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ПРЕГЛЕДНИ НАУЧНИ РАД

DOI: 10.5937/zrpf1-44497

UDK: 336.748.14:[336.74:004.738.5

Раd примљен: 03.06.2023.

Раd прихваћен: 28.06.2023.

ON THE DEFLATIONARY NATURE OF BITCOIN

Abstract: *Bitcoin was presented at the end of 2008 but the question still remains whether it is a form of money or something entirely different. Bitcoin was not designed with the aim to create money in a strict sense but primarily with the intention to make the transfer of value as effective as possible. Yet, Bitcoin has a capacity to take on the role of money, and that capacity was recognized in court cases. In this regard, the paper presents the results of the primarily empirical but also theoretical research conducted previously on the volatile but still very deflationary nature of Bitcoin and its effect on monetary obligations. The idea that cryptocurrencies can be also used as a hedging instrument to prevent the negative effects of domestic currency depreciation might be controversial for a number of reasons, one of which is certainly the volatile nature of bitcoin "price". We stress that periodic depreciation of its value does not mean that bitcoin is inflationary. On the contrary, bitcoin is deflationary by nature, which is evident in different in-built mechanisms and new ways of application. In this paper, the author uses different analytical method techniques to single out and describe various deflatory mechanisms, both preprogramed and factual ones. The author also applies the synthetical method and its techniques, primarily abstraction and generalization, to sum up the data confirming the main hypothesis that bitcoin is by nature deflationary despite its volatility and, therefore, it can be used as a hedging mechanism.*

Keywords: *Bitcoin, monetary obligations, contract, currency clauses, cryptocurrency clauses deflation.*

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1. Introduction

The evolution of the money is inseparably tied to the technological progress, although money evolved significantly slower because of the legal or cultural constraints (Calcaterra, Kaal, Rao, 2020: 202-203). Naturally, the emergence of digital technology prompted the idea of generating cash-like asset¹ which can be deposited and transferred in a digital format. Interestingly enough, the third industrial revolution revived the theory that private entities, if permitted, are capable of providing at least as trustworthy “coins” as those that are created by the state (Hayek, 1976: 24). As complex hi-tech infrastructure allowing completely transparent and predetermined issuance gradually developed, the theory seemed less utopian (Syropyatov, 2021: 324). The third industrial revolution brought about exciting projects, some of which came out to be very successful, and these, depending on historical interpretation, initiated the fourth or even fifth big alteration of money (Radulović, 2021: 30). It is considered that DigiCash sets both technical and ideological background for modern digital currencies (Turudić, Milić & Štulina, 2017: 193; Roth, 2015: 528). Yet, none of the earlier projects, mostly because of their inefficient centralized infrastructure (Cavalihero, Cavalihero, 2022: 209), became nearly as successful as the most radical one (Hutchinson & Dowd, 2015: 357) – “Bitcoin: A Peer-to-Peer Electronic Cash System” (Nakamoto, 2008: 1-9).

Bitcoin is the first successful example of demonopolization of fiat currency market through gradual implementation of money issued by private entities (Syropyatov, 2021: 319-320). As contemporary society strives to decentralized solutions for human interaction (Calcaterra, Kaal, Rao, 2020: 193), in almost perfect environment for its success (Đorđević, 2018: 96), Bitcoin² proved to be a useful economic (Đorđević, 2018: 100) but also legal instrument³.

1 For more on different money-like assets, see: Karame & Androulaki, 2016: 11-13.

2 In this article, in order to accurately distinguish Bitcoin as the operating software, system or network from bitcoin as a digital asset (data or currency of some value), we will refer to Bitcoin as a system by using capital letter “B” and to bitcoin as an asset by using a lowercase letter “b” (Antonopoulos, 2014: xvii, 18, 116; Cvetković, 2018: 120; Hutchinson & Dowd, 2015: 357 fn.).

3 As of June 2021, El Salvador became the first country to legally recognize Bitcoin as a legal tender in almost full capacity, support it with technically impressive digital infrastructure (customized wallet, specialized government exchange platform, different free applications, and even special network), and introduce various incentives to promote this quite interesting experiment (Ley Bitcoin, *Diario Oficial* ES, 110/2021, Decreto No 57). The Central African Republic was the second national economy to introduce Bitcoin as a legal tender and reserve currency (République Centrafricaine Cryptomonnaie, *Journal Officiel* CAF, 22/2022).

Strictly speaking, Bitcoin is neither a commodity nor currency (Abramowicz, 2015: 3). Bitcoin is not money. It is a payment system. A solid argument can be made that Bitcoin is actually an institution or a platform that creates and enforces property rights (Abramowicz, 2015: 3). But then, jurisprudence established that bitcoin has the capacity to take the role of money (Raskin, 2015: 980). So, if we think of it as money, it is a form of “outside money” (Garrat, Wallace, 2018: 1887), which is especially appreciated among monetary users that are already accustomed to cashless electronic economic environments (Dimitrijević, 2018: 224-225)⁴.

In-depth analysis confirms that bitcoin value is highly volatile in both short and longer periods (Baur, Dimpfl, 2021: 2663–2683). Yet, young currency is expected to be volatile (Đorđević, 2018: 100). The list of reasons for its volatility is well described (Mirjanich, 2014: 223; Syropyatov, 2021: 320-322, 326-327). A solid argument can also be made that volatility was higher at the beginning, which ultimately can be good news for the potential of the Bitcoin to evolve into a (more) stable currency (Baur, Dimpfl, 2021: 2668-2669).

Still, in times when its volatile nature comes to the fore, it is highly important to understand what the deflationary nature of bitcoin actually means. Volatility is a phrase that describes how much the value of a medium of exchange changes over time, or precisely at what rate. If we think of deflation as appreciation of value induced by discrepancy in supply and demand that drives up the exchange rate of a currency (Antonopoulos, 2014: 180), bitcoin is deflationary by nature but still volatile. Different mechanisms make it resilient to inflation. This is true even though bitcoin is a speculative asset, or at least can be interpreted as such (Šoja, Senarathne, 2019: 46), because it is not backed up by any asset or guarantee (Šoja, Senarathne, 2019: 46), and it does not represent the current state of a country’s economy (Vareško, Deković, 2022: 91). Specifically, bitcoin value is not immune to its own depreciation, sudden appreciation, and various kinds of manipulation. At this point, it is almost impossible to prevent them because the Bitcoin system operates as a free and essentially unregulated⁵ market. The

4 Electronic money is a form of digital money and a phase in its evolution, and so are cryptocurrencies; yet, cryptocurrency is not electronic money and should be confused with electronic money (Dimitrijević, 2018: 228).

5 Although there are national regulations (Cvetković, 2018: 127128; Zebec, 2018: 90-93), as well as international regulations (Cvetković, 2018: 126-127; Mijatović, 2022: 95-100), Bitcoin, both as a system and currency, is absolutely immune to both national and international regulations. However, there is a dose of optimism that stable coins, conceptually speaking, can underscore that technology-driven optimization of policy making is actually possible in complex monetary systems (Calcaterra, Kaal, Rao, 2020: 194). But, the adequate model first has to be discovered by the jurisprudence (Raskin, 2015: 972) and then confirmed in a safer environment, such as “Sandbox” or “Innovation Hubs” (Jović, Nikolić, 2022: 48-51).

time cost of Bitcoin usage (Garrat, Wallace, 2018: 1889) is a real danger and, on top of that, bitcoin value is almost entirely unpredictable (Garrat, Wallace, 2018: 1896; Syropyatov, 2021: 320). It makes it even more difficult to defend the hypothesis of its deflationary nature.

Be as it may, even when its price drops dramatically, it does not mean that the bitcoin is inflationary. This is crucial to understand if we aim to clarify the properties and legal nature of monetary obligations nominated in bitcoin, and especially if we intend to regulate them properly. In that sense, this paper is merely an introduction into this subject matter.

2. Fixed supply

Bitcoin is an open-source software that uses decentralized network design (Caetano, 2015: 103-104; Đorđević, 2018: 97)⁶. Accurately, it is electronic, bidirectional, decentralized (Đorđević, 2018: 97) payment system based on cryptographic proof (Nakamoto, 2008:1), developed with the aim of excluding accredited intermediaries through the concept of “digital trust” (Cavalheiro, Cavalheiro, 2022: 207; Horvatić, Tafra: 2022 108-109; Syropyatov, 2021: 325), without compromising security and privacy during transaction⁷, at lower costs and as fast as possible (Roth, 2015: 529).

To make the transfer of value possible, value had to be linked to an asset inside the system. As the system is fully digitalized, this asset could only exist in digital form, *i.e.* units of virtual currency represent a value (Đorđević, 2018: 97). It is a common misconception that the name of this asset is Bitcoin. Bitcoin is a peer-to-peer monetary network, it is a program, software, a platform, but not currency. Bitcoin as a currency does not exist outside or anywhere inside the network (Cvetković, 2018: 124). The basic unit of this paying system is the *Satoshi*, a digitalized piece of information that is permanently linked to the digital platform (Antonopoulos, 2014: xvii, 18, 116). Nonetheless, although technically incorrect, it has become a norm to use bitcoin as a unit with ratio to Satoshi of 1:100.000.000 (Radulović, 2021: 32).

To grasp this concept, we can compare bitcoin to traditional ways of performing monetary obligations (Cvetković, 2018: 121; Đorđević, 2018: 100-102). By

6 There is a natural tendency toward monopoly in the Network (Hutchinson & Dowd, 2015: 364-368). Yet, the possibility of creating absolute monopoly is only a theoretical one. As the entire community of enthusiasts is actively using the room left for improving the Network, there is number of mining protocol propositions (“getblocktemplate” being the most successful one), which prevent centralization.

7 Privacy and security are not synonyms. These are two different aspects of payment systems effectiveness, each with distinctive individual features (Karame, Androulaki, 2016: 14-17).

its characteristics, bitcoin is essentially somewhere between gold and dollar (Syropyatov, 2021: 323), but the primary idea was to create a digital asset which mimics gold. The easiest way to make a newly created asset valuable is to make it rare. Thus, Bitcoin network protocols are set up in a way to make the total supply carefully calculated, finite and limited⁸. By fixing the overall number of bitcoin in circulation to 21.000.000, the initial issuer and inventor resolved two major problems – additional issuing and counterfeiting (Garrat, Wallace, 2018: 1887). Thus, “printing” new money in the Bitcoin network beyond the expected issuance rate is impossible, which means that bitcoin as a currency cannot be inflated (Antonopoulos, 2014: 2).

Since Bitcoin is a software, it is “nothing more” than a set of preprogrammed rules. As these can be updated, technically there is a possibility to change the source code to allow a quantitative increase of coin supply. Yet, as we see it, this is only theoretically possible. Why?

Bitcoin is constructed on revolutionary technology called blockchain. Blockchain is a digital database that contains information on every change in the network (Цветковић, 2020: 128; Teomete Yalabik, Yalabik, 2019: 37). Once entered and confirmed, data on change that happened becomes permanently stored into a block, which is then linked to the existing chain where blocks are uniformly ordered, chronologically timestamped, substantially immutable (Цветковић, 2020: 129; Catanzaro & Kain, 2020: 52; Horvat, Tafra, 2022: 108)⁹. The chain of added blocks is distributed through the network, and its management is entirely consensus-based (Radulović, 2021: 36), which means that no one exerts control over it (Magnuson, 2022: 883)¹⁰. This is a very important point because every block in the chain contains a certain number of bitcoin, and the total supply

8 It is estimated that there are 171000 metric tons of gold in the world (Đorđević, 2018:101), but it is only a presumption. On the other hand, the Bitcoin system is not based on any similar presumption. The system creators went step further and offered cryptographic assurance of its limited supply (Cvetković, 2018: 121). This means that there is no danger of any unexpected discoveries of commodity that can bring instability to the monetary regime (Cachanosky, 2019: 371). Also, unlike gold, it is impossible to temper with bitcoin “purity” and thus compromise the idea of its limited supply (Cvetković, 2018:121).

9 Bitcoin employs blockchain as a public ledger containing the full record of all public transactions in the history of the Bitcoin network (Cavalihero, Cavalihero, 2022: 209). In that context, it is interesting that bitcoin that was seized in the “*Silk Road*” case was transferred to the FBI wallet (1FfmbHfnpaZjKFvyilokTjJusN455paPH) by nodes through regular verification procedure on the Bitcoin’s blockchain; moreover, this transfer, but also later auction of coins and their transfer to buyers, is fully transparent and can be traced through a simple check of changes in the chain (Raskin, 2015: 982-983).

10 Satoshi Nakamoto withdrew from the public in April 2011 leaving the responsibility of developing the code and network to a thriving group of volunteers (Antonopoulos, 2014: 4).

gradually increases by consensually adding new blocks¹¹, but not more than 13.230.000 of them.

In traditional economic systems, monetary authority guarantees the quality, quantity and value of money, and banks and other intermediaries exercise control over transactions (Pernice, 2021: 770). Bitcoin functions as a protocol, *i.e.* a set of preprogramed governing rules (Raskin, 2015: 971) without a referee (Abramowicz, 2015: 3). In the Bitcoin network, there is no central authority of any kind that oversees and manages the platform (Catanzaro, Kain, 2020: 52; Teomete Yalabik, Yalabik, 2019: 37). First, this means that there is no single point of failure (Hutchinson & Dowd, 2015: 359). Second, there is no need for third trusted party to conduct the registration process and/or to guarantee accuracy of transaction balances, all of that for the reason that trust in network is based on cryptography as a science (Cvetković, 2018: 121; Dinić, 2014: 110; Đorđević, 2018: 97; McGinnis, 2020: 60; Raskin, 2015: 974)¹². This is where this ingenious concept comes to the fore: management is assigned to the Network itself, actually to computers that perform the transaction verification process (Đorđević, 2018: 98; Hutchinson & Dowd, 2015: 360). It follows that the system is almost entirely self-regulating and fully decentralized. Further, not only initiated transactions but any *other change in the network has to be a result of consensus among all individual participants in the network* (author's emphasis). Thus, in order to change the source code after the obligatory community debate is closed, it is necessary that majority of nodes in the network express their approval. With tens of thousands of nodes running the network, it is safe to assume that it is almost impossible to reach a consensus to change the core code protocol, especially the part that makes this system superior to most crypto projects.¹³

This protocol makes bitcoin superior to other crypto projects. Namely, in the early 1970s, it was clear that there might not be a necessity or any advantage (at least not anymore)¹⁴ in unquestioned and universally accepted government pre-

11 In analogy with Friedman's "Island of stone money", Bitcoin operates via decentralized (digitalized) collective memory (Hutchinson & Dowd, 2015: 358).

12 Trust in the network depends on the functioning of majority mining computers in the network. The logical conclusion arising from this fact indicates that the increased volume of bitcoin transactions implies higher security; increasing the volume of the network, increases the trust (Dinić, 2014: 110).

13 Observing the history of attempts to initiate even "smaller" technical (protocol) changes embodied in the Bitcoin hard forks (Bitcoin XT, Bitcoin Classic, SegWit), we can see that none of these projects (not even "BitcoinCash") surpassed the success and acceptance rate of Bitcoin fork.

14 Following more than 2000 years' long history of governments prerogative of issuing money, the Nobel prize laureate Hayek enumerated legitimate reasons for reserving the monopoly of issuing money for state institutions (Hayek, 1976: 21-26).

rogative of producing money, and that it might be harmful for national economy development if currency competitiveness is not endorsed (Hayek, 1976: 20). Specially, this refers to national economies that are fully dependent on foreign currency, which was the case in El Salvador (fully relying on USD).

We can go even further. Solid arguments can be made to support the claim that the governments absolute control over money can even be interpreted as a form of oppression, no less than the denial of civil liberties (McGinnis, 2020: 60). Although it is “complementary currency” (Pernice, 2021: 769), bitcoin is the most powerful weapon in what seems to be “fundamental assault” on the remains of this outdated oppressive idea in modern monetary order (McGinnis, 2020: 61).

If there is any truth in this bold claim, then limited supply is the single most important feature that makes bitcoin if not superior then at least competitive to fiat currencies¹⁵. This is especially true if we bear in mind the collective abolition of Bretton Woods monetary arrangement and the gold standard which, according to economic experts (Syropyatov, 2021: 324), started the inflationary era in economic history. Therefore, there is no economic or legal logic to justify the transformation of the system from “digital gold” to disunited quasi-democratic fiat monetary order, especially among nodes who are generally true “decentralized finance” enthusiasts¹⁶.

3. Halving

The creator(s) of Bitcoin aimed to make a digital asset that behaves like gold¹⁷. Thus, they made an ideological decision not to release all bitcoin in circulation at once (Cachanosky, 2019: 371). The total number of bitcoin is predetermined, but the schedule of its creation is fixed (Raskin, 2015: 971) because the network was set up so that it can gradually build up the coin supply at a decreasing rate through the process called “mining”.

15 The idea of Bitcoin is deeply rooted in the Austrian economic school of thought which is renowned for its harsh criticism of governments interventions which actually worsen the economic and business cycles and cause substantial inflation (Zebec, 2018:89).

16 The Bitcoin network does not enforce protocols and rules to members who disagree with them. It allows them to safely take separate ways by initiating so-called hard fork. There is even a special piece of software called Git built in the network, created to make forking of source code available to users (Caetano, 2015:104-105). The result is more than hundred (more or less known and successful) projects in the crypto space which are started in this way – as a Bitcoin fork (Caetano, 2015: 104).

17 “The Bitcoin rule, logo and wording suggest that the project is inspired in the gold standard. Consider, for instance, that Bitcoins are produced through a process called “mining” with diminishing returns that mimics gold extraction from the underground, and that the logo is a gold coin” (Cachanosky, 2019: 371).

The responsibility to add verified transactions into a block and update the chain of blocks is entrusted to a special group of network participants – miners. To complete the delegated task, miners must solve a series of complex mathematical problems, which requires immense computing power. To incentivize them to make their computing power available for the network purposes, “double reward” system was built in the Bitcoin protocol. First, a miner collects a small percentage of each transaction that is written in a newly created block. On top of that, the “winning” miner receives new bitcoin from the network as a reward when the “coin base” transaction is placed into a new block (Antonopoulos, 2014: 115; Hutchinson & Dowd, 2015: 361; Nakamoto, 2008:4). It means that the issuer of bitcoin is not a bank, government, supra-government institution, individual or company; the issuers are users themselves (Dinić, 2014: 110). On 3rd January 2009, the “genesis block” was mined (Horvatić, Tarfa, 2022:107-108). Miner(s) of this block received 50 bitcoins. From that moment on, every time a new block was created, a miner received 50 newly created bitcoins.

The total supply increases gradually, but not at the same speed. As already noted, each block contains a certain number of bitcoins, and the total supply of coins increases by adding new blocks. However, the blocks do not have the same capacity, i.e. they do not contain the same amount of bitcoin. The network is preprogramed, first to cut miners reward by 50% with every 210.000 added blocks, but also to adjust the complexity of mathematical problem to the amount that is already mined, so that a new 1MB block containing roughly 4000 written transactions (Horvatić, Tafra, 2022:109) is created every ten minutes on average (Antonopoulos, 2014:2, 177-178; Đorđević, 2018:97-98; Raskin, 2015:976; Roth, 2015:528). Simple mathematics shows that the mining reward decreases roughly every four years. Since 11th May 2020, mining reward per block is 6.25 bitcoins. The rate at which new blocks (hence bitcoin) are added to the existing chain gradually decreases (until it reaches the number of 21.000.000).

The act of cutting off a miner’s reward by half is called “halving”. The idea behind the process of halving was to make bitcoin mimic gold even when it comes to the dynamic of its excavation (Đorđević, 2018: 98). From the economic and legal standpoint, through the process of halving, the deflationary nature of bitcoin comes to the fore because the already limited supply of coins is further reduced. For the purpose of comparison, at the time of writing this paper, more than 18,5 million (out of 21 million) bitcoin was released in circulation, but the last bitcoin will be released in circulation once block 13.230.000 is mined. Following the dynamic of the Network, it is estimated that this will happen approximately in the year 2137 (Antonopoulos, 2014:178; Raskin, 2015:976). This means that inflation percentage is controlled, not only through supply that is finite but also through 64 halving events, after which the circulation rate of a new bitcoin decreases.

3. Superhalving

Bitcoin was first recognized as money on the basis of the regulatory standpoint by the Financial Crimes Enforcements Network (Mirjanich, 2014: 214), then in judicial practice in the famous “*Silk Road*” cases (Raskin, 2015: 981-982; Zebec, 2018: 89) and in *SEC vs Shavers* case (Raskin, 2015: 979-980). Yet, although it is not wrong to think of bitcoin as a currency, as already noted, we like to think of Bitcoin as a payment system. It was the original idea (Syropyatov, 2021: 325) and Bitcoin was actually used in that capacity in first years, mostly for small online transactions (Vareško, Deković, 2022: 91).

The true potential of this system, which is impressive *per se*, can be fully comprehended only if it is perceived as part of the future decentralized financial system (DeFi). In his numerous lectures and interviews, Antonopoulos provides a great analogy by comparing the DeFi space with the Internet from early days. In that analogy, Bitcoin is compared to e-mail which was the first and (for a long time) single functional application on the Internet. In the DeFi space, Bitcoin is the first and (in many ways) the most important but not the only functional application. Precisely, the way the Bitcoin network uses the distributed ledger technology is nothing but one possible representation of true potential of incredible piece of computer engineering called a blockchain. Having in mind the countless functions of the Internet today, this analogy offers the best insight into the scale and the potential of the DeFi space.

Using this and other related technologies certainly goes way beyond the creation of different payment and even financial systems. Blockchain technology and cryptocurrencies, decentralization protocols in general, are part of a long-term proliferation cycle and they have an opportunity and capacity to further expand the innovation and opportunities that started in the early years of the Internet (Calcaterra, Kaal, Rao, 2020:204; Syropyatov, 2021:320). From the legal standpoint, there is no doubt that blockchain technology will reorganize any activity which requires public display of information (Cvetković, 2018:122). It also has a capacity to reorganize all decision-making activities of the slow and expensive state apparatus through a peer-to-peer decision making process (Abramowitz, 2015:7-9). It challenges the conventional assumption that centralized institutions, such as legislatures and courts, are needed to produce law of sufficient clarity to be workable (Abramowitz, 2015:9). Finally, it has been proven that blockchain technology is essential for future development of the present-day mainstream ideas, like IoT (Internet of Things) and IoE (Internet of Everything) (Horvat, Tafra, 2022:108). Thus, as impressive as they are, even the DeFi space, IoT or IoE will be just fragments, or applications of the so-called “Web 3.0”.

Yet, if we consider it strictly from the monetary standpoint, we believe that the existing centralized financial system is outdated, inefficient, incredulous, and needlessly expensive; as such, it will be replaced by a more efficient economic structure. It has been scientifically proven that the current size of cryptocurrency market and its growing strength has the capacity to disrupt the entire financial system (Vareško, Deković, 2022:91). From the ideological standpoint, the DeFi system seems to be the most obvious replacement. However, at this moment, more than a decade after the Bitcoin network became fully operational, the DeFi structure sounds a bit futuristic. Yet, the contours of the system are now clearly visible. Certain parts of the system are more than functional, and effects they create bring into life the basic idea of DeFi. It is visible in the process called “superhalving”.

To our knowledge, the term superhalving was used for the first time in a newsletter that the world renowned expert on cryptocurrencies Teeka Tiwari sent to his readers and subscribers. To explain his discovery, he used the analogy with halving. Superhalving refers to decreasing the number of coins in circulation but, unlike halving, superhalving is not tied to the Bitcoin code. According to Mr. Tiwari, it is a hypothetical situation related to the opportunities that miners now have in the DeFi ecosystem (Tiwari, 2021).

Miners provide computing power necessary to keep the Bitcoin blockchain operative, and the rationale for allocating their computing resources to the Network comes in the form of a newly released bitcoin. Until recently, miners were not in a position to hold coins they were rewarded with. To stay in the “race” for new coins in the environment of perpetually growing competition, they had no other choice but to sell earned coins to fund the upgrade of computing resources for further operations. This was their only option because ownership of any kind of crypto-asset was not gateway to (traditional) sources of capital (Tiwari, 2021).

Nowadays, the situation is remarkably different. First, financial institutions are now highly involved in the crypto-market (Magnuson, 2022: 884). They offer financial services and create highly profitable spaces for their clients related to Bitcoin, Ethereum, and other projects. Second, exchange traded funds, crypto-exchanges and miners, all catering to the cryptocurrency industry, have developed into major industries themselves (Magnuson, 2022: 884). According to Tiwari, miners are able for the first time to raise money through capital markets. According to his study, miners and crypto-companies have already raised more than ten times more capital for their future ventures than in previous years (Tiwari, 2021).

Furthermore, miners nowadays do not even have to have access to investment banks, capital funds or other selected institutional or individual investors. Similarly to Bitcoin, the DeFi is a monetary inclusive space in the absolute sense. Via alternative blockchain-based decentralized model of finance, it is possible to bypass unnecessary intermediaries and to step into virtual peer-to-peer capital relations. It is possible to borrow, save, schedule payment, trade, purchase insurance, invest, prove ownership, and even automatically rebalance a portfolio on the financial market which is always open, fully decentralized, remarkably safe, and almost completely immune to human errors. By means of the innovative investment apparatus, this financial ecosystem makes capital raising simple, informal, straight forward, and thus cheaper for miners across the globe, and anyone who wants to finance their future ideas and ventures. Through cryptocurrencies, smart contracts and tokens created on various blockchain platforms for potential investors and funders, regardless of where they are currently located, miners can provide the necessary capital for updating their mining equipment or other activities. It further means that miners do not have to immediately sell bitcoin they received as a mining reward. They can now hold it (which they do most of the times) with the intention to allocate their portfolio, realistically expecting its price to increase. This means even less coins in circulation, consequently reduced supply, and finally lowered inflation rate. In short, this is the process of superhalving.

We find the idea of superhalving to be very interesting. Still, although it was well elaborated, we believe that this phenomenon can and should be interpreted in a broader sense than suggested by Tiwari. It does not have to be strictly related only to the construction of a new crypto-financial digital world and opportunities in it. Other circumstances may create a similar effect and cause a decrease of the bitcoin volume. They should be researched under the same nominator, *i.e.* superhalving. In that context, we may mention two circumstances which have the greatest deflationary impact on the market.

First, in a technical sense, Bitcoin can be interpreted in various ways: as a software, as a network, as an application. In the economic sense, bitcoin can take over the role of currency, a payment system, a (digital) asset, and even the role of merchandise or commodity (Cvetković, 2018:129-133; Pernice, 2021:772). Considering its applicability and its role in general, different studies undoubtedly confirmed that bitcoin has constantly evolved¹⁸ (Vareško, Deković, 2022:91). It has become more diverse and globalized (Karabulut, Sari, 2022: 56). Given that the idea behind creating this system was to make a transfer of value as efficient as possible, *i.e.* to make the payment system effective, the growing spread of bit-

18 It is undoubtedly confirmed by the comprehensive study on the number of patents related strictly to Bitcoin and its chain (Cavalhiero, Cavalhiero, 2022: 211-216).

coin confirms that it can be characterized as a collectively recognized medium of exchange (Pernice, 2021:777). However, at this point, there are crypto-projects that allow more efficient, faster and less expensive allocation of value; so, bitcoin is rarely used for that purposes. Yet, bitcoin has a number of superior features (it is rare; it has limited supply and timely lowered issuance rate; it allows privacy, confidentiality and is thus immune to seizure; it is easily “portable”, easy to store and requires low or no maintenance; it is rather simple to use, and it is not someone’s liability. Due to these features, bitcoin behaves like digital gold, and is mostly used as a store of value. In other words, despite its obvious volatility, both the deflationary design of Bitcoin and its decentralized and global nature enhance its store of value properties (Baur, Dimpfl, 2021:2681). Thus, most of the time, bitcoin is more demanded as an asset than as a currency, so it mostly behaves as a store of value (Đorđević, 2018:100). This especially becomes evident in times of economic, geopolitical, or health crises such as one caused by the SARS-CoV-2 pandemic, or an ongoing energy crisis.

This is why individuals, big financial institutions, companies and even some governments include a certain amount of bitcoin into their portfolios to protect their savings and investments. They hedge against inflation as it is expected that gold-like assets behave contrary to stocks and fiat currencies in times of crises. Scientific research confirms that the diversification of portfolios through bitcoin (if traditional assets are also included) can be a great investment choice even for those investors who are not inclined to take higher risks (Syropyatov, 2021:323; Šoja, Senarathne, 2019:54-58). This means that all those entities do not purchase bitcoins (or rarely mine them) with the intention to use them for payment or transfer of value. They prefer long-time holding over engaging in transactions and releasing it into circulation, which leads to the overall supply reduction. As this is a natural tendency in the network, it is safe to say that this is also a type of superhalving.

Finally, there is another tendency in the crypto ecosystem that can be interpreted as a form of superhalving, and thus a deflationary mechanism, although it is quite accidental. As already noted, bitcoin is rather simple to use, store, and maintain. However, a certain degree of practical knowledge is necessary. Bitcoin can become unreachable if the “wallet”(the hard or online one) is mismanaged. The most common way to make a bitcoin inaccessible is to lose it.

In effect, it is impossible to lose a bitcoin because coins are permanently linked to the network. At any time, the Network participants can determine at what address every single coin is located. But then, private keys that allow access to coins stored to a certain address are the “symbol” of ownership (Raskin, 2015: 977, 1002), and they can be lost (Hutchinson Dowd, 2015:361). Bitcoin wallets,

especially the hard ones, can also be lost. As estimated, about 20% of bitcoins that are released into circulation have become permanently unavailable (Mijatović, 2022:103). Further, it is reasonable to expect that more bitcoins will be “lost” over a course of time; therefore, the actual supply of bitcoin, although unknown due to the risk of permanent loss (Hutchinson & Dowd, 2015: 361), is definitely smaller than it is preprogrammed and will get gradually reduced. This makes a bitcoin even more deflationary than previously projected.

4. Conclusions

It is a well-known fact that money is usually, but not necessarily, subjected to a state monopoly (Pernice, 2021: 773). Until recently, the general public was not prepared to question the dogma of the governments prerogative of “producing” money (Hayek, 1976:20). Nowadays, the general public is not eager to unquestionably accept the *lex monetae* concept and governments monopoly on issuing money. Competitive ideas are well formulated, and relevant sources are just “a few clicks away”. Still, the idea presented in a white paper titled “*Bitcoin: A Peer-to-Peer Electronic Cash System*” is undeniably the most thought-provoking one. The recently conducted comprehensive statistical analysis confirms that this is the general opinion in academic circles (Karabulut, Sari, 2022: 58-66). Even the critics of the Bitcoin tecno-economic architecture agree that Bitcoin undeniably demonstrates the practical possibility of fully decentralized monetary system based primarily on distributed trust (Hutchinson & Dowd, 2015:380).

Although stable coins are referred as “Hayek’s money” (Syropyatov, 2021: 322-323), those backed up by precious metals (such as gold) but primarily those backed up by parent fiat currencies, cannot be used for the final implementation of Hayek’s theory in real economy (Syropyatov, 2021: 328). We believe that it is the Bitcoin that is the actual embodiment of the old idea of issuing *different* kinds of money which represent different abstract units fluctuating in their value relative to one another (Hayek, 1976: 25), and that are clearly distinguishable by different denominations among which public could choose freely (Hayek, 1976: 21). The entire Bitcoin system promotes this idea in a way like no other money-like asset has ever done before. Moreover, relying entirely on advanced technological concepts, Bitcoin does not depend on governments’ permission of any kind and is not limited by state borders¹⁹. This intriguing system has been stress-tested numerous times. Although it is not fully stable and is far from perfect, all turbulations have made the system only more resilient. This can-

¹⁹ It was recorded that even in 1999 Milton Friedman stated that the one thing that’s missing, but that will soon be developed, is a reliable e-cash: a method whereby on the Internet you can transfer funds from A to B without A knowing B or B knowing A (Zebec, 2018: 88).

not be said about its direct competitors – government issued currencies. Quite the opposite. In a short period of time, specifically from the moment when the World Health Organization recognized the outbreak of the SARS-CoV-2 pandemic triggered by a new type of coronavirus, the bitcoin was transformed from a subcultural phenomenon into the most popular and appreciated (digital) asset in not more than a few months. The very nature of the SARS-CoV-2 pandemic, primarily the need to limit physical contact, favoured the digitalization of all models of performing day-to-day activities and consequently created a perfect environment for all crypto-projects (Mijatović, 2022:94). Yet, the very fact that a bitcoin on a free market is about 20.000 times more valuable than USD suggests that there is more to it. This is true regardless of whether bitcoin is perceived as money or not.

The theory of competitive currencies, particularly currencies that are not issued by a state or any central authority, proves to be sustainable at least. Actually, if we have a centralized and coercive order on the one hand and a voluntary and decentralized system on the other hand (McGinnis, 2020: 59), it appears that “a voluntary agreement to use a specific item as a means of payment” (Đorđević, 2018:97; McGinnis, 2020:61) can even be superior to the “currency monopoly” dogma. Yet, as we see it, detection of deflationary mechanisms built in Bitcoin source code, and recognizing them as immutable by general public, is the biggest secret to its success. Obviously, this is not the only interesting feature of the Bitcoin system but, in times of crises such as the one triggered by SARS-CoV-2 virus and its numerous variants, those features come to fore, especially when compared to the mode of operation of “imperative” currencies. Anyhow, this observation has been supported by judicial practice. In certain cases, courts precisely stated that bitcoin is deflationary by nature and that it could be a better store of value than numerous legal currencies around the world which are very susceptible to inflation (Pernice, 2021: 778).

The Bitcoin system questions the universally accepted idea of state sovereignty on the subject of money issuance. Theoretically, Bitcoin does not undermine monetary sovereignty; in effect, the community can even contribute to the exercise of this type of sovereignty by giving trust to a means of exchange other than legally imposed ones (Pernice, 2021: 775). It is natural that this approach seems suspicious, even more so because this system does not offer answers to all the questions arising in the completely decentralized and unregulated free currency market. Still, this is a fascinating financial assemblage. Numerous technological and economical features make it appealing for all those who are eager to explore possible alternatives to state supremacy in this field. The question whether those alternatives are sustainable, and to what extent, remains to be answered. Yet, we truly believe that deflationary mechanisms, even simple ones

like those built in the Bitcoin system, must be welcomed as parameters in the current or the next phase of both money and monetary obligations evolution.

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О ДЕФЛАТОРНОЈ ПРИРОДИ БИТКОИНА

Резиме

Виртуелни систем за плаћање Биткоин представљен је крајем 2008. године. Ипак, и данас недостају одговори на нека од фундаменталних питања. Једно од тих питања је да ли је Биткоин заиста новац или нешто сасвим друго.

Биткоин као систем примарно је дизајниран не са циљем да се створи „нова врста новца“ у најужем смислу већ са циљем да се створи платформа која обезбеђује да се трансфер вредности изврши на што је ефикаснији начин могуће. Ипак, иако то није суштински, биткоин има капацитет да преузме улогу новца, а тај капацитет је препознат и у судским одлукама. Препознајући и уважавајући тај капацитет, у овом раду презентујемо резултате претежно емпиријског истраживања спроведеног претходно о нестабилној, али опет изразито дефлаторној природи биткоина и њеном утицају на новчане облигације. Конкретно, иако би идеја могла бити контроверзна из више разлога, а волатилна природа „цене“ биткоина је свакако један од њих, сматрамо да периодична депресијација његове вредности не значи да је биткоин инфлаторан. Напротив, биткоин је дефлаторан по природи. Различити уграђени механизми, али и нови начини примене истичу ту природу. Дакле, у раду користимо различите технике аналитичког метода, најпре да издвојимо различите дефлаторне механизме, како оне програмиране тако и оне фактичке, а затим и да их опишемо. Даље, у раду користимо синтетичке методе, најпре генерализацију и апстракцију, да сумирамо резултате истраживања који потврђују као тачну полазну хипотезу да је биткоин по природи изразито дефлаторан и поред његове нестабилности, те да се може користити као заштитни механизам у монетарним облигацијама.

Кључне речи: *Биткоин, новчане облигације, уговор, валутне клаузуле, криптовалутне клаузуле, дефлација.*