

Cryptocurrencies and their Position in the financial market

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Abstract

The article aims to identify the position of cryptocurrencies on the financial market and evaluate the profitability of invested capital in selected cryptocurrencies for the period between 2018-2022. The data needed to identify and define selected cryptocurrencies and then model investment examples are obtained using the analysis method. Based on the obtained results, the comparison method is used, where the subject is the profitability of cryptocurrencies. Then it is determined which of the analysed cryptocurrencies is the most profitable for the monitored period. The return on invested capital is calculated using the ROI method as part of the fundamental research. The results showed that Bitcoin showed the most significant profitability.

Keywords: cryptocurrency, investment, profitability, financial market

Introduction

Cryptocurrencies are among the topics currently being discussed and are receiving more and more space and attention from the general public (Valaskova et al., 2022). It all started in 2008 with the publication of Nakamoto's article (2008), and a few months later, the first-ever cryptocurrency and current phenomenon called Bitcoin was created. Other new cryptocurrencies could have been built quickly, and new ones were created over time and are still being created. According to Howarth (2022), over 20,000 types of cryptocurrencies are on the market.

The history of virtual currencies is strongly linked to the development of Bitcoin. The general public became aware of cryptocurrencies around 2011 when large-scale investments in cryptocurrencies began (Marousek et al., 2015). The growing interest is also evidenced by the fact that over time other, currently very well-known cryptocurrencies were created that can compete with Bitcoin with their profitability and

are slowly approaching it in terms of market capitalisation. These cryptocurrencies include Ethereum, Dash, Litecoin, Cardano, Shiba Inu or Dogecoin (Gao et al., 2022). In the case of the recently mentioned Dogecoin and Shiba Inu currencies, these were internet pranks and recessions. However, these currencies increased their value by more than 3,500% within a few months and have since been called Memecoins (Lansiaux et al., 2022).

Cryptocurrencies can be understood as an alternative and innovative investment tool, which makes them very attractive for both large investment companies and small investors. Thanks to this investment tool, the profitability of the investment can be several hundred percent in a few days (Kučera et al., 2022). The main goal of Bitcoin's creators was to create an entirely new system that would not be affected by the decisions and behaviour of central banks and governments worldwide. The functioning of Bitcoin was supposed to consist of the possibility of using it as a common currency or as an alternative option for storing funds compared to other financial instruments on the financial market, such as shares or bonds (Klieštík et al., 2020). One of the main reasons for depositing funds in Bitcoin and cryptocurrencies, in general, is inflation, one of the biggest global financial problems (Aharon and Qadan, 2022).

Nica and Stehel (2021) state that the enormous popularity of cryptocurrencies can also be evidenced by several global companies that accept Bitcoin as a means of payment for their services or products. Examples are Apple, Microsoft and Starbucks. The most significant player in virtual currencies is the American entrepreneur, philanthropist, visionary and owner of Tesla and SpaceX, Elon Musk, who, especially in 2021 and 2022, launched an enormous avalanche that negatively and positively affected all investors in virtual currencies. In the Czech Republic, the company Alza can be cited as an example of a recipient of Bitcoin as a means of payment (Trojáková and Horák, 2021).

Calvaa (2019) states that crypto-currencies and their position in the financial market is an extensive topic and is currently more and more addressed and analysed. Above all, the profitability and risk associated with investing in virtual currencies is an exciting issue that needs to be addressed and understood. To penetrate the world of virtual currencies, it is necessary to know how cryptocurrencies work, what properties they have, how they can be obtained or how they function as an alternative investment tool compared to notorious financial instruments such as stocks, bonds, commodities or popular currency pairs (Aliu et al., 2022).

This article aims to identify the position of cryptocurrencies on the financial market and evaluate the profitability of investments in selected types of cryptocurrencies for the period under review. A partial goal is to compare the cryptocurrency portfolio with other financial instruments on the financial market, and investors invest their capital. To fulfil the set goal, two research questions were set:

V01: What is the profitability of investing in Bitcoin, Ethereum, Litecoin and XRP, and which cryptocurrencies were the most profitable from 2018-2022?

VO2: What are the possibilities and features of a transaction using Bitcoin, Ethereum, Litecoin and XRP?

Literature research

Weierud and Zabell (2020) state that cryptocurrencies follow money in their functioning and properties. While both of these currencies have a lot in common, there are also many areas where the paths of these two types of currency diverge. Bartolucci and Kirilenko (2020) state that virtual currencies have their characteristics, like money. These characteristics make cryptocurrencies an utterly unique form of currency. According to the authors, these properties include divisibility, digitality, globality, anonymity and limited quantity. According to Ruiz, and Angelis (2022), the main difference between money and cryptocurrencies is the decentralisation of cryptocurrencies, when no leading institution can regulate cryptocurrencies, and they are not a means of forced circulation, which applies to money. Thus, money is legal tender in a specific territory, while cryptocurrencies are taken as contractual tender and are considered intangible chattels (Simanovskiy, 2018). Prasolov and Kolesnikova (2018) come up with a similar opinion, namely that money can be devalued, confiscated or frozen by a particular central institution (government, national bank) or socio-political phenomenon (war, epidemic), which is not the case with cryptocurrencies. According to Zimba et al. (2019), ownership is attributed to a specific authorised person who owns access data to a cryptocurrency wallet or safe and can only perform careful manipulations with cryptocurrencies. A considerable advantage is found by Almeida et al. (2023) in the impossibility of counterfeiting cryptocurrencies. This opinion is supplemented by Korennaya and Tydykova (2019) with their claim about the impossibility of falsifying a transaction that would be recorded in the primary organ of the functioning of cryptocurrencies – in the blockchain.

Alexiadou et al. (2023) add that cryptocurrencies are often the target of criticism, mainly because of their energy intensity. Wang (2021) sees a significant drawback: cryptocurrencies can threaten the state monopoly of printing and issuing money. According to the same author, the destruction of the entire blockchain can also occur, based on which all cryptocurrencies can collapse, which cannot happen to cash.

Zandla (2022) states that cryptocurrencies can be obtained in several possible ways, namely by mining, buying in a crypto machine, buying on an exchange or exchange, buying from a natural or legal person, as a means of exchange for goods or services, as a whole or in part of the salary or some cases even for free. Uddin, Mannana and Youssefa (2021), also dealing with the issue of crypto-currencies, mention the possibilities of their preservation, which happens, for example, through a programmed wallet, a mobile application, virtual storage or a safe.

According to Król et al. (2021), it is possible to classify cryptocurrencies into four primary groups based on their specifics. We are talking about Bitcoins, Altcoins, Tokens and Memecoins. The authors add that each cryptocurrency has values: the exchange rate

(most often given in USD) and market capitalisation – the amount of funds invested in the cryptocurrency. Gupta and Chaudhary (2022) state that each specific cryptocurrency has its own abbreviation, name, exchange rate and market capitalisation, as well as particular conditions of its operation. For this research, four types of concrete cryptocurrencies were selected for analysis, which will be briefly presented in the following text.

The first cryptocurrency is Bitcoin, which was created as the first cryptocurrency in 2008 by an author/group of authors under the pseudonym Satoshi Nakamoto. As of 3/7/2023, it is the most used virtual currency with a market capitalisation of \$432.8 billion. For comparison, the market capitalisation of all cryptocurrencies is 1.1 billion. USD The All-Time High Bitcoin reached was USD 68,789.63. Bitcoin works on the principle of Proof of Work, where miners are evaluated based on verification and subsequent approval or rejection of transactions (Mariappan et al., 2023). Another cryptocurrency, Ethereum, is described by Kapengut and Mizrach (2023). In the case of Ethereum, it is a platform based on a decentralised blockchain algorithm. The author is a Russian-Canadian programmer and visionary, Vitalik Buterin, who launched Ethereum in 2015. Ethereum is the second most used virtual currency, with a market capitalisation of USD 188.85 billion (03/07/2023). Historical maximum - All-Time High, which Ethereum reached was 4,891.70 USD. Unlike Bitcoin, Ethereum has an unlimited amount to mine and can never be completely depleted. Since 2022, Ethereum has been operating on the principle of Proof of Stake, which evaluates Ethereum holders. The third currency is Litecoin. According to Mariappan et al. (2023), this currency was created as an alternative currency based on Bitcoin's source code and is probably the best-known derivative of Bitcoin. Following its origins, Litecoin uses the Proof of Work system. The creator of Litecoin is Google programmer Charles Lee who launched Litecoin in the fall of 2011. Like Bitcoin, Litecoin has a limited supply.

This amount is 84 million pieces of Litecoin, and, unlike Bitcoin, it has yet to be known when I will reach total extraction. Litecoin's market cap as of 03/07/2023 is \$6.215 billion. The All-Time High Litecoin reached was \$412.96. Jiang et al. (2023) state that in 2012 a network called XRP Ledger was created by programmers Larsen, McCaleb Britto and Schwartz. Unlike the vast majority of cryptocurrencies, XRP is not mined, as the total volume of 100 billion coins was issued immediately upon the launch of the XRP Ledger network. The network releases 10-30 million XRP coins into circulation at irregular intervals and is available for users to purchase. Total market capitalisation as of 3/7/2023 is \$19.1 billion. The All-Time High XRP reached was \$3.84.

Methods and Data

As part of the research, the four above cryptocurrencies will be analysed, i.e. Bitcoin, Ethereum, Litecoin and XRP. The values of these cryptocurrencies will be drawn from the website binance.com, which publishes the current values of all cryptocurrencies and deals from the past. The analysed period represents the years 2018 and 2022. The value calculations of the model examples will be performed based on formulas with the

resulting value in USD converted according to the current exchange rate of the CNB to CZK. A single exchange rate of 22.33 CZK/USD will convert all values from USD to CZK.

In the first part, the selected cryptocurrencies will be compared with each other to determine their transparency and anonymity, as well as the possibility of transactions - their number per second and the time of transaction confirmation. The partial goal will be the description of the selected cryptocurrencies, namely their origin, the current description of the coins (as of 10/03/2022), the maximum amount of cash and fees for carrying out the transaction and determining the fee depending on the electricity. The data to perform this comparison will be obtained from official cryptocurrency websites, namely bitcoin.com, ethereum.org, litecoin.com and ripple.com. The following formula will be used for the model calculation of the amount of the fee depending on the electricity used for the transaction:

$$\text{Electricity energy price} \div 365 \div 24 \div \frac{1}{6} \text{ hour} \div \text{amount of transaction} \quad (1)$$

In the next part of the work, based on data from binance.com for 2018-2022, a summary of the development of the exchange rate value of individual currencies in USD will be created. Discounts will be given for an annual interval. One calendar year will therefore be in the range from 1/1 to 12/31. The exchange rate development values will always be taken on the first day of the period, i.e., on 1/1 and the last day, i.e. 31/12. Following this in summary, an analysis of the profitability of cryptocurrencies will be performed based on the calculation of the development of the value, which is given by the formula:

$$X = Y + (Z - Y) \quad (2)$$

Where:

- X is the total value of cryptocurrency as of the last day of the period,
- Y is the final value of the cryptocurrency of the previous period,
- Z is the value of the cryptocurrency on the first day of the new period.

Following this calculation, a calculation of the percentage development of the value of cryptocurrencies will be performed, from which four model examples of the profitability of an investment invested in cryptocurrencies will then be compiled. The following formula gives the calculation of the percentage development of the value of cryptocurrencies:

$$\text{Percentual develop} = (\text{new value of currency} \div \text{old value of currency}) - 1 \quad (3)$$

An amount of USD 4,000 will be invested in each cryptocurrency as input capital according to the exchange rate as of 1/1/2018. Based on the profitability calculation, the results will be published as of 12/31/2022 and based on the comparison, it will be determined which of the selected cryptocurrencies was the most profitable according to the ROI method, which is represented by the following formula:

$$ROI = \frac{Earning}{Investment} - 1 \tag{4}$$

A partial step in every operation with cryptocurrencies will also be a deduction from the profit in the form of tax on other income using the FIFO method since it will be more suitable for this form of calculation than the weighted arithmetic average method since all cryptocurrencies will be bought and sold in the same time horizon. The following formula gives the tax calculation using the FIFO method:

$$Tax = (sale\ price - purchase\ price) * 0,15 \tag{5}$$

Results

The results section deals with the analysis of selected cryptocurrencies, the development of their value between 2018 and 2022, and a comparison of the benefits of invested capital in cryptocurrencies and other financial instruments. The selected cryptocurrencies are Bitcoin, Ethereum, Litecoin and XRP. The selected cryptocurrencies pool a sample of 64.23% of the market capitalization of all known cryptocurrencies.

Comparison of selected cryptocurrencies

Based on the great diversity of cryptocurrencies and the significant differences in the characteristics of cryptocurrencies, it is necessary to compare selected cryptocurrencies with each other, namely a comparison of anonymity, transparency, transaction options, transaction fees, the number of coins and a general description of the creation of cryptocurrencies.

Table 1 refers to the classification of selected cryptocurrencies based on anonymity.

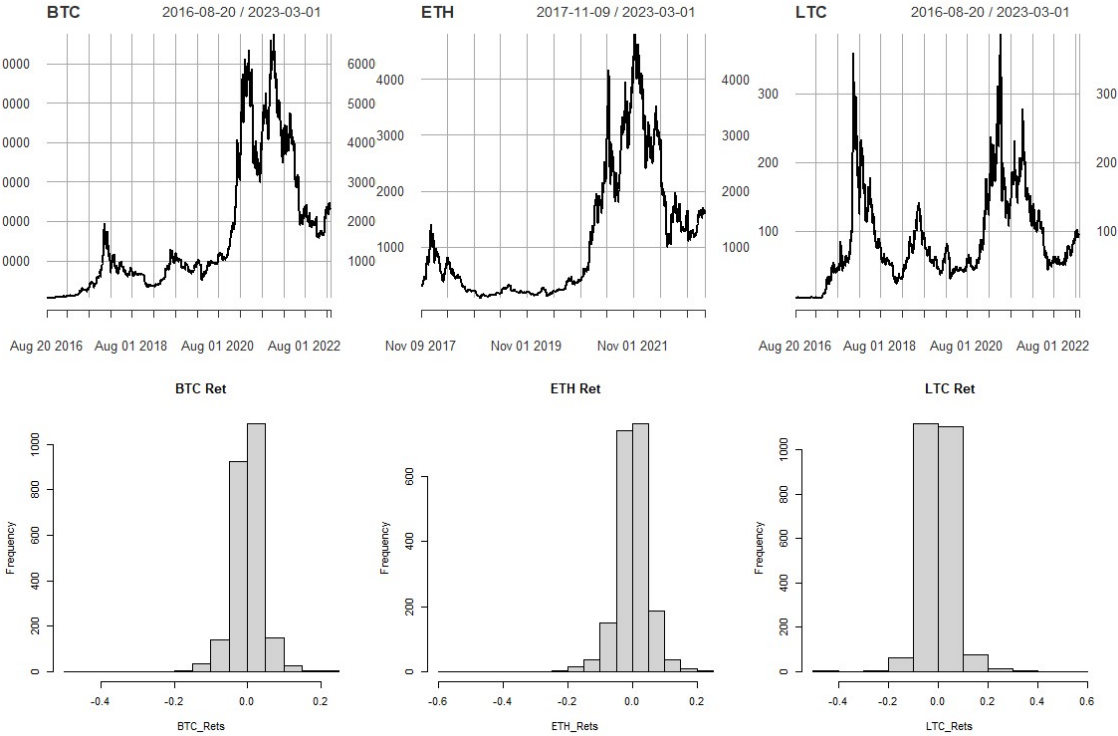
Table 1 Anonymity and transparency of selected cryptocurrencies.

Anonymous	Pseudo - anonymous	Transparent
	Bitcoin Ethereum Litecoin	XRP

Source: own processing.

As can be seen from Table No. 1, the most represented group consisting of cryptocurrencies with a transparent - public blockchain, namely Bitcoin, Ethereum and Litecoin, is the pseudo-anonymous group. As a result, these three analysed cryptocurrencies can be determined as anonymous. Still, in the case of a transaction, they can be assigned to a specific user account and thus lose their anonymity. In the case of XRP, we can talk about complete transparency since XRP was created as an innovative technology for banking software.

Figure 1 Bitcoin, Ethereum, and Litecoin price and return performance.



Note: This figure indicates price and return performance of Bitcoin (BTC), Ethereum (ETH), and Litecoin (LTC). The series cover the period from August 2nd 2016 to August 1st 2023 based on daily frequencies.

Table No. 2 refers to all important transaction options for analysing selected cryptocurrencies.

Table 2 Transaction options aspects for analysing selected cryptocurrencies.

Cryptocurrency name	Number of transactions per second	Average transaction confirmation interval	Transaction fee in USD
Bitcoin	7	72 min	0,10-0,62
Ethereum	30	5 min	0,48
Litecoin	12	22 min	0,10-0,25
XRP	1500	3-5 sec	0,000003456

Source: own processing.

The number of transactions is fixed, and as seen from Table No. 2, the most influential cryptocurrency in terms of the number of transactions per second is the XRP currency,

namely 1500 transactions per second. It is almost as powerful as Visa (1664 transactions per second) or Mastercard (1567 transactions per second). Bitcoin has the longest average transaction confirmation time, namely 72 minutes. This confirmation time is justified by the most significant presence in the market and the resulting highest number of transactions, where only seven transactions can be made in one second based on Bitcoin technology. In contrast, the XRP currency performs transaction confirmation almost instantly.

The fees listed in Table No. 2 are only transaction verification fees and are not the entire fee the user must pay in case of trading. The central part of the fee is the cost of electricity.

The value of the fee is therefore given as a share of the electricity consumed for Bitcoin mining per year and the number of transactions, and then the number of blocks, which contain 1600-2400 transactions, with the fact that the verification of one block takes an average of 10 minutes. The global cost of electricity consumption for Bitcoin mining is \$3.3 billion. The variance based on the number of transactions in individual blocks can be found based on the model examples below.

$$3.300.000.000 \div 365 \div 24 \div 6 \div 1600 = 39,24 \text{ USD} \quad (6)$$

$$3.300.000.000 \div 365 \div 24 \div 6 \div 2400 = 26,14 \text{ USD} \quad (7)$$

The fee for confirming a Bitcoin transaction ranges from \$26.14 to \$39.24. The average price of the fee is USD 32.69, i.e., CZK 730. This fee price does not include the costs associated with the mining hardware, which can amount to considerable sums. The transaction fee for Bitcoin alone, which is 0.10 USD - 0.62 USD, becomes negligible compared to the price of the electricity fee and hardware costs.

In the case of Ethereum and Litecoin, electricity consumption fees are different compared to Bitcoin and are lower by 80%-95%. On average, transaction confirmation fees for ETH and LTC are \$4.09 (CZK 91.3) combined with a transaction execution fee of \$0.48 for ETH and \$0.175 for LTC.

In the case of XRP, the cost of electricity consumption is neglected since the currency is not mined but only managed by a central governing authority, for which the user pays a transaction fee of an average value of 0.000003456 USD, which can be taken as a nominal fee and can therefore be stated, that the XRP transaction confirmation fee is free. Table 3 refers to the description of the analysed cryptocurrencies.

Table 3 Description of selected cryptocurrencies.

Cryptocurrency name	Origin	Number of coins as of 3/10/2023 (circulating market supply)	Maximum number of coins in circulation
Bitcoin	Extraction	19.325.849	21.000.000
Ethereum	Extraction	122.372.489	Unlimited
Litecoin	Extraction	71.498.663	84.000.000
XRP	Emission	50.948.238.947	100.000.000.000

Source: own processing.

Origination in the case of BTC, ETH, and LTC occurs based on mining either a limited or unlimited amount of coins that may be available to cryptocurrency users. In the case of XRP, this currency (100 billion pieces) was created in one moment, and they were introduced gradually to the financial market using emissions - the so-called release process. Based on the data from Table 3, it is possible to identify the similarity in mining and the number of coins in circulation of Bitcoin and Litecoin since these two currencies depend on each other, and Litecoin was created from Bitcoin. The number of coins in circulation in the case of BTC as of 03/10/2023 is 92% of the maximum amount. In the case of LTC, 91.1% of the total amount can be introduced to the cryptocurrency market based on the protocols of both currencies.

Analysis of the development of the value of selected cryptocurrencies for the period 2018-2022

BTC exchange rate development for the period 2018-2022

The following Table 4 shows the development of the exchange rate value of Bitcoin in USD from 1/1/2018 to 12/31/2022. From the values shown, the highest value, namely 47,735 USD, was recorded by BTC 1.1. 2022. On the contrary, the lowest value, namely USD 3,707, was recorded by BTC on 12/31/2018.

Table 4 BTC exchange rate development for the period 2018-2022 in USD.

1. 1. 2018	31. 12. 2018
9.172	3.707
1. 1. 2019	31. 12. 2019
3.799	7.193
1. 1. 2020	31. 12. 2020
7.197	28.916
1. 1. 2021	31. 12. 2021
29.324	46.196
1. 1. 2022	31. 12. 2022
47.734	16.532

Source: own processing.

Table 5 shows the percentage development of the exchange rate value of Bitcoin from 1/1/2018 to 12/31/2022. The stated values are given based on the percentage increase or decrease of the percentage value compared to the previous period.

Table 5 Percentage evolution of BTC exchange rate value for the period 2018-2022.

1. 1. 2018	1. 1. 2019	1. 1. 2020	1. 1. 2021	1. 1. 2022	31. 12. 2022
0 %	- 58 %	+ 89 %	+ 307 %	+ 63 %	- 65 %

Source: own processing.

Calculating the return on investment of USD 4,000 in BTC using the ROI method:

$$ROI = \frac{7.208}{4.000} - 1 = 80 \% \quad (8)$$

Calculating tax on a \$4,000 BTC investment using the FIFO method:

$$Tax = (7.208 - 4.000) * 0,15 = 481 USD \quad (9)$$

Calculating the return on investment of USD 4,000 in BTC using the after-tax ROI method:

$$ROI = \frac{6.727}{4.000} - 1 = 68 \% \quad (10)$$

Based on the calculations, the net profit from the invested USD 4,000 in BTC after tax deduction is USD 2,727 (CZK 60,893), corresponding to a 68% return on invested capital.

ETH exchange rate development for the period 2018-2022

Table 6 shows the development of the exchange rate value of Ethereum in USD from 1/1/2018 to 12/31/2022. From the values shown, it can be concluded that ETH recorded the highest value of 3,676 USD on 12/31. 2021. Conversely, the lowest value of USD 129 was recorded by ETH on 12/31/2018.

Table 6 ETH exchange rate development for the period 2018-2022 in USD.

1. 1. 2018	31. 12. 2018
772	132
1. 1. 2019	31. 12. 2019
139	129
1. 1. 2020	31. 12. 2020
131	737
1. 1. 2021	31. 12. 2021
729	3676
1. 1. 2022	31. 12. 2022
3768	1195

Source: own processing.

Table 7 shows the percentage development of the Ethereum exchange rate value from 1/1/2018 to 12/31/2022. The stated values are given based on the percentage increase or decrease of the percentage value compared to the previous period.

Table 7 Percentage development of the Ethereum exchange rate value for the period 2018-2022.

1. 1. 2018	1. 1. 2019	1. 1. 2020	1. 1. 2021	1. 1. 2022	31. 12. 2022
0 %	- 82 %	- 6 %	+ 456 %	+ 417 %	- 68 %

Source: own processing.

Calculating the return on investment of USD 4,000 in ETH using the ROI method:

$$ROI = \frac{6.191}{4.000} - 1 = 54,7 \% \quad (11)$$

Calculating tax on a \$4,000 ETH investment using the FIFO method:

$$Tax = (6.191 - 4.000) * 0,15 = 329 USD \quad (12)$$

Calculating the return on investment of USD 4,000 in ETH using the after-tax ROI method:

$$ROI = \frac{5862}{4.000} - 1 = 46,5 \% \quad (13)$$

Based on the calculations, it can be concluded that the net profit from the invested USD 4,000 in ETH after tax deduction is USD 1,862 (CZK 41,578), which corresponds to a 46.5% return on invested capital.

LTC exchange rate development for the period 2018-2022

Table 8 shows the evolution of the exchange rate value of Litecoin in USD from 1/1/2018 to 12/31/2022. From the values shown, the highest value, namely 150.7 USD, was recorded by LTC 1.1. 2022. On the contrary, the lowest value of USD 29.9 was recorded by LTC on 12/31/2018.

Table 8 LTC exchange rate development for the period 2018-2022 in USD.

1. 1. 2018	31. 12. 2018
53,2	29,9
1. 1. 2019	31. 12. 2019
31,5	41,4
1. 1. 2020	31. 12. 2020
41,6	124,4
1. 1. 2021	31. 12. 2021
125,9	146,2
1. 1. 2022	31. 12. 2022
150,7	69,9

Source: own processing.

Table 9 shows the percentage evolution of the Litecoin exchange value from 01/01/2018 to 12/31/2022. The indicated values are given based on the percentage increase or decrease of the percentage value compared to the previous period.

Table 9 Percentage development of the LTC exchange rate value for the period 2018-2022.

1. 1. 2018	1. 1. 2019	1. 1. 2020	1. 1. 2021	1. 1. 2022	31. 12. 2022
0 %	- 41 %	+ 32 %	+ 200 %	+ 19 %	- 53 %

Source: own processing.

Calculating the return on investment of USD 4,000 in LTC using the ROI method:

$$ROI = \frac{5.255}{4.000} - 1 = 31,3 \% \quad (14)$$

Calculating tax on a \$4,000 LTC investment using the FIFO method:

$$Daň = (5.255 - 4.000) * 0,15 = 188 \text{ USD} \quad (15)$$

Calculating the return on investment of USD 4,000 in LTC using the after-tax ROI method:

$$ROI = \frac{5067}{4.000} - 1 = 26,7 \% \quad (16)$$

Based on the calculations, the net profit from the invested USD 4,000 in LTC after tax deduction is USD 1,067 (CZK 23,826), corresponding to a 26.7% return on invested capital.

XRP exchange rate development for the period 2018-2022

Table 10 shows the development of the exchange rate value of XRP in USD from 1/1/2018 to 12/31/2022. From the values shown, it can be concluded that the highest value, namely 0.851 USD, was recorded by XRP 1.1. 2022. On the contrary, the lowest value, USD 0.193, was recorded by XRP on 12/31/2019.

Table 10 XRP exchange rate development for the period 2018-2022 in USD.

1. 1. 2018	31. 12. 2018
0,223	0,35
1. 1. 2019	31. 12. 2019
0,362	0,193
1. 1. 2020	31. 12. 2020
0,195	0,219
1. 1. 2021	31. 12. 2021
0,237	0,831
1. 1. 2022	31. 12. 2022
0,851	0,338

Source: own processing.

Table 11 shows the percentage development of the exchange rate value of XRP from 1/1/2018 to 12/31/2022. The indicated values are given based on the percentage increase or decrease of the percentage value compared to the previous period.

Table 11 Percentage development of the XRP exchange rate value for the period 2018-2022.

1. 1. 2018	1. 1. 2019	1. 1. 2020	1. 1. 2021	1. 1. 2022	31. 12. 2022
0 %	+ 62 %	- 46 %	+ 23 %	+ 259 %	- 60 %

Source: own processing.

Calculating the return on investment of USD 4,000 in XRP using the ROI method:

$$ROI = \frac{6.062}{4.000} - 1 = 51,6 \% \quad (19)$$

Calculating tax on a \$4,000 XRP investment using the FIFO method:

$$Tax = (6.062 - 4.000) * 0,15 = 309 USD \quad (20)$$

Calculating the return on investment of USD 4,000 in XRP using the after-tax ROI method:

$$ROI = \frac{5753}{4.000} - 1 = 43,8 \% \quad (21)$$

Based on the calculations, it can be concluded that the net profit from the invested USD 4,000 in XRP after the tax deduction is USD 1,753 (CZK 39,144), which corresponds to a 43.8% return on invested capital.

Comparison of selected cryptocurrencies based on profitability

Profitability was determined using the ROI method based on calculations of the exchange rate value of all four analyzed cryptocurrencies from 1/1/2018 to 12/31/2022. More information can be found in Table 11.

Table 12 Profitability of selected cryptocurrencies based on the ROI method.

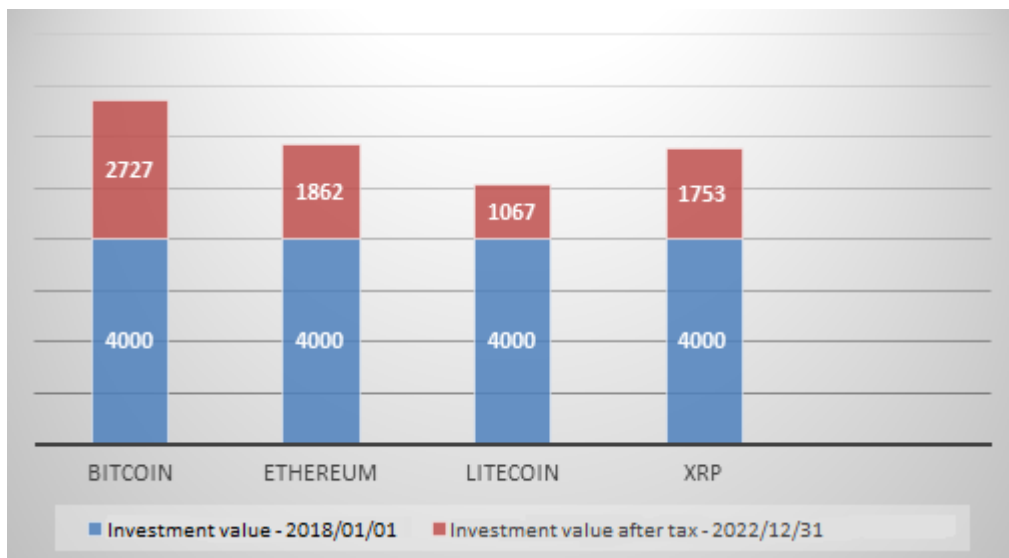
Cryptocurrency name	Bitcoin	Ethereum	Litecoin	XRP
Profitability according to ROI	68 %	46,5 %	26,7 %	43,8 %

Source: own processing.

The results in Table 11 show that the most profitable cryptocurrency for the analysed period is Bitcoin, whose profitability is 68% of the profit from the original investment of USD 4,000. Net profit after tax is \$2,727. The second highest profitability was recorded by Ethereum, namely a profit of 46.5% from the initial investment of 4,000 USD. Net profit after tax is estimated at \$1,862 for Ethereum.

The XRP currency recorded slightly less profitability, the profitability of which is determined at 43.8% of the profit from the initially invested amount of USD 4,000. The lowest profitability of the cryptocurrencies analysed belongs to Litecoin and is determined at 26.7% of the profit from the initially invested USD 4,000. For better orientation, Figure 1 is inserted with a graphical representation of the initial and final values of individual investments in BTC, ETH, LTC and XRP for the analysed period.

Figure 2 Investment values of selected cryptocurrencies.



Source: own processing.

Based on the data from Figure 1, it can be stated that all analysed cryptocurrencies made a profit during the monitored period. The most profitable was Bitcoin, whose value at the end of the monitored period was 6,727 USD (net profit of 2,727 USD). The second highest profitability was recorded by Ethereum, which had a value of 5,862 USD at the end of the monitored period (net profit of 1,862 USD). At the end of the period under review, XRP reached a value less than 3% lower than Ethereum, namely USD 5,753 (net profit of USD 1,753). The lowest value of the selected cryptocurrencies at the end of the analysed period was achieved by Litecoin, namely a value of 5,067 USD (net profit of 1,067 USD).

Based on the development of the value of the investment, when the most profitable was Bitcoin, then Ethereum, then XRP, and the least good was Litecoin, it can be interestingly stated that the order of these cryptocurrencies corresponds to their order based on market capitalisation on the market as of 31/12/2022 when cryptocurrencies were ranked one after the other, as in the case of the value as mentioned above analysis - 1. Bitcoin, 2. Ethereum, 6. XRP, 13. Litecoin.

Discussion

Based on the results achieved using the method of analysis and comparison, it is possible to answer the research questions defined in the chapter on the objectives of this research.

RQ1: What is the profitability of investing in Bitcoin, Ethereum, Litecoin and XRP, and which cryptocurrencies were the most profitable in the period 2018-2022?

Based on profitability calculations using the ROI method, it can be stated that none of the analysed cryptocurrencies achieved negative profitability, and the invested capital at the beginning of 2018 showed profitability at the end of 2022. The profitability of each cryptocurrency analysed is different and ranges between 68%-26.7%. The most profitable of the analysed virtual currencies for the monitored period is Bitcoin, which, based on the calculation of profitability according to the ROI method, presents a profitability of 68% after deducting tax from other income. Using a model investment example with invested capital worth USD 4,000, it was found that the total value of the investment in Bitcoin was USD 6,727 at the end of the monitored period. Therefore, the net profit when fulfilling the tax obligation was USD 2,727 (CZK 60,893). From this value, it can be concluded that the annual average profit of the investment is 545 USD (12,179 CZK) and in the case of a monthly average profit, the value is 45.5 USD (1,015 CZK). Based on the results, Ethereum was found to be the second most profitable cryptocurrency for the analysed period, the profitability of which, based on the calculation using the ROI method, reached 46.5% after deducting the tax from other income. Using a model investment example with an invested capital of USD 4,000, it was found that the total value of the Ethereum investment was USD 5,862 at the end of the analysed period. The net profit of the asset after tax deduction from other income amounted to USD 1,862 (CZK 41,578). From this value, it can be concluded that the annual average profit of an investment in Ethereum is USD 372.4 (CZK 8,315), and in the case of a monthly average profit, the value is USD 31 (CZK 693). The third best-performing currency based on profitability is XRP. The return on investment in XRP is 43.8% using the ROI method and the subsequent result. Using a model investment example with \$4,000 of invested capital, the XRP investment's total value was \$5,753 at the end of the review period.

The net profit of the investment after deducting tax from other income amounted to USD 1,753 (CZK 39,144). From this value, it can be concluded that the annual average profit of an investment in XRP is USD 351 (CZK 7829) and in the case of a monthly average profit, the value is USD 29.2 (CZK 652).

Litecoin is the cryptocurrency with the worst profitability from the set of cryptocurrencies analysed, which, based on the calculation using the ROI method, was 26.7%. Based on a model investment example with an invested capital of USD 4,000, the Litecoin investment's total value was USD 5,067 at the end of the period under review.

The asset's net profit after the tax deduction from other income amounted to USD 1,067 (CZK 23,826). From this value, it can be concluded that the annual average profit of an investment in XRP is USD 213.4 (CZK 4,765), and in the case of a monthly average profit, the value is USD 17.8 (CZK 397). Refer to Table 12 for a summary of all the essential values and profitability of the analysed BTC, ETH, LTC and XRP.

Table 13 Summary of BTC, ETH, LTC and XRP profitability and values.

Cryptocurrency name	Bitcoin	Ethereum	Litecoin	XRP
Profitability in %	68	46,5	26,7	43,8
Value at the end of the period in USD	6.727	5.862	5.067	5.753
Net profit at the end of the period in USD	2.727	1.862	1.067	1.753

Source: own processing.

RQ2: What are the possibilities and features of a transaction using Bitcoin, Ethereum, Litecoin and XRP?

The basic possibilities and characteristics of transactions using them are determined by analysing selected cryptocurrencies. The primary and most essential transaction circles include the number of transactions per second, the average transaction interval, and the transaction fee. The analysed cryptocurrencies can be divided into two groups based on the results. The first group comprises pseudo-anonymous cryptocurrencies, namely Bitcoin, Ethereum and Litecoin. The second group consists of a single representative, the fully transparent XRP currency. The set of cryptocurrencies is divided into two groups based on the similarity of properties and the fees charged for carrying out the transaction.

The first group consisting of Bitcoin, Ethereum and Litecoin, combines a similar number of transactions using these currencies per second, with seven transactions for Bitcoin, 30 for Ethereum and 12 for Litecoin. Bitcoin has the most prolonged transaction confirmation interval, with an average of 72 minutes. The Bitcoin derivative Litecoin has a noticeably shorter average transaction confirmation interval of 22 minutes. Ethereum, which operates on its protocol, source code and, unlike Bitcoin and Litecoin, operates on the principle of Proof of Stake, has an average transaction confirmation interval of 5 minutes. The similarity between these three analysed cryptocurrencies can also be found in the transaction fee amount. For Ethereum, the transaction fee is fixed at \$0.48. For Bitcoin and Litecoin, the transaction fee varies within a specific range, namely USD 0.10-0.62 for Bitcoin and USD 0.10-0.25 for Litecoin. However, within the framework of a Bitcoin transaction, the fee for the functioning of Bitcoin must be taken into account, as well as its financially demanding energy consumption and hardware equipment. Based on calculations of the average fee for a Bitcoin transaction, 32.69 USD (730 CZK) is found. The fee for making a transaction using Bitcoin, which is in the range of 0.10-0.62 USD, becomes negligible at 32.69 USD. Due to the high fee for a Bitcoin transaction, paying small amounts with Bitcoin (e.g. drinks or food in a restaurant) is not recommended, as the transaction fee alone would exceed the amount paid many times over. The average total fee for a transaction using Ethereum and Litecoin is USD 4.09 (CZK 91.3).

The second group, formed by the XRP cryptocurrency, differs from the previous one in all analysed areas. Thanks to its advanced software, it can perform up to 1,500 transactions per

second, while the average confirmation interval is 4 seconds. In terms of the number of possible transactions per second, XRP can compete with, for example, Visa (1,664 transactions per second) or Mastercard (1,567 transactions per second). The average XRP transaction fee is \$0.000003456. This fee can be taken as negligible within the payment. Of all the cryptocurrencies analysed, XRP is the most powerful in transactions. This fact is because XRP was created as a software for banking companies.

Conclusion

Cryptocurrencies are an attractive alternative investment tool that will increase interest in the future. The expectation of growth in the market capitalisation of cryptocurrencies is supported by high volatility and high profitability of invested capital. However, it is necessary to consider the high level of risk, which can be in the form of regulations, hacker attacks and, last but not most minor, sharp falls in the exchange rates of individual currencies, which can also be artificially created. From the point of view of a potential investor in virtual currencies, it is necessary to consider both the positive and negative properties that cryptocurrencies offer and, based on them, decide whether to invest. The limit of this research is partly the inconsistent opinion and definition of crypto-currency experts, as well as a specific complication in choosing a method for calculating the tax payment within the profit from crypto-currency. In the future, the issue of cryptocurrencies will likely be more specific and regulated by legislation. Based on the results of this research, the obtained data can be followed up on the profitability of cryptocurrencies and analysis on the prediction of the development of the value course of cryptocurrencies.

This article aimed to identify the position of cryptocurrencies on the financial market in connection with the profitability development in selected types of cryptocurrencies for 2018-2022. The goal of the work is fulfilled, as cryptocurrencies were identified and defined using the analysis method. Subsequently, a comparative process was carried out for this analysis, the purpose of which was to compare selected cryptocurrencies in terms of their functioning and properties, exchange rate development, and profitability when using the method ROI.

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