main topic.

1. Literature Review

Eichengreen (2019) published that there is no regular transition from commodity money to fiat money, and the transition from paper money to digital will not be straight like a symmetrical line. Indeed, history is not a linear process. Thus, Arikan (2020b) published that before the invention of writing which took place around 3200 B.C., commercial activities were carried out with small symbols named "Token", each representing different goods and services. The crypto tokens and crypto coins used today are digital and current versions of historical Tokens. Lemieux (2016) and Herian (2017) mentions that many different sectors such as inheritance, supply chain and finance can be digitalized with the recording technology of the blockchain. Although it is perceived by governments that there is a negative perception of cryptocurrencies (Jackson, 2018), corporate companies such as JD.com, AliBaba, Provenance, Walmart, Toyota are known to test blockchain-based supply chain applications and make partial applications (Kshetri & Loukoianova, 2019). Bech & Garratt (2017) schematized crypto coins with the help of Venn Diagram. Accordingly, cryptocurrencies are in digital form, but unlike e-money under the control of a central bank, they are in a decentralized structure, universally accessible form and in use from person to person.

In the 2018 annual report of the BIS, it was stated that the digital currencies likely to be issued by central banks will affect the financial sector in 3 main streams: Monetary policies, stability and payments. According to the report, the magnitude of the impacts will depend entirely on the technological and economic design of the digital currency that is likely to be extracted. Regarding cryptocurrencies, the inability to protect users and investors, illegal use such as money laundering, and instability factors such as volatility are currently obstacles. A regulation proposal, rather than a ban, has been made in overcoming obstacles. The other BIS report dated March 2020; Options are reviewed, noting that the current cross-border payments system is slow and expensive. The examination of new payment systems; It has been stated that it has become a priority for policy makers. In the same report, BIS Managing Director Carstens stated that peer-to-peer arrangement, which directly connects payers and creditors and minimizes intermediaries, is the most transformative option to make payments more practical. In the report, which argues that the cooperation of tokenized applications with traditional financial methods will bring success, the central bank digital money applications are questioned, the DLT and P2P payment systems are intensely focused, and it is stated that the tokenization of the securities, which are limited pilot applications in Switzerland, can facilitate the payment cycle.

Volumes of cryptocurrencies are extremely volatile as their values (Baur et al., 2018a). Fama et al. (2017) published that volatility is expected to decrease as the volume increases over time in the immature markets. Gandal (2019) has reported volatility changes caused by price manipulations in the Bitcoin ecosystem.

Vovchenko et al. (2017) analysed that user errors are the most important factor on crypto security problems. The factual analysis in the literature showed that unfair gain attempts as pump & dump or whale activities frequently have negative reflections such as hyper volatility (Güleç, 2018: 96 -99). Cheah & Fry (2015) presented price of speculative cryptocurrencies such as Bitcoin for the period from 2010 to 2014 the perspective of speculation, bubbles, economic and social issues. Baur et al. (2018b) and Selmi et al. (2018) report that cryptocurrencies are open to speculation and manipulation.

Arikan (2020a) test that there is a significant bidirectional linkage between price of cryptocurrency and its popularity. In other words, the popularity and value of cryptocurrencies appear as two variables that trigger each other. Nguyen et al. (2020) analyse the linkage between trends. Google data and stock exchange returns and determine negative correlation. Corbet et al., (2018) stated the linkages among cryptocurrencies and other financial instruments and report that cryptocurrencies have different dynamics comparing to the others.

Cryptocurrencies volatile directly or indirectly through news of new tax laws and new approaches issued by official institutions especially Internal Revenue Service (IRS) (Auer & Claessens, 2018). Cihangir (2018) quantitatively revealed the valuation effect of social perception on what a crypto asset is in a survey-based study.

Auer & Claessens (2018) published the effects of news in financial markets on the value of Bitcoin. Dyhrberg (2016a) showed in his asymmetrical GARCH model research that Bitcoin value reacted symmetrically to bad or good news. On the other hand, it was stated that with the increase of prohibition and uncertainty news, the interest in crypto assets has increased (Demir et al., 2018; Wu et al., 2019).

2. An Overview of the variables Affecting the Value of Cryptocurrencies

The variables of affecting the price of cryptocurrencies can be expressed as in Figure 1.

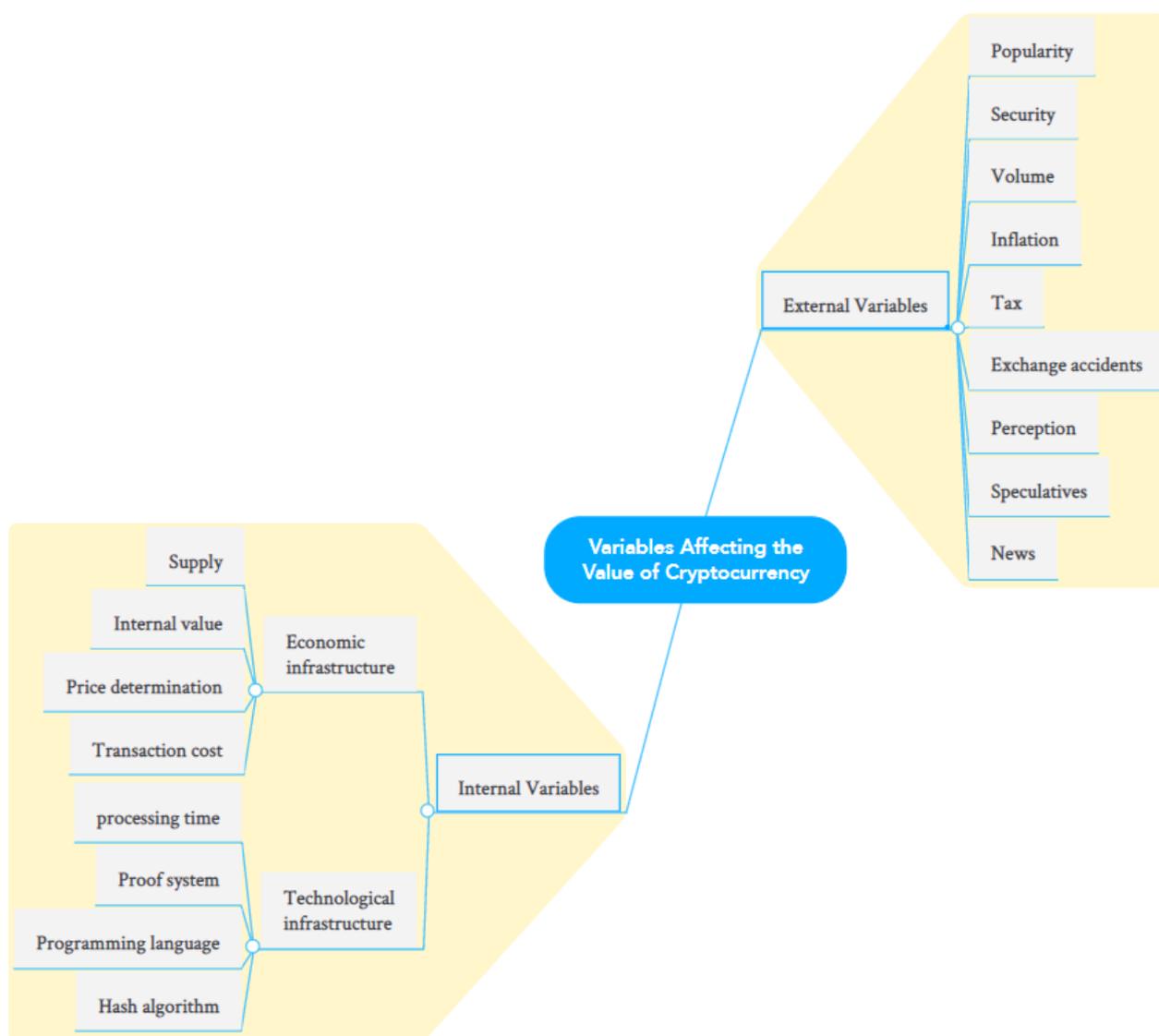


Figure 1: Variables Affecting the Value of Cryptocurrency

Source: Authorial

2.1. Internal factors that determine the value of cryptocurrencies

Internal factors that determine the value of cryptocurrencies, which are the most known element of the crypto ecosystem, can be examined under two internal topics: economic and technological structure. For example, Bitcoin is a cryptocurrency written in the C++¹ programming language,

¹C++: New generation object-oriented programming language.

using the SHA-256² encryption algorithm, based on the Proof of Work (PoW)³ consensus system. The reliability and duration of the process can also be examined under the title of technological infrastructure. Hash functions are the programs that provide the conversion of input data into fixed length data blocks (Table 1). All these features are variables that define the technological infrastructure of Bitcoin.

Table 1. SHA-256 application.

Data	SHA-256 code
abc	ba7816bf8f01cfea414140de5dae2223b00361a396177a9cb410ff61f20015ad
Abc	06d90109c8cce34ec0c776950465421e176f08b831a938b3c6e76cb7bee8790b
ABC	b5d4045c3f466fa91fe2cc6abe79232a1a57cdf104f7a26e716e0a1e2789df78
1	6b86b273ff34fce19d6b804eff5a3f5747ada4eaa22f1d49c01e52ddb7875b4b
10	4a44dc15364204a80fe80e9039455cc1608281820fe2b24f1e5233ade6af1dd5

Source: Authorial

Issues such as how new Bitcoin will be supplied on the market, how long the supply will take, how they will be distributed, and transaction costs are related to the algorithm created for the economic infrastructure. Continuing from the Bitcoin example, the reward miners received for a block of digits decreased from 50 BTC in 2009 to 25 BTC in 2012, 12.5 BTC in 2016 and 6.25 BTC in 2020. On the other hand, total hash rate has increased cumulatively. As the third parameter, exponential increase in the hash rate required to reveal 1 block is seen. Thus, total production continues to increase at a decreasing rate as the number of people using Bitcoin increases. The increase in supply is not infinite. The regulations regarding money supply are made by the algorithm of Bitcoin when the time comes.

2.2. External factors that determine the value of cryptocurrencies

2.2.1. Popularity

Recent studies show that there is a significant statistical relationship between popularity and price of cryptocurrency. While some papers report that the relationship is from popularity to price (Dulupçu, Yiğit, & Genç, 2017; Garcia et al., 2014), current studies show that there is a bidirectional causality linkage among them (Arıkan, 2020a). In other words, as the value of crypto money increases, its popularity increases and/or the popularity triggers the price.

2.2.2. Security

According to security analysis of Vovchenko et al. (2017), there is no clear difference in the frequency of crypto monetary and internet banking security issues, and both are mostly caused by

² SHA-256 (Secure Hash Algorithm): It consists of 6 hash algorithm sets based on SHA-2. Used by US National Security Agency (NSA). SHA-256 is also used in proof of work calculations and cryptocurrency address generation calculation. It consists of the most secure among the encryption algorithms. Regardless of the input length, the function can use a 256-bit output. As seen in the safe hash algorithm calculation, the slightest variation in the input results in the output varies completely. The input cannot be reached by moving from the output. (table 1).

³ Proof of Work (PoW): It is one of the commonly used consensus systems. Although it existed before Bitcoin, its awareness increased with the use of Bitcoin in its infrastructure. Since Bitcoin is decentralized, the system needs a functioning that will protect itself. In this process, the goal of the miners is to create a block that contains the most transactions. The block in question must be compatible with certain operating principles. In order to produce a block that complies with the principles, high computing power is a basic requirement. The first miner who finds the ideal block is rewarded with a transaction fee. The work done to find the ideal block in this cycle is defined as PoW.

user errors. However, it is important to examine accidents of crypto exchanges under a separate topic from crypto monetary transactions. On the other hand, even disruptions in HTTP are associated with cryptocurrencies among the public, creating a negative shock effect on crypto value. For example, it was concretely observed that Bitcoin reacted to the OpenSSL vulnerabilities and the Heartbleed⁴ in 2014 with more than 10% drop. Such vulnerabilities are not related to the structure of cryptocurrencies as the encryption system works without any problems.

2.2.3. Volume

Volatility is expected to decrease as the volume of transactions increases over time in an immature market (Fama et al., 2017). Currently, the movements of most cryptocurrencies are like a more volatile similar of a small stock. So, the directions and speculations cause tremendous volatility especially in the values of small volume crypto assets. While speculative initiatives are tried to be prevented by legal sanctions in official exchanges, crypto exchanges that do not have any legal regulations are open to such actions. Especially newly or low volume cryptocurrencies are easily managed by speculators and can be managed for profit regardless of free market variables. In fact, many cryptocurrencies that have no stories and solutions are often observed by the crypto community, where they are launched with such profit prospects.

2.2.4. Inflation

The main factors leading to the increase in general price levels are costs (cost inflation), increases in demand (demand inflation) and money supplied by central banks (monetary inflation). Indeed, according to monetarist doctrine, monetary policies are the underlying factor of inflation (İslatince, 2016). However, the supply of Bitcoin, the flagship of cryptocurrencies, does not depend on an authority like the central bank. Bitcoin supply is limited to 21 million. As of 29.01.2020, while the total Bitcoin supply in the market was 18,288,375, the remaining 2,811,625 BTC are waiting to be made by miners. Removal of the small amount of Bitcoin is prolonged due to the increase in mining difficulty. It is estimated that it will take nearly 100 years to obtain the remaining Bitcoins. In addition, the Bitcoin network goes through a process called halving every four years and block rewards are halved. Bitcoin miners received a 12.5 BTC reward from one block as of January 2020, while this number dropped to 6.25 BTC in May 2020. Therefore Bitcoin, whose supply is not connected to a central authority, is not directly affected by monetary policies such as fiat money. The similar interpretation can be made for independent cryptocurrencies that have a technological design that will not cause inflation like Bitcoin.

2.2.5. Tax

Some official authorities' tax crypto assets by accepting them as commodities, while others consider them as money and exempt from tax (Alnıaçık, 2019). Crypto assets have been observed to volatile directly or indirectly through new tax laws and new approaches issued by official institutions especially Internal Revenue Service (IRS) (Auer & Claessens, 2018). Legal uncertainty continues with the reluctant attitudes of governments regarding cryptocurrencies and different practices are observed in taxation worldwide.

2.2.6. Crypto exchange accidents

Cybercrime in crypto exchanges can be directed at individual users, and sometimes affect the entire crypto exchange. These pirate actions emerge as an important factor that both causes personal damage, shaking trust in the crypto ecosystem and triggering volatility. For example, the 750 thousand BTC big hack experienced in MtGox in 2014 made the mixed story behind the hyper volatility of the exchange more complicated. In 2016, after the 120,000 BTC robbery on the Bitfinex exchange, a rare event occurred and gradually covered the losses of most of the stock market fund holders. In 2018, \$ 530 million worth of cryptocurrency was stolen on the Coincheck exchange and it crashed with this attack. In 2019, Canada's largest volume crypto exchange is known to have failed to reach \$ 137 million worth of crypto assets after its founder's sudden death. The biggest exchanges of the time such as BitFloor, Poloniex, Bitstamp have been robbed or hundreds of thousands of BTC funds have been unfairly changed, claiming to be robbed.

⁴ Heartbleed: A non-virus-related vulnerability resulting in leakage of personal data, bug.

2.2.7. Perception

Cihangir (2018), quantitatively revealed the valuation effect of social perception on what a crypto asset is. As crypto money is a tool of exchange and value retention, it is expected that its value will continue to hover above real value as the perception of an eco-digital asset that will be highly appreciated in the future increases. It can be said that such perceptions push the technology behind cryptocurrency to the second plan and trigger artificial fluctuations.

2.2.8. Speculations and manipulations

In addition to the studies that cryptocurrencies are open to speculation (Baur et al., 2018b), the factual analysis in the literature showed that unfair gain attempts as pump & dump or whale activities frequently have negative reflections such as hyper volatility (Güleç, 2018: 96 -99). In this process, it is seen that especially the new investors lost their crypto savings, and manipulator made a great profit in short term. Crypto exchanges that provide to obtain very high return in least time have attracted many speculators over time. Unlike the official exchanges, the lack of a legal response to unfair earnings attempts has made crypto exchanges more insecure.

2.2.9. News

It can be said that the news about cryptocurrencies increased the awareness of them. As a matter of fact, there are studies showing that there is a relationship between the recognition and value of cryptocurrencies in the literature. For example, Auer & Claessens (2018: 62) expressed the effects of news in financial markets on the price of Bitcoin or Dyhrberg (2016a) showed in his asymmetrical GARCH model research that Bitcoin price reacted symmetrically to bad or good news.

Conclusion and Recommendations

The study aims to gather the variables that affect the value of cryptocurrency in the literature under a single roof. The internal variables that affect the price are stated economically and technologically. Subtitles of economic infrastructure are supply, internal value, price determination and transaction cost. Technological infrastructure is expressed as processing time, proof system, programming language and hash algorithm. External variables affecting the price are popularity, security, volume, inflation, tax, crypto stock market accidents, perception, speculations /manipulations and news.

With high volatility, manipulative gains in crypto exchanges and the expectation of extreme return in short term in the public, it can be said that the market value of crypto currencies is higher than it should be, throwing the promised future idea to the second plan and shadowing its current potential and blockchain technology.

Speculative and manipulative initiatives are common in crypto exchanges. There are some case analysis that a new investor who has just met cryptocurrencies, first opened his eyes on crypto exchanges and lost his investments on there in a short time. It has been observed that new investors often lose their savings through inexperience or "pump & dump".

In crypto exchanges, hackers crashing the entire exchange or stealing individual savings are common and unlikely to be legally followed. In the past, there have been massive robberies in which all crypto assets of users were stolen, along with hot wallets belonging to crypto exchanges and even cold wallets and are reported to be still happening as of 2020.

Revealing and closing the security gaps in the crypto ecosystem that are known to be not in the structure of the blockchain and which are mostly seen in the crypto exchanges or the code blocks of the platforms, may have a positive effect increasing the value of the cryptocurrencies. It can be said that this kind of approach can benefit such as Linux that successful open-source software initiatives. It may be a more efficient way for crypto asset developers to inform the public transparently from collective works and developments to produce effective solutions.

It is a good choice for investors who intend to trade cryptocurrencies to use a personal crypto wallet. As a matter of fact, crypto exchanges are environments that are not audited by official institutions, are not regulated, and have no legal basis. In case of cyber security problems, the investor cannot claim rights from the crypto exchange market. In this context, personal and hardware crypto wallets can provide partial guarantees for investors. It is a good approach for new

investors to "study" what they buy and sell until they find out what cryptocurrency and crypto market are and start investing with an amount that will not be saddened when they lose.

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