A SYSTEMATIC LITERATURE REVIEW ON PERCEPTION, ADOPTION, AND INVESTMENT DECISION-MAKING IN CRYPTOCURRENCY MARKETS: UNVEILING GLOBAL TRENDS AND GAPS

Julija MOSINA, Galina ŠEVČENKO

Department of Financial Engineering, Faculty of Business Management,
Vilnius Gediminas Technical University, Saulėtekio al. 11, LT-10223 Vilnius, Lithuania

Abstract. The research conducts a systematic literature review to critically analyse the complex interrelations among perception, adoption, and investment decision-making in the cryptocurrency markets. The study synthesizes global research findings, highlighting how investor perception and adoption patterns impact investment behaviour. Additionally, the review evaluates the methodologies utilized in existing studies, providing valuable insights into their strengths and limitations. This comprehensive analysis consolidates current knowledge in understanding the mentioned interrelations, identifies key gaps in existing research as numerous aspects remain unexplored and suggests potential directions for future studies, aiming to deepen the understanding of cryptocurrency market dynamics and enhance investment strategies.

Keywords: cryptocurrency perception, cryptocurrency adoption, investment decision-making, behavioural finance, systematic literature review, research methodologies.

JEL Classification: G11, G41, D83.

1. Introduction

The emergence of cryptocurrencies has introduced a significant shift in investment landscapes worldwide. Cryptocurrency as an innovative financial technology and as a digital asset that utilizes blockchain technology for security and operates outside traditional financial systems has attracted substantial interest from investors, regulators, and academic researchers. However, the volatile nature of cryptocurrency markets together with speculative investment behaviour, regulatory uncertainties and the complexity of blockchain technology, presents a set of challenges for investors. These factors make the study of investor perception, adoption patterns, and decision-making processes in cryptocurrency investments particularly important. As cryptocurrencies continue to evolve, understanding these dynamics becomes crucial for investors looking to navigate this new investment tool effectively.

The aim of this research is to conduct a systematic literature review to analyse the complex dynamics between investor perception, adoption, and investment decision-making within the cryptocurrency markets. By critically evaluating existing studies and scientific reports, this review aims to clarify the complex relationships among investor perception, adoption patterns, and investment strategies, synthesizing global research findings to explain how these elements collectively influence investment behaviour in the cryptocurrency sector. Moreover, this study examines the methodologies utilized in these investigations. In doing so, this research aims to provide a comprehensive overview of the state of knowledge in the field, offering insights into the nuances of how cryptocurrencies are perceived, adopted, and utilized as investment tools. This review also seeks not only to summarize the findings of prior research but also to propose directions for future studies that can address the identified gaps and expand our understanding of cryptocurrency market dynamics and to serve as a foundational resource for future researchers, investors, and policymakers.

---

* Corresponding author. E-mail: *galina.sevcenko@vilniustech.lt*

2. Research methodology

This systematic literature review adheres to established protocols for identifying, selecting, and critically evaluating a wide range of academic articles focused on cryptocurrency investment. Methodology is structured around several key phases:

Search strategy: we conducted a comprehensive search of electronic databases, including "Academic Search Ultimate", "Business Source Ultimate", "Computers & Applied Sciences Complete", DOAJ (Directory of Open Access Journals), IEEE/IET Electronic Library, "Science Direct", "Springer Ejournals", "Wiley" Online Library, JSTOR, "Scopus", "Web of Science", "Research Gate", ROAD: Directory of Open Access Journals, "Elsevier" "Science Direct" Journals, EBSCOhost MasterFILE Premier, EBSCOhost Business Source Complete, EBSCOhost Academic Search Complete excluding databases less likely to contain cryptocurrency-related topics. The search was designed to capture a broad spectrum of relevant studies published in 2018–2024, concentrating on those published in 2021–2024. The keywords and phrases used in the search are comprehensive, and cover various combinations thereof related to cryptocurrencies including "cryptocurrency", "cryptocurrencies", "crypto", "cryptocurrency markets", "cryptocurrency investment", "cryptocurrency perception", "cryptocurrency adoption", "cryptocurrency liquidity", "cryptocurrency volatility", "cryptocurrency diversification", "cryptocurrency investment strategies", "cryptocurrency market trends", "cryptocurrency bubbles", "cryptocurrency price", "cryptocurrency portfolio", "cryptocurrency portfolio optimisation", "cryptocurrency sentiment analysis", "cryptocurrency risk management", "cryptocurrency investment decision-making", "cryptocurrency and fundamental analysis", "cryptocurrency and technical analysis", "cryptocurrency portfolio management", "cryptocurrency evaluation", "cryptocurrency regulation", "cryptocurrency tax", "cryptocurrency investment psychology", "behavioural economics and cryptocurrency", "herding behaviour", "fear of missing out", "overconfidence", "cryptocurrency investor sentiment", "cryptocurrency marketing", "cryptocurrency and institutional investors", "cryptocurrency sustainability", "cryptocurrency ethics". To review the frequency and significance of specific keywords in the literature on the discussed topic from 2013 to 2024, refer to Appendix.

Selection criteria: inclusion criteria were defined to select studies that specifically address investor perceptions, adoption of cryptocurrencies, or investment decision-making processes. Both empirical and theoretical studies were considered, provided they offered insights into the methodologies employed or presented findings relevant to the scope of this review. Exclusion criteria included articles not published in English, conference abstracts without full text, and studies not directly related to the investment aspects of cryptocurrencies. Cryptocurrency technologies related articles, cryptocurrency as other than investment instrument related articles, money laundering using cryptocurrencies related articles were also excluded.

Data extraction and analysis: for each selected article, key information was extracted, including the study's objectives, methodology, main findings, and the authors' recommendations for future research. This data extraction process enabled a systematic comparison and synthesis of the literature, highlighting dominant themes, methodological approaches, and identified gaps.

Quality assessment: the methodological quality of each study was assessed using established criteria, focusing on the strength of the research design, the appropriateness of the methods used, and the reliability of the findings. This assessment helped in distinguishing high-quality studies that contribute significantly to the field.

Synthesis of findings: the final phase involved synthesizing the extracted data to identify key trends, common methodologies, and gaps in the existing literature. This synthesis provided the foundation for our recommendations for future research, aimed at addressing identified gaps and advancing the understanding of cryptocurrency investments.

3. Perception and adoption patterns in cryptocurrencies

Between 2019 and 2023 the adoption of cryptocurrencies has seen an exponential increase, with usage growing by hundreds of percent annually, highlighting a significant surge in interest and acceptance of digital currencies worldwide (Statista, 2023). In 2023, the global adoption of cryptocurrencies saw a decline due to a range of economic, regulatory, and technological factors globally. However, there was a notable exception in lower-middle-income countries, where adoption saw growth and resilience. In North America, report data showed reduced crypto activity following the global cryptocurrency exchange "Futures Exchange" (FTX) collapse and a banking crisis impacting key institutions. The pullback was primarily from institutional investors, while smaller professional and retail traders maintained consistent activity (Chainalysis, 2023). The outlook for 2024 suggests a potential uplift in crypto growth, driven by factors like Bitcoin's halving (Chan et al., 2023) and approval of Bitcoin ETFs (Exchange-traded funds), although new European Union regulations and ongoing industry changes introduce a note of caution (Pantaleo & Vianelli, 2024). This scenario shows how the perception of cryptocurrencies, along with the decisions to adopt and invest in them, is deeply affected by the underlying economic, regulatory, and technological landscape. These elements are closely linked, showing the direct connection between external conditions and the internal decision-making processes of individuals and institutions. Economic, regulatory, and technological landscape are not the only factors. In the context of cryptocurrencies perception encompasses investor opinions and impressions on the security, reliability, usability, and potential of cryptocurrencies. The perception of cryptocurrencies is a complex and multifaceted phenomenon, which is shaped and continuously

influenced by various factors, including a wide spectrum of sociodemographic, sociocultural, psychological, behavioural economics, economic, and marketing aspects. These factors together create a complex framework that determines how investors perceive cryptocurrencies and react to market changes. Factors such as age, gender differences, education, profession, and income are crucial in shaping their investment attitudes and risk tolerance. Cultural norms, values, and societal attitudes towards risk and innovation can influence investors' perceptions. Decisions are often influenced not just by rational calculations but also by psychological factors, including emotions, past investment experiences, trust, and habits. Behavioural economics, which examines how psychological, social, and emotional factors affect economic decisions, is particularly important in understanding cryptocurrency investment behaviour. The macroeconomic environment, interest rates, inflation, currency fluctuations, and economic growth also play key role in determining the attractiveness of investment opportunities. The perception of cryptocurrencies as independent decentralized assets is also affected by the overall economic situation and financial market conditions. How cryptocurrencies are presented and marketed also greatly influences their perception. Marketing campaigns, media reports, brand marketing, and market sentiment analysis are important parts of forming perceptions of cryptocurrencies.

Perception plays a crucial role in the adoption process of cryptocurrencies. The adoption of cryptocurrencies describes the process through which individuals, organizations, or societies start to accept, integrate, and use cryptocurrencies as a potential alternative to traditional currency or investment options. The influence of cryptocurrency perception on adoption includes trust as a key factor. If people perceive cryptocurrencies as safe, reliable, and stable, they are more likely to trust and use them. Conversely, if cryptocurrencies are viewed as unsafe or speculative, it can hinder their adoption (Arli et al., 2021). Other factors are – understanding of technology, social pressure, cultural and geographical factors. An individual's ability to understand the technology behind cryptocurrencies, how they work, and their value are directly linked to adoption. If people do not grasp the purpose or benefit of cryptocurrencies, they are unlikely to use those (Arli et al., 2021). Opinions and beliefs about cryptocurrencies are often influenced by social pressure from one's environment (Bozkurt & Akgul, 2023). If an individual observes that cryptocurrencies are popular within their community or social circle, they are more likely to adopt them.

The adoption of cryptocurrencies varies across different cultures and geographies. Governments around the world have taken diverse approaches to cryptocurrency regulation. While some countries have embraced digital currencies by establishing clear regulatory frameworks, others have imposed restrictions or outright bans. The regulatory landscape significantly influences both the adoption rates and the development of crypto-related services in different regions. For example, in countries with unstable currencies and financial systems, cryptocurrencies may be perceived as a safer alternative, affecting the speed of adoption. Contrary example is China, which in 2021, prohibited financial institutions and payment services from handling cryptocurrency transactions to prevent bypassing national currency transfer rules. This action was aimed to foster domestic investment, combat crime, and lower the energy used in cryptocurrency mining (John et al., 2021).

The introduction of taxes on cryptocurrency profits is also shaping investment strategies. Since 2019, nearly all European countries have introduced taxation on cryptocurrency profits (The Law Library of Congress, 2021), with Bulgaria and Moldova (Lazari & Vieru, 2023) being among the latest to do so. This trend towards establishing a legislative framework for cryptocurrencies is not limited to Europe – countries worldwide, including the USA, Unites Kingdom, Argentina, Brazil, Canada, and Australia, have also moved towards regulating and taxing cryptocurrency transactions (The Law Library of Congress, 2021). These tax obligations, including the need to report overseas crypto holdings, add a layer of complexity and potential deterrence for individual investors considering entering the crypto market. Such regulatory environments highlight the balance between encouraging innovation and ensuring market security, but they may also slow down some investors due to the additional compliance efforts required.

MiCAR (The Markets in Crypto-Assets Regulation), which will become applicable in European Union (EU) from June 30 to December 30, represents a significant regulatory development in the EU, aiming to harmonize the approach to crypto-assets across member states (European Securities and Markets Authority, 2023). By providing a clear legal framework, MiCAR is set to influence
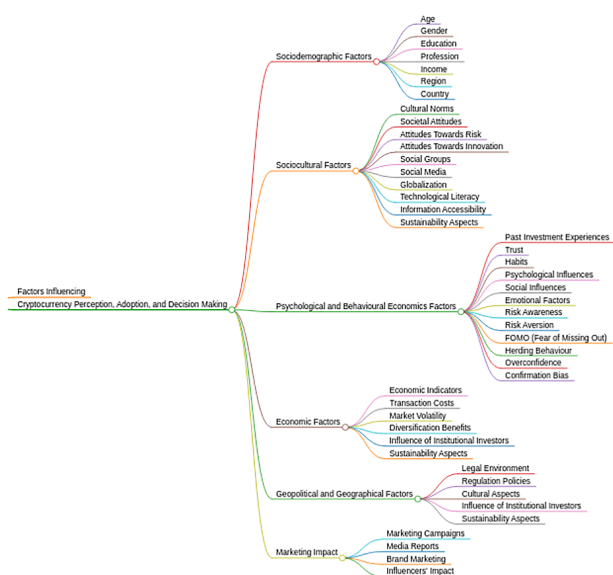

Figure 1. Factors that shape the perception, adoption, and decision-making processes in cryptocurrency (source: compiled by the authors)

both the adoption and decision-making processes of investors and businesses within the cryptocurrency market. It seeks to enhance transparency, security, and trust in crypto-assets, potentially increasing investor confidence and encouraging more informed decision-making. The establishment of uniform rules across the EU could lead to increased adoption by reducing regulatory uncertainty, making it easier for entities to operate across borders. Thus, MiCAR's introduction is poised to significantly impact how cryptocurrencies are perceived, adopted, and utilized, by providing a structured and safer environment for engaging with digital assets. On the other hand, Pantaleo and Vianelli (2024) conducted deep analysis of the document and identified gaps in the guidelines and suggest adjustments, underlining the implications for market participants. Authors claim that while MiCAR aims to enhance market integrity and financial stability by setting requirements for crypto-asset issuers and service providers, challenges remain in achieving uniformity and clarity across the EU, especially regarding the definition of securities and the operational scope for third-country firms. Additionally, research highlights the ongoing need for the adaptation in regulatory approaches to support the evolving crypto-asset market effectively (Pantaleo & Vianelli, 2024).

The following mind-map (Figure 1) provides a detailed visualization of the various factors that shape the perception, adoption, and decision-making processes in cryptocurrency market, giving the insights discussed in this section.

4. Understanding investment decision-making in cryptocurrency markets: evaluating risks, returns, and strategies

In our review, we investigate research papers on how people make decisions about investing in cryptocurrencies, focusing on areas such as understanding the value of cryptocurrencies for individual investors, the unpredictable nature of the market and its potential for growth, along with its tendency for quick price changes and speculative behaviour. We look at different ways investors assess the value of cryptocurrencies, including technical and fundamental analysis, which is crucial given the unique aspects of cryptocurrencies like their complex technology and unclear regulations. Additionally, we address the importance of risk assessment in managing the specific risks associated with the technologically advanced and volatile cryptocurrency market, including regulatory and technological risks, and strategies for effective portfolio management through diversification and position sizing. Understanding the relationship between investment time horizons and expected returns is essential, especially in a market characterized by significant volatility, where short-term and long-term investments can yield vastly different outcomes. Further in this section, we'll look into specific examples showing how people perceive the risks of cryptocurrencies, aim for gains, and consider various elements that affect their choices to invest in cryptocurrencies.

The study by Murugappan et al. (2023) examines how people around the world perceive and use cryptocurrencies, focusing on what drives or deters them from investing in this asset. It finds that the main reasons people invest in cryptocurrencies are due to their potential profitability, novelty, investors' high risk tolerance. The research used a survey to collect opinions from a variety of people, which helped to identify key attitudes towards the use of cryptocurrency for online purchases, savings, and investments, despite widespread uncertainty and a general lack of deep understanding of the technology. The study suggests that future research should include following how these attitudes change over time and should look more deeply into why people feel the way they do about cryptocurrencies, to better understand the evolving dynamics of the cryptocurrency market (Murugappan et al., 2023).

Wongsunopparat and Nanjun (2023) conducted a research aimed to explore the determinants affecting consumer adoption of cryptocurrencies through a structured survey of 400 individuals. The research outlines how convenience, popularity, usefulness, credibility, recommendations, risk, and price stability influence consumer behaviour towards adopting cryptocurrency. According to the research, convenience, with user-friendly interfaces and mobile applications, enhances accessibility and transaction speed, promoting adoption. Popularity, driven by social proof, media coverage, celebrity endorsements, and business acceptance, builds trust and interest. Perceived usefulness and credibility are pivotal for adoption, emphasizing practical benefits and trustworthiness. Recommendations from personal social environment positively impact adoption decisions. However, price stability and risk perceptions are critical, with volatility deterring adoption and perceived risks negatively affecting willingness to engage with cryptocurrencies. Addressing these factors can guide strategies to increase cryptocurrency adoption and usage. Future research is encouraged to examine demographic-specific adoption patterns and the evolving impact of market trends on consumer behaviour. Structural Equation Modeling (SEM) has been employed for data analysis. The value of Cronbach's alpha coefficient has been used to measure the reliability of the survey questionnaire. The methodology's strength lies in its comprehensive use of SEM, which is versatile in examining both observable and unobservable variables, providing a robust framework for understanding complex relationships. This approach enables the detailed analysis of theoretical relationships through a combination of regression and factor analysis. However, the methodology's reliance on fit indices for model evaluation presents a potential weakness, as the lack of standardized criteria for acceptable levels can lead to inconsistencies in assessing model fit (Wongsunopparat & Nanjun, 2023).

Stix's (2021) research examines crypto-asset ownership and purchase intentions among Austrians. It finds

that Austrian crypto-assets owners are motivated by profit expectations and the perceived advantages of crypto-assets for payments. The study uses surveys to analyse socio-economic profiles, financial knowledge, risk tolerance, and trust towards banks among crypto-asset owners and potential adopters. This approach allows for a detailed analysis of the motivations and characteristics of crypto-asset owners and potential adopters. The study's strength lies in its comprehensive data collection, enabling a nuanced understanding of the factors influencing crypto-asset adoption. However, the reliance on survey data might introduce self-reporting biases, and the cross-sectional nature of the study limits the ability to infer causality. The significant association between risk tolerance, technological interest, and crypto-asset ownership is highlighted through statistical analysis, showing that individuals with higher risk tolerance and a keen interest in technology are more likely to own crypto-assets. This link underlines the importance of personal traits and perceptions in the adoption of new financial technologies. The research highlights the limited role of distrust in banks or conventional currencies in driving ownership and suggests that investment and payment utility perceptions significantly influence adoption intentions. Author suggests future research could further explore the underlying factors influencing the adoption of crypto assets, considering the evolving dynamics of the cryptocurrency market (Stix, 2021).

The study by Almeida and Gonçalves (2023) conducts a comprehensive analysis of investor behaviour in the cryptocurrency market, utilizing a systematic literature review of 166 papers. Methodologically, it employs VOSviewer (software tool for constructing and visualizing bibliometric networks) for bibliometric analysis and NVivo (qualitative data analysis (QDA) computer software package) for coding literature findings, offering insights into the sociodemographic characteristics of investors and market inefficiencies. The study's strengths lie in its structured approach and extensive dataset, but it also suggests the potential for bias due to the reliance on published literature and the complexities of investor behaviour not fully captured. The study reveals a trend towards herding behaviour influenced by social factors and market sentiment, highlighting the market's susceptibility to speculative bubbles and the dominance of irrational investment decisions. The study also addresses the impact of volatility, liquidity, and diversification in the cryptocurrency market, highlighting their roles in investor decision-making processes. This comprehensive review also highlights cryptocurrencies' hedging and diversification properties, showing mixed evidence on their effectiveness against various economic uncertainties and markets. For example, it suggests Bitcoin's notable hedging capability against geopolitical risks, economic uncertainties, and during the COVID-19 pandemic, with varying effectiveness over time and under different market conditions. Positive perceptions of these properties can drive adoption, as investors seek to mitigate risks and

improve portfolio performance. Conversely, scepticism or negative findings might deter investment. Thus, the evolving understanding of these properties, reflecting through mixed evidence, shapes investor behaviour and market dynamics, indicates a complex interaction between perception, adoption, and investment decisions in the cryptocurrency markets. The research suggests that investor perceptions of volatility and liquidity risks significantly affect adoption rates and investment decisions, encouraging a more cautious approach to diversification strategies within cryptocurrency portfolios. The research identifies gaps such as the need for a broader demographic study and suggests future exploration into the effects of investor sentiment on market dynamics. The authors suggest future research directions include a deeper investigation into institutional versus retail investor sentiment and the exploration of behavioural biases like optimism and overconfidence in cryptocurrency investments. The researchers also recommended exploring these interrelations, particularly how evolving market conditions might alter investor perceptions and strategies in the face of emerging risks and opportunities (Almeida & Gonçalves, 2023).

Researchers Lestari et al. (2022) conducted a study aimed to explore how various factors such as financial literacy, risk perception, and overconfidence impact cryptocurrency investment decisions, considering investment experience as a moderating variable. The researchers collected data through questionnaires from 200 respondents (Medan, Indonesia) using nonprobability purposive sampling technique and analysed it using multiple linear regression in SPSS (Statistical Software Package for the Social Sciences). The study revealed that financial literacy and risk perception significantly influence cryptocurrency investment decisions, while overconfidence does not have a significant impact. Additionally, investment experience was found to positively affect investment decisions and act as a moderator between financial literacy, risk perception, and investment decisions in cryptocurrency. However, the study notes certain limitations, such as its focus on specific variables and reliance on self-reported data, which may not fully capture the complexity of investor behaviour. The researchers suggest future studies could expand the scope by including investment experience as an independent variable to further understand its role in cryptocurrency investment decisions (Lestari et al., 2022).

While previous case studies focused on miscellaneous determinants and motivations for investing in cryptocurrencies, the further case studies specifically explore the influence of sociodemographic factors such as age and gender on investment decisions.

Age significantly impacts how people decide to invest in cryptocurrencies. Younger investors are generally more willing to try new investment options, including cryptocurrencies, because they're comfortable with digital technology. Older investors often show caution, hesitating due to the high volatility and security concerns

of cryptocurrencies. Yet, there are both young and old enthusiasts eager to explore cryptocurrency investments. Research indicates that cryptocurrency investors are usually younger than those investing in traditional assets (Gagarina et al., 2019; Steinmetz et al., 2021).

Gender differences play a crucial role in how individual investors perceive cryptocurrencies as an investment tool, with traditionally male-dominated financial markets seeing an increasing involvement of women in investing, including in cryptocurrencies. The research conducted by Alonso et al. (2023) provides an in-depth analysis of the disparities in cryptocurrency engagement between genders in Spain. It highlights that women's participation is significantly lower, attributed to their lesser investment experience and a notable lack of knowledge about cryptocurrencies. A particular point of concern for women is the perceived insecurity associated with cryptocurrency investments. The study employs a structured questionnaire designed due the Theory of Planned Behaviour to capture attitudes and perceptions towards cryptocurrencies and examine factors such as age, education, and gender. It uses statistical analyses, such as the Kolmogorov-Smirnov Z statistic, Student's t-test, and Mann-Whitney U test, to ensure the robustness of its findings. Despite these methodological strengths, the reliance on self-reported survey data could introduce biases. Furthermore, the study reveals the complex interrelations between individual perceptions, societal norms, and the decision-making process in cryptocurrency markets, emphasizing the need for targeted educational efforts to mitigate the gender gap by enhancing knowledge and addressing security concerns (Alonso et al., 2023).

In 2021, a survey conducted in the United Kingdom by researcher McMorrow revealed that nearly 40% of cryptocurrency investors were women, despite the belief that most lacked a deep understanding of cryptocurrencies. Consequently, McMorrow concluded that gender does not need to be specifically analysed in the cryptocurrency market (McMorrow & Esfahani, 2021). Despite these trends, it is important to emphasize that gender differences in investing can vary depending on culture, education, experience, and personal values, suggesting that research in this area could be objective in the context of different countries and regions.

Jenita and Rizwan (2022) conducted a comprehensive study to understand the cryptocurrency investment perceptions among salaried employees in Chennai City (India), with a special focus on gender-based differences. Utilizing a descriptive and quantitative approach, the researchers collected data from a diverse group of 300 salaried individuals using the snowball sampling method. The data analysis was carried out using the Statistical Package for the Social Sciences (SPSS) and included the application of the independent sample t-test. The study revealed several insights into how gender influences perceptions of cryptocurrency investments. Both male and female investors were found to prioritize regular income from these investments. Male investors exhibited a more

thorough analysis of financial risks, such as examining price-to-earnings ratios and liquidity aspects, whereas female investors showed a minor concern for political risks, likely due to low political interest. Additionally, the study revealed that female investors tend to invest more cautiously, prioritizing the security of their investments and being motivated by successful examples in cryptocurrency investment. On the other hand, male investors showed greater concern for tax savings. Both genders were found to be keen on understanding the technological risks associated with cryptocurrency investments, recognizing that its productivity is heavily dependent on innovation and advanced technology. Moreover, both male and female investors expressed intentions to use the returns from their cryptocurrency investments for purchasing future assets. However, the research also points out limitations, such as the specific focus on salaried employees in one geographic area, which may not fully represent the broader population's views. The authors suggest a need for further exploration into the factors driving these differences, including studies that encompass a wider range of demographics and geographical locations to gain a more comprehensive understanding of investor behavior in cryptocurrency markets (Jenita & Rizwan, 2022).

4.1. Behavioural finance factors in cryptocurrency investments

Behavioural finance indicates a focus on exploring how psychological influences and cognitive processes impact investment decisions within the cryptocurrency market. This topic is of high importance and offers a rich area for analysis, considering the high volatility and speculative nature of cryptocurrencies. The cryptocurrency market, while technologically advanced, is significantly shaped by the behaviours and psychological patterns of its participants. Market dynamics within this sector can often be attributed to collective psychological behaviours, highlighting the phenomenon of group influence on individual decision-making process (Naeem et al., 2021). Investment decisions within this market are not solely driven by objective analysis. They are also profoundly affected by investors' psychological reactions to changes in market conditions. The phenomenon of Fear of Missing out (FOMO) shows how looking forward to potential profits can quickly increase interest in new cryptocurrencies, causing them to become popular quickly (Ratu Hafishina et al., 2023). In contrast, when market prices drop, fear and worry about losing investments can lead to many investors selling off their holdings (Naeem et al., 2021). The role of media and social media is crucial in shaping what investors expect and the stories they hear, which can alter their objective view of the market (Bozkurt & Akgul, 2023). These emotional factors often lead to the creation of market bubbles or sharp falls in prices (Montasser et al., 2022). Therefore, it's essential for investors to distinguish the real signals of the market from the

noise of collective emotional responses, building strength against the influence of common psychological patterns.

Das et al. (2022) conducted a research on how behavioural finance factors influence the investment decisions of Indian cryptocurrency investors. The analysis highlighted that behavioural finance factors such as herding (investors following the crowd), heuristics (simple decision-making rules), and prospect (evaluation of gains and losses) significantly influence Indian investors' decisions in the cryptocurrency market contributing to market inefficiency and high price volatility. This inefficiency stems from market prices not always reflecting true values. These insights highlight the importance of psychological and behavioural aspects in financial decision-making, especially within the context of emerging and highly volatile markets like cryptocurrencies. The study suggests further investigation of the relationship between exchange rates and cryptocurrencies and the volatility of cryptocurrencies, along with their association with global financial market indices. It also suggests further research of other behavioural factors and their effects across different demographic segments to enhance the comprehension of global cryptocurrency investment behaviours. A quantitative methodology, utilizing snowball sampling was used in this research. Data was analysed through multiple regression analysis with SPSS (Statistical Software Package for the Social Sciences). The methodology's strength lies in its empirical approach to understanding investor behaviour, providing quantitative evidence of the psychological factors at play. However, the reliance on self-reported data through questionnaires and the snowball sampling technique may introduce biases and limit the generalizability of the findings (Das et al., 2022).

4.2. Assessing investment strategies

Different investors see cryptocurrencies in varied ways. For instance, individual and institutional investors use different information resources, investment strategies, and risk management approaches. Table 1 below presents various decision-making models prevalent in cryptocurrency investment.

Experienced and inexperienced individual investors have different opinions on using cryptocurrencies as an investment, and their views are shaped by their experience in the market. This difference is important for understanding the various ways people invest in cryptocurrencies. Inexperienced individual investors often lack knowledge in investing, may make emotional or uninformed decisions, they might follow popular trends without fully understanding them. Their decisions are usually driven by behavioural finance factors. Experienced investors usually adopt a more analytical approach, tend to be more critical, rely on their past successes and failures to make informed decisions. However, they can also be influenced by behavioural finance factors. Institutional investors, such as pension funds and banks, typically invest in cryptocurrencies to diversify their portfolios for the long-term and used detailed analyses.

Table 1. Decision-making models in crypto investment

Model	Key components	Application in crypto investing
Behavioural finance	Heuristics, biases, emotions	Explains irrational behaviours, like FOMO, herding behaviour or panic selling
Fundamental analysis	Economic indicators, market states	Used to assess the intrinsic value of crypto assets
Technical an analysis	Chart patterns, volume, price movements	Used to predict future market behaviours based on past trends
Sentimental analysis	Investor mood, media sentiment, social media trends	Gauges market sentiment to inform buy or sell decisions
Portfolio theory	Diversification, risk-reward	Guides the construction of a balanced crypto asset portfolio
Risk management	Stop-loss orders, position sizing, hedging	Mitigates potential losses in highly volatile crypto markets

Review of the next article will demonstrate a case on how professional investors could decide on their cryptocurrency investments, focusing on the use of ranking systems. For investors aiming to optimize their portfolios by balancing high returns against risks and looking for cryptocurrencies that offer the best diversification benefits when combined with traditional assets.

The study by Juškaitė and Gudelytė-Žilinskienė (2022) offers insight into how professional investors might approach cryptocurrency investment strategies, contrasting with the behaviour-driven decisions of non-professional investors. The authors aimed to select cryptocurrencies ideal for investment and diversification, focusing on the best risk-return mix for portfolios. They evaluated cryptocurrencies listed in the B10 BITA CRYPTO 10 INDEX, considering factors like market capitalization and daily trading volume, which indicate market liquidity. This approach underscores the sophisticated methods professionals use to assess cryptocurrencies, utilizing detailed criteria to determine their investment potential. This methodology, combined with the EDAS (Evaluation based on Distance from Average Solution) method for the analysis of investment opportunities in cryptocurrencies, highlights a comprehensive strategy that balances high returns against high risks, catering to professional investors seeking to optimize their investment portfolios. The study suggests considering all examined cryptocurrencies for portfolio diversification, emphasizing the importance of their investment attractiveness based on ranking and correlation analyses. Specifically, Bitcoin, Ethereum, and Dogecoin were highlighted as viable additions to portfolios aligned with major indices like S&P500 and Euro Stoxx 50. Terra, despite its fifth ranking, was noted for its potential diversification benefits, given its minimal and non-significant correlation with

the analysed stock indices, indicating a strategic diversification option. The research authors although point out the method's reliance on historical data as a limitation and suggests further exploration of additional factors that could impact investment decisions (Juškaitė & Gudelytė-Žilinskienė, 2022).

4.3. Cryptocurrencies sustainability, adoption and investment decision-making

The sustainability of cryptocurrencies has emerged as a critical concern in the digital finance sector, given the significant energy consumption associated with mining activities, particularly for coins like Bitcoin (Makurin, 2023). This issue not only raises environmental concerns due to the carbon emissions related to such operations but also initiates debates on the long-term viability of cryptocurrencies as a green alternative to traditional financial systems. Addressing these sustainability challenges is crucial for the continued adoption and evolution of cryptocurrencies, making it an essential area of study for researchers. In this context, Yin et al.'s (2023) study offers a novel approach to assessing the sustainability of major cryptocurrencies through a sophisticated analytical framework. Utilizing a multiple attribute group decision-making method (MAGDM) with interval-valued Pythagorean fuzzy numbers (IVPFNs), the study provides a more thorough evaluation of cryptocurrencies' sustainability. The methodology's innovative use of fuzzy logic and grey systems theory to handle uncertainty and imprecision in decision-making is a significant contribution to the field. However, the complexity of the fuzzy systems and reliance on expert input may limit its broader applicability. The authors recommend further explore additional factors affecting cryptocurrency sustainability, thereby contributing valuable insights to the discussion on sustainable digital finance practices (Yin et al., 2023).

The method described by Yin et al. (2023) can be interpreted as incorporating variables such as energy consumption, mining cost, and computing power sustainability into a multi-criteria evaluation framework for assessing cryptocurrency sustainability. These factors are critical in determining a cryptocurrency's environmental impact, with energy consumption and mining cost directly influencing the carbon footprint and overall sustainability of digital currencies. Computing power sustainability, meanwhile, addresses the efficiency and environmental impact of the computational resources needed for blockchain operations. Integrating these considerations offers a more comprehensive view of what constitutes a sustainable cryptocurrency, aligning with broader environmental objectives and providing a nuanced approach to evaluating digital currencies' ecological implications.

Another example of sustainability and cryptocurrency adoption and investment behaviour related multi-criteria approach we see in the research conducted by Alqudah et al. (2023). The article reviews the growth and current trends in the sustainability of cryptocurrency

investments, using a bibliometric analysis to identify five main areas of research. It points out the significance of understanding market efficiency, volatility, and risk for investors, underlines the increasing relevance of how cryptocurrencies are accepted and perform financially, and highlights Bitcoin's large market presence potentially overshadowing other digital currencies' worth. The study investigates how sustainability, features of cryptocurrencies, and blockchain technology are interconnected, proposing ways to make digital currencies more eco-friendly. It calls for a broad strategy to grasp the financial behaviours in cryptocurrency, including how investors tend to follow each other. The study suggests a subtle advancement in the research of cryptocurrency sustainability, urging future work to fill the observed gaps. This includes looking into how different consensus algorithms affect sustainability, creating uniform frameworks for evaluation, and examining cryptocurrencies' regulatory, financial, and environmental issues. It outlines both theoretical and practical outcomes, stressing the study's value for investors, policy creators, and academic circles, and recommends ways toward developing more sustainable cryptocurrency practices and a better grasp of market behaviours and investor decisions. (Alqudah et al., 2023).

4.4. Impact of institutional investors on cryptocurrency adoption and investment decision-making

The involvement of institutional investors in cryptocurrencies significantly impacts decision-making for several reasons. Institutional investors bring in large amounts of capital, which can increase the market's liquidity and potentially stabilize prices. Moreover, institutional investors typically have access to sophisticated analysis and risk management tools, influencing market trends and investor sentiment. However, their involvement can also lead to market manipulation concerns and increased volatility due to large-scale trades.

There has been a noticeable increase in institutional investment in cryptocurrencies, with more hedge funds, financial institutions, and corporations adding digital assets to their portfolios (Macheel, 2023). This trend indicates growing acceptance and legitimization of cryptocurrencies within the traditional financial system. For instance, in October 2023, Fidelity, US financial services company managing $4.5 trillion in assets, published a report "Bitcoin First Revisited" discussing the prospects of Bitcoin as an investment instrument. The report underscores Bitcoin's monetary advantages and its role as an initial step towards investing in cryptocurrencies, lending more weight to the choice of Bitcoin as an investment instrument (Etoro, 2023). Furthermore, some of the world's largest banks have begun offering services related to the custody, trading, and investment of cryptocurrencies. For example, one of Brazil's four largest banks initiated financial services related to cryptocurrencies, resulting in a 70% surge in Bitcoin holdings in Brazil within just a few months (Ng & Arslanian, 2022). JP Morgan Chase,

a leading global bank, started providing cryptocurrency custody and trading services in 2022, demonstrating their confidence and commitment to the market. This not only makes cryptocurrencies more accepted in the investment community but also opens up the market to a wider group of both institutional and private investors, promoting its growth and leading to a more stable environment for investment. In addition, the launch of Spot Bitcoin Exchange Traded Funds (ETFs) in the US market in January 2024 represented a significant development. These ETFs experienced high trading volumes and net inflows, about $1.5 billion in total, demonstrating widespread investor interest. After their debut on January 11, the Spot Bitcoin ETFs have maintained average daily trading volumes of $2.1 billion. This performance aligns them with leading products in the US equity and bond markets regarding trading activity. The successful introduction of the Spot Bitcoin ETFs reflects a strong preference among investors and financial advisors for the convenience and liquidity this product structure offers, further establishing Bitcoin's presence in the global financial market (Grayscale, 2024). On the other hand, recently The European Central Bank (ECB) expressed caution and scepticism towards Bitcoin, especially in the context of its recent ETF approval, emphasizing the speculative nature of Bitcoin and questioning its sustainability without economic fundamentals or a fair value basis. The ECB warns of the social and environmental risks associated with Bitcoin's speculative bubble, highlighting the lack of effective measures against money laundering, cybercrime, and the potential financial losses for less educated investors. Despite the temporary rally fuelled by structural reasons such as market manipulation, demand as a "currency of crime", and regulatory shortcomings, the ECB declares that Bitcoin's fair value is zero, challenging the notion of its safety and investment viability. This perspective emphasizes the ECB's concern over the speculative dynamics of Bitcoin, the environmental impact of its mining, and the broader social implications of its volatility (Bindseil & Schaaf, 2024). ECB's scepticism and caution towards Bitcoin, along with its emphasis on the speculative nature and lack of fundamental economic support, could be interpreted as the immaturity of the cryptocurrency market.

5. Systematic and structured presentation of interrelations in cryptocurrency perception, adoption and decision-making emphasising the impact of factors and environment

Table 2 shows how perception, adoption, and decision-making processes related to cryptocurrencies vary based on the age, gender, education, profession, and income of investors.

Table 3 shows the ways in which an investor's psychological statement and behavioural tendencies impact their engagement with the cryptocurrency market.

Table 4 outlines the economic considerations that play a significant role in how individuals perceive and engage with the cryptocurrency market, from the macroeconomic context to the specific investment environment.

Table 5 explains how geopolitical and geographical contexts shape the way cryptocurrencies are perceived, adopted, and integrated into decision-making processes, highlighting interrelations between local and global influences.

Table 6 examines the impact of marketing efforts and public communication on the ways in which cryptocurrencies are perceived, adopted, and integrated into investment strategies, underscoring the crucial role of sharing information and group behaviour.

Table 2. Investors' demographics and its impact on cryptocurrency perception, adoption, and decision-making in cryptocurrency, markets (source: compiled by the authors)

Investors' demographics	Impact on perception	Impact on adoption	Impact on decision-making
Age – the generational differences in familiarity and trust in cryptocurrencies.	Younger tend to be more open to adopting new technologies, including cryptocurrencies, viewing them as innovative and potentially beneficial. Older generations may be more sceptical due to perceived risks and a lack of understanding.	Adoption is higher among younger individuals who are more informed about technological advancement. Older individuals may be more cautious, preferring traditional investments.	Younger investors may prefer aggressive, high-risk strategies, while older investors prioritize security and may be conservative in their approach.
Gender – the influence of gender on financial behaviour and risk tolerance.	Men may view cryptocurrencies as a new opportunity in technology and investments, whereas women may be more cautious.	Men might adopt cryptocurrency more rapidly due to a higher risk tolerance, women's adoption rates are increasing as the market matures and becomes more accessible.	Men might engage in more frequent trading based on market trends, women might focus on long-term investments and stability.
Education – the level of education affecting understanding, perception of cryptocurrencies.	Higher levels of education can lead to a more comprehensive understanding of cryptocurrencies, fostering a more favourable perception of their potential.	Individuals with higher education are more likely to adopt cryptocurrencies. Less educated have limited access to technology.	Decision-making in highly educated individuals tends to be more analytical and data-driven, with a focus on long-term trends and fundamentals.

Investors' demographics	Impact on perception	Impact on adoption	Impact on decision-making
Profession – the correlation between one's profession and knowledge of cryptocurrencies.	Professionals in computer technology and finance may have a more positive perception due to direct applicability.	Professional backgrounds related to technology and finance related to higher rates of adoption due to a better understanding of potential benefits.	Investment decisions may be influenced by professional expertise, with tech and finance professionals likely using cryptocurrencies for diversification and due to innovation.
Income – the funds to invest and experiment with new forms of investments like cryptocurrencies.	Individuals with higher income may perceive cryptocurrencies as a diversification strategy, whereas those with lower income may view it as inaccessible or too risky.	Higher-income individuals may adopt cryptocurrencies as part of a broader investment portfolio, while lower-income individuals might be cautious due to limited disposable income.	Income levels can influence the amount and frequency of investment in cryptocurrencies, with wealthier individuals potentially allocating more funds to crypto investments.
Country/Regional economic stability, regulatory environment, cultural attitudes towards crypto.	In regions with favourable regulations and a high-tech culture, perception is likely to be positive. In regions with restrictions, perception could be negative.	Adoption is facilitated in regions with supportive regulations and hindered where the legal framework is unclear or unfavourable.	Decision-making is heavily influenced by regional factors; in supportive regions, individuals may invest more confidently, while in others, they may be deterred by regulatory risks.

Table 3. Investor psychology and behavior impacts on cryptocurrency perception, adoption and investment decisions (source: compiled by the authors)

Investor psychology and behaviour	Impact on perception	Impact on adoption	Impact on decision-making
Trust – the level of trust in the crypto market's stability and growth potential.	A strong trust can lead to a more favourable view and openness to cryptocurrency as a valid investment. While scepticism arises from market volatility and regulatory uncertainty.	Trust in the system and its security can significantly increase the likelihood of cryptocurrency adoption, while mistrust can deter potential users.	Investment decisions are heavily influenced by trust; trusted currencies and platforms see more investment.
Risk aversion – the higher is risk aversion, the lesser is risk tolerance.	High-risk aversion leads to a sceptical perception of cryptocurrencies, often seen as too volatile and uncertain.	Risk-averse individuals tend to be cautious and may delay or avoid adopting cryptocurrencies due to their volatile nature.	Decisions made by risk-averse individuals often favor more traditional and perceived safer investments over cryptocurrencies.
Past investment experiences – previous successes or failures in investments.	Investors with positive past experiences in investments, including cryptocurrencies, are likely to have a more optimistic perception, while negative past experiences could lead to avoiding the cryptocurrencies.	A history of positive investment outcomes can encourage further adoption of cryptocurrencies, while negative outcomes may cause hesitancy.	Investors often rely on their past experiences to guide future investment decisions, repeating strategies that were successful and avoiding those that were not.
Habits – established patterns of financial behaviour.	Long-standing habits of traditional investment can create resistance to the relatively new and complex nature of cryptocurrencies.	Habitual reliance on traditional financial systems may impede the adoption of cryptocurrencies, which requires a shift in investment behaviour.	Investment habits shape the choice of asset classes, with those habituated to diversification more likely to include cryptocurrencies in their portfolios.
Social influences – the impact of friends and societal trends on individual decisions.	Endorsements or criticisms from social environment can significantly shape one's perception of cryptocurrencies, either as a legitimate investment or a speculative risk.	The likelihood of adopting cryptocurrencies can increase in environments where friends or influencers support for their use.	Individuals influenced by social factors may base their investment decisions on the prevailing attitudes within their social circles or those held by individuals they respect.
Emotional factors – emotional reactions to market trends or investment outcomes.	Emotional responses to the highs and lows of the market can heavily influence perception, with excitement heightening interest and fear inducing scepticism.	Emotional reactions, such as the fear of missing out (FOMO), can drive rapid adoption during market surges, whereas panic can lead to sudden withdrawals.	Emotions can overwhelm analytical decision-making, leading to impulsive choices like buying during hype or selling in a crash.

Investor psychology and behaviour	Impact on perception	Impact on adoption	Impact on decision-making
Cognitive biases – the influence of systematic errors in thinking on financial decisions.	Cognitive biases can lead to distorted perceptions, such as overestimating the potential of cryptocurrencies based on recent trends.	Biases like herding behaviour can prompt individuals to adopt cryptocurrencies simply because others are doing so.	Decision-making can be skewed by biases, such as confirmation bias, leading investors to favour information that supports their preconceived notions about cryptocurrencies.

Table 4. Economic considerations related to cryptocurrency perception, adoption and decision-making (source: compiled by the authors)

Economic considerations	Impact on perception	Impact on adoption	Impact on decision-making
Economic indicators – macro-level economic metrics such as GDP, inflation rates, and employment statistics.	Positive economic indicators may enhance the credibility of cryptocurrencies as a growth sector, while negative indicators can magnify perceived risks and lead to scepticism.	Strong economic performance can boost confidence and increase adoption rates, as investors look to diversify in booming markets. Conversely, economic downturns may also drive adoption as a hedge against instability.	Investors may adjust their crypto investment strategies based on macroeconomic indicators, allocating more funds during times of economic growth or using crypto as a hedge during downturns.
Market volatility – the frequency and extent of price fluctuations in cryptocurrency markets.	High volatility of cryptocurrency market is often perceived as a risk and a chance for substantial gains, affecting the overall appeal of cryptocurrencies.	Some investors are attracted to volatility for potential high returns, leading to increased adoption, while others may be deterred by the risks involved.	Investment decisions may involve strategies to capitalize on or protect against volatility, such as timing the market or diversifying investments.
Transaction costs – the expenses associated with buying, selling, or transferring cryptocurrencies.	Lower transaction costs can enhance the perception of cryptocurrencies as efficient and accessible, while high costs can be discouraging.	The adoption of cryptocurrencies is more favorable when transaction costs are low, enabling frequent trading and investment activities.	Consideration of transaction costs is crucial in investment decision-making, particularly for those engaging in high-frequency trading or international transactions.
Market liquidity – the ease with which cryptocurrencies can be bought or sold without affecting the market price.	High liquidity is often associated with a mature and stable market, which can improve the perception of cryptocurrencies.	Greater market liquidity tends to encourage adoption, as it implies ease of entry and exit for investors.	Liquidity issues significantly affect investment decisions; more liquidity leads to larger investments, while less advises caution. Liquidity varies among various cryptocurrencies.
Diversification benefits – the role of cryptocurrencies in spreading investment risk across various assets.	The potential for non-correlated asset classes can improve the perception of cryptocurrencies as a diversification tool.	Adoption is likely to increase among those looking to diversify their investment portfolio to manage risk.	The decision to invest in cryptocurrencies often considers the diversification benefits, especially for investors looking to optimize their risk-return profile.
Influence of institutional investors – The participation of institutional investors in the crypto market.	The involvement of institutional investors often validates cryptocurrencies as a legitimate asset class, improving public perception.	The entry of institutional investors can serve as a catalyst for wider adoption, as it signals market maturity and stability.	Institutional behaviour, such as significant investments or the creation of cryptocurrency funds, can influence individual decision-making, signalling confidence in the market.

Table 5. Geopolitical, geographical contexts shaping cryptocurrency perception, adoption and investment decisions (source: compiled by the authors)

Geopolitical and geographical contexts	Impact on perception	Impact on adoption	Impact on decision-making
Regulatory environment.	Positive regulatory environments can enhance the legitimacy and perceived safety of cryptocurrencies, encouraging a favorable view. Conversely, strict or unclear regulations can foster scepticism and concern.	Adoption rates are significantly higher in regions with clear, supportive cryptocurrency regulations, as legal clarity provides a sense of security for investors. Regions with restrictive policies see slower adoption due to legal risks.	Regulatory considerations are of high importance in investment decisions. Investors often weigh the legal landscape, choosing to engage more in jurisdictions with supportive legal frameworks.
Economic stability – the overall economic health and stability of a region or country.	In regions experiencing economic instability or inflation, cryptocurrencies might be perceived as a viable alternative to traditional financial systems, offering a hedge against economic uncertainty. Stable economies might view them as less essential.	Adoption tends to be higher in economies facing financial instability, where cryptocurrencies are seen as a way to preserve value. In stable economies, adoption may be driven more by speculative interest or investment diversification.	Economic stability influences decision-making, with investors in unstable regions more likely to allocate a part of their portfolio to cryptocurrencies as a protective measure.
Geopolitical tensions – the impact of international relations and conflicts on financial decisions.	Geopolitical uncertainties can lead to increased interest in cryptocurrencies as decentralized and borderless assets, seen as less susceptible to government control and sanctions.	Adoption can spike in regions experiencing geopolitical tensions, as individuals and businesses look for ways to bypass financial restrictions and preserve capital.	Investors may consider geopolitical risks in their decision-making process, potentially turning to cryptocurrencies as a safe haven or for transactional freedom.
Access to technology – the availability and quality of technological infrastructure, including internet access	Regions with high technology adoption and well developed internet infrastructure tend to have a more positive perception of cryptocurrencies, seen as another facet of technological advancement.	High technology access directly correlates with higher cryptocurrency adoption rates, as it facilitates access to exchanges, wallets, and information.	The level of technological access influences investment decisions, with better-connected investors more likely to engage with and invest in cryptocurrencies.
Cultural attitudes – societal views and cultural openness to innovations and digital financial solutions.	Cultures that are generally open to innovation and have a positive stance towards digital finance are more likely to perceive cryptocurrencies positively. Conservative cultures may view them with suspicion.	Cultural receptiveness to new technologies plays a crucial role in the adoption of cryptocurrencies. Societies with a predisposition towards technological and financial innovations adopt cryptocurrencies more readily.	Cultural attitudes influence individual and collective decision-making, with more tech-embracing cultures showing a higher willingness to invest in cryptocurrencies.
Cross-border transactions – the need for and frequency of international financial transactions.	In regions where cross-border transactions are common and necessary, cryptocurrencies might be perceived as a practical solution to reduce transaction costs and time.	Adoption is particularly high among users and businesses that frequently engage in international transactions, valuing the efficiency and lower costs offered by cryptocurrencies.	The decision to invest in or use cryptocurrencies is strongly influenced by the utility they provide for cross-border transactions, with those benefiting from these advantages more likely to adopt.

Table 6. Impact of marketing implementation on cryptocurrency perception, adoption and investment decisions (source: compiled by the authors)

Marketing implementation	Impact on perception	Impact on adoption	Impact on decision-making
Media coverage – the nature and sentiment of news and reports about cryptocurrencies.	Positive media sentiment can significantly enhance the attractiveness and legitimacy of cryptocurrencies, promoting interest and optimism. Negative news can induce fear, uncertainty, and doubt, reducing their perceived value.	Extensive and favorable media coverage can lead to increased public awareness and adoption, as it often serves as the primary information source for potential investors.	Positive news might encourage buying or holding, while negative reports can trigger sell-offs or discourage entry into the market.
Social media influence – the role of influencers and social media platforms in shaping opinions about cryptocurrencies.	Influencers and social platforms can rapidly impact public opinion on cryptocurrencies, with endorsements and positive discussions generating enthusiasm, and criticism or scams causing scepticism.	Social media influencers and platforms significantly impact cryptocurrency adoption by shaping public opinions and attitudes toward digital currencies.	Investors frequently turn to social media for insights and trends, allowing influencer opinions and viral content to heavily impact decision-making processes, including timing and choice of investments.
Advertising campaigns – the impact of targeted advertising campaigns by cryptocurrency companies and platforms.	Targeted advertising campaigns by cryptocurrency companies effectively shift public perception by emphasizing the innovative aspects and potential financial returns of digital currencies, making them more appealing to a broader audience.	Advertising campaigns play a crucial role in driving adoption, as they not only raise awareness but also demystify cryptocurrencies for potential users, encouraging them to explore and engage with digital currencies.	Advertising can lead to a dual effect on investment decision-making: on one hand, it can educate potential investors about the opportunities within the cryptocurrency market. On the other hand, it can contribute to speculative behavior, too optimistic views without a full understanding of the risks involved.

Table 7. Cryptocurrency perception, adoption and investment decision-making by investor type (source: compiled by the authors)

Investor type	Perception	Adoption	Decision-making process
Professional individual investors	Often view cryptocurrencies as a valuable component of a diversified investment portfolio. Their perception is shaped by a deep understanding of market dynamics and the technological advancements of digital currencies. Strong trust based on understanding of the technology and market history.	Adoption among professionals is strategic, with investments carefully chosen based on thorough analysis and how well they fit into their overall investment strategy.	Decision-making is highly analytical, relying on fundamental and technical analysis, market trends, and the potential for integration with existing assets. Risk management is important, with strategies in place to mitigate losses and capitalize on gains. Less emotional reaction to market changes, awareness of cyclical patterns. They are likely to use cryptocurrencies for both short-term trading and long-term holding, depending on their investment goals.
Non-professional individual investors	Perception can vary widely but is often influenced by media, social networks. Trust often influenced by external opinions and the perceived popularity of crypto. Some see cryptocurrencies as an opportunity for quick gains, while others are concerned about volatility and risk.	Adoption is more likely to be influenced by trends and the fear of missing out (FOMO).	Decision-making may be less structured, with decisions often based on emotional reactions to market movements, tips from social media. There is typically less focus on risk management and more on potential rewards. Non-professionals might invest in cryptocurrencies without a clear strategy.
Institutional investors	Generally cautious, with a growing interest as the market matures. Perception is based on comprehensive market analysis, the regulatory landscape, and the potential for cryptocurrencies to offer non-correlated returns.	Adoption is methodical, investments often made through specialized funds or as part of broader asset diversification.	The process of making investment decisions is methodical, requiring deep research, consideration of legal frameworks, and a detailed analysis of potential risks. Such decisions are typically approached with an eye toward the future, prioritizing the likelihood of market expansion, shifts in regulatory landscapes, and how well digital currencies can complement existing financial portfolios.

Table 7 highlights the distinct approaches and considerations that professional individual investors, non-professional individual investors, and institutional investors bring to their engagement with cryptocurrencies. Each group's unique perspective and strategy underscore the diverse nature of the cryptocurrency investment landscape.

6. Conclusions

Cryptocurrency perception and adoption. Overall, perception, adoption, and investment decision-making are strongly influenced by information from media and social networks, legal environment, the depth of understanding of technology, emotional reactions, personal experience, financial literacy, as well as sociodemographic and geographic factors. The adoption process of cryptocurrencies is closely linked with perception, forming a relationship where perception drives adoption, and adoption can influence perception. It's crucial for investors, businesses, and regulatory authorities to understand this interconnection to better integrate cryptocurrencies into the economy and society. Cryptocurrency adoption is driven by several key factors: awareness and financial literacy boost confidence and market participation; regulatory clarity encourages adoption, while uncertainty can deter it. Economic instability may drive people towards cryptocurrencies for security, whereas stability reduces urgency. Social endorsement and market sentiment also influence adoption rates. Furthermore, easy access to trading platforms promotes adoption, emphasizing the need for simplicity in technology use. These factors together create a dynamic environment shaping the path of cryptocurrency acceptance.

Investor perspectives and strategies. The cryptocurrency investment landscape is shaped by the diverse perspectives and strategies of various investor types. While non-professional investors' decisions in cryptocurrency investments are mostly influenced by behavioural economics factors, professional investors often utilize a variety of tools, methods, and theories to include cryptocurrencies into their investment portfolios. Understanding these distinctions is crucial for analysing how different investors make decisions and how these choices affect the market's overall behaviour.

Environmental concerns, institutional investments and regulatory challenges. The high energy use of cryptocurrency mining raises environmental concerns and questions about its sustainability, emphasizing the importance of addressing these issues for its future adoption and development.

The rise in institutional investment in cryptocurrencies and the approval of cryptocurrency ETFs highlight a significant move towards their acceptance and integration into the traditional financial ecosystem. However, the ECB's concerns about the speculative bubble, environmental impact, and potential for social harm underscore the market's developmental challenges and regulatory uncertainties. In summary, despite the attractiveness of cryptocurrencies, the market of this asset is still evolving. As regulations are just starting to emerge, it's important for investors to carefully consider their decisions in cryptocurrency investments, taking into account how they perceive and adopt these digital assets.

Methodological Approaches in Cryptocurrency Research and Advanced Analytical Techniques. Cryptocurrency research encompasses a wide range of methodologies, each chosen based on the specific questions. Qualitative and quantitative approaches, including surveys and interviews, provide insights into user behaviours, perceptions, and regulatory impacts, while mixed-method studies aim to offer a more comprehensive understanding by combining these approaches. The application of diverse methodological approaches, including the Theory of Planned Behaviour (TPB), the Unified Theory of Acceptance and Use of Technology (UTAUT), and potentially the Diffusion of Innovations (DOI), enriches our understanding of cryptocurrency adoption. However, the current research landscape reveals gaps, particularly in applying the Diffusion of Innovations (DOI), signalling opportunities for further exploration and contribution. The use of advanced analytical techniques like the Multiple Attribute Group Decision-Making (MAGDM) and the Evaluation based on Distance from Average Solution (EDAS) method in cryptocurrency research demonstrates a trend towards more sophisticated analysis. These methods offer deeper insights into the complexities of the market, supporting more informed decision-making and strategy development.

7. Suggestions for future research

Future research should explore the complex effects of technological advancements in blockchain on the security, adoption, and efficiency of cryptocurrencies. Analysing market sentiment to understand how psychological and social factors shape investor behaviour, through methods like social media sentiment analysis, is also essential. Furthermore, examining the relationship between economic indicators and cryptocurrency market movements is crucial for identifying potential strategic advantages. The significance of cybersecurity on investor confidence, especially following breaches and fraud, is another important area for investigation. Studies should also assess the connections between cryptocurrencies and traditional asset classes across different market conditions, offering insights into their potential for portfolio diversification. Considering the environmental impact of cryptocurrency mining and its influence on public and investor attitudes is increasingly important, underscoring the need for eco-friendly practices in digital finance. In addition to the previously outlined areas, future research should also consider the nuanced effects of legislation and taxation on investor decision-making in the cryptocurrency investment. Understanding how these regulatory aspects influence both market dynamics and

investor strategies is essential. The role of institutional investments deserves attention, specifically their impact on the behaviour and decision-making processes of individual investors. This exploration could reveal insights into market sentiment and potential shifts in investment patterns. Moreover, developing new methods for evaluating portfolio efficiency that incorporate cryptocurrencies is timely. Such methodologies would address the unique volatility and risk-reward profiles of digital assets, offering investors up-to-date tools for portfolio management. Lastly, with the emergence of cryptocurrency ETFs, there is a need for studies that assess their influence on the broader market and investment strategies. Investigating these ETFs could provide valuable perspectives on how traditional financial products are adapting to include cryptocurrencies, potentially transforming investment strategies and investor approaches.

Evaluating the methodologies of cryptocurrency research reveals both the progress made and the challenges that lie ahead. As the field continues to evolve, so must the approaches used to study it. To overcome these challenges, future research must prioritize the development of interdisciplinary methodologies that can adapt to the fast evolution of cryptocurrencies. Collaborations between computer scientists, economists, and scholars could foster the creation of comprehensive research frameworks. There is also a need for standardized data collection and analysis protocols to enhance the comparability and reliability of research findings.

Acknowledgements

Disclosure statement

Authors declare that they do not have any known competing financial, professional, or personal interests from other parties.

References

Almeida, J., & Gonçalves, T. C. (2023). A systematic literature review of investor behavior in the cryptocurrency markets. *Journal of Behavioral and Experimental Finance*, *37*, Article 100785. https://doi.org/10.1016/j.jbef.2022.100785

Alonso, S. L. N., Jorge-Vázquez, J., Rodríguez, P. A., & Hernández, B. M. S. (2023). Gender gap in the ownership and use of cryptocurrencies: Empirical evidence from Spain. *Journal of Open Innovation*, *9*(3), Article 100103. https://doi.org/10.1016/j.joitmc.2023.100103

Alqudah, M., Ferruz, L., Martín, E., Qudah, H., & Hamdan, F. (2023). The sustainability of investing in cryptocurrencies: A bibliometric analysis of research trends. *International Journal of Financial Studies*, *11*(3), Article 93. https://doi.org/10.3390/ijfs11030093

Arli, D., van Esch, P., Bakpayev, M., & Laurence, A. (2021). Do consumers really trust cryptocurrencies? *Marketing Intelligence & Planning*, *39*(1), 74–90. https://doi.org/10.1108/MIP-01-2020-0036

Bindseil, U., & Schaaf, J. (2024). *ETP approval for bitcoin – the naked emperor's clothes.* The European Central Bank. https://www.ecb.europa.eu/press/blog/date/2024/html/ecb.blog20240222~0929f86e23.en.html

Bozkurt, G., & Akgul, I. (2023). Is cryptocurrency technology adoption effective in individuals' investment behavior? *Iranian Journal of Management Studies*, *16*(2), 375–393. https://doi.org/10.22059/ijms.2022.337741.674917

Chainalysis. (2023). *The 2023 geography of cryptocurrency report.* https://go.chainalysis.com/geography-of-cryptocurrency-2023.html

Chan, J. Y.-L., Phoong, S. W., Phoong, S. Y., Cheng, W. K., & Chen, Y.-L. (2023). The bitcoin halving cycle volatility dynamics and safe haven-hedge properties: A MSGARCH approach. *Mathematics*, *11*(3), Article 698. https://doi.org/10.3390/math11030698

Das, S., Ahmed, S. S., & Pachoni, P. (2022). Behavioral finance in cryptocurrency market: An integrated and empirical investigation. *Central European Management Journal*, 30(3), 1313–1323.

Etoro. (2023). *Fidelity report makes case for BTC as an investment. Weekly Crypto Roundup.* https://www.etoro.com/news-and-analysis/crypto/fidelity-report-makes-case-for-btc-as-an-investment/

European Securities and Markets Authority (2023). *Markets and crypto-assets regulation (MiCA).* https://www.esma.europa.eu/esmas-activities/digital-finance-and-innovation/markets-crypto-assets-regulation-mica

Gagarina, M., Nestik, T., & Drobysheva, T. (2019). Social and psychological predictors of youths' attitudes to cryptocurrency. *Behavioral Sciences*, *9*(12), Article 118. https://doi.org/10.3390/bs9120118

Grayscale. (2024). *January 2024: The debut of spot bitcoin ETFs.* Grayscale Investments. https://www.grayscale.com/research/market-commentary/january-2024-the-debut-of-spot-bitcoin-etfs

Jenita, A. M. A., & Rizwan K., F. (2022). A study on the perception of crypto currency investment among salaried employees in Chennai city with special reference based on gender. *Journal of Positive School Psychology, 6*(6), 7733–7741.
https://journalppw.com/index.php/jpsp/article/view/8943/5835

John, A., Shen, S., & Wilson, T. (2021, Sep-tember 24). China's top regulators ban crypto trading and mining, sending bitcoin tumbling. *Reuters.* https://www.reuters.com/world/china/china-central-bank-vows-crackdown-cryptocurrency-trading-2021-09-24/

Juškaitė, L., & Gudelytė-Žilinskienė, L. (2022). Investigation of the feasibility of including different cryptocurrencies in the investment portfolio for its diversification. *Business, Management and Economics Engineering*, *20*(1), 172–188. https://doi.org/10.3846/bmee.2022.16883

Lazari, L., & Vieru, R. (2023). Tax on income obtained from cryptocurrency transactions. *Journal of Research on Trade, Management and Economic Development*, 10(1), 112–123.
https://ibn.idsi.md/sites/default/files/imag_file/112-123_0.pdf

Lestari, D., Sadalia, I., & Silalahi, A. (2022). The effect of financial literacy, risk perception, overconfidence, and investment experience on cryptocurrency investment decision. *In Pro-*

ceedings of the 19th International Symposium on Management (INSYMA 2022) (pp. 158–164). Atlantis Press. https://doi.org/10.2991/978-94-6463-008-4_21

Macheel, T. (2023, May 8). Institutional interest in crypto is "maturing", says Cantor Fitzgerald's Han. *Crypto World*. https://www.cnbc.com/2023/05/08/institutional-interest-in-crypto-is-maturing-says-cantors-han.html

Makurin, A. (2023). Technological aspects and environmental consequences of mining encryption. *Economics Ecology Socium*, *7*, 61–70.
https://doi.org/10.31520/2616-7107/2023.7.1-6

McMorrow, J., & Esfahani, M. S. (2021). An exploration into people's perception and intention on using cryptocurrencies. *Holistica: Journal of Business and Public Administration*, *12*(2), 109–144. https://doi.org/10.2478/hjbpa-2021-0018

Montasser, G. El, Charfeddine, L., & Benhamed, A. (2022). COVID-19, cryptocurrencies bubbles and digital market efficiency: Sensitivity and similarity analysis. *Finance Research Letters*, *46*, Article 102362.
https://doi.org/10.1016/j.frl.2021.102362

Murugappan, M., Nair, R., & Krishnan, S. (2023). Global market perceptions of cryptocurrency and the use of cryptocurrency by consumers: A pilot study. *Journal of Theoretical and Applied Electronic Commerce Research*, *18*(4), 1955–1970. https://doi.org/10.3390/jtaer18040098

Naeem, M. A., Mbarki, I., & Shahzad, S. J. H. (2021). Predictive role of online investor sentiment for cryptocurrency market: Evidence from happiness and fears. *International Review of Economics & Finance*, *73*, 496–514.
https://doi.org/10.1016/j.iref.2021.01.008

Ng, A., & Arslanian, H. (2022). *Webinar on crypto-assets: Latest developments and regulatory implications* [Video]. YouTube. https://www.iosco.org.my/news-media/webcasts-podcasts

Pantaleo, A. & Vianelli, A. (2024). (Regulatory) history in the making: The path to MiCAR. *SSRN*.
http://doi.org/10.2139/ssrn.4714854

Ratu Hafishina, A. D., Abraham, J., Spits Warnars, H. L. H., Hartono Manurung, R., & Nainggolan, T. (2023). Disrupting Money: Psychological Factors of Investment Biases in Cryptocurrency. *TEM Journal*, *12*(1), 482–493.
https://doi.org/10.18421/TEM121-58

Statista. (2023). *Share of respondents who indicated they either owned or used cryptocurrencies in 56 countries and territories worldwide from 2019 to 2024.* https://www.statista.com/statistics/1202468/global-cryptocurrency-ownership/

Steinmetz, F., von Meduna, M., Ante, L., & Fiedler, I. (2021). Ownership, uses and perceptions of cryptocurrency: Results from a population survey. *Technological Forecasting & Social Change*, *173*, Article 121073.
https://doi.org/10.1016/j.techfore.2021.121073

Stix, H. (2021). Ownership and purchase intention of crypto-assets: survey results. *Empirica*, *48*(1), 65–99.
https://doi.org/10.1007/s10663-020-09499-x

The Law Library of Congress. (2021). *Regulation of cryptocurrency around the world: November 2021 update.*
https://tile.loc.gov/storage-services/service/ll/llglrd/2021687419/2021687419.pdf

Wongsunopparat S., & Nanjun Z. (2023). Study of Factors Influencing Consumer to Adopt Cryptocurrency. *Business Management and Strategy*, *14*(2).
https://doi.org/10.5296/bms.v14i2.21074

Yin, W., Zhang, M., Zhu, Z., & Zhang, E. (2023). A novel approach based on similarity measure for the multiple attribute group decision-making problem in selecting a sustainable cryptocurrency. *Heliyon*, *9*(5), Article e1605.
https://doi.org/10.1016/j.heliyon.2023.e16051

APPENDIX

Analysis of the keywords frequency related to perception, adoption, and decision-making in cryptocurrency markets (2013–2024)

Examining the data from 2013 to 2024, the evolution in the field of cryptocurrency research is evident. During the initial years, between 2013 and 2016, the focus was predominantly on foundational concepts, as indicated by the frequent mentions of "Cryptocurrency" and "Crypto". This suggests an introductory phase of scholarship where the basic understanding of cryptocurrency was being established.

The period of 2017 to 2020 marked a significant shift, with an increase in the frequency of terms such as "Cryptocurrency regulation" and "Cryptocurrency tax". This aligns with the period's heightened activity in cryptocurrency markets and indicates a scholarly response to the emerging needs for regulatory frameworks. Additionally, there was an increased emphasis on investment-related research, with terms like "Cryptocurrency investment", "Cryptocurrency risk management", "Cryptocurrency portfolio management", and "Cryptocurrency diversification" becoming more common. This reflects a growing interest in the mechanics of cryptocurrency investment and the strategies to mitigate its inherent risks.

In the most recent period, from 2021 to 2024, the research seems to have progressed into exploring more sophisticated and socially relevant themes. There is a notable interest in "Cryptocurrency sustainability" and "Cryptocurrency ethics", underscoring a movement toward understanding the enduring effects of cryptocurrencies on society and the environment. Furthermore, the rise in terms related to behavioural economics and sentiment analysis, such as "Fear of missing out (FOMO)", "Herding behaviour", and "Cryptocurrency investor sentiment", suggests a more comprehensive investigation into the psychological factors influencing cryptocurrency investment decisions.

Keywords	2013–2016	2017–2020	2021–2024
Cryptocurrency	402	4007	5900
Cryptocurrencies	402	4011	5911
Crypto	997	2475	3908
Cryptocurrency markets	122	1448	2677
Cryptocurrency market Trends	53	232	384
Cryptocurrency perception	1	45	94
Cryptocurrency adoption	16	182	347
Cryptocurrency liquidity	1	86	197
Cryptocurrency volatility	13	477	1189
Cryptocurrency bubbles	6	91	130
Cryptocurrency price	27	676	1493
Cryptocurrency diversification	0	84	269
Cryptocurrency portfolio	5	216	589
Cryptocurrency investment Strategies	3	87	265
Cryptocurrency investment	40	627	1346
Cryptocurrency investor	38	645	1275
Cryptocurrency investor sentiment	0	30	145
Cryptocurrency sentiment analysis	6	76	175
Cryptocurrency risk management	10	257	540
Cryptocurrency investment decision-making	1	34	128
Cryptocurrency investment decisions	3	134	350
Cryptocurrency fundamental analysis	2	52	94
Cryptocurrency technical analysis	3	61	167
Cryptocurrency analysis	108	1195	2364
Cryptocurrency portfolio management	2	115	317
Cryptocurrency portfolio cptimization	0	27	76
Cryptocurrency asset evaluation	0	46	115
Cryptocurrency regulation	103	541	600
Cryptocurrency tax	46	472	458
Cryptocurrency investment psychology	0	13	47
Behavioural economics and cryptocurrency	2	54	161
Herding behaviour cryptocurrency	0	20	61
Fear of missing out (FOMO) cryptocurrency	0	5	19
Cryptocurrency overconfidence	0	1	14
Cryptocurrency marketing	11	137	170
Cryptocurrency and institutional investors	25	280	189
Cryptocurrency sustainability	1	65	215
Cryptocurrency ethics	4	47	46