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CRYPTOCURRENCIES AND CHALLENGES OF THE USE OF CRYPTOCURRENCY IN MODERN FINANCE

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Abstract: *The paper examines the role of cryptocurrencies in modern finance. A literature review method is applied to synthesize previous research and gain insight into the opportunities and challenges of using cryptocurrencies. The results show that cryptocurrencies offer institutional investors and individuals lower transaction costs, greater privacy, significant diversification benefits and alternative financing solutions. Research shows that there are challenges associated with integrating cryptocurrencies into modern finance. These include the lack of regulatory standards, the risk of criminal activity, high energy and environmental costs, regulatory prohibitions and restrictions on use, security and privacy concerns, and the high volatility of cryptocurrencies. The aim of the work is to fill that gap and to provide useful information for the academic and professional public. To answer the research question, a literature review was conducted using various academic databases, such as Google Scholar, Scopus, Web of Science, and Springer Link. The research highlights the similarities and differences of the conclusions and results reached by different authors. The paper provides useful information for the academic and professional public, including those who wish to have an understanding of these new financial instruments. The research question is “What are the opportunities and challenges of cryptocurrencies in modern finance?”*

Keywords: *cryptocurrencies, finance, financial systems*

INTRODUCTION

Most of the conducted research makes the analogy of cryptocurrencies with “digital gold” (Harwick, 2014). Capitalist economies are characterized by the desire for a free market and as little as possible government intervention in the economy (Grujić, 2022). Accordingly, cryptocurrencies embody Hayek’s dream of groups of people having their

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own money because “there is competition among private money rather than government monopoly” (Hayek, 1990). After the global financial crisis in 2008, an unknown individual, group or organization presenting itself under the pseudonym “Satoshi Nakamoto” proposed an electronic diktat exchange system based on the digital currency bitcoin (Nakamoto, 2008).

Bitcoin is a decentralized digital currency introduced in 2008 and implemented in early 2009. A significant impetus for the creation of cryptocurrencies was the need to create a system that enabled fast and cheap transactions without the mediation of third parties such as banks (Bação et al., 2018; Chapron, 2017; Kfir, 2020; Kolber, 2018; Sudzina, 2018). Accordingly, many scholars, enthusiasts, and futurists consider Bitcoin as a future alternative to government-issued currency (Bouri et al., 2018; Bouri et al., 2017; Hong, 2017). Since the launch of Bitcoin, several thousand cryptocurrencies have entered circulation (Forbes, 2023). According to the website CoinMarketCap, there are almost 23,000 cryptocurrencies in circulation today with a total market capitalization of 1.1 trillion dollars (CoinMarketCap, 2023).

Cryptocurrencies are most commonly defined as digital financial assets for which ownership and transfers of ownership are guaranteed by cryptographic decentralized technology (Swan, 2015; Giudici, Milne & Vinogradov, 2020). They are used to purchase real goods and real services in the real world (Dostov and Shust, 2014; Guadamuz and Marsden, 2015). In addition, cryptocurrencies represent a significant departure from the traditional design, management and regulation of financial systems (Shahzad et al., 2018). The technology behind the proliferation of cryptocurrencies is blockchain (Hashemi Joo et al., 2019). Namely, after the appearance of the bitcoin cryptocurrency, a large number of other cryptocurrencies based on the principle of blockchain technology were formed, with the aim of attracting a critical mass of users that could potentially provide wider use. On the global level, in terms of market capitalization, the following are current: Dogecoin, Ethereum, XRP, Tether, Bitcoin Cash, Litecoin, Stellar, etc. The mentioned market is subject to significant price fluctuations, which is one of the main disadvantages of the decentralized payment system. Blockchain technology is defined by Treiblmaier (2018) as “a digital, decentralized and distributed ledger in which transactions are recorded and added in chronological order to create permanent and secure records.”

Blockchain technology is based on peer-to-peer connectivity and cryptographic security, enabling decentralized access with improved

transparency and trust instead of the centralized nature of traditional monetary systems. There are numerous opportunities and use cases for blockchain in literature and practice. Some of them are asset exchange system (Swan, 2015; Yermack, 2015) banking industry (Abid, 2014), blockchain or consensus as a service (Dyhrberg, 2016), clearing and settlement (Baur et al., 2018) cryptocurrencies (White, 2015) identity management (Katsiampa, 2017) insurance industry (Guesmi et al., 2019), internet of things (Radivojac & Grujić, 2018a), securities trading (Dyhrberg, 2016), remittance system (Yermack, 2015) securities registry of paper values (proxy voting) (Pieters et al., 2017), smart contracts (Kristoufek, 2015; Baek, 2015), voting system (Platanakis and Andrew, 2019).

Briere et al. (2013) believe that cryptocurrencies, especially bitcoin, are new financial instruments and alternative investments with diversification benefits. Many cryptocurrencies are used as a medium of exchange for everyday payments and have similar characteristics to other financial instruments such as precious metals (Omane-Adjepong et al., 2019). Many authors support the claim that cryptocurrencies have no intrinsic value (Cheah and Fry, 2015), but the economic value and future of the use of cryptocurrencies and blockchain technology remains an open debate (Demir, Gozgor, Lau, Vigne et al. 2018). At the same time, the authors agree that blockchain represents the greatest innovation in information science because it represents distributed databases in which trust is established through mass collaboration and smart code, and not through a powerful institution that carries out authentication (Arsov, 2017; Laabs & Đukanović, 2018). The key advantage of blockchain technology lies in the fact that it enables the establishment of secure, reliable and decentralized autonomous systems that have applications in various fields (Yuan & Wan, 2018).

Blockchain technology has attracted significant attention from central banks and institutional investors. Many financial institutions are using blockchain to establish financial technology startups (often called FinTech) to leverage blockchain to provide financial services and support cryptocurrencies. This paper will fill a gap in the literature concerning the lack of a comprehensive analysis of cryptocurrencies from a financial perspective. In this regard, this research represents one of the attempts to understand the role of cryptocurrencies in the transformation and disruption of financial systems. Accordingly, the research objectives will answer the research question “What are the opportunities and challenges of cryptocurrencies in modern finance?” The contribution of the paper is

that it sheds new light on the role of these new financial instruments in simplifying cross-border transactions, improving the privacy and security of transactions and providing innovative financing mechanisms.

METHODS

To answer the research question, a literature review was conducted using various academic databases, such as Google Scholar, Scopus, Web of Science, and Springer Link. The research highlights the similarities and differences of the conclusions and results reached by different authors. In addition to citations and indexing, the criteria used in the selection of literature are the aspiration that the works were published during the last decade in English, Serbian or Croatian and that they were categorized as scientific work. This methodological approach aims to establish a comprehensive understanding and critical assessment of knowledge relevant to a particular topic and potentially reveal weaknesses or claims that merit further investigation. Starting with a focus on the origin and source of cryptocurrencies, the research refers to the work of Nakamoto (2008) as it represents the first reference on cryptocurrencies and is recognized as a basic work that laid the foundation for a large number of studies examining bitcoin and blockchain technology. The research is focused on books, chapters and conference papers that have the words: “cryptocurrency” and “finance” in their titles, abstracts or keywords. Identified sources included in this review were screened for relevance based on three questions: “Does the research describe cryptocurrencies in the context of finance?”, “Does the paper address the possibility of using cryptocurrencies in modern finance?” and “Does the paper provide insight into adoption challenges cryptocurrency in modern financial systems?” These questions served as a kind of filter during the review of titles, abstracts, keywords, and research objectives and questions.

LITERATURE REVIEW

According to Trautman (2014), cryptocurrencies are a subset of digital currencies that can either have centralized institutions or be based on a decentralized network. In short, cryptocurrencies are a new type of currency (Duque, 2020; Hudson & Urquhart, 2019) that is digital and produced from cryptographic algorithms, exchanged over the Internet using protocols such as peer-to-peer networking (Nakamoto, 2008). Another way of defining cryptocurrencies is the fact that they are based

on the use of complex cryptographic techniques to provide users with a secure medium of exchange (Bulut, 2018). The creation of value (or money) and the initiation of transactions is managed by the mining process, which is a set of mathematical algorithms implemented within the underlying protocol (Adhami et al., 2018; Cennamo et al., 2020). Most cryptocurrencies were created to introduce new units of currency with a limited total amount (Baur et al., 2015). Unlike government currencies, cryptocurrencies are not governed by established laws, but by technology (Dodd, 2018). This makes cryptocurrencies a new invention that is different from traditional currencies. In the field of finance, the emergence of cryptocurrencies represents a new area that requires additional public and academic attention (Aslan & Sensoy, 2020; Baumöhl, 2019; Cerqueti et al., 2020; Corbet et al., 2019). At the time of writing, the cryptocurrency market is valued at approximately US\$1.1 trillion, with nearly 50% of that value in Bitcoin tokens. From a technical perspective, cryptocurrencies work through a peer to peer distributed and decentralized network (Nakamoto, 2008). However, there are no specific regulatory bodies (Alonso & Luis, 2019; Yalaman & Yildirim, 2019) that check and control transactions and the transfer of value within the network. Second, cryptocurrencies operate within a robust peer-to-peer infrastructure that cannot be stolen by hacking and is supported by blockchain technology (Clark & Burstall, 2018; Karpan, 2019; J. Wang et al., 2017). Technology guarantees that financial transactions and transfers of value between two parties, regardless of their type, take place directly and without the mediation of a third party (Keogh, Dube, et al., 2020; Keogh, Rejeb, et al., 2020; Treiblmaier, 2019). The lack of trust between exchange partners is reinforced by the public key cryptography mechanisms used to secure the conclusions of monetary transactions (Uddin et al., 2019).

A common misconception among the general public is the confusion between the terms “Bitcoin” and “Blockchain”. As previously stated, Bitcoin was the first successful cryptocurrency to use blockchain technology (Nakamoto, 2008). The decentralized approach brought by the blockchain enables simplification of the execution of cryptocurrency-based transactions and bypassing the intermediation of banks, securities settlement systems and brokers (Rejeb, 2018a; Rejeb et al., 2018, 2019a). Moreover, blockchain forms a global network (Pinna et al., 2018) to generate new units of currency and facilitate the transfer of existing units from one side to another through computational evidence. All cryptocurrencies use a peer-to-peer blockchain design to facilitate instant

transactions. Given that cryptocurrencies are not government-issued currencies (Bunjaku et al., 2017; Fantacci, 2019; Gurrib et al., 2019), they are not controlled by central banks, so they are often called decentralized currencies. Cryptocurrencies aim to overcome the challenges associated with currencies based on gold and fiat currencies (Bartos, 2015) and a growth rate defined according to the rigor and precision of mathematics. In the Bitcoin system, money creation is distributed so that the number of units approaches 21 million units (Fabian et al., 2016). There are currently around 19 million Bitcoin units in circulation, which means that 90% of Bitcoins have already been mined. Limiting the number of bitcoins that can be minted (ie, miners) helps ensure a stable supply of this cryptocurrency because no individual, financial institution, or government has the power to control the supply of bitcoins or “inflate” their value. Each unit of cryptocurrency has its own address with a public and private key. Transactions are initiated using a private key. In a cryptocurrency financial system, users can gain value by engaging in specific transactions with other users (e.g., selling products) or by mining (Courtois et al., 2014; Hayes, 2015; Lim et al., 2014). Mining is the process of recording several transactions as a block in a blockchain (Conti et al., 2018). Miners are specialized nodes (i.e. computers) that retrieve transaction records, verify them, and create new blocks by performing complex computational operations and cryptographic functions. In the Bitcoin example, miners solve a mining puzzle (Houy, 2014) in approximately ten minutes and receive Bitcoin rewards in return.. Jedan od glavnih koncepata blokčejna su zapisi ili transakcije (Rejeb, 2018b; Rejeb i dr., 2019b; Rejeb i Bell, 2019; Rejeb i Rejeb, 2019). Blockchain transactions can be described as a process in which the parties involved gain or lose a certain status (e.g. owner status) (Lanko et al., 2018). In order to create new records (eg transactions), the hash of the first block (or previous block) of the record needs to be passed to a miner who uses it and generates the hash of the second block (Tama et al., 2017).

The process of introducing a new block into the blockchain and solving the hash means executing a certain algorithm (for example, Bitcoin uses “Proof-of-Work”, Ethereum uses “Proof-of-Stake”) that allows the creation and addition of new blocks to the blockchain. This approach prevents attackers from confirming an invalid transaction. Moreover, miners perform computationally expensive tasks to participate in what is essentially a lottery for the right to add the next block to the chain (Catalini & Gans, 2016; Michelman, 2017). Before transaction records are published on the blockchain, a large number of participants

(i.e. nodes controlling more than 50 percent of the total computing power in the network) reach an agreement or consensus, after which the next block is added. Once a block has been successfully introduced with its new identity (represented by the block's hash) to the blockchain, it is distributed among all the nodes of the network to ensure that they are all updated with the latest version of the blockchain. The reward, in the form of crypto-tokens such as Bitcoin or Ether, is given to the miner who has done the work and verified the correctness of the transaction. By doing so, miners will be motivated to engage computing resources to solve puzzles and offset the costs incurred in the blockchain (e.g. electricity costs) (Hsieh et al., 2018; Symitsi & Chalvatzis, 2018). This process is continuously repeated as more transactions are introduced to the network.

The use of blockchain technology in the exploitation of cryptocurrencies can offset costs (Berg et al., 2019), which is an essential element that manifests itself in different ways in the financial system. These costs include intermediary commissions, contract creation and maintenance fees, settlement procedures, security and user authentication. Cryptocurrencies can solve several problems inherited in current financial systems, such as lack of trust, transaction inefficiency, and instability (Nakamoto, 2008). The traditional approach to cross-border payments is characterized by its inefficiency, high cost and liquidity blockage. Payment processes are not transparent and present several uncertainties in terms of pricing and fraud risk. Accordingly, payments in cryptocurrencies could alleviate some of these problems. Namely, cryptocurrencies can be used to prevent fraudulent exchanges or payments, making service transactions simple and efficient (Buhalisu et al., 2019).

The most extensive use of cryptocurrencies is online payment options. The proliferation of cashless payments and the use of credit cards have contributed to the emergence of cryptocurrencies as the most popular form of payment on the Internet. Pournader et al. (2020) believe that companies can make instant money transfers, reducing the commissions needed to pay for goods and services. In this regard, Radivojac and Grujić (2018) emphasize that as long as “the costs of transactions are lower than the costs of payment transactions, the rational behavior of legal and natural persons dictates that they should encourage the use of cryptocurrencies with the aim of reducing the costs of transactions and overcoming the existence of intermediary”. The scope and limitations of the application of cryptocurrencies and blockchain technology in international business and financial markets. For example, Ripple is a decentralized, open-source, peer-to-peer digital payment platform

that enables almost instantaneous transfers of currencies regardless of their form. Ripple used blockchain to connect existing bank ledgers and enable near-real-time cross-border payments. Ripple can process more than 1500 transactions per second. Ripple users are equipped with a signing/confirming key pair to securely send payments. Each Ripple transaction submitted to the network requires a transaction fee specified in the blockchain. Today, some online stores allow their customers to pay in cryptocurrencies, such as Bitcoin, Litecoin, and Peercoin, despite the fact that cryptocurrencies are not yet accepted in many countries (Mendoza-Tello et al., 2018; Omane-Adjepong & Alagidede, 2020; Vandezande, 2017). Cryptocurrency payments can be made between accounts or wallets resulting in lower transaction costs, increased security and privacy (Till et al., 2017). On these points, Nica et al. (2017) argue that the popularity of the Bitcoin system is attributed to the low transaction fees it offers users, making it a viable alternative to conventional payment services. However, to achieve this cost advantage, Alonso-Monsalve et al. (2020) note that cryptocurrency trading should operate based on various assumptions that may not hold in certain situations, including fast connections between users, low transaction costs, and high liquidity.

Cryptocurrency settlement time is much shorter than other payment methods. In the case of Bitcoin, the settlement time of an average of ten minutes is much faster than any cashless financial transaction, which can take days or weeks (Nakamoto, 2008). Although transferring large amounts of cash is a risky and troublesome problem in the physical world, cryptocurrencies can be transferred very quickly and secretly between users. The use of cryptocurrencies may mean that transaction accounts no longer need to be on bank balance sheets. Instead, all cryptocurrency transactions could be recorded on a single shared distributed ledger (or blockchain) to facilitate banking arrangements. Cryptocurrency implementations often use a proof-of-work mechanism to record all transactions in a public ledger, thus protecting consumers from fraud (Coc et al., 2017). In addition, cryptocurrencies could solve payment process disruptions due to specific settlement failures. Also, many authors perceive cryptocurrencies as a new type of speculative asset that is attractive to investors who want to make a profit (Grujić, 2022). For example, Katsiampa (2017) finds that the bitcoin market is characterized by its highly speculative nature.

Undoubtedly, part of the rise in the price of Bitcoin can be explained by speculation. Therefore, it can be concluded that the main motive and reason for the creation of cryptocurrencies is the fact that classic

money did not satisfy the ideas of certain groups of people in terms of the speed of transactions or the way to acquire wealth. Second, certain groups began to lose patience and want to completely avoid regulation of financial flows and create a parallel, less regulated, financial system that would meet their demands. It is hard to resist the impression that the generation of cryptocurrencies is called “mining” or “mining” in order to emphasize the effort, time and energy required to acquire a certain amount of cryptocurrencies. In this regard, “mining” is an attempt to simulate “quasi-cover” because “mining” is cleverly used as an allusion to the digging of gold in mines. “Mining” is rational and economically justified in countries where the price of electricity is low. Under this condition, it is possible to make a profit by “mining” only if powerful computers work continuously at a low price of electrical energy. Bearing in mind the fact that “mining” is increasingly complex as the “fever” has caught the miners, the expenses of “mining” are approaching the income generated by acquiring cryptocurrencies. In addition, “mining” should represent a psychological phenomenon of gold cover that is completely overcome in the modern economy. Therefore, cryptocurrencies have no coverage, and the primary goal of “mining” is not to create a new unit of currency, but to secure the network. After that comes the processing of transactions, which does not require a lot of resources, and as a reward for all this, a defined amount of cryptocurrency. Accordingly, “mining” is merely a way of distributing cryptocurrencies and maintaining a system whereby individuals will use cryptocurrencies while expecting them to have a market value. In this regard, putting the hardware into the “mining” function is the motive of the “miners” to get a certain number of cryptocurrencies (Qin, Yuan & Wang, 2018).

At the same time, “the market value represents nothing else but is established only by expectations about the value in the future which is the definition of a bubble” (White, 2015, 393).

According to Dyhrberg et al. (2018), bitcoin’s low adoption and its sufficient market depth contribute to the general perception that bitcoin is an investable asset. The literature on the price of Bitcoin is growing, providing evidence that cryptocurrencies exhibit independent price behavior compared to other conventional financial instruments, such as bonds, stocks and commodities (Baur et al., 2018; Bouri et al., 2017). The high volatility of investing in cryptocurrencies is compensated by a high expected return. Similarly, the low correlation of cryptocurrencies with stocks, bonds, commodities and foreign exchange rates creates the potential for diversification for investors. The opportunities that

cryptocurrency diversification brings have attracted considerable attention with research reporting various findings. Dorfleitner & Lung (2018) argue that in case cryptocurrencies are used as an investment and not only as a means of payment or exchange and are held for diversification reasons within an investor's portfolio, the behavior of cryptocurrency returns and their volatility can be significantly different on weekends. Accordingly, cryptocurrencies are not only perceived as an alternative currency but also as an investment object. Considering the gained popularity as a cryptocurrency and the accompanying blockchain technology, there are numerous studies that examine and show the speculative nature of bitcoin (Yermack, 2015; Kristoufek, 2015; Baek and Elbeck, 2015; Dyhrberg, 2016). After examining the nature of bitcoin, Yermack (2015) and Kristoufek (2015) concluded that it cannot be explained with the help of modern economic theories because it shows more speculative features compared to other financial instruments and currencies (Šoja & Chamil, 2019). Other authors try to explain whether this cryptocurrency is a currency or a good, a commodity (Dyhrberg, 2016; Katsiampa, 2017; Pieters and Vivanco, 2017; Radivojac and Grujić, 2018a). In addition, some authors (Dyhrberg 2016; Al-Yahyaee, Mensi, Al-Jarrah, Hamdi, & Kang, 2019) indicate that bitcoin has certain characteristics of other classes of assets or financial instruments such as currencies and gold. Therefore, it enables portfolio diversification. There are also conflicting findings. For example, Baur et al. (2018) prove that the characteristics of bitcoins, viewed as financial instruments, are different compared to gold or the dollar. Other research shows that the cryptocurrency bitcoin can be a desirable instrument for diversification (Liew & Hewlett, 2017). This assertion was tested precisely in a portfolio consisting of traditional financial instruments such as gold, bonds and stocks, both for conservative investors and for those investors who prefer risky investments (Guesmi, Saadi, Abid, & Ftiti, 2019; Šoja & Chamil, 2019; Šoja, 2019; Platanakis & Andrew, 2019). The main attraction of institutional investors for investing in bitcoin is the diversification of placements and the simplicity of capital investment (Levy, 2020). Unlike other financial instruments, bitcoin has no basis to guarantee its value and sustainability. Ram (2019) in an extensive analysis using the Šaprp ratio showed that bitcoin provides higher risk-weighted returns compared to other financial instruments and asset classes. Trautman and Dorman, (2018) conducted a correlation analysis among different financial instruments such as stocks, real estate, gold, and bonds. They proved the benefits of applying diversification to these financial instruments. Bitcoin can be a desirable instrument

for diversification. It can be (also) used as risk protection and as an alternative asset in a portfolio that includes major stock indices, bonds, oil, gold, and the most famous commodity indices (Šoja & Chamil, 2019). The inclusion of Bitcoin in a portfolio of traditional financial instruments is in line with diversification tests by investing in traditional financial instruments. In addition, earlier research shows that this strategy gives excellent results when applied to instruments with similar characteristics and risk levels, such as government bonds (Grujić, 2016). Grujić and Šoja (2021), observing the period during 2019 and 2020, show that it is justified to include bitcoin in the portfolio structure. They created two portfolios, one without bitcoin and one with bitcoin. The goal in the optimization of both portfolios is to minimize risk. The results of the research indicate that the cryptocurrency bitcoin represents a desirable source of diversification in an investment portfolio that is made up primarily of traditional financial ones. Moreover, the results show that this statement is valid for the investor who has a high risk aversion and for institutional investors who want to take more risks. The conclusion is that the rational behavior of institutional investors dictates the consideration of investing in Bitcoin using the Markowitz model. However, given the extremely high level

The development of modern financial systems, in which investors' interest in investing in crypto assets is growing, has led to the search for new ways to finance projects and raise capital based on the blockchain. The fundraising mechanism through which new companies and startups raise capital from the public by selling tokens (i.e. records in the blockchain or other distributed information system that confirm the user's ownership of a certain asset) is called an initial coin offering (ICO) (Demidenko et al. , 2018). Usually an ICO starts with the announcement of the project to be financed and the required marketing activities to attract as many potential investors as possible. In short, ICOs are usually launched by disseminating a new business idea to the public explained through a "white paper", in which a team of proponents, a target amount to be raised and a given number of tokens to be distributed among subscribers according to a predetermined exchange rate with one or more existing cryptocurrencies. Although the ICO market is still in its infancy, the size of this market is considerable as the scope of ICOs has expanded exponentially beyond its initial purpose (Momtaz, 2019) ICOs are often considered one of the significant innovations in financing entrepreneurial ventures. In accordance with Härdle et al. (2020), Using ICOs is a promising funding channel for entrepreneurs, although it is not fully understood by some

investors and companies still offer ICOs without economically viable use cases. The reason for this development lies in the fact that the ICO represents an opportunity to participate in a project or in a decentralized autonomous organization (DAO). Despite promising high returns, ICOs are unsafe investments because the process is still unregulated, leaving room for fraud, theft and fake projects (Momtaz, 2019). Tokens sold through ICOs may be transferable, fungible or interchangeable with others on the same platform (Crosby et al., 2016). Furthermore, ICO tokens can be traded on secondary markets, even before the end of the ICO. In reality, the tradable feature of these tokens serves to motivate agents and potential investors to get involved in the venture.

Hundreds of startups and companies are currently exchanging cryptocurrencies. Cryptocurrencies have significantly supported the global rise of e-commerce. The development of cryptocurrency markets creates a new model of trust for e-commerce (Mendoza-Tello et al., 2019), increases monetary circulation (Mendoza-Tello et al., 2018) and enables efficient online cross-border trade (Foley et al., 2019).

DISCUSSION. CHALLENGES OF CRYPTOCURRENCY IN MODERN FINANCE

Many of these important transactions are the result of the high speed, low cost and efficient nature of virtual currencies. The blockchain protocol and cryptocurrencies are not only incredibly useful for large companies; small businesses can also benefit from micropayments and exchange transactions. In short, the use of cryptocurrencies in everyday transactions and financial ecosystems is constantly on the rise. As cryptocurrencies continue to grow, there is a possibility that they may replace the role of traditional currencies and become more likely. However, there are several challenges ahead that prevent the widespread adoption of cryptocurrencies as a means of exchange of value and a source of income. The growing momentum of cryptocurrencies and FinTech brings certain risks that raise several questions and concerns regarding the sustainability of the future integration of virtual currencies into the monetary and financial system, especially in the absence of legislation and regulatory standards (Avdeychik & Capozzi, 2018; Mendoza-Tello et al., 2018). Today, there is exponential growth in the development of the online black market. The emergence of bitcoins has already revived black markets and provided numerous opportunities due to their quasi-anonymity, which makes it difficult to trace the identity of operators and users (Baldimtsi et al., 2017). According to Kerr (2018),

Bitcoin is the perfect tool for doing business in the digital black market because it undermines the police efforts of the authorities. Cryptocurrencies have the potential to drive structural changes in the way black markets operate. In this regard, there are authors who claim that cryptocurrencies are the ideal means of hawala money transfer. The informal money transfer system that operates outside of formal financial systems has been known for centuries as hawala. Hawala in the Middle East and Asia has been a well-established system of financial transactions for centuries. This system was introduced by Arab merchants and caravan owners to protect themselves from robbery. Hawala in Arabic means transfer, and as an additional meaning, the word “trust” is added to it, which emphasizes the way the system works. The essence of this system is a network of intermediaries - havaladars. Namely, havaladars transfer money quickly, in the utmost confidence, transactions are carried out even in the most remote villages, without any trace. This system is therefore based solely on mutual trust. Thus, hawala is the transfer of money without a physical change of the owner of the initial shipment, i.e. without the physical movement of money. Therefore, the hawala transaction process takes place outside the control of the state and institutions in charge of supervision (Radivojac & Grujić, 2018b). For example, let the money sender be a citizen of Bosnia and Herzegovina residing in Germany, but his residence visa has expired, which makes his stay in Germany illegal. Suppose he wants to send money to his mother in Bosnia and Herzegovina. For this purpose, he cannot use a formal way of transferring money because he could be detected as a foreigner in illegal stay. He will get in touch with hawala broker X. He will hand him the amount of money he wants to send to his mother in Bosnia and Herzegovina. They can agree on a password to receive money, and the intermediary will charge the sender a certain commission for his service. Intermediary X takes a certain commission and contacts another intermediary Y in BiH, and informs him about the agreed password. Intermediary Y agrees to pay the sender's mother the money he already has with him. Intermediary Y contacts the money sender's mother. After he hears from her the agreed password, he hands her the money and receives a certain commission for it. The result of the transfer is that intermediary X owes intermediary Y the money that intermediary Y paid to the sender's mother.

In illegal markets, cryptocurrencies are commonly used to facilitate the sale of weapons, drugs, and other illicit goods (Miller, 2016). Similarly, cryptocurrencies fuel a monetary system used for illicit transactions, including drug trafficking, money laundering and child pornography. As a result, the ubiquity of black markets in controlled economies threatens

the stability of people's lifestyles, their activities and their incomes (Scharding, 2019). Cryptocurrencies have been linked to illegal activities due to their ability to challenge government oversight of monetary policy and circumvent existing regulatory schemes. Likewise, cryptocurrencies are considered the largest unregulated markets in the entire world (Alonso & Luis, 2019). The decentralized nature of cryptocurrency-based transactions makes them difficult to track and accordingly can help conceal criminal activities (Afzal & Asif, 2019). In 2011, the Federal Bureau of Investigation (FBI) shut down the online black market known as "Silk Road", which was established by Ross Ulbricht (operating under the pseudonym "Dread Pirate Roberts"). The FBI estimated that more than 9.5 million bitcoins were used to purchase illicit goods from the Silk Road website (Popper, 2015). This phenomenon has alerted citizens, companies and governments to the use of Bitcoin and other cryptocurrencies for illicit trade. However, once cryptocurrencies are replaced by fiat currencies, it is easier to discover the sources of money, as was the case with Silk Road. Consequently, the use of cryptocurrencies must strictly adhere to anti-money laundering regulations (Fadeyi et al., 2020). As cryptocurrencies gain more recognition and popularity, they will likely spill over into other domains and impact other industries. The technology that supports cryptocurrencies, blockchain, is highly dependent on power consumption, graphics processing units, and energy-intensive computing capabilities for cryptocurrency mining (Fadeyi et al., 2020). Cryptocurrency mining processes have received similar adverse publicity following reports that cryptocurrencies involve high energy consumption and have a detrimental impact on the environment. Nime, the initial application of the blockchain, or Bitcoin, was designed without considering the technology's effects on the environment (Truby, 2018).

Although the current mining technology is oriented towards energy efficiency in the future, the high rate of electricity consumption and emissions are expected to increase to the point that cryptocurrency mining may not be profitable in the foreseeable future (Rejeb, A., Rejeb & Keogh, 2021). Cryptocurrencies can act as tax havens, undermining the ability of governments to audit and prosecute tax evaders. An even more worrying fact is the possibility of using cryptocurrencies to finance terrorism. Their ability to conceal transactions with a high level of privacy and anonymity makes cryptocurrency payments highly suitable for financing transnational terrorist activities and global criminal structures. Although cryptocurrencies depend on robust security protocols enabled by blockchain technology, users are not immune to hacking, fraud, theft, and privacy intrusions.

Criminals have already been able to target exchanges and successfully steal large amounts of Bitcoin. For example, in its history bitcoin has experienced more than a few dozen thefts, including several incidents where the stolen value of bitcoin exceeded \$1 million (Bunjaku et al., 2017). Security issues continue to be a significant problem in the handling and storage of cryptocurrencies. Hackers can attack a user's wallet and steal cryptocurrency units (White, 2015). In 2016, an application built on the Ethereum protocol was found to be faulty and resulted in the theft of approximately \$70 million worth of Ether tokens at the time (Auer, 2019). Moreover, the security of cryptocurrencies fundamentally relies on asymmetric encryption of public and private keys. However, knowledge of the private key equates to ownership of Bitcoin (Wei et al., 2019). As a result, the loss of the private key or other credentials may result in loss of control over the wallet. It also means that the user of the cryptocurrency will not be able to get the funds back because there is no central body that oversees the system. Stealing private keys can be accomplished using several techniques such as installing buggy or malicious code, phishing, key loggers, and Trojan horses that effectively capture all user keystrokes and forward them to a remote attacker. Unlike government-issued currencies, cryptocurrencies are not presented in physical form or controlled by a regulatory body. They only derive their value from the expectations of the community and the trust of those who participate in this system. A significant disadvantage of cryptocurrencies is their high volatility, mainly due to their design and free fungibility (Jaag & Bach, 2015). In fact, cryptocurrencies are subject to high volatility because there is no central authority that guarantees the stability of their value. For example, the price of one bitcoin rose from \$13 in January 2013 to \$1,242 on November 29, 2013, which is just below the price of an ounce of gold (Hughes & Middlebrook, 2014). The volatility of cryptocurrencies can be exploited and amplified if financial institutions engage in speculative investments, resulting in chain reactions and financial crises. Similarly, cryptocurrency prices can create "bubbles". The volatility and uncertainties associated with cryptocurrencies make it challenging to provide reliable valuations for reporting and auditing purposes, especially from a tax compliance and reporting perspective. Tucker (2013) noted that a high level of volatility increases the risk of holding cryptocurrencies and the likelihood of their manipulation through signaling false positives in order to sell the purchased cryptocurrency at higher prices. In such a scenario, when investors sell off their cryptocurrencies, the supply increases resulting in a drop in the price of a particular cryptocurrency and serious losses for other holders.

CONCLUSION

Despite all the advantages, several challenges remain. One of the biggest obstacles in the spread of cryptocurrencies is the lack of governance in peer-to-peer network transactions. Users are at risk of becoming victims of fraud and attacks. In addition, cryptocurrencies are underpinned by blockchain technology, which could allow malicious actors to operate unsupervised. In cases where errors affect cryptocurrencies or the private key is stolen, users may lose their wallets and the ability to transact with other parties. Apart from these disadvantages, mining and creating cryptocurrencies requires considerable electricity consumption which often requires economies of scale. Investors and companies may also consider using cryptocurrencies to facilitate tax evasion, money laundering and the financing of illicit activities. A large area for further research has been identified. In the existing literature, there is insufficient research on the usability of cryptocurrencies and blockchain technology. In addition to the use of cryptocurrencies in financial markets, there is still a large space for the development and use of blockchain technology in the economy. In this regard, most of the current research is related to Bitcoin and few are focused on other cryptocurrencies. Further research should focus on smart contracts and to increase knowledge beyond cryptocurrencies. Namely, although the blockchain is presented in the environment of cryptocurrencies, this idea can be used in various other occasions. Further scope for research exists in the fact that there are not enough high-quality publications on the use of cryptocurrencies and blockchain in financial markets at the journal level. Currently, most research is published at conferences, symposia and workshops. Accordingly, future studies could provide research into various aspects of cryptocurrencies, such as their technical infrastructure, security, regulation, tax policy, social acceptance, and education. Also, for further research, it is desirable to compare different cryptocurrencies and their advantages and disadvantages compared to traditional currencies and other digital currencies.

MOGUĆNOSTI I IZAZOVI UPOTREBE KRIPTOVALUTA U MODERNIM FINANSIJAMA

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Apstrakt: U radu se istražuje uloga kriptovaluta u savremenim finansijama. Primjenjuje se metoda pregleda literature kako bi se sintetizirala prethodna istraživanja i dobio uvid u mogućnosti i izazove korištenja kriptovaluta. Rezultati pokazuju da kriptovalute nude institucionalnim investitorima i pojedincima niže transakcione troškove, veću privatnost, značajne prednosti diverzifikacije i alternativna rješenja finansiranja. Istraživanje pokazuje da postoje izazovi povezani s integracijom kriptovaluta u moderne finansije. To uključuje nedostatak regulatornih standarda, rizik od kriminalnih aktivnosti, visoke troškove energije i zaštite životne sredine, regulatorne zabrane i ograničenja upotrebe, brige o bezbjednosti i privatnosti te visoku volatilnost kriptovaluta. Cilj rada je da popuni tu prazninu i da pruži korisne informacije za akademsku i stručnu javnost. Kako bi se odgovorilo na istraživačko pitanje, provedeno je istraživanje literature koristeći različite akademske baze podataka, kao što su Google Scholar, Scopus, Web of Science i Springer Link. U istraživanjima se ističu sličnosti i razlike zaključaka i rezultata do kojih su došli različiti autori. Rad daje korisne informacije za akademsku ali i za stručnu javnost, uključujući one koji žele imati razumijevanje ovih novih finansijskih instrumenata. Istraživačko pitanje glasi „Koje su mogućnosti i izazovi kriptovaluta u modernim finansijama?“

Ključne riječi: kriptovalute, finansije, finansijski sistemi

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