

CRYPTOCURRENCIES AS A SUBJECT OF FINANCIAL INVESTMENTS. RISK ANALYSIS AND POTENTIAL BENEFITS ON THE EXAMPLE OF BITCOIN

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ABSTRACT

The cryptocurrency market has been developing dynamically in recent years. The rapid development of the market is the result of increased interest in cryptocurrencies both from the entities treating it as a means of payment and from investors acquiring cryptocurrency for speculative purposes. Blockchain technology, on the basis of which cryptocurrencies are created, has gained acceptance in the financial industry and many entities are conducting advanced work on its use in their operations. On the other hand, numerous supervisors, including the European Banking Authority, the European Central Bank, the National Bank of Poland, and the Polish Financial Supervision Authority warn against investing in cryptocurrencies, indicating the numerous risks associated with such investments. The aim of the article is to analyze the potential risks and benefits of investing in cryptocurrencies. The main risks related to investments in cryptocurrency were analyzed on the example of bitcoin, and the rate of return and correlations with changes in the currency prices of other financial instruments were analyzed.

Key words: cryptocurrency, bitcoin, financial investment

JEL codes: G11

INTRODUCTION

The cryptocurrency market has been developing dynamically in recent years. Market capitalization of all cryptos on 7 January 2018 reached a maximum value of USD 830 billion. Five years earlier at the beginning of 2013, this value was little more than USD 1 billion. The rapid development of the market was a consequence of an increased interest in cryptocurrencies, both from entities treating it as a means of payment and from investors acquiring cryptocurrency for speculative purposes. Blockchain technology, on the basis of which cryptocurrencies are created, has

gained acceptance in the financial industry. Therefore, many entities are conducting advanced work on its use in their operations. On the other hand, numerous supervisory authorities (including the European Banking Authority, the European Central Bank, the National Bank of Poland, and the Polish Financial Supervision Authority), warn against investing in cryptocurrencies, pointing to numerous threats related to such investments. When analyzing the status of these instruments in various countries, one can observe a very different approach from regulators. In some countries (Japan, Malta), bitcoin has become an acceptable means of payment, while others have taken steps to legalize or

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restrict the operation of exchanges and the possibility of buying such currencies (China). The aim of the article is to analyze the potential risks and benefits of investing in cryptocurrencies. The main risks related to investments in cryptocurrency were analyzed on the example of bitcoin, and the rate of return and correlations of changes in currency prices with other financial instruments were analyzed.

DEVELOPMENT OF THE CRYPTOCURRENCY MARKET

According to the definition proposed by the European Banking Authority [EBA 2013], digital currencies are: “an unregulated form of digital money that is not issued or guaranteed by a central bank and may constitute a means of payment”. Cryptocurrencies are a special type of digital money. They can be defined as [Piech 2016]: “a type of digital token based on cryptography used for digitally signing transactions and to control the growth of the supply of tokens”. Cryptocurrencies are based on a decentralized peer-to-peer network (P2P). Cryptocurrencies, due to their hybrid nature, can be used as a means of payment, investment (security tokens) and access (utility tokens) [Nabilou 2019].

Introduced into the market in January 2009, bitcoin is the most popular and most commonly used cryptocurrency. “It is a hybrid between commodity currency and fiat currency without intrinsic value and independent of any government or monetary authority” [Baur et al. 2018]. In recent years bitcoin has been a subject of

growing attention both from investors and academics, mainly due to its innovative features, transparency and simplicity [Urquhart 2016]. One of the main goals of the introduction of bitcoin was to enable free payments and transfers on a global scale without the participation of intermediaries, such as banks [Lo and Wang 2014]. The number of transactions which used bitcoin blockchain rose exponentially from around 1,000 per day in 2011 to around 300,000 per day in mid-2016 [Tasca et al. 2018]. However, as research conducted by ARK Investment and Coinbase shows, most bitcoin holders treat it as a financial investment – a means of storing value (thesaurization). In 2015, 64% of its owners perceived bitcoin as a means of storing value, in 2016 it was 54% [Burniske and White 2017]. Some studies show that bitcoin are mainly used as speculative investment and not as an alternative currency or medium of exchange [Baur et al. 2018].

The figure presents changes in the market capitalization of bitcoin. Starting from 2011, other cryptocurrencies competitive in relation to bitcoin started to appear in the market. The total market capitalization of cryptocurrency increased sharply in 2017 and at the beginning of 2018. At that time, the price of one bitcoin approached USD 20,000 and the total market value exceeded USD 800 billion. Since then, the price of bitcoin and the value of the entire market has been steadily declining. At the end of December 2019, the bitcoin market capitalization was USD 134 billion and market capitalization for all cryptocurrency was USD 196 billion [Coinmarketcap.com 2020].

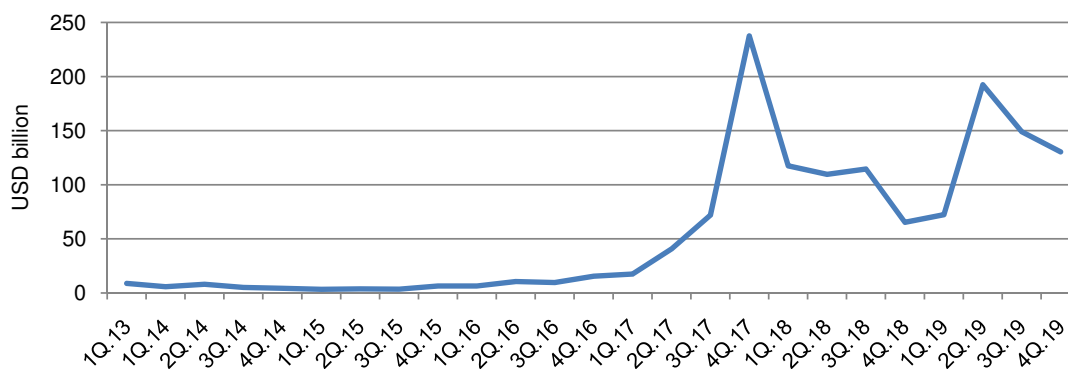


Fig. Capitalization of bitcoin market at the end of each quarter from 2013 to 2018

Source: coinmarketcap.com [accessed 15.01.2020].

Since the inception of bitcoin, over 1,500 other digital currencies have appeared in the market, and more than 600 are currently traded [Alessandretti et al. 2017]. Most of the newly created currencies were identical to bitcoin, differing only in terms of value. Only a small few featured a development of this concept or introduced significant innovations (e.g. Ethereum) [Hileman and Rauchs 2017]. Table 1 shows the share of the most important cryptocurrencies in the total market capitalization of cryptocurrencies in 2013–2019. By 2017, bitcoin was the defini-

tive leader in the market, the share of which exceeded 75%. At the beginning of 2017, bitcoin's market share began to decline, mainly in favor of ripple, litecoin and ethereum and a bit later also in favor of bitcoin cash. By the end of 2018, the share of bitcoin in the market started to increase again and from the minimum level of 32.8% (18 January 2018) increased to over 68.4% (December 2019).

Despite the creation of many new cryptocurrencies, bitcoin is still the currency with the largest capitalization and significance.

Table 1. Share of the three most important cryptocurrencies in total market capitalization of cryptocurrencies in 2013–2019

Date	Cryptocurrency	Market value (USD billion)	Share in the whole crypto market (%)
31 December 2013	bitcoin	9.1	88.3
	litecoin	0.6	5.8
	ripple	0.2	1.9
31 December 2014	bitcoin	4.3	76.8
	ripple	0.7	12.5
	paycoin	0.2	3.6
31 December 2015	bitcoin	6.4	92.8
	ripple	0.2	2.9
	litecoin	0.2	2.9
31 December 2016	bitcoin	14.4	87.8
	ethereum	0.6	3.7
	ripple	0.2	1.2
31 December 2017	bitcoin	237.5	38.8
	ripple	89.1	14.5
	ethereum	73.2	11.9
31 December 2018	bitcoin	67.5	51.7
	ripple	15.1	11.6
	ethereum	14.6	11.2
31 December 2019	bitcoin	134.6	68.4
	ethereum	14.7	7.5
	ripple	8.5	4.3

Source: coinmarketcap.com [accessed 20.01.2020].

BITCOIN AS THE SUBJECT OF FINANCIAL INVESTMENT

When considering bitcoin as a subject of financial investment, it is worth starting with an analysis of the characteristics of various investment assets. According to popular classification, investment assets can be divided into three basic categories [Greer 1997]. Capital assets – bringing to the owner a certain stream of financial flow. They are characterized by having value equal to the sum of the discounted future cash flow that they will generate in the future. Commodity assets – those that are traded in financial commodity markets. Such assets have a certain economic value, resulting from their utility value, but do not bring their owners financial flow, and cannot be processed or consumed. Assets that store value (thesaurisation function), do not generate income and cannot be consumed. They have a value resulting from their purchasing power or the game of market forces. The latter group includes bitcoin. Some examples of individual assets are presented in Table 2.

According to portfolio analysis, which is the theoretical framework for making investment decisions, the basic parameters characterizing various assets include: risk, expected rate of return and correlation with other assets [Elton and Gruber 1998]. To assess investment efficiency, usually both the rate of return and risk are taken into consideration. Therefore, typical ratios which are used include: Sharpe, Jensen and

Treynor [Żebrowska-Suchodolska 2018]. Investors strive to make decisions that will create an effective portfolio, i.e. one that will have one of two characteristics: (1) at the expected rate of return, there will be minimal investment risk or (2) with a certain level of risk, the potential return will be maximized [Jajuga and Jajuga 2015].

In addition to the risks typical of other financial assets, investing in cryptocurrencies carries other specific risks. The risks shared with other types of assets can include: market risk, volatility risk and liquidity risk. Numerous risk-specific cryptocurrencies are described, among others, by supervisory authorities overseeing the financial market. The National Bank of Poland and the Polish Financial Supervision Authority have issued public warnings to draw attention to the following issues [KNF 2017]:

- Cryptocurrencies are not electronic money, currency or legal tender (they do not meet the criteria set out in the Act of 19 August 2011 on payment services). They are only a “digital representation of the contractual values among its users”.
- Cryptocurrency holders are exposed to a significant risk of losing money due to theft. This may be as a consequence of cyber-attacks on entities running exchanges that trade in cryptocurrencies or provide customer storage services. For example, in 2014 one of the biggest bitcoin exchanges, Mt. Gox, collapsed and announced that 754,000 of its customers’ bitcoins were stolen by hackers.

Table 2. Examples of assets belonging to different categories

Specification	Financial assets	Commodity asset	Value storing asset
Stocks	x		
Debentures	x		
Properties that bring income	x		
Commodities – crops, energy resources		x	
Precious metals		x	x
Currencies			x
Works of art			x
Bitcoin and other cryptocurrencies			x

Source: Greer [1997].

The market value of these bitcoins was at that time around USD 450 million [Böhme et al. 2015].

- Funds stored in cryptocurrencies are not covered by guarantees of state institutions (such as the Bank Guarantee Fund).
- Prices of many cryptocurrencies are characterized by very high volatility (significantly exceeding other types of financial assets).
- There is risk related to the possibility of fraud; some offers for investment in cryptocurrencies may have the character of financial pyramids.
- A large number of institutions providing services related to cryptocurrencies operate outside the territory of Poland and the EU, which may significantly hamper the investigation of possible claims.

In addition, the Polish Financial Supervision Authority [KNF 2017] and the European Securities and Markets Authority [ESMA 2017] have drawn attention to the very high risk associated with investing in ICOs (Initial Coin Offerings).

The European Banking Authority [EBA 2013], like Polish institutions, points out that the majority of investors buying cryptocurrencies use stock exchanges or transaction platforms. Many of them operate without guarantees that would protect investor funds in case of financial problems which could occur for the institution: for instance, as a result of hacker attacks. In addition, the EBA has drawn attention to cases where money stored in digital wallets on a computer or smartphone has been lost. Given the generally low level of security protecting such devices, there is a risk of a hacker attack and loss of all the digital currencies stored in this way. Trading and exchanging digital currencies may also give rise to tax liabilities (VAT or capital gains tax), depending on the regulations that apply in individual countries.

The lack of unambiguous legal regulations, varied treatment of bitcoin in particular countries, and the possibility of unexpected changes in legal regulations can also create additional investment risk. An example of the realization of this type of risk can be seen in countries that have introduced a ban on payments using bitcoin, and a ban on exchanging bitcoin into traditional currency (China, Indonesia) [Bloomberg News 2018]. The actions of some states to limit the

possibility of using bitcoin may result, to some extent, from the fact that one of the basic advantages of bitcoin – anonymity in financial transactions – encourages people and organizations involved in criminal and terrorist activities to use it [Schuh and Shy 2016].

DATA AND METHODOLOGY

In order to calculate the basic parameters characterizing bitcoin as a potential investment, the historical monthly rates of return for the BTC/USD exchange rate were calculated for the period from 1 January 2011 to 31 December 2019. They were compared with the rates of return on the following instruments: gold (based on XAU/USD price of gold futures), the S&P 500 Index and the EUR/USD exchange rate. Then, standard deviations and the correlation of monthly returns for the above-mentioned instruments were calculated. The quotations data from the stooq.pl website was used for the calculations. For the calculation of rates of return, standard deviation and correlation, data from closing quotes was used.

Tables 3, 4 and 5 contain the data on historic returns on bitcoin investments in 2011–2019. The data was compared to the rates of return on other assets: gold, S&P 500 and EUR.

Table 5 also shows calculations for the average monthly rate of return from the assets for the entire analyzed period. In the years 2011–2019, bitcoin was characterized by a very high positive rate of return (18.1%), exceeding by several times the rate of return that could be achieved when investing in other assets. The rapid increase in the price of bitcoin was caused by rapidly growing demand (both due to speculative motives and related to its use as a means of transferring value), with limited supply and very low initial capitalization (low base effect).

It is worth mentioning that at the beginning of 2011, the price of bitcoin was around USD 0.3, which translated into a market value for the whole market of approximately USD 3 million. In 2017, it was estimated that the number of active holders of bitcoin portfolios ranged from 2.9 million to 5.9 million [Hileman and Rauchs 2017]. Table 6 presents data on the risk related to price fluctuations of bitcoin, gold, S&P 500 index

Table 3. Monthly rates of return from bitcoin, gold, S&P 500 Index and EUR in 2011–2014 (%)

Month	2011				2012				2013				2014			
	B	Z	S	E	B	Z	S	E	B	Z	S	E	B	Z	S	E
I	76.3	-5.7	1.1	2.6	29.1	11.0	4.4	1.0	51.1	-0.8	5.0	2.9	9.2	3.4	-3.6	-2.0
II	65.4	5.8	3.2	0.9	-11	-2.4	4.1	1.8	63.5	-5.1	1.1	-3.8	-32	6.3	4.3	2.4
III	-8.8	1.5	-0.1	2.6	0.0	-1.6	3.1	0.1	171	1.1	3.6	-1.9	-19	-3.0	0.7	-0.2
IV	267	9.2	2.8	4.5	1.8	-0.3	-0.7	-0.7	52.9	-7.5	1.8	2.7	-1.7	0.0	0.6	0.7
V	204	-1.8	-1.4	-2.8	4.7	-6.3	-6.3	-6.7	-7.9	-6.2	2.1	-1.3	36.5	-2.6	2.1	-1.7
VI	84.2	-2.3	-1.8	0.7	28.4	2.5	4.0	2.5	-25	-11.0	-1.5	0.1	4.6	6.1	1.9	0.5
VII	-16	8.3	-2.1	-0.6	40.6	1.1	1.3	-2.9	12.9	7.5	4.9	2.2	-8.3	-3.4	-1.5	-2.2
VIII	-39	12.3	-5.7	-0.1	8.7	4.8	2.0	2.2	26.2	5.2	-3.1	-0.6	-13	0.4	3.8	-1.9
IX	-37	-11.0	-7.2	-6.9	22.0	4.7	2.4	2.3	3.9	-4.7	3.0	2.3	-24	-6.1	-1.6	-3.9
X	-37	5.3	10.8	3.4	-9.6	-2.9	-2.0	0.8	49.6	-0.4	4.5	0.5	-12	-3.0	2.3	-0.8
XI	-8.6	2.3	-0.5	-2.9	12.2	-0.3	0.3	0.2	448	-5.2	2.8	0.0	11.3	-0.3	2.5	-0.6
XII	43.0	-10.5	0.9	-3.6	7.5	-2.2	0.7	1.6	-35	-4.0	2.4	1.3	-16	1.2	-0.4	-2.8

B – bitcoin, Z – gold, S – index S&P 500, E – rate EUR/USD.

Source: Author's own study based on data from the stooq.pl website.

Table 4. Monthly rates of return from bitcoin, gold, S&P 500 Index and EUR in 2015–2018 (%)

Month	2015				2016				2017				2018			
	B	Z	S	E	B	Z	S	E	B	Z	S	E	B	Z	S	E
I	-28	8.5	-3.1	-6.6	-12.8	5.3	-5.1	-0.3	0.7	5.2	1.8	2.6	-29.8	3.2	5.6	3.4
II	10.8	-5.6	5.5	-1.0	16.5	10.8	-0.4	0.5	23.4	3.2	3.7	-2.1	3.4	-2.0	-3.9	-1.8
III	-3.7	-2.3	-1.7	-4.0	-4.8	-0.5	6.6	4.6	-9.7	-0.1	0.0	0.9	-34.6	0.5	-2.7	1.0
IV	-3.4	0.1	0.9	4.4	9.5	4.9	0.3	0.6	20.3	1.7	0.9	2.1	35.2	-0.7	0.3	-1.9
V	0.2	0.5	1.0	-2.1	15.7	-6.0	1.5	-2.8	78.2	0.0	1.2	3.2	-18.1	-1.3	2.2	-3.2
VI	10.9	-1.5	-2.1	1.5	26.7	8.7	0.1	-0.2	10.3	-2.1	0.5	1.6	-22.1	-3.5	0.5	-0.1
VII	8.4	-6.6	2.0	-1.5	-1.6	2.3	3.6	0.7	12.8	2.3	1.9	3.6	31.1	-2.4	3.6	0.1
VIII	-19	3.6	-6.3	2.1	-12.9	-3.2	-0.1	-0.2	65.9	4.0	0.1	0.7	-8.7	-1.9	3.0	-0.7
IX	3.0	-1.7	-2.6	-0.3	5.8	0.7	-0.1	0.7	-12.6	-3.0	1.9	-0.9	-5.2	-0.6	0.4	0.0
X	35.1	2.4	8.3	-1.5	15.4	-3.1	-1.9	-2.3	53.3	-0.7	2.2	-1.4	-5.2	2.0	-6.9	-2.5
XI	18.3	-6.8	0.1	-3.9	6.1	-8.1	3.4	-3.4	53.5	0.3	2.8	2.1	-37.2	0.6	1.8	0.0
XII	13.8	-0.3	-1.8	2.7	29.5	-1.9	1.8	-0.7	46.6	2.2	1.0	0.9	-6.2	4.9	-9.2	1.3

B – bitcoin, Z – gold, S – index S&P 500, E – rate EUR/USD.

Source: Author's own study based on data from the stooq.pl website.

Table 5. Monthly rates of return from bitcoin, gold, S&P 500 Index and EUR in 2019 (%)

Month	2019				The average monthly rate of return 2011–2019			
	B	Z	S	E	B	Z	S	E
I	-7.5	3.0	7.9	-0.2				
II	11.0	-0.7	3.0	-0.7				
III	7.1	-1.5	1.8	-1.3				
IV	30.9	-0.7	3.9	0.0				
V	57.0	1.7	-6.6	-0.4				
VI	46.1	8.1	6.9	1.8	18.1	0.2	0.9	-0.1
VII	-18.4	0.2	1.3	-2.6				
VIII	-4.7	7.8	-1.8	-0.7				
IX	-13.6	-3.3	1.7	-0.8				
X	10.4	2.7	2.0	2.3				
XI	-15.1	-3.2	3.4	-1.2				
XII	-7.3	3.6	2.9	1.8				

B – bitcoin, Z – gold, S – index S&P 500, E – rate EUR/USD.

Source: Author’s own study based on data from the stooq.pl website.

and EUR measured by the standard deviation of the monthly rate of return.

When analyzing the data in Table 6, very high levels of standard deviation of bitcoin returns are noteworthy. This indicates the existence of a very high risk related to the volatility of the price of this asset. Table 7 presents data on the correlation of rates of return of bitcoin with other assets (gold, S&P 500 index and EUR/USD exchange rate).

The correlation ratios of bitcoin with other assets are very low. From the point of view of creating an investment portfolio, this is a very desirable feature. Investors are looking for assets with low correlation (preferably negative) for their portfolios, because it allows them to achieve a risk-diversification effect. From this point of view, bitcoin seems to be an asset that can be considered a good supplement to portfolios of classical financial assets.

Table 6. Standard deviation of monthly returns from bitcoin, gold, S&P 500 index and EUR/USD exchange rate in 2011–2019 (%)

Index	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bitcoin (BTC/USD)	98.7	16.0	131.3	18.7	16.7	13.9	30.2	23.1	24.7
Gold (XAU/USD)	7.6	4.6	5.3	3.9	4.4	5.8	2.5	2.5	3.8
Index S&P 500	4.6	3.0	2.5	2.3	3.9	2.9	1.1	4.4	3.7
EUR/USD	3.3	2.6	2.1	1.7	3.2	2.1	1.8	1.8	1.5

Source: Author’s own study based on data from the stooq.pl website.

Table 7. Correlation coefficient for monthly rates of bitcoin, gold, S&P 500 index and EUR/USD exchange rate in 2011–2019

	BTC/USD	XAU/USD	S&P 500	EUR/USD
BTC/USD	1.0000	-0.0177	0.1267	0.0872
XAU/USD	-0.0177	1.0000	0.0375	0.3443
S&P 500	0.1267	0.0375	1.0000	0.3486
EUR/USD	0.0872	0.3443	0.3486	1.0000

Source: Author’s own study based on data from the stooq.pl website.

CONCLUSIONS

The introduction of bitcoin in 2009 – the first cryptocurrency – can be considered as a very important financial innovation. Since then, the cryptocurrency market has evolved considerably: both in terms of quantity and the overall value of existing currencies. In the background of this process, the entire ecosystem of entities dealing in mediation in transactions (cryptocurrencies), their safe storage (portfolios), mining (digging) and solutions related to payments has been created. At the same time, many entities are trying to implement blockchain technology for other commercial applications.

The analysis of the exchange rate of bitcoin in 2011–2019 shows that it is characterized by very high historical rates of return, which is also associated with a very high risk of price fluctuations. From the point of view of shaping an investment portfolio, an important and desirable feature of bitcoin is the low correlation coefficient between this currency and other investment assets. It is worth noting, however, that bitcoin investments are burdened with additional risks that do not exist for other types of assets. Among these risks is, for example, the possibility of losing some or all of the invested funds due to problems in the exchange market, since these intermediaries in the purchase of cryptocurrencies offer no guarantees for deposited funds. In addition is the added possibility of losing money stored in digital portfolios as a result of cybercriminal activities. Investors considering the purchase of bitcoin should be aware of the existence of such risks and should try to limit them by skillfully using the most secure intermediaries which operate in countries that regulate their operations, and

which use technological solutions that make it difficult or completely impossible to steal cryptocurrencies.

Acknowledgements

The article is the result of the project: International Scientific Conference “Financialization and Society”, implemented by the University of Information Technology and Management based in Rzeszów, in cooperation with the National Bank of Poland as part of the economic education program.

REFERENCES

- Alessandretti, L., Baronchelli, A., ELBahrawy, A., Kandler, A., Pastor-Satorras, R. (2017). Evolutionary dynamics of the cryptocurrency market. *Royal Society Open Science*. <http://dx.doi.org/10.1098/rsos.170623>
- Baur, D.G., Hong, K., Lee, A.D. (2018). Bitcoin: Medium of exchange or speculative assets? *Journal of International Financial Markets, Institutions and Money*, 54, 177–189.
- Bloomberg News (2018). What the World’s Governments Are Saying About Cryptocurrencies. 26.08.2018. Retrieved from <https://www.bloomberg.com/news/articles/2018-03-26/what-the-world-s-governments-are-saying-about-cryptocurrencies> [accessed 29.08.2018].
- Böhme, R., Christin, N., Edelman, B., Moore, T. (2015). Bitcoin: Economics, technology, and governance. *Journal of Economic Perspectives*, 29 (2), 213–38.
- Burniske, Ch., White, A. (2017). Bitcoin: Rising the Bell for a New Asset Class. Research White Paper, ARK Invest+CoinBase. Retrieved from http://research.arkinvest.com/hubfs/1_Download_Files_ARK-Invest/White_Papers/Bitcoin-Ringing-The-Bell-For-A-New-Asset-Class.pdf?hsCtaTracking=b61e33ed-207f-4a68-8c36-c30137cf54ea%7C4429a5e8-db0c-46e4-a9e9-e4d1a41fcb68 [accessed 15.06.2018].

- Elton, E.J., Gruber, M.J. (1998). *Nowoczesna teoria portfelowa i analiza papierów wartościowych*. WIG-Press, Warszawa.
- European Banking Authority (2013). Warning to consumers on virtual currencies (EBA WRG 2013 01). Retrieved from <http://www.eba.europa.eu/documents/10180/598344/EBA+Warning+on+Virtual+Currencies.pdf> [accessed 19.09.2018].
- European Securities and Markets Authority (2017). ESMA alerts investors to the high risks of Initial Coin Offerings (ICOs). Retrieved from https://www.esma.europa.eu/sites/default/files/library/esma50-157-829_ico_statement_investors.pdf [accessed 10.06.2018].
- Greer, R. (1997). What is an Asset Class, Anyway? *The Journal of Portfolio Management*, 23 (2), 86–91. <https://doi.org/10.3905/jpm.23.2.86>
- Hileman, G., Rauchs, M. (2017). Global cryptocurrency benchmarking study. Cambridge Centre for Alternative Finance. Retrieved from <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/global-cryptocurrency/#.W6KlZfnLjIU> [accessed 25.06.2018].
- Jajuga, K., Jajuga, T. (2015). *Inwestycje*. Wydawnictwo Naukowe PWN, Warszawa.
- Komisja Nadzoru Finansowego (2017). Komunikat KNF w sprawie sprzedaży tzw. monet lub tokenów [Initial Token Offerings – ITOs or Initial Coin Offerings – ICOs]. Retrieved from https://www.knf.gov.pl/o_nas/komunikaty?articleId=60178&p_id=18 [accessed 10.06.2018].
- Lo, S., Wang, J., Ch. (2014). Bitcoin as a Money? Federal Reserve Bank of Boston. *Current Policy Perspective*, 4. Retrieved from <https://www.bostonfed.org/publications/current-policy-perspectives/2014/bitcoin-as-money.aspx> [accessed 13.03.2020].
- Nabilou, H. (2019). How to regulate bitcoin? Decentralized regulation for a decentralized cryptocurrency. *International Journal of Law and Information Technology*, 27 (3), 266–291.
- Piech, K. (2016). *Leksykon pojęć na temat technologii blockchain i kryptowalut*. Strumień „Blockchain i kryptowaluty” programu od papierowej do cyfrowej Polski. Retrieved from https://www.gov.pl/documents/31305/0/leksykon_pojec_na_temat_tehnologii_blockchain_i_kryptowalut.pdf [accessed 19.09.2018].
- Schuh, S., Shy, O. (2016). US Consumers’ Adoption and Use of Bitcoin and Other Virtual Currencies. Federal Reserve Bank of Boston, Boston. Retrieved from https://www.dnb.nl/en/binaries/Consumer_VC_paper_DNB_FINAL_corrected_tcm47-344530.pdf [accessed 14.08.2018].
- Tasca, P., Hayes, A., Liu, S. (2018). The evolution of the bitcoin economy. *The Journal of Risk Finance*, 19 (2), 94–126.
- Urquhart, A. (2016). The inefficiency of Bitcoin. *Economics Letters*, 148, 80–82.
- Żebrowska-Suchodolska, D. (2018). Evaluation of the Results of the Equity Funds in the Years 2004–2015 Using Var and CVaR Measures. *Acta Scientiarum Polonorum. Oeconomia*, 17 (3), 131–139.

KRYPTOWALUTY JAKO PRZEDMIOT INWESTYCJI FINANSOWYCH. ANALIZA RYZYKA I POTENCJALNYCH KORZYŚCI NA PRZYKŁADZIE BITCOINA

STRESZCZENIE

Rynek kryptowalut rozwijał się dynamicznie w ostatnich latach. Szybki rozwój rynku wynikał ze wzrostu zainteresowania kryptowalutami zarówno ze strony podmiotów traktujących je jako środek płatniczy, jak i ze strony inwestorów nabywających kryptowalutę w celach spekulacyjnych. Technologia *blockchain*, na podstawie której tworzone są kryptowaluty, zyskała akceptację branży finansowej. Z jednej strony wiele podmiotów prowadzi zaawansowane prace nad jej wykorzystaniem w prowadzonej działalności, ale z drugiej liczni nadzorcy, w tym Europejski Urząd Nadzoru Bankowego, Europejski Bank Centralny, Narodowy Bank Polski, Komisja Nadzoru Finansowego, ostrzegają przed inwestowaniem w kryptowaluty, wskazując na ryzyko związane z takimi inwestycjami. Analizując status tych instrumentów w różnych krajach, można zaobserwować bardzo odmienne podejście organów regulacyjnych. Celem tego artykułu jest analiza potencjalnego ryzyka i korzyści związanych z inwestowaniem w kryptowaluty. Główne ryzyko związane z tego rodzaju inwestycjami analizowano na przykładzie bitcoina. Przeanalizowano również stopy zwrotów i korelacje zmian cen walut z innymi instrumentami finansowymi.

Słowa kluczowe: kryptowaluta, bitcoin, inwestycje finansowe