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PODRŠKA UMJETNE INTELIGENCIJE (AI) INVESTITORIMA NA TRŽIŠTIMA KRIPTOVALUTA

Apstrakt: Relativno nedavna kreacija i pojava kriptovaluta (Bitcoin, ''blockchain''), čemu su put utrle enormno brze tehnološke promjene i inovacije, dovela je i do vrlo dinamičnog širenja njihove upotrebe diljem svijeta . Mimo prvobitne uloge u sistemu plaćanja , zbog niza njihovih osobina, kriptovalute postaju sada prvenstveno medij čuvanja vrijednosti odnosno postaju vrlo specifična roba kojom se trguje na tržištima kriptovaluta. U ovom našem kratkom uvidu u specifičnu problematiku kriptovaluta pokušali smo ukazati na inferiornost kriptovaluta u ulozi medija plaćanja u odnosu na tradicionalne platne instrumente (fiat novac) . S druge strane , kao instrumenti investiranja problem kriptovaluta je u tome što su njihove cijene na tržištima ekstremno volatilne čime su ulaganja u kriptovalute visokošpekulativna . Budući da se kriptovalute pojavljuju u digitalnoj formi (bez ikakve intrinsične vrijednosti) njihova cijena direktno zavisi od odnosa ponude i tražnje na tržištu koji je veoma promjenjiv te su i stoga cijene volatilne i teško predvidive. S obzirom na takvu njihovu prirodu potrebni su vrlo sofistikovani alati koji pomažu investitorima da donesu odgovarajuću odluku prilikom kupovine ili prodaje kriptovaluta . Razvoj vještačke inteligencije (AI) korespondira s rastom i korišćenjem kriptovaluta. Zbog svojih novih mogućnosti, umjetna inteligencija postaje vrlo moćan alat u rukama investitora koji sada mogu lakše i efikasnije upravljati svojim ukupnim ulaganjima a posebno sa ulaganjima u kriptovalute. Strateška moć AI na ovom planu odnosi se na mogućnosti predviđanja cijena, volatilnosti, izgradnju i upravljanje portfoliom sa naprednijim strategijama upravljanja portfoliom, zaštita od tržišnih rizika i prevara. Open AI (ChatGPT i Deepseek) koje smo ovdje analizirali pružaju veoma veliki raspon pomoći i savjeta u segmentima koje smo prethodno pomenuli . Te asistencije se odnose na poslove korišćenja kriptovaluta za plaćanja i investiranja u kriptovalute. Pored profesionalnih investitora i individualni i mali ulagači mogu korsititi pomoć open AI u rasponu od edukacije pa kroz sve faze investiranja do upravljanja portfoliom.

Ključne riječi: kriptovalute , investicije u kriptovalute , podrška open AI investitorima u kriptovalute

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ARTIFICIAL INTELLIGENCE (AI) SUPPORT FOR INVESTORS IN THE CRYPTOCURRENCY MARKET

Abstract: The relatively recent creation and emergence of cryptocurrencies (Bitcoin, ''blockchain''), which was paved by enormously rapid technological changes and innovations, has led to a very dynamic spread of their use throughout the world. Beyond their original role in the payment system, due to a number of their characteristics, cryptocurrencies are now primarily a medium of value storage, that is, they are becoming a very specific commodity traded on cryptocurrency markets. In this brief insight into the specific issue of cryptocurrencies, we have tried to point out the inferiority of cryptocurrencies in the role of a medium of payment compared to traditional payment instruments (fiat money). On the other hand, as investment instruments, the problem with cryptocurrencies is that their prices on the markets are extremely volatile, which makes investments in cryptocurrencies highly speculative. Since cryptocurrencies appear in digital form (without any intrinsic value), their price directly depends on the supply and demand relationship on the market, which is very variable, and therefore the prices are volatile and difficult to predict. Given their nature, very sophisticated tools are needed to help investors make the right decisions when buying or selling cryptocurrencies. The development of artificial intelligence (AI) corresponds to the growth and use of cryptocurrencies. Due to its new capabilities, artificial intelligence is becoming a very powerful tool in the hands of investors who can now more easily and efficiently manage their overall investments, especially investments in cryptocurrencies. The strategic power of AI in this area refers to the ability to predict prices, volatility, build and manage a portfolio with more advanced portfolio management strategies, and protect against market risks and fraud. The Open AIs (ChatGPT and Deepseek) that we have analyzed here provide a very wide range of assistance and advice in the segments we have previously mentioned. These assistances relate to the use of cryptocurrencies for payments and investing in cryptocurrencies. In addition to professional investors, individual and small investors can also use the help of open AI in the range from education through all phases of investment to portfolio management.

Keywords: cryptocurrencies, investments in cryptocurrencies, AI and investors in cryptocurrencies, application of AI when investing in the cryptocurrency market

1. INTRODUCTION

This paper explores the new opportunities that artificial intelligence (AI) opens up for cryptocurrency investors. At the beginning, we looked at the nature and character of cryptocurrencies, the multiple possibilities of their use that open up for users, and the problems that users encounter. We focused in particular on the use of cryptocurrencies as an investment instrument. The central topic was the analysis of the issues and opportunities that open up for investors who can now use artificial intelligence that can greatly improve the process and quality of almost all decisions related to transactions in cryptocurrency markets.

One of the several goals of the research was to sketch the economic nature and key features of cryptocurrencies in the shortest possible strokes. Starting from this, we realized that the multiplicity of functions of cryptocurrencies opens up space for meeting the broader needs of users. This then more easily explains their worldwide use, which does not seem to be directly dependent on the level of development and size of individual countries. It seems that some local characteristics of individual economies primarily determine the degree of acceptance of cryptocurrencies by domestic residents, which varies in a wide range of investment, transactional, speculative motives, psychological factors, political instability, macroeconomic (in) stability, regulatory factors, etc. As the development of cryptocurrencies and the development of artificial intelligence (AI) coincide, we started from the assumption that investing in cryptocurrencies and doing business with them can no longer be imagined without the use of closed or open AI Chat bots . Artificial intelligence still cannot replace the knowledge and experience of professional investors, but it is undoubtedly becoming a very useful tool for them. For individual investors for whom cryptocurrencies open up space for the most direct participation in the financial market, AI Chat bot is extremely useful in the domain of their easier information and easier and faster education. It is expected that very soon, the development of AI will open new opportunities for users in the domain of investing and using cryptocurrencies for other purposes. This paper focuses on the analysis of the multifunctionality of cryptocurrencies, i.e. their use for various purposes, which we associate with the support that AI can provide to users, especially from the perspective of small individual investors with insufficient knowledge in the field of investing in financial markets, especially in terms of working with cryptocurrencies.

2. WHAT ARE CRYPTOCURRENCIES AND REASONS FOR USING CRYPTOCURENCIES

The name ''cryptocurrency'' comes from the Greek word ''krypto'' which means ''hidden''. Cryptocurrencies (virtual currencies) are digital assets that use cryptography to secure transactions and regulate the creation of new units. ''Crypto'' means that the content is secured and exclusively accessible only to the sender and recipient. Cryptocurrencies operate on a decentralized network structure based on blockchain technologies. There is no central institution or entity that controls the issuance and transfer of these ''currencies''. There are no limits on the amount that can be transferred within the network. The issuers of these ''currencies'' are private players and not central monetary institutions. The currencies are encrypted. The world of cryp-

tocurrencies is highly technical and few people really understand it. The system as a whole is still not fully regulated by appropriate national or international regulations. It is highly decentralized and is managed by distributed consensus.

The world of cryptocurrencies includes encryption, miners, proof-of-stake and proof-of-work models, hash functions, nodes, tokens, timestamps, blockchains, various types of wallets, keys, and of course cryptography. Proof of work (PoW) is a network of miners that solve complex mathematical problems using computers, consuming huge amounts of electricity (with a high degree of security because a possible attack on the network is extremely expensive). The first miner to solve the problem gets the right to add a new block to the blockchain and is rewarded with cryptocurrency, such as Bitcoin. Proof of Stake (PoS) works by having users (validators) lock up a certain amount of cryptocurrency as a deposit (stake). Then, an algorithm randomly selects one of them to verify and add a new block to the blockchain. Validators are compensated in the form of transaction fees. The advantages are lower energy consumption, faster transactions, and lower costs. The disadvantages are that those who own more cryptocurrency have a greater chance of being selected, which can lead to centralization. Many new cryptocurrencies are choosing PoS because of its environmental sustainability.

The most famous cryptocurrency is Bitcoin (launched in 2009), a system designed to electronically mimic the characteristics of cash transactions. It is designed to enable peer-to-peer (or person-to-person) transactions, without the need to know or trust the other person in the transaction, and to do so without the need for a central institution (such as a bank) to intervene. Unlike conventional national currencies that derive some of their value from being legally defined as legal tender, Bitcoin and other cryptocurrencies have no legal or intrinsic value.

Instead of using a bank, the Bitcoin system uses 'blockchain' technology to record transactions and ownership of bitcoins. This is essentially a technology that links groups of transactions ('blocks') together over time (in a 'chain'). Each time a transaction occurs, it forms part of a new block that is added to the chain. As a result, the blockchain provides a record (or database) of every Bitcoin transaction that has ever occurred, available for anyone to access and update on a public network (this is often called a "distributed ledger"). The integrity of the Bitcoin system is protected by 'cryptography', which is a method of verifying and securing data using complex mathematical algorithms (or codes). This makes the system very difficult to corrupt. A new block of transactions is created approximately every ten minutes. 'Miners' are eager to solve the codes and process transactions because they are rewarded with new bitcoins (currently 6.25 new bitcoins per block). (https://www.rba.gov.au.)

However, the reward drops after 'Halving'. 'Halving' is one of the fundamental mechanisms in the Bitcoin protocol. Halving means that after about 210,000 blocks have been mined, which takes four years, the reward given to miners for processing transactions drops by fifty percent. Thus, the halving of the reward reduces the rate at which new digital "coins" are released into circulation. In this way, a slower growth in supply with stable demand results in higher prices. This is an imitation of Bitcoin scarcity that aims to defend the market value of Bitcoin over time. Thus, it was expected that by the end of 2024, the price of Bitcoin would break the psychological

barrier of $ 100,000. (https://velikeprice.com) which actually happened. The highest price of Bitcoin was $ 108,786 on January 20, 2025. (ChatGTP. 01/28/2025)

One of the characteristics of the Bitcoin system is that the supply of Bitcoins increases at a predetermined rate and is limited to about 21 million (with each Bitcoin divisible into 100 million satoshis or 0.00000001 Bitcoins). For this reason, the supply of Bitcoins is often compared to the supply of a scarce commodity, such as gold.

According to the Chainanalysis report (www.chainanalysis.com), the relatively largest use of cryptocurrencies in 2023 was registered in India, Nigeria, Vietnam, the USA, Ukraine, the Philippines, Indonesia and Pakistan, Brazil and Thailand. In 11th, 12th and 13th place are China, Turkey and Russia. Of the developed countries, the USA is in 4th place and the UK is in 14th place. The reasons for the widespread use of cryptocurrencies are not the same in all countries. In Vietnam, which is definitely among the relatively largest users of cryptocurrencies, the main reason for this is that cryptocurrencies are used as an investment tool, although there are other good options. It is difficult to explain this, but it is possible that investors in that country are generally more inclined to riskier investments. In countries with high labor migration, transferring earnings to their home countries has the lowest costs if done by transferring cryptocurrencies, then there are countries with highly inflated national currencies (Venezuela, Argentina and Turkey), so keeping savings in cryptocurrencies is a form of protection against a decline in the purchasing power of earnings. In some developing countries, especially in Africa, individuals are inclined to use cryptocurrencies in mutual payments (Kenya and Nigeria) and are at the forefront of innovative P2P payments via mobile payments. In this way, it is a process of avoiding options such as bank transfers and digital options that are related to such a type of payment. In the developed world (USA, Great Britain, Canada, South Africa and Australia), the use of cryptocurrencies is mostly related to institutional investment. In countries under sanctions, cryptocurrencies help to overcome these restrictions more easily. Likewise, in war-torn economies (Ukraine, for example), there is a lack of trust in institutions and capital flight. Finally, there are also reasons for tax avoidance.

In the Western Balkans, the use of cryptocurrencies in the public is constantly increasing, but in general the volume of their use is still relatively very low. This is evidenced by the fact that a very small volume of exchange takes place based on the use of cryptocurrencies and ATMs with cryptocurrencies. In Serbia, 5 ATMs were installed, and in BiH 6 ATMs for cryptocurrencies and there are 5 cryptocurrency exchanges, exclusively in the Republika Srpska, because in the other entity, the Federation of BiH, this business is still not regulated by law (according to the latest data, Deepseek, April 2025). Officially, there are no ATMs and cryptocurrency exchanges in North Macedonia, Albania and Montenegro. In practice, however, payments with cryptocurrencies are increasingly used (Montenegro, for example). Some countries such as BiH and the so-called Kosovo have not adopted an adequate regulatory framework, while Albania and Serbia have legally regulated it. Given the widespread crime and corruption in the Western Balkans, their use is primarily determined by the need to "launder" money obtained from illegal or unregistered activities. Crypto mining is a legal activity, but for example, in the North of Kosovo and Metohija, a

significant increase in electricity consumption without payment was observed in the early 2000s, as well as in North Macedonia. This was the result of widespread cryptocurrency mining activities by illegally connecting to the electricity grid. (The use of cryptocurrencies is gaining momentum in the region https://riskbullletins.globalinitiative.net) The condition for combating the misuse of cryptocurrencies is to adopt adequate legal regulations in these countries and to train and capacitate financial intelligence experts with knowledge.

Based on a brief insight into the use of cryptocurrencies in the world, it can be concluded that, although the use of cryptocurrencies shows an extremely rapid growth dynamics, the scope, motives and reasons for their use vary greatly across countries. These reasons cannot be directly linked to the level of development achieved by individual countries, as their use is equally widespread in rich and less developed, or third world, countries. The prevalence of their use can primarily be linked to the characteristics of cryptocurrencies in the context of investment assets (instruments) or as a means of transaction that is most exploited in countries where the presence of illegal activities is widespread, such as in the Western Balkans. Very important reasons for this are the unevenness of legal regulations across countries (where this unevenness ranges from a complete lack of regulations to direct bans on the use of cryptocurrencies to complete legalization (El Salvador-2021). It is certain that the different state of regulations across countries also affects the extent of the use of cryptocurrencies by residents. Some of their characteristics influence their use in countries with a large diaspora as a cheap means of transferring remittances. Due to the long-term trend of growth in the market value of cryptocurrencies, they are often used as a hedging instrument against the risk of inflation (in countries with inflationary economies) and in war economies for understandable reasons. It is interesting that the spread of the use of cryptocurrencies is not directly related to the technical level of users, which indicates the importance and dominance of the functions that cryptocurrencies successfully perform for their needs. It is certain that the harmonization of regulations at the international level will enhance the use of cryptocurrencies in all their aspects and legal purposes. The emergence of cryptocurrencies has in some way initiated the emergence of central bank digital currencies, to which the European Central Bank seems to be closest. It is certain that the introduction of a digital euro will influence changes in the way cryptocurrencies are used, reduce their volatility, and generally have positive effects on the further development and growth of the volume and use of cryptocurrencies as a whole.

3. CRYPTOCURRENCIES AS MONEY AND THEIR ROLE IN CURRNET TRANSACTIONS

Central bank experts will always say that cryptocurrencies are not money. In the very rich professional literature, you will find somewhat different views. The general public is mainly subject to marketing and PR where Bitcoin is presented as a gold coin with the letter B and a dollar sign, which should create a very clear association that it is a fully-fledged money. This is practically one of the modern myths that arose as a result of the enormous and rapid development of new technologies that have dramatically influenced the emergence of completely new (virtual) products in the

already very complicated financial markets. The widespread financial illiteracy of the public makes it very difficult for it to keep up with new technological developments, especially in the financial sphere. The massive and complete ignorance of the general public in monetary issues and the digital world, as well as the great susceptibility to propaganda, makes it completely uncritically considered as money. The truth is that the vast majority of transactors are not ready to accept private digital currencies in the real world. The public's understanding of the role of cryptocurrencies is best reflected by Wikipedia, whose definition of cryptocurrency states that cryptocurrency is a type of digital money that operates on the basis of cryptographic algorithms. ''It has all the characteristics of real currency except that it is not backed by state authority and exists only in electronic form''. https://hr.m.wikipedia.org/wiki/

In reality, cryptocurrencies do not have all the characteristics of money and are not real currency precisely because there is no central monetary authority behind it. A growing number of studies in the world focus on the monetary characteristics of cryptocurrencies and the other part on the financial aspects, i.e. the price of bitcoin. in the context of its role as an investment commodity.

The conventional definition of money is very broadly conceived in the sense that it claims that ''money is everything that is generally accepted in exchange'', (Rudiger Dornbush, Stanley Fisher, Stephen Sparks, 1989. p336.). This means that the functions of exchange, calculation, means of preserving value and other functions can also be performed by other types of assets. The difference between money and cryptocurrencies is determined through the prism of their ability to be efficient media of exchange, units of account, and store of value (Dirk Baur and Thomas Dimpfl. 2021.)

David Yermack, (2015) argues that Bitcoin is not money because it functions poorly as money. In support of this, Avaneesh Jumde, Boo Yun Cho, (2020) argue that fiat money is still preferred for several reasons. Nicolas Cachanosky, (2019) argues that Bitcoin in particular, and cryptocurrencies in general, do not have a good monetary rule and that this shortcoming seriously limits their prospects of becoming widely used money.

Fernandez Villaverde J. (2018) argues that cryptocurrencies are bubbles without fundamental value and that, in general, they cannot provide optimal amounts of money or price stability. Furthermore, the author believes that cryptocurrencies can play a role in supplementing current means of payment and disciplining central banks to provide better fiat money. Saifedean Ammous (2018) concludes that the rigidly inflexible supply of digital currencies and wildly fluctuating demand make digital currencies too unstable to be used as a unit of account in the foreseeable future. Due to the relatively low growth of supply, Bitcoin has a potential store of value function compared to other cryptocurrencies, which is facilitated by the absence of any authority that could change the supply schedule. It is becoming obvious that Bitcoin is not real "money" but relies on existing currency, concludes Andreas Rahmatian, (2019). Currently, its most important, primary and real role is to enable speculation and circumvent fiscal regulations (money laundering).

George Selgin, (2015) believes that such money can provide the basis for a monetary regime without any monetary authority, but is able to provide a high degree

of macroeconomic stability. However, in relation to this claim, we must state that for a monetary system without a central monetary authority, the key obstacle is the insufficient supply of these currencies, as has long been the case with commodity money (gold). Marco Fama, Andrea Fumagalli and Stefano Lucarelli conclude that Bitcoin is a highly speculative financial asset, but the sociotechnical innovations introduced by Bitcoin in particular have opened the possibility of a deep rethinking of the nature of money. Aware of several major limitations that accompany Bitcoin, to be a medium of exchange, the authors wonder whether this experience can pave the way for the birth of new and more democratic monetary instruments that involve a whole combination of political, technical and social elements. Malherbe Leo, Matthieu Montalban, Nicolas Bedu and Caroline Granier, (2019) discuss the issue of trust in cryptocurrencies, which is of crucial importance in the monetary and financial system in general. They believe that trust is now manifested through the technical institution of blockchain. However, the authors realize that Bitcoin cannot be used as everyday money because it would lead to a "deflationary and dysfunctional monetary regime," and high transaction costs.

Marc Gronwald, (2019) explores the similarities between Bitcoin and commodities in the context of their short-term supply. The supply of gold and oil is uncertain, while in the case of Bitcoin supply, they argue, there is no uncertainty. Therefore, the observed movements in Bitcoin prices can be interpreted as the result of Bitcoin demand shocks. The empirical results of the Bitcoin exchange rate dynamics in the study by Hui Cho-Hoi, Hui, Lo Chi-Fai, Chau Po-Hon and Wong Andrew, (2020) show that the Bitcoin exchange rate shares some characteristics of commodity currencies with the risk of falling. This suggests that Bitcoin behaves as a currency that is between fiat money and crypto-commodities used for trading and investment purposes. To explain the nature of cryptocurrencies, we will use a comparison of cryptocurrencies and the unusual stone money from the Polynesian island of Yap (which can still be found on that island), an example often cited in world textbooks on macroeconomics and monetary economics. Finely processed stones in the form of wheels of various sizes were used for centuries as a measure of value and a means of exchange among the islanders. Its value depended on the size and fineness of the processing. Stone money was obtained in a quarry on another very distant island. It had to be excavated, processed and transported by primitive vessels to the home island. It served as a measure of value, a means of exchange and a means of storing value. It was generally acceptable and in some cases of transactions, it did not even have to be physically transported (due to its bulkiness). It was "known" who its owner was and that was enough. In this way, such money functioned in circulation as a claim recorded in the collective knowledge and consciousness of the islanders.

When we compare the stone currency Rai from the island of Yap and cryptocurrencies, we see that they have in common that there is no real value behind these currencies except for the great work and costs (human labor, computer systems and high energy consumption) during their mining. Both are scarce and limited. However, "stone money" would have an advantage over cryptocurrencies because it is a sui generis money that is accepted without restrictions, and the value of goods is measured by the "quantity" of stone. No other measure of value is needed here, as

is the case with cryptocurrencies, whose value must be expressed in dollars, euros or other currencies because the prices of goods and services are defined in those currencies (Novo Plakalović, 2004).

The general acceptability of cryptocurrencies has not yet been achieved and it seems that this will not be the case in the distant future. For this reason, they cannot be classified as money according to its narrow definition, which implies, among other things, that money has its own nominal value that does not change over time (one hundred dollars is nominally always one hundred dollars). Cryptocurrencies have a value that is formed on the market (except for "stablecoins" that are tied to a hard currency), which is why their value changes almost daily. Cryptocurrencies are not even close substitutes for money that can be converted into money very quickly and easily with minimal costs at some unknown date in the future at a known nominal price. Cryptocurrencies cannot function independently, that is, without calculating their value in relation to an official national currency. (dollar, euro, etc.). Despite the best will, it is not possible to find any element within the standard definitions of money that applies to cryptocurrencies or that cryptocurrencies fulfill. Cryptocurrencies should be defined by a new definition of money, which would be "that money can be anything that someone wants to accept in exchange" (Novo Plakalović, 2024). The history of money is full of examples that would fit this hypothetical definition, but it makes no sense in any way in a modern economy, especially an economy with extremely complex and sophisticated financial systems. Such a definition of money no longer makes sense, especially since we see that even some unusual and strange objects that served as money in the distant past had much more characteristics of real money than modern cryptocurrencies.

Research suggests that only a small part of the total amount of cryptocurrencies is used by their holders to make current payments. In the US and other countries, the use of cryptocurrencies for payments is growing, but it is still a very small part of the total market activity. The reasons are primarily the volatility of cryptocurrency prices, regulatory obstacles, and limited acceptance by merchants. Most cryptocurrencies are held as long-term investments in digital wallets, with the most famous Bitcoin being treated as digital gold and used as a store of value.

At the beginning of 2024, it is estimated that over 9,000 different cryptocurrencies were registered, and by the end of the year their number will have increased to over 10,000 (Deepseek, 30. 01.2025). According to data provided by Svjetlana Šurlan, Ana Ristović, and Urban Červek (2025), at the end of 2024 there will be over 23,000 cryptocurrencies. Their capitalization is currently equal to the value of 2.03 trillion US dollars. (Deepseek, 30.01.2025) and according to data from Šurlan et al (2025) their capitalization is around 3.35 trillion dollars. The total value of money as defined by M2 (effective currency cash plus various short-term deposits and savings deposits of low value with banks and other financial institutions) worldwide, in January 2025, amounted to approximately 100 trillion US dollars. The total capitalization of Bitcoin is currently about 820 billion US dollars (www. coinmarketcup.com) and this is about 57% of the total capitalization of cryptocurrencies. This means that Bitcoin represents only 0.82% of the value of the total amount of money in the world. These relations are variable given the large fluctuations in the market value of Bitcoin, but

even if it were to double or halve, nothing significant would change. If Bitcoin is viewed as a financial asset in a broader sense, and not exclusively as money, then we can see that Bitcoin only contributes 0.3% to the total world financial assets (255 trillion dollars, www.bcg.com). We can conclude that Bitcoin still does not have the capacity to disrupt traditional monetary systems.

At the end of the presentation on the monetary significance of cryptocurrencies, i.e. their role in the payment system, we asked a direct question to open artificial intelligence in what way it can help users when using cryptocurrencies in their payment transactions. We asked ChatGPT, which is a chatbot with artificial intelligence (AI) and which provides users with detailed and accurate answers to all questions.

In its response, the AI emphasized that it can help in choosing the right cryptocurrency (in terms of its convenience and speed) as well as one that carries lower transaction costs.

The assistance further relates to: choosing a wallet (mobile wallets, hardware wallets and card exchange offices); where and how to pay with cryptocurrencies (online stores, local businesses, prepaid cards, peer-to-peer -P2P); how to minimize transaction costs and ensure transaction speed; as well as issues of security and protection, using hardware wallets for larger amounts of hot notes; , checking the address before sending; storing private keys and using two-factor authentication (chat GTP) and all this then leads to further concretization of questions to which AI will provide continuous answers.

We asked the same question to the Chinese open AI. Deepseek answers that its help can relate to: choosing the right currency; choosing a wallet; advice on monitoring transaction costs; drawing attention to tax obligations; instructions on security; instructions for checking the acceptability of cryptocurrencies; monitoring cryptocurrency exchange rates to really know how much is being spent; education and information; using payment services that support cryptocurrencies; planning for the future in order to monitor regulatory changes that may affect the use of cryptocurrencies in development.

It is obvious that these two open AIs provide help and advice in somewhat different domains and that their combined, simultaneous application can very well cover the needs of users for quality advice.

4. AI SUPPORT FOR INVESTING IN CRYPTOCURENCIES

When we talk about the nature and functions of cryptocurrencies, we can conclude that they are at the same time payment instruments, savings instruments and investments. Activities in cryptocurrency markets have been growing significantly in recent years. In all this, it seems that the fascination with these currencies was more in the sphere of speculative activities (buying cryptocurrencies for profit) than related to their use as a new and unique system or payment instrument. In this regard, it is worth emphasizing the fact that there is a high degree of price volatility in many cryptocurrencies.

For example, the price of Bitcoin rose from around 30,000 USD in mid-2021 to almost 70,000 USD at the end of 2021 before falling to around 35,000 USD in early 2022, and on September 11, 2023, the price of Bitcoin was at the level of 25,000 USD. In

January 2024, its market value was US$39,956 (https//cointelegraph.com). The price of bitcoin on January 31, 2025 was US$104,768 (Chat GTP). Such high fluctuations in the market value of cryptocurrencies can cause large losses for non-professional investors. Rival cryptocurrencies such as Ethereum have experienced similar volatility.

Research on Bitcoin can be categorized into two main areas based on its attributes: financial attributes and currency attributes. Research on the financial attributes of Bitcoin is based on its treatment as a financial asset. Therefore, it is analyzed using traditional methods of determining asset prices in the financial field. Research on the currency attributes, on the other hand, focuses on the potential use of Bitcoin as a currency in commodity trading and other related activities.

During the relatively short experience after the emergence and use of cryptocurrencies, it turned out that the popularity and disproportionate demand for digital currencies in relation to their supply, influenced that cryptocurrencies primarily began to be used as investment digital assets. The reason for investors entering the cryptocurrency market is the enormous growth of their market value and returns in a relatively short period of time. For these reasons, most recent research on cryptocurrencies treats digital currencies as financial assets. It is estimated that about 90% of existing bitcoins are stored on exchanges and cryptocurrency trading platforms. For these reasons, Yun Joo An, Choi Paul Moon Sub, Huang H.Seth H., (2021) conclude that digital currencies show the potential to inject liquidity during market stress.

Between 2019 and 2022, Bitcoin's annualized return reached an incredible 143% (Linxian Huang, 2024). It is hard to believe and expect traditional financial markets to provide such returns. Recent research is looking for potential changes in the cryptocurrency market to protect against market risk and predict abnormally high returns. Therefore, practical applications that can be integrated with traditional financial markets are being sought, such as diversified portfolios, hedging strategies, and safe haven applications. (Huang, 2024).

The development of digital currencies also coincides with the development of AI. The dominant use of cryptocurrencies in investment activities has also led to the increasing application and exploration of the possibilities of applying AI and machine learning in analyzing the cryptocurrency market. It is obvious that without the application of AI, effective investment in digital assets in the markets will not be possible.

Machine learning models have shown satisfactory performance in quantitative finance, although they are still in their early stages. Jihen Bouslimi, Sahbi Boubaker, Kais Tissaoui (2024) cite several studies that suggest that machine learning is a fruitful alternative to econometric modeling and that machine learning achieves higher forecasting accuracy than widely accepted econometric approaches. A new machine learning-based methodology proposed by Adrian Viéitez, Matilde Santos and Rodigo Naranjo (2024) offers two investment strategies. They are designed for Ethereum (ETH), based on price and trend predictions of this cryptocurrency using real data. The investment strategies are designed to validate the models and allow for profit.

4.1. Research Review on the Role of AI and Machine Learning in Cryptocurrency

The study by , Abdulrezzak Zekiye, Fadi Amroush , Semih Utku and Oznur Ozkasap (2023) focuses on analyzing historical data and using artificial intelligence algorithms to identify factors that affect the price of a cryptocurrency and find risky cryptocurrencies.

Aleksander Iliev and Malvika Panwar (2023) show that using AI, or algorithms, one can forecast cryptocurrency prices for the next two days. A machine learning system learns from past data, constructs prediction models, and predicts the output for new data when it receives it. The more data the model has, the better the output can be predicted. The accuracy of the Solana, Binance, Ethereum cryptocurrency algorithms is over 96%. The algorithms have worked well and their efficiency can be further increased by using deep learning algorithms such as ANN, RNN, or LSTM.

A large amount of raw data is generated daily and needs to be "cleaned" through research. The work of Rini Saxena, Dev Dubey, Amandeep Kaur and Satnam Kaur (2022) presents predictions of cryptocurrency values by efficiently preparing the dataset. Their goal was to use artificial intelligence algorithms and machine learning models to predict the closing price of a cryptocurrency, making it easier for users to trade these currencies.

In their study, Farida Sabry, Wadha Labda, Aiman Erbad and Qutaibah Malluhi (2020) point out that with this huge data representing transactions in the blockchain along with millions of transactions being executed on various exchange websites, the growing number of tweets, posts and articles related to Bitcoin and cryptocurrencies, there is a clear need for automated tools to process and analyze this vast data. Artificial intelligence (AI) techniques can learn from this vast amount of data by analyzing and discovering patterns to facilitate and secure trading and mining. Detecting patterns in money laundering transactions and other fraudulent transactions and trading schemes can help limit criminal activities involving cryptocurrencies due to the privacy and security threats they pose.

The results of a study by Laura Alessandretti, Abeer El Bahrawy , Luca Maria Aiello and Andrea Baronchelli (2018) show that non-trivial, but ultimately simple, algorithmic mechanisms can help predict the short-term evolution of the cryptocurrency market

It is clear that in the future, AI and the "machine learning community" will be of great importance for predicting cryptocurrency prices and their future changes and for managing portfolios in the cryptocurrency market. (Rasoul Amirzadeh , Asef Nazari and Dhananjay Thiruvady , 2022)

A research by Awotunde Joseph Bamidele et al. (2021) shows how to adapt Long Short-Term Memory (LSTM) to build a cryptocurrency price prediction model. The conclusions are that machine learning models provide better performance in predicting cryptocurrency prices and that the proposed model is effective in predicting cryptocurrency prices compared to similar models with an accuracy of 67.4%.

The application areas related to trading are volatility prediction, portfolio construction and fraud detection. Liu.Yulin and Zhang Luyao, (2023) present an automated trading strategy advised by the PU ratio that outperforms conventional buy-and-

hold and market timing strategies. There are other challenges related to mining, cybersecurity, anonymity and privacy. Artificial Intelligence (AI) techniques are not limited to machine learning (ML) techniques (supervised, unsupervised, semi-supervised, and augmented), but also include evolution-based and knowledge-based techniques (Sabry, at al. 2020; Amirzadeh et al. 2022).

Ante Lennart and Demir Ender, (2023) find significant abnormal returns for 90% of tokens after the launch of ChatGPT, up to 41% within two weeks. Research by Jose Almeida and Tiago Cruz Gonçalves (2024) contributes to the existing literature by providing a nuanced understanding of how technological advances such as ChatGPT affect market efficiency in emerging AI-Crypto markets. Their results suggest that market efficiency in these sectors is not static, but evolves with technological innovations and sector-specific characteristics.

Recently, there has been talk of a combination of artificial intelligence (AI), big data, and cloud computing. Blockchain is revolutionizing the production of information systems and various applications. It is estimated that the combination of AI and blockchain has enormous potential for the development of new financial service models based on digitalization. The benefits of using an integrated AI and blockchain platform are discussed on many financial services platforms. Cryptocurrencies are accompanied by issues of cybersecurity, mining, privacy, anonymity, as well as regulatory challenges that regulators must address (Hosen M. at al. 2022). Zhenrui Zhang (2022) discusses the need to establish a framework for the allocation of digital currency. Two existing methods, Proof of Work and Proof of Stake, make this possible. The first method is more widely used by service providers because it does not have a high limit and is more balanced. Artificial intelligence can help improve this method and make the new framework work more efficiently. An AI assistant can monitor the entire transaction process and ensure that the validation is acceptable.

According to a study by Venus S. Jin (2024), AI technology users who are investors in blockchain technologies, cryptocurrencies, and non-fungible tokens (NFTs) have a higher perception of blockchain transparency than non-investors, a higher interest in cryptocurrencies, and a higher perceived value of NFT assets than non-investors. Waseem Nasir and Khalid Hussain, (2024) summarize the areas of AI's impact on cryptocurrency markets through enhancing market efficiency, investment strategies, and user engagement. AI facilitates the valuation, authentication, and personalization of digital assets and makes it easier for users to navigate the complex cryptocurrency market. AI helps strengthen trust and transparency in the cryptocurrency market. It helps in deeper understanding and wider accessibility and adoption of cryptocurrencies.

4.2 Assistance of various open AIs when investing by professional investors

Gioia Arnone (2024) analyzing ChatGPT points out its ability to produce text and its writing is very similar to human. He further explores how Chat GTP, through machine learning and natural language processing, contributes to the user's better understanding of information, as well as to analyzing current market sentiment and interpreting market news. Chat GTP encourages educated decision-making by providing concrete examples from real life.

We asked AI, namely ChatGTP and Deepseek, what specific assistance AI can provide and what advice they can give to professional investors when investing in the cryptocurrency market.

Chat GTP says it can help large investors by providing: advanced analytics and insights in terms of in-depth analysis of the 'tokenomics' of partnership teams and 'use case' scenarios of projects, evaluation of decentralization security and regulatory status of projects, 'on chain' analysis of large capital flows and 'smart money' behavior, then there is technical analysis (identification of key support and resistance levels, trends and patterns on charts). Assistance with more advanced use of indicators (RSI, MACD, Bollinger Bands, Fibonacci levels) and finally analysis of volume and liquidity on CEX and DEX platforms.

'Sentiment' analysis (monitoring social networks and forums - Twitter, Reddit, telegram) to detect trends, analysis of Google searches and interest for specific tokens, fear and greed indices, leverage levels and liquidations. Furthermore, there are appropriate analyses of macroeconomic factors (the relationship between the cryptocurrency market and stocks, bonds, gold and the dollar, the impact of the FED policy and its interest rates and global economic disruptions, the analysis of stablecoins and their impact on market liquidity. Special assistance is provided for risk management strategies. This includes assistance with portfolio diversification and hedging strategies, optimization of the risk-reward ratio and determination of appropriate positions, use of derivatives (futures, options) to protect capital. Finally, it provides access to exclusive data and models (advanced algorithms for prediction or price prediction based on AI models, analysis of data from blockchain explorers and DeFi protocols, on-chain metric analysis (BTC SOPR, MVRV, NUPL, exchange inflows/outflows). Specific advice and more precise analyses regarding a specific token, sector (DeFi, NFT, RWA, AI) or market strategy (ChatGTP, 02. 02. 2025.). Deepseek offers a much wider range of services and analyses than Chat GTP. First of all, there is market and trend analysis (technical, fundamental and sentiment analysis) and they are more or less similar to ChatGTP. Risk management is the next area of AI assistance (portfolio diversification (considering different cryptocurrencies and sectors within the crypto world). ''Stop-loss'' and ''take profit'' orders (protecting capital and locking in profits) and finally there is understanding volatility and helping to prepare for the high volatility characteristic of the crypto market. Legal and regulatory frameworks (information on the current regulatory frameworks in different countries and how they can affect the crypto market.), then tax implications and proper reporting of gains and losses.

Technological insights are the next area where AI helps in understanding the basics of blockchain technology, smart contracts and other technical aspects of cryptocurrencies, Security tips (cryptocurrency storage practices).

A special area is research and education. There is up-to-date information on the latest events, trends and innovations in the world of cryptocurrencies. Educational materials, recommendations of books, articles, courses and other resources for further education on cryptocurrencies and blockchain technologies.

The next area is investment strategies (long-term vs. short-term investment strategies) where Deeepseek helps develop strategies in line with the investor's goals and

risk profiles. Furthermore, there is ICO/IDO analysis, i.e. advice on evaluating initial coin offerings (ICOs) and initial offerings of decentralized exchanges (IDOs).

The seventh point is advice on tools and platforms. First of all, there are recommendations for reliable cryptocurrency trading platforms, taking into account factors such as security, fees and user experience, and finally advice on the best tools for monitoring and managing crypto portfolios.

The last area of assistance is related to trading psychology. It helps with emotional control, primarily by helping the client understand the psychological aspects of trading and how to manage emotions such as fear and greed. It advises on discipline and patience in long-term investments. (Deeepseek, 02.02.2025)

4.3 Open AI help for individual investors when investing in crypto markets

We asked two open AI models, Chat GTP and Deepseek, about the type of help and advice they offer to small individual investors in crypto markets.

When it comes to ChatGTP, there is primarily help in the field of education because small investors, individuals, by nature, are not professionals and are usually financially illiterate, especially when it comes to cryptocurrencies. This includes AI help in explaining about cryptocurrencies on cryptocurrency exchanges and crypto wallets. The next area is investment strategies, the basic ones: HODL, DCA (dollar cost averaging), swing trading. Instructing users on how to recognize potential projects and avoid scams, manage risk and protect their capital. Market analysis is the next area (basics of technical and fundamental analysis, how to use indicators such as RSI, MACD, MA and understanding market cycles and investor psychology). Finally, there are numerous tips such as choosing a safe exchange, basic tools and resources for monitoring the market (CoinGecko, TradingView) and finally reporting scam projects and pump & dump schemes. (ChatGTP 02.02.2025.)

Deepseek provides a wider range of topics and tips that can help small investors navigate the cryptocurrency markets.

Explanations on basic issues related to cryptocurrency and market analysis are similar to ChatGTP. Risk management is related to portfolio diversification, stop-loss and take-profit orders and understanding volatility.

This platform helps small investors choose the appropriate investment strategy such as Holding - long-term holding, Day trading - trading to take advantage of daily fluctuations, and DCA - Dollar-Cost Averaging or regular investment of a fixed amount to reduce the impact volatility.

Deepseek also offers tax and legal advice (reporting cryptocurrency gains depending on the country, and understanding the legal framework and regulatory requirements and legal implications of cryptocurrency trading. This open AI model recommends platforms and tools for monitoring the market.

Trading psychology is a separate area. There are emotional control where it helps to avoid emotional trading under stress and to develop strategic thinking or a disciplined approach to investing.

Ensuring security involves avoiding scams, phishing and fake projects and security practices related to protecting accounts and funds.

Gives insight into learning resources, recommends literature, books, articles and videos for further learning, refers to communities and forums where support and information from other investors can be found. Finally, there is an update on market trends where it helps to follow the news or how to be informed about the latest events and trends in the crypto world and event analysis or how to interpret the impact of major events (e.g. within the framework of regulations, etc.) on the market. (Deepseek 02.02.2025.)

The scope for open AI to assist small investors in the cryptocurrency market is already clear. From this perspective, it is now almost impossible to imagine individuals engaging in investment and cryptocurrency transactions in any sense, whether as a means of payment, speculative investment, or long-term investment, without the help of open AI.

5. CONCLUSION

The very pronounced dynamics of the growth of the use of cryptocurrencies around the world suggests the need to study and better understand their nature and characteristics, as well as the directions and dynamics of their evolution, as well as the institutions that form the infrastructure for their use and regulation. In this paper, we started by defining the true nature and functions of cryptocurrencies. We concluded that their properties provide users with wide opportunities to realize many of their goals and satisfy certain specific user requirements. The numerous goals of very different users on the one hand and the functions that, due to their nature, cryptocurrencies can effectively realize, open up a very wide scope for their use. That is why it is understandable why cryptocurrencies arouse increasing public interest. The possible effects that can be realized through each specific function of cryptocurrencies greatly expand the scope for their use by economic participants. The payment function as the original area where cryptocurrencies were first introduced is a special area and it is not limited only to the transactional motives of the participants who may have various other motivations that point the user to cryptocurrency as the most suitable instrument for achieving their goals (money laundering, tax avoidance, low transaction costs, etc.). It is true that the monetary function, or rather the transactional function of cryptocurrencies, still plays a marginal role in the entire payment system. As an investment instrument, they can best satisfy the speculative motives of the user, given the very high volatility of cryptocurrency prices. As a means of storing value, cryptocurrencies provide the user with an instrument whose value, according to current trends, will ensure long-term growth in the value of his investment. In this sense, although significantly different from gold in its intangible character compared to gold, which is a materialized commodity, cryptocurrencies, given their limited quantity and limited growth, provide long-term growth in the price of cryptocurrencies, which is also reflected in gold as a rare commodity. In countries with high inflation, cryptocurrencies serve as a hedging instrument, or as an instrument that provides financial assets from a decline in the purchasing value of the domestic currency. The use of cryptocurrencies in individual countries is very uneven. It is noticeable that this does not depend directly on the level of income in each country, but rather on certain factors and characteristics of local economies. Somewhere, investment motives for using cryptocurrencies are more pronounced, somewhere transactional, then, somewhere there are more massive

cross-border money transfers that avoid high transaction costs, hedging motives, tax evasion, money laundering, or the use of cryptocurrencies when carrying out illegal or unregistered activities of transactors. The improvement and harmonisation of national and international regulations and the emergence of digital cryptocurrencies of central banks will certainly affect the introduction of more order and discipline in the use of cryptocurrencies and affect the growth of their use. The growth of the use of digital currencies in countries where this has been weak so far will depend on faster adaptation to national and international regulation of these activities, raising the level of financial literacy of citizens and the business sector, and strengthening the level of technical education of the population.

The dominant use of cryptocurrencies as investment assets has led to increasing interest and research into the possibilities and applications of AI and machine learning in cryptocurrency market analysis. The use of AI primarily relates to predicting cryptocurrency price changes and analyzing portfolio management. The use of AI and machine learning is becoming very useful in solving problems of cybersecurity, mining, privacy, and anonymity.

The key usability of AI analysis results relates to protection against market risk and predicting high returns. Research has shown that AI already shows certain advantages over econometric modeling. The advantages of AI are that they control enormous amounts of data, which allows AI to register certain patterns in order to secure trading and mining and limit criminal activities. Particularly attractive are the possibilities of AI to predict short-term evolutions of the cryptocurrency market (price forecasts) and to help with investor portfolio management. AI helps with volatility prediction, portfolio construction and fraud detection. With its help, more advanced investment strategies can be applied compared to, for example, buy and hold strategies.

The specific assistance provided by the open AI models analyzed in our paper, namely Chat GTP and the Chinese Deepseek, refers to a whole range of possible help and assistance when investing in cryptocurrencies or using them in the payment process, in addition to direct advice on which currency to buy, or what and when to invest in. . They leave that choice to the user or the client's financial consultant, which is completely understandable. Open AI provides assistance to professional investors and individual investors, who are assumed to be largely poorly informed or, better yet, financially illiterate. In this way, raising the level of financial literacy of AI users remains a major challenge for them in the future. The use of AI in the segment of investing in cryptocurrencies, as well as for all other investments in the financial market, implies prior education that can be effectively implemented precisely through AI. The key assistance of AI generally relates to portfolio management and risk protection. In cureent situation , it seems, that is becoming impossible to imagine any investment in the cryptocurrency market without the use or support of all forms of AI (open, closed) in all phases of using cryptocurrencies, whether in the process of using them as a payment or investment instrument. For individual investors who are not familiar with the eco-world of cryptocurrencies, serious education with the help of AI is ahead, which can be a very effective instrument for achieving this goal. On the end, the users must be trained to the point of being able to ask the right questions to the Chatbot.

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