CRYPTOCURRENCY AS AN INVESTMENT OR DISRUPTIVE TECHNOLOGY: THEORETICAL INSIGHS

Assistant professor PhD Cristina Gabriela COSMULESE
Stefan cel Mare University of Suceava, 720229, Romania
gabriela.cosmulese@usm.ro

Abstract
One of the most exciting contemporary technology-driven developments is the rise of the cryptocurrency market, which challenges the established model of the money market. In this sense, the aim of this paper, is to study the nature of the new currency, highlighting the differences between it and the official ones as well as security issues related to their value and volatility. The risks will also be mentioned, both those related to fraud and cybercrime, and those associated with energy consumption, which raise several issues in terms of environmental impact. Relevant characteristics such as volatility and stability, which are closely linked, will also be examined to explore the role that this currency can play not only as a means of payment but also as a store of value.

Key words: *cryptocurrency; blockchain; volatility; environmental impact; energy consumption; technology*

JEL Classification: *O33*

I. INTRODUCTION

The economic and financial system that we have come to know could undergo major transformations in the coming years. The payment system, the presence of borderless exchanges, the financing of businesses, the management of property deeds: a whole world is changing after the emergence of the first digital currencies and a new technological platform, the Blockchain. The purchase of cryptocurrencies has recently taken on unimaginable proportions, as has their capitalization. The spread of cryptocurrencies has taken on planetary proportions and borders have been eliminated. A system is increasingly being built and developed that could largely change access to credit and financing. Digital currencies have enjoyed a considerable increase in popularity over time due to their speculative aspects. Aside from the fact that they are unlikely to supplant official currencies, it is indisputable that the debate is becoming increasingly important, not only on the use of cryptocurrencies and their nature, but above all on the technology behind them.

In fact, blockchain technology can be used both to produce money in a decentralized way and without intermediaries, and to enable all kinds of transactions, i.e. to allow the conclusion of reliable and secure contracts or to register the ownership of tangible and intangible assets, such as intellectual property or copyrights.

It is probably no coincidence that the birth of Bitcoin dates back to 2008, the first year of a terrible financial crisis, with banks at the center of a series of accusations, including a few bankruptcies and many bailouts with public intervention. While the role of banks and financial institutions may be justified by a fundamental public function, criticism of their privileges and their inability to support the real economy may have encouraged the emergence of an alternative system. Traditional payment systems are still preponderant because, beyond people's resistance to technological innovation, the new system only allows bitcoin to be transferred. So, bitcoin (the system) only uses bitcoin (the currency). The fact is that it is not enough to own bitcoin, one must also set prices in bitcoin and conclude contracts in bitcoin. Bitcoin should not only be the instrument for purchasing power, it should become a de facto currency, with a code, BTC, and a symbol, B, as much as the euro and the dollar (EUR and €, USD and $). Certainly, a different currency from the usual ones. First of all, it is abstract and cannot be touched. But above all, there is one feature that differentiates it from the others: bitcoins represent an asset for whoever owns them, without being at the same time a liability for anyone else (Bellemo, 2018).

II. THE EMERGENCE OF CRYPTOCURRENCIES

With the 2008 financial crisis, interest in cryptocurrencies grew as they could be a solution to the problems of legal tender and Hal Finney developed Hashcash, the first reusable Proof-of-Work system, an algorithm that Bitcoin used to develop its system for confirming transactions between users on the network, called mining. The domain bitcoin.org was registered on 18 August 2008 by Satoshi Nakamoto (pseudonym of the inventor of the protocol). The first version of the Bitcoin software was released, including the bitcoin generation system which

sets a maximum limit of 21 million bitcoins to be created by the year 2140. On 3 January 2009, the first blockchain was created, a series of chronologically linked blocks containing transactions, which serves as a ledger distributed among users. On 12 January 2009, the first bitcoin transaction from Satoshi to Hal Finney took place, and from 2010 onwards, the first online exchanges, such as Bitcoin Market and Mt.Gox, emerged, where it is possible to hold one's own wallet, deposit and withdraw money in the site's supported currencies and make transfers to other users. On 6 November 2010, the exchange rate reached half a dollar and the bitcoin economy surpassed one million dollars. By January 2011, a quarter of the maximum possible number (21 million) of bitcoins had already been generated, on 9 February bitcoin reached the value of one dollar and then rose to ten dollars on 2 June of the same year and various exchanges sprang up in different

In September 2012, the Bitcoin Foundation was founded and more and more businesses started to accept this cryptocurrency as a means of payment. In 2013, FinCEN (Financial Crimes Enforcement Network), an office of the US Treasury Department, established regulatory guidelines for decentralised digital currencies, classifying those who convert bitcoins into money as susceptible to registration and other legal obligations; meanwhile, Bitcoin's market capitalization reached one billion dollars, with an exchange rate of one hundred dollars. For the first time, the US federal drug agency listed some bitcoins as seized goods. "On Tuesday, 1 October 2013, US authorities shut down Silk Road, the best-known of the illegal e-commerce sites, which is hidden and hard to reach, and arrested the site's founder and owner in a San Francisco library: his name is Ross William Ulbricht". It was a site specialising in the sale of drugs and other illegal products, located in a part of the Internet not indexed by classic search engines, and using bitcoins as a method of payment to allow anonymous purchases. The closure of this platform gave bitcoin popularity and on 27 November 2013 it reached a value of one thousand dollars and the first ATM was even set up in Vancouver, Canada, to allow customers to buy bitcoins in downtown bars. Even Baidu (the Chinese search engine) allowed customers to pay with bitcoin; the University of Nicosia announced that it would accept bitcoin for tax payments, calling it the gold of tomorrow.

In December the People's Bank of China banned financial institutions from using bitcoin and from that moment on its value from just over a thousand dollars began to fall, as a result Baidu stopped accepting bitcoin for some services and shortly after China banned cryptocurrency in the country completely with the closure of some exchanges. With the rise of Bitcoin's popularity many exchanges became targets for hackers and some had to suspend their operations, such as Mt.Gox, while some companies started to accept bitcoin such as the Sun-Times newspaper, as well as Dell and Microsoft.

Japan recognised that cryptocurrencies had similar functionalities to real coins and approved them as a legal means of payment in 2017. In the meantime, new cryptocurrency exchanges continued to open in different countries, more companies started to accept bitcoin and more hacking attacks occurred. The popularity of the cryptocurrency also grew academically, to the point that the Bitcoin graphic symbol was included in the category of currencies in the Unicode coding system.

Bitcoin, the first cryptocurrency, has experienced severe price fluctuations; its price reached a peak in late 2017. Many researchers think that bitcoins and other cryptocurrencies, which largely share the same functioning, are really just a giant speculative bubble, ready to burst at any moment (Enoksen, Landsnes, Lučivjanská & Molnár, 2020). If we look at the bitcoin price since its inception until today, as we have seen before, we can see how it has risen, slowly at first and then all of a sudden rapidly (see Figure 1). At the beginning of 2017, the bitcoin exchange rate against the dollar was around $966, in June was worth $3,000, and in less than 12 months the value of the cryptocurrency exploded, until it reached a peak of almost $20,000 in mid-December 2017 (Bellemo, 2018: p. 58). In the next period it suffered a decline due to South Korea's announcement of additional measures to regulate bitcoin trading. Moreover, in 2018, several companies banned the use of this cryptocurrency, the price of which remained quite low and then grew back very quickly from 2019 onwards (Storer, 2020: p.17). As of 14/02/2020, there are 15,955 establishments in the world that accept bitcoin as a means of payment according to the Coinmap.org website.
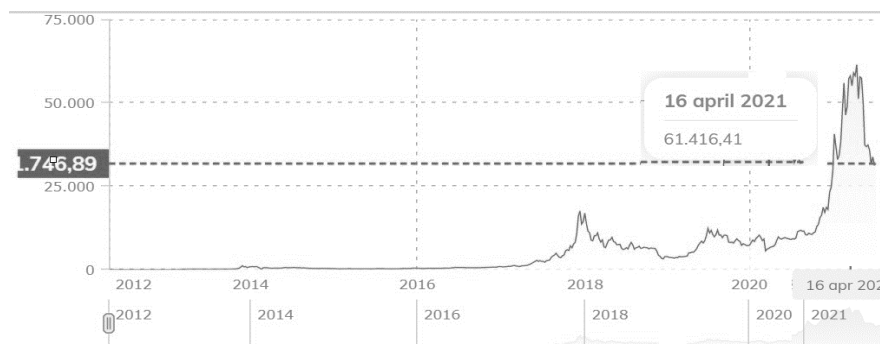
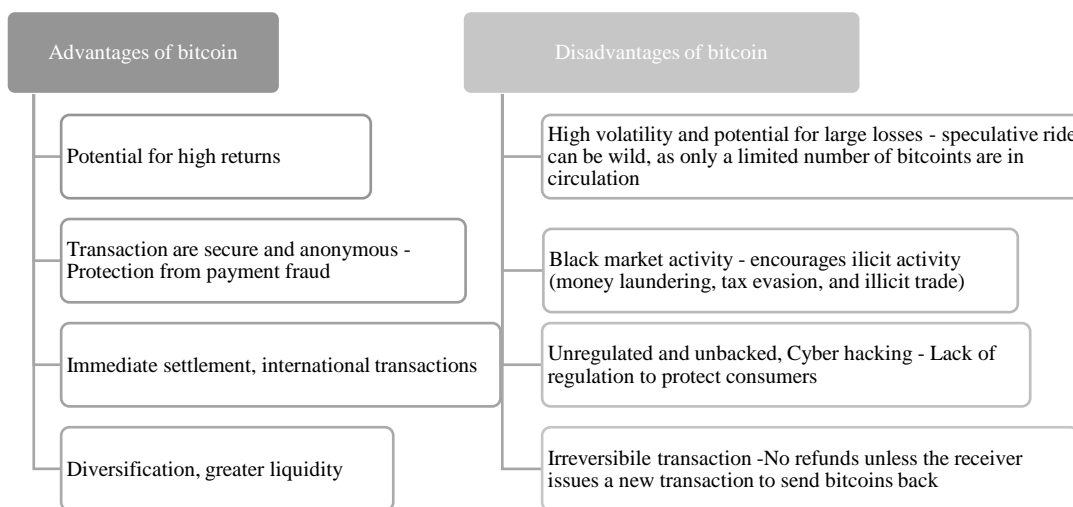**Figure 1 – BTC/USD quotation (2012-2021)**
Source: https://www.money.it/+Bitcoin-BTC-USD-quotazione

In March 2020, "after climbing to a high of around $8,000, the entire crypto market crashed in a dramatic event that became known as Black Thursday. This memorable day saw Bitcoin shed 40% of its value in a matter of hours" (see https://kriptomat.io/bitcoin-btc-price/). This was followed, however, by another bull run and two years on from Black, Bitcoin set a new all-time high of $61,416.

Such a fluctuating quotation is mainly due to the fact that at the base there is the law of supply and demand: the price of bitcoin is closely related to how much people are willing to pay to get possession of it. The high volatility of the value of cryptocurrencies, compared to a more or less stable fluctuation of the dollar and other currencies, leads more and more people to think that this is not a successful innovation but rather an experiment destined to fail. Those who think so, however, can bet on the loss of value of digital currencies: a whole series of special tools have been created to position themselves "short" on cryptocurrency, that is, to take the short position, or to bet on the fall and deflation of prices. Therefore, not even for the most pessimistic, for those who believe that the value of bitcoin is destined to fall, the cryptocurrency is therefore a useless tool.

III. PROS AND CONS OF INVESTING IN BITCOIN CRYPTOCURRENCY

Over the years, security measures have constantly evolved, represented by advances in science and technology made available to the issuer precisely to make a banknote increasingly difficult to imitate. In this respect, an important and highly topical phenomenon is called bitcoin, which is a decentralized electronic payment system and digital currency - cryptocurrency, created to ensure the protection of investments and the free financing of businesses without recourse to financial institutions and outside any constraints and regulations. Opinions on this phenomenon are divided (see Figure 2). While some authors (Narayana, Bonneau, Felten, Miller & Goldfeder, 2016; Antipova & Emelyanova, 2018; Bondarenko, Kichuk & Antonov, 2019) consider cryptocurrency as being created to provide investment protection and free business financing without recourse to financial institutions and outside any constraints and regulations., other researchers analyzing cryptocurrencies, associate them with a technology that has the potential for disintermediation and disruption (Hurlburt & Bojanova, 2014; Baiyere, Donnellan, Hevner, Smith & Stikeleather, 2015; Limba, Stankevičius & Andrulevičius, 2019).

Advantages of bitcoin	Disadvantages of bitcoin
Potential for high returns	High volatility and potential for large losses - speculative ride can be wild, as only a limited number of bitcoints are in circulation
Transaction are secure and anonymous - Protection from payment fraud	Black market activity - encourages ilicit activity (money laundering, tax evasion, and illicit trade)
Immediate settlement, international transactions	Unregulated and unbacked, Cyber hacking - Lack of regulation to protect consumers
Diversification, greater liquidity	Irreversibile transaction -No refunds unless the receiver issues a new transaction to send bitcoins back

Figure 2 – Advantage and Disavantage of Investing in Bitcoin Cryptocurrency
Source: Adapted after Hurlburt & Bojanova, 2014 and Kulkarni, 2021

Cryptocurrencies involve different form factors, technologies and business models that affect consumers and merchants differently. Therefore, they involve certain risks due to the speculative nature of this payment instrument and the high volatility of the exchange rate. A particular aspect of them would be the fact that unlike the cost of regular fiscal money which depends on certain elements such as: gold, silver, the rate of major international currencies, political events in the world, volatility of oil prices, cryptocurrencies do not depend directly on official institutions and financial instruments or inflation, and their unique code cannot be copied, this allows ensuring the safety and security of cryptocurrencies (Antipova & Emelyanova, 2018; Sorici (Zlati), Grosu. Cosmulese & Socoliuc, 2021).

IV. THE FUNCTIONING OF A BLOCKCHAIN

The main reason that hindered the introduction of a digital currency was the need for an intermediary to certify the payment. A normal transaction is simply equivalent to a reduction of the balance of the first user and a simultaneous increase of the balance of the second user. The intervention of the bank is decisive. It must check the availability of the first current account, accept the order, send it into execution, update the two balances and communicate them to the two users. All this must be centralized. If an intermediary is not chosen, however, there must be a register in which to enter the amounts of the transaction, as well as the codes of the two users.

The novelty lies in a technology that enables distributed bookkeeping. The ledger in which all payments are recorded is no longer the prerogative of the individual bank, but is held by all users. Not only is it decentralized, even better it is distributed in a network in which each node can be considered central. This distributed network is called the Blockchain and its purpose is to hold all the information in the ledger called the Distributed Ledger. In the blocks of the chain, as we will see later, the generalities of the payer, the sum of the transaction and the generalities of the beneficiary are recorded. In each block, the transactions generated within about ten minutes and references to the previous block are recorded. The complete blockchain allows you to control all individual transactions in their temporal distribution. The publicly available website blockexplorer.com allows to view every single piece of information. According to the supporters of the new technological tool, the monopolistic regime of banks is eroded and control is returned to citizens.

We have seen that all payments are traceable, but it is not necessarily easy to trace the identity of the users, as their names and surnames are missing. Operators are in fact identified by a code and have a public key (similar to a home address) and a private key (similar to a code that opens the door). Other operators can only see the public key to identify the senders or recipients of a transaction (see Figure 3).

Figure 3 – Bitcoin overview
Source: Antonopoulos, 2017

In the overview diagram below, we see that the bitcoin system consists of users with wallets containing keys, transactions which are propagated across the network and miners who produce (through competitive computation) the consensus blockchain, the authoritative ledger of all transactions.

For example, suppose that a friend of mine sends me money. In this case if I wanted to, I could check all his transactions or, at least, those linked to that specific public key. In order to guarantee anonymity as much as possible, the Bitcoin system allows the generation of several key pairs. Changing the key pair at each operation helps to increase the difficulty of tracking. The system is however not totally anonymous, it is sometimes referred to as 'pseudonymisation'. Since the registry is in the public domain, it is theoretically possible to reconstruct all possible steps when only one of the transactions is linked to a real-world payment.

The great success of Bitcoin has brought to the forefront the role of the platform on which it is based. We have previously seen its main features, namely decentralisation, transparency, security and unchangeability. The applications are becoming more and more numerous. Indeed, in a world characterised by participation, the reduction of disputes, where one must operate in a regime of maximum clarity, since all information and decisions are public, the Blockchain represents an innovation of extreme interest, not only from a technological point of

view, but also from the point of view of businesses and public administration. For these reasons, it is worth looking into how it works. First of all, beyond the various possible definitions, it can be said that Blockchain represents a platform that allows the processing of a large amount of data recorded on a distributed database. The main objective is the management of transactions related to this data. There is no central control element, but a network of individual computers, nodes connected to each other, which share the information. There is therefore no central node, everyone participates and is equally important, forming a peer-to-peer network in which everyone is in contact with everyone.

In the case of the Blockchain, the records are shared, within the computers that make up the network, and the main objective is to maintain the integrity of the system. Information must be stored correctly and no one must be able to access data for which they do not have authorisation. The problem is to ensure trust, in the absence of a central authority, in the relations between the different actors.

The common objectives of a blockchain can be:
- It must unequivocally identify the name of the owner of an asset (money, house, etc.);
- It must be able to defend the ownership of an asset;
- It must store all transactions (involving money, property, etc.);
- It must protect data;
- It must be accessible to authorized users;
- It must add transactions to the records and decide, in case of non-consent, which ones are correct.

The blockchain is a distributed ledger, in the sense that this ledger is not stored in a central point but is present at the same time on all the devices connected to the network, each of which is perfectly synchronized on the same documents: therefore, each user has a copy and it is possible to view it even online, in some sites, without downloading software. The advantages of this system are numerous, in fact power is distributed among the users of the network because participation is required to approve blocks. It is not necessary to have a central authority that manages the supply of currency, as its creation is linked to an algorithm, based on a cryptographic system to guarantee the security of transactions and privacy. Moreover, since there is no central entity, the costs of carrying out transactions are low and the risk of the centralization of power in one individual is a scarcely feasible event in practice. There is trust in the network, in fact the reliability and security of the system is based on the consent of all users, whose privacy is guaranteed thanks to pseudonymity and at the same time.

V. ELECTRICITY CONSUMPTION AND THE ENVIRONMENTAL IMPACT OF BITCOIN NETWORK

Because of the energy consumption, from an ecological point of view Proofof-Work (PoW) [1] does not have a positive impact. Unfortunately, it is not possible to know exactly how much Bitcoin consumes in electricity, because each miner has its own equipment, which can be more or less efficient, depending on the mining equipment one has decided to buy and not only that, but also on i.e. the cooling system, which consumes energy. If in 2017 the bitcoin network consumed almost 5 Terawatt hours (TWh), given that Jamaica consumes slightly more than 3 TWh per year, in 2018 the bitcoin network consumed almost 29 TWh as a benchmark it's just about Nigeria's yearly consumption (see Figure 4).

Figure 4 – Bitcoin energy consumption
Source: BitcoinEnergyConsumption.com

According to the University of Cambridge, on one hand, Bitcoin consumption in 2019 would amount to about 53.03 TWh. Blockchainanalytics.pro, on the other hand, predicted Bitcoin network consumption in 2019 to

be 43 TWh18, which is slightly more than New Zealand's annual consumption. Instead, according to Digiconomist (see https://digiconomist.net/bitcoin-energy-consumption), Bitcoin consumed about 73.121 Terawatt hours of electricity in 2019 (see BitcoinEnergyConsumption.com). This is a number that varies over time depending on the total global hash rate and is currently almost as high as Colombia's electricity consumption in one year.

Beyond the difference in estimates, it is essential to develop new solutions to improve the productivity of the grid. Some states have begun to put restrictions in place in order to aim for higher energy efficiency and to meet climate targets.

In addition to fears about the volatility of the currency, the opacity of the system, possible cybercrime and black-market connections, the increasing demand for energy has also fuelled discussions in the world of cryptocurrencies. We have seen that behind the creation of bitcoins there is a complex mathematical process carried out by powerful computers to generate new coins and validate all transactions. The more progress is made, the higher the rate of complexity of the calculations, the higher the consumption of electricity, so studies carried out so far agree that the need will increase in the future. The six largest consortia are in China, where the price of electricity is lower than in many other countries, as is the cost of renting land and buildings. The problem is that most of the power plants are coal-fired, with a worrying environmental impact due to their low quality.

The issue of more sustainable production, both economically and ecologically, has led some large consortia to seek out the use of clean energy in countries such as Canada or Iceland, not least to limit the damage caused by pollution and global warming. Trying to measure the energy consumed is difficult. A study done by economist de Vries (2021), an expert on Blockchain, points out that while it is possible to estimate the total computing power of the Bitcoin system, there is little information on the machines used and their power. A consortium does not have one type of machine and not all of them have the same cooling requirements. Each one generates as much heat as a portable heater; the additional energy expenditure to dissipate all this heat can potentially be significant, depending on factors such as climate and cooling technology chosen. Miners generally operate their facilities behind closed doors and the information they provide is sometimes contradictory.

VI. CONCLUSION

We all wonder whether the Bitcoin phenomenon will have a significant future, but it is probably still too early to make reliable judgements. In any case, two scenarios for the future of cryptocurrencies can be considered. One option may be a complete ban on the use of cryptocurrencies and another scenario is based on legislative design of the cryptocurrency market. Regarding the second option, I believe that in order to successfully implement this path, it is necessary to create "functional" laws aimed at creating a transparent market for cryptocurrencies and, most importantly, control of cryptocurrency transactions. It will also be necessary to require the holding of a proper register for monitoring as well as licensing of cryptocurrency activities.

Connections with the Internet of Things, the possibilities of a fully automated home (smart home) or a 'smart car', the provision of real-time services, the monitoring of daily activities, food and sports, including blood pressure and blood glucose levels, are all fields where the contribution of this technology can be increasingly relevant. We have seen how it enables alternative solutions in the area of raising finance for new businesses with initial coin offering (ICOs) [2] or in the conclusion of virtual agreements with Smart Contracts, not to mention all the applications in the industrial and business worlds, from goods movement to insurance. All within a framework characterized by security and transparency. These characteristics, security and transparency, are however closely linked to certain limitations of this technological platform. It is not yet ideal at a time when there is a need for speed in the processing of information. It is still expensive from an economic point of view, not to mention the problems of high energy consumption and environmental impact. On paper it is a decentralized system, but there remains the danger that a group with large financial means can take over most of the nodes, with the consequences seen above. This is another reason why a large number of nodes is essential. Increased security very often equates to loss of privacy. These are problems that can be tackled with different strategies, depending on requirements. One can give up some security, but guarantee greater privacy or greater speed. It is certainly a system in continuous evolution, with extremely interesting potentialities, far beyond those of a virtual currency.

End notes
[1] Bitcoin's Proof-of-Work is a distributed consensus algorithm, because with this system, a decentralized agreement is reached between nodes to add new blocks, without the need for a central body to act as a controller.
[2] An initial coin offering (ICO) is a type of capital-raising activity in the cryptocurrency and blockchain environment.

REFERENCES

1. Antipova, T., & Emelyanova, I. (2018, October). Cryptocurrency in Digital Wallet: Pros and Cons. In The 2018 International Conference on Digital Science (pp. 313-322). Springer, Cham.

2. Antonopoulos, A. M. (2017). Mastering Bitcoin: Programming the open blockchain. O'Reilly Media, Inc. Retrieved May 5, 2021 from: https://unglueit-files.s3.amazonaws.com/ebf/05db7df4f31840f0a873d6ea14dcc28d.pdf

3. Baiyere, A. & Donnellan, B. & Hevner, A. & Smith, C., & Stikeleather, J. (2015). Disruptive Innovations and IT - Wicked yet Empowering combination. In: Proceedings Thirty Sixth International Conference on Information Systems. Retrieved May 13, 2021, from: https://pdfs.semanticscholar.org/b118/a9d1975093243a8db1061e0e2a0290486a53.pdf?_ga=2.41975010.679614516.1553350098-1846347052.1553350098

4. Bellemo, G. (2018). Blockchain e criptovalute rischi e opportunità (doctoral thesis), Universita Ca`Foscari Venezia, Italy.

5. Bitcoin Energy Consumption Index. Retrieved 10 May, 2021 from: https://digiconomist.net/bitcoin-energy-consumption

6. Bitcoin Price BTC. Retrieved May 5, 2021 from: https://kriptomat.io/bitcoin-btc-price/

7. Bondarenko, O., Kichuk, O., & Antonov, A. (2019). The possibilities of using investment tools based on cryptocurrency in the development of the national economy. *Baltic Journal of Economic Studies,* 5(2), 10-17.

8. de Vries, A. (2021). Bitcoin boom: What rising prices mean for the network's energy consumption. *Joule*, 5(3), 509-513.

9. Enoksen, F. A., Landsnes, C. J., Lučivjanská, K., & Molnár, P. (2020). Understanding risk of bubbles in cryptocurrencies. Journal of Economic Behavior & Organization, *176*, 129-144.

10. Hurlburt, G. F., & Bojanova, I. (2014). Bitcoin: Benefit or curse? *It Professional*, 16(3), 10-15.

11. Kulkarni, S. (2021). Bitcoin: Pros and Cons of Investing in World's Largest Cryptocurrency. Goodreturns.in. Retrieved May 3, 2021 from: https://www.goodreturns.in/classroom/pros-and-cons-of-investing-in-bitcoin-advantages-and-disadvantages-of-bitcoin-cryptocurrency-1209500.html

12. Limba, T., Stankevičius, A., & Andrulevičius, A. (2019). Cryptocurrency as Disruptive Technology: Theoretical Insighs, *Entrepreneurship and Sustainability Issues*, 6(4), 2068-2080.

13. Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press. NJ, United States.

14. Sorici (Zlati), M.L., Grosu. V., Cosmulese, C.G., Socoliuc, M. (2021). Adjusting Financial Reporting in the Perspective of Transferring Financial Transactions to the Cryptocurrency Market. In the 17th Economic International Conference Challenges and Opportunities for a Sustainable Development, 7-8 May, 2021, Iasi, Romania: LUMEN Proceedings.

15. Storer, L. (2020). Bitcoin e Litecoin: un'analisi dei dati (doctoral thesis), Universita Ca`Foscari Venezia, Italy.