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COMPLEX ANALYSIS OF CRYPTOCURRENCIES AND THEIR IMPLICATIONS IN THE CONTEXT OF MONEY LAUNDERING AND TERRORISM FINANCING

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Abstract: *This study investigates the potential role of Bitcoin in terrorism financing by analyzing the decentralization and anonymity features of cryptocurrencies that facilitate illegal transactions. In the context of delayed regulatory capacity regarding innovations in financial technology, the study explores new opportunities for terrorism financing. International reports, such as that of the financial action task force on money laundering, highlight the growing risks of terrorism financing associated with virtual currencies like Bitcoin.*
While terrorist financing based on emerging technologies enables terrorist organizations to swiftly transfer funds globally, this phenomenon simultaneously increases the difficulties in combating terrorism financing at the national level. In light of this technological revolution and the expansion of terrorism, the study focuses on the interaction between Bitcoin and terrorism, exploring whether terrorist attacks significantly contribute to Bitcoin price fluctuations and to what extent the cryptocurrency may evolve into a currency used for terrorism financing.

Keywords*: cryptocurrencies; blockchain; money laundering; terrorism financing; illegal transactions.*

Introduction

In the context of rapid technological advancements and significant transformations within global financial markets, Bitcoin and blockchain technology have become subjects of particular interest and relevance for both the academic environment and investors in Romania. This investigation focuses on the impact and multiple implications that Bitcoin has on the Romanian financial landscape, addressing aspects related to price volatility, potential diversification benefits in investment portfolios, and crucially, the connections between Bitcoin and specific risks in the Romanian context, including geopolitical and security-related risks.

The first section of the analysis focuses on how Bitcoin could act as a hedge against global risks and geopolitical uncertainties, highlighting how its behavior may influence the economic and financial landscape in Romania in the face of international challenges.

In the second section, the study explores the diversification perspective that Bitcoin can offer to Romanian investors, considering the peculiarities of the local market and how this digital asset can contribute to optimizing portfolios in a specific economic context.

The third section focuses on the controversial aspect of terrorist financing and the impact of terrorist attacks on the price of Bitcoin in the specific context of Romania. Risks and potential vulnerabilities are analyzed from the perspective of national security.

The last section will focus on the potential risk of money laundering through cryptocurrencies in the specific context of Romania, highlighting concerns and implications of this issue on the financial system and national security.

In light of technological advancements and the increasing adoption of cryptocurrencies in Romania, concerns regarding the risk of money laundering have become more pronounced. Cryptocurrencies, including Bitcoin, have been associated with potential vulnerabilities to

illegal activities, including money laundering, due to their anonymity features and the difficulty of central monitoring.

Relevant studies indicate a rise in the use of cryptocurrencies in financial transactions in Romania, and this trend may bring with it significant money laundering risks. Bitcoin, due to its privacy features and lack of regulation, can represent an attractive means for those attempting to conceal or launder illegally obtained funds.

Romanian authorities face the challenge of developing and implementing effective regulations to prevent and combat money laundering through cryptocurrencies. Simultaneously, there is an emphasis on strengthening the supervision and monitoring capabilities of cryptocurrency transactions to ensure compliance with international standards and protect the integrity of the national financial system.

This section aims to discuss concerns and risks associated with the use of cryptocurrencies in the Romanian context, emphasizing the need for proactive and efficient measures to prevent their use for illegal purposes, including money laundering.

Through this investigation, a comprehensive analysis of the relationship between Bitcoin and the Romanian financial environment is proposed, aiming to illustrate its potential impact and highlight relevant aspects for financial professionals and local investors.

1. Properties of Bitcoin in the context of global financial markets

Over the years 2017-2022, Bitcoin and blockchain technology have become subjects of intense research and discussion, capturing the attention of both the academic community and global investors. This analysis aims to provide a comprehensive synthesis of research during this period, highlighting the evolution and conclusions drawn from recent studies.

In a context marked by intense interest, investigations into Bitcoin and blockchain technology have covered various aspects, reflecting the complexity and broad impact of this innovation on the global financial landscape. At the forefront of these research efforts is the significant contribution of Min Xu, Xingtong Chen and Gang Kou (Xu, Chen and Kou 2019), who conducted a thorough review of the current state of academic research in the blockchain field, focusing particularly on its implications for business and the economy. It is important to emphasize that this work serves as a crucial source for understanding the depth and directions that research has taken in this field.

Their analysis focuses on a substantial sample of 756 articles related to blockchain technology from the Web of Science Core Collection. The results indicate that the most frequently addressed field is Computer Science, followed by Engineering, Telecommunications, Business, and Economics. Particularly interesting is the research in the Business and Economics domain, where the paper identifies key nodes in the literature, such as the most cited articles, the most productive countries, and the most frequent keywords.

By analyzing keyword clusters, five remarkable research themes are highlighted: "economic benefit, blockchain technology[6], initial coin offerings, FinTech Revolution[7], and the sharing economy" (Xu, Chen and Kou 2019, 4-14). These directions suggest not only the diversity of approaches in blockchain research but also the significant impact this technology has on the economy, including aspects such as financial innovation and the sharing economy. It is clear that blockchain technology has not only captured the attention of researchers but also

[6] Blockchain technology is a type of distributed technology initially recognized as the underlying infrastructure for cryptocurrencies, with Bitcoin being the first and most prominent example. However, the concept of blockchain has evolved and has been embraced across various domains due to its features of security, transparency, and decentralization.
[7] The FinTech Revolution refers to the significant transformations and innovations brought to the financial industry through the use of modern technology.

continues to redefine and shape how we approach finance and business in the digital age. However, the study acknowledges some limitations. The analysis focuses exclusively on literature from the Web of Science Core Collection, which may create gaps in the relevance of existing literature.

Two years later, Helder Sebastião and Pedro Godinho (Sebastião and Godinho 2021) introduces the use of machine learning techniques in developing cryptocurrency trading strategies, highlighting technological advancements in the financial sphere. This research explores the predictability and profitability of machine learning-based trading strategies for three major cryptocurrencies: Bitcoin, Ethereum, and Litecoin. Using linear models, the analysis covers the period from August 15, 2015, to March 3, 2019, with a test sample starting from April 13, 2018.

According to the obtained results, it is evident that individual models exhibit relatively low forecasting accuracy. Their study indicates success in generating returns, but it is crucial to note the associated risk characterized by significant maximum drawdowns and conditional value-at-risk (CVaR) values ranging between 3.88% and 13.40%. A notable aspect is the strategies applied to ethereum and litecoin, which recorded an annualized Sharpe ratio[8] of 80.17% and 91.35%, demonstrating the ability to achieve positive annualized returns even after considering transaction costs. These findings highlight the promising potential of combining multiple models in developing cryptocurrency trading strategies. However, careful risk management is essential due to the significant volatility in this financial environment (Sebastião and Godinho 2021).

In the context of the same topic, the volatility of Bitcoin, a recent study led by Laith Almaqableh (Laith Almaqableh, Damien Wallace, Vijay Pereira, Vikash Ramiah, Geoffrey Wood, Jose Francisco Veron, Imad Moosa, Alastair Watson 2023) analyzed the underlying factors of this volatility and its impact on global markets. The research specifically explored the connection between anti-drug trafficking activities, including associated arrests, and developments in cryptocurrency markets. This analysis highlighted the degree of criminal involvement in these markets, emphasizing a significant impact of anti-drug trafficking actions on cryptocurrencies.

The study sheds light on the complexity of financial markets and the role Bitcoin can play in the current context of volatility and uncertainty. Understanding the influence of external factors, such as anti-drug trafficking efforts or political uncertainty, can provide investors with meaningful perspectives in decision-making. However, further research is important to refine understanding and more efficiently manage the risks associated with this rapidly changing market.

The most recent approach regarding Bitcoin and blockchain technology involves the geopolitical risks they face, as direct confrontations occur between states and groups of different ideologies and religions. Sovereignty, extreme left or right-wing ideas gain ground even in the most consolidated democracies in the world. The perspective brought by Ahmet Faruk Aysanand his team (Aysan, et al. 2019) highlights the increasing importance of Bitcoin in protective strategies, in a context marked by growing uncertainties globally. To support this observation, the study uses the Ordinary Least Squares[9] (OLS) method to estimate the relationships between price volatility, Bitcoin returns, and global geopolitical risk (GPR).

[8] The Sharpe ratio, also known as the Sharpe index, is a measure of the performance of an investment or investment strategy developed by economist William F. Sharpe. This indicator provides an assessment of the investment's return in relation to the assumed risk. The formula for the Sharpe ratio is: Sharpe Ratio = (Portfolio or investment return - Risk-free rate) / Portfolio volatility.

[9] Least Squares Method (OLS) is a statistical technique used to estimate the parameters of a linear regression model. This method aims to find the regression line that minimizes the sum of the squared differences between the observed values of the dependent variable and those predicted by the model.

Aysan's results indicate a positive connection between price volatility and Bitcoin returns, consistent with the influence that geopolitical events can have on the cryptocurrency.

Additionally, Aysan adds significant nuance through Quantile-on-Quantile[10] (QQ) analyses, showing that these effects are more pronounced at the higher quantiles of both Global Geopolitical Risk and Bitcoin price volatility and returns. This finding suggests that Bitcoin can offer enhanced protection against global geopolitical risks, especially in extreme conditions and periods of significant uncertainty. It is important to underline that these results can provide investors with an understanding that Bitcoin can act as a hedging strategy in situations of geopolitical instability, offering them an additional option in managing their portfolios in the context of a turbulent global financial environment.

The critical opinion expressed by Jamal Bouoiyour, Refk Selmi and Mark E. Wohar (Bouoiyour Jamal, et al. 2019) casts doubt on Bitcoin's ability to act as a safe haven in the face of market risks. This perspective highlights significant obstacles and challenges facing Bitcoin, including a lack of regulation and excessive speculation. In his study, he started with the idea that Bitcoin functions as a refuge with reduced effectiveness in the short term, contrary to the expectations of investors seeking assets to reduce portfolio volatility in the face of extreme events, such as uncertainty associated with unexpected outcomes of US elections. Their analysis adds an interesting nuance to the attractiveness of Bitcoin. It is emphasized that, given the current loss of confidence in the stability of the banking system and future economic security, Bitcoin has benefited from the volatility present in markets. Its property of existing outside the political borders of a single country gives it potential as a form of protection for the US stock price index in turbulent periods.

The conclusion is that Bitcoin does not fully meet the requirements of a "safe haven" in periods of market turmoil and increased uncertainty. While investors are known to migrate to "safe havens" in such periods, Bitcoin does not possess this characteristic absolutely. As a cryptocurrency, Bitcoin is vulnerable to cyber-attacks that can threaten the stability of its entire system. Therefore, while Bitcoin represents a fascinating idea and an interesting experiment, its characteristics, such as a lack of regulation, excessive volatility, and speculative nature, suggest that it cannot be viewed as a permanent component of investment portfolios but rather as an asset with significant risks in financial history.

2. Bitcoin as a diversification option in investment portfolios

In the context of investments, Bitcoin represents a particularly attractive option for portfolio diversification. Investors, seeking alternative investment options, have noted a significant increase in the integration of cryptocurrencies into their portfolios, according to a study conducted by Fang and his colleagues (Libing Fang, Elie Bouri, Rangan Gupta, David Roubaud 2019). Bitcoin becomes increasingly appealing to investors due to its high average returns and low correlation with other financial assets, as found by Khaled Guesmi and his team in 2019 (Guesmi, et al. 2019).

The latter, in their findings, suggest that all models confirm significant returns and volatility transmission. VARMA (Vector Auto Regressive Moving Average) was the first-order model used for autoregressive components and moving average components. The VARMA (1,1)-DCC-GJR-GARCH model is the most suitable for modeling the common dynamics of a variety of financial assets. This model is a complex combination of multiple economic and financial models used to analyze and forecast the common dynamics of a set of financial assets.

[10] Quantiles-on-Quantiles (QQ) is a method used in statistics and data analysis to compare the distributions of two data sets. It involves comparing the quantiles (values that delineate fixed proportions of a distribution) of one variable with the corresponding quantiles of another variable.

Firstly, VARMA stands for Vector Autoregressive Moving Average, a statistical model used for analyzing time series.

The second is DCC (Dynamic Conditional Correlation), which models and forecasts the dynamic conditional correlations between variables in a matrix. In fact, it is a good tool for studying the volatility of these virtual currencies, as it takes into account changes over time in the correlations between financial assets. The last model is GJR-GARCH (Generalized Autoregressive Conditional Heteroskedasticity), which measures asymmetry in volatility. GARCH is a model used to describe the conditional variation of volatility in financial time series. The "GJR" prefix indicates the presence of asymmetry in the impact of positive and negative events on volatility.

Thus, Guesmi and colleagues, through their combined model, concluded the complex relationships between financial variables, as well as the dynamics of volatility in a dynamic and conditional manner, and provided ways to hedge against Bitcoin volatility in investment. The mentioned research shows that hedging strategies involving gold, oil, stocks, and Bitcoin significantly reduce portfolio risk compared to the risk of a portfolio consisting exclusively of gold, oil, and stocks. These findings underscore the importance of a well-thought-out approach to portfolio management, where Bitcoin plays a significant role in optimizing and reducing risks associated with investments (Guesmi, et al. 2019).

In an economic climate characterized by uncertainties, Elie Bouri, Rangan Gupta and Xuan Vinh Vo (Bouri, Lupta and Vo 2020) brings to attention the perspective that Bitcoin may represent a viable alternative to the traditional stock market while offering diversification benefits for investors. According to the results obtained from his research, the price behavior of all investigated cryptocurrencies is turbulent, but notably, only Bitcoin jumps seem to be influenced by developments in the geopolitical risk index. This finding regarding the significant co-jumps of Bitcoin appropriately complements previous research suggesting that this cryptocurrency can act as a hedge against geopolitical risk.

By highlighting this link between Bitcoin developments and geopolitical factors, the role of this cryptocurrency in investment portfolios is emphasized, providing investors with a diversification option and a potential form of protection against geopolitical uncertainties. It is important to note that this approach not only complements but also strengthens the existing perspective on Bitcoin as an asset with distinctive characteristics and adaptability potential in volatile economic environments (Bouri, Lupta and Vo 2020).

These results underline the importance of a profound understanding of the complex relationships between Bitcoin and external factors, such as geopolitical risk. Investors could benefit from including Bitcoin in their portfolios, considering not only the potential for attractive returns but also its potential to act as a protective element against fluctuations and unforeseen geopolitical events. However, it is essential to consider the risks associated with cryptocurrency investments, given their volatile nature and market specificity. Thus, Bitcoin not only offers investors the potential for value growth but also an opportunity to efficiently diversify portfolios in a continuously changing financial environment.

Further explanations and suggestions come from the study conducted by Muhammad Owais Qarni and Saiqb Gulzar (Qarni and Gulzar 2021), which highlights that Bitcoin can make a significant contribution to portfolio diversification, especially when alternative foreign currencies are involved in the forex market. The objective of this research was to analyze how the volatility transferred from Bitcoin affects the foreign currency pairs of major trading currencies. The results obtained through volatility transfer index methods and frequency connectivity provided evidence of low integration, asymmetric volatility transfer, and a dominant role of short-term frequency connectivity between Bitcoin markets and foreign

currency pairs denominated in major trading currencies. These patterns vary over time, responding to various domestic and global events (Qarni and Gulzar 2021).

Against the backdrop of Bitcoin's rapid growth and increasing investor confidence, a significant acceleration of cryptocurrencies is observed. However, history indicates that rapid appreciation is often followed by equally rapid depreciation. Even after Bitcoin has experienced a significant loss of its value, evidence shows a continued downward trajectory over time. Despite some concerning forecasts, a collapse of Bitcoin seems to have no significant impact on financial markets. The low integration of Bitcoin markets with the forex market suggests significant implications for portfolio diversification and risk minimization (Qarni and Gulzar 2021).

The conclusion of the mentioned studies is that, in the context of a constantly changing financial market and associated uncertainties, investors could benefit from the information provided by this research. Using Bitcoin investment as a form of protection against risks associated with the forex market and, at the same time, adding foreign currency investments to portfolios can represent effective strategies for risk diversification. Thus, portfolio managers and investors can adjust their portfolios intelligently, minimizing risk and optimizing potential returns in a complex financial environment.

3. Impact of terrorism and geopolitical risk on the Bitcoin market

In recent years, the volatility of the Bitcoin market has been the subject of thorough research, and one of the factors that has captured attention is the impact of terrorism and geopolitical risk on cryptocurrency prices. Recent studies have identified significant links between geopolitical risk and Bitcoin price dynamics, highlighting the influence of terrorist acts on this ever-evolving market. Pankaj C. Patel and Jack Richter (Patel and Richter 2020) examines the complex relationship between terrorist attacks, the macroeconomic environment, and their impact on investment perspectives. His findings emphasize that terrorist attacks have a significant impact on the macroeconomy, leading to a decline in investor confidence and negatively influencing Bitcoin yields. This analysis highlights the sensitivity of the Bitcoin market to terrorist events and how investors' perceptions of economic stability can influence cryptocurrencies.

The results obtained indicate that the monthly proportion of successful terrorist attacks has a significant effect on the monthly decrease and increase in cryptocurrency yields. It is observed that the success in terrorist attacks is negatively associated with cryptocurrency yields, while the number of injuries and deaths is negatively and positively associated with these yields, respectively. Furthermore, the success in terrorist attacks has the greatest impact on yields compared to the number of injuries and deaths. These findings are robust and persistent even when controlling for cross-sectional correlation between major cryptocurrencies (Patel and Richter 2020).

The analysis suggests that cryptocurrencies may represent a weak hedge against successful terrorist attacks. The results are consistent for cryptocurrencies in the first three quarters of market capitalization, and mediation analysis suggests that terrorist attacks negatively affect yields through the short-term decline in the macroeconomic cycle. This perspective emphasizes the importance of understanding the complex connections between geopolitical events, the economy, and crypto markets, highlighting the need for robust and diversified investment strategies in the face of global turbulence (Patel and Richter 2020).

In light of the heightened global geopolitical risks and the frequency of terrorist acts, asset evaluation, including cryptocurrencies, was examined by Afees A. Salisu, Lukman Lasisi and Jean Paul Tchankam in a recent study (Salisu, Lasisi and Tchankam 2021). An empirical model was formulated to estimate the vulnerability of advanced economies, including the G7 and Switzerland, to global geopolitical risk (GPR) and to assess the predictive capacity of this global risk factor. The basic hypothesis was that stock market investments decline during

periods of high geopolitical risks. For analysis, a predictive model was developed, and the dataset included historical stock market indices covering over a century of monthly data for eight advanced economies. In addition to the cumulative index for the historical geopolitical risk index (GPR), two variants of this index, GPRA[11] and GPRT[12], were considered. The first covers all "acts" constituting GPR, such as war, nuclear invasion, and terrorism, while the second represents threats associated with these acts (Salisu, Lasisi and Tchankam 2021).

The conclusions of their study revealed that GPR is a significant predictor of stock market yields in advanced economies, except for Italy. It was also found that the stock market suffers greater impacts from threats of geopolitical risks (such as war and terrorism) than from their actual occurrences. It is noted that advanced stock markets are vulnerable to GPR and therefore cannot function efficiently as protection instruments against this type of risk. This is supported by the negative sign of coefficients for GPR variants. It is also observed that models considering GPR variants outperform the reference model, both for estimates made during the analysis period and for those made outside this period. An extended model that includes another important global factor, the price of oil, supports this assertion and consolidates the robustness of the GPR-based model against other additional predictive factors (Salisu, Lasisi and Tchankam 2021).

Regarding this topic, in addition to the study on the link between virtual currency volatility and global markets, Laith Almaqableh and her team (Almaqableh, Reddy, et al. 2022) adds an interesting perspective on risk transfer generated by terrorist attacks. He finds that despite the positive contribution to cryptocurrency yields, these attacks also lead to short-term risk transfer behaviors between different cryptocurrencies. Using daily cryptocurrency yields and event study methodology, abnormal cryptocurrency yields around terrorist activities were estimated. Asset valuation models were adjusted with interaction variables to identify the impact of individual attacks, and ARCH[13] models were used to determine changes in systematic risk. The conclusions indicate that terrorist attacks positively contribute to cryptocurrency yields and simultaneously induce short-term risk-changing behavior for different cryptocurrencies. The overall conclusion is that cryptocurrency market yields are positively associated with terrorist attacks, generating positive abnormal yields. Based on the augmented CAPM[14] model, the cumulative abnormal yield 180 days before attacks was 98.35%, with other window horizons displayed. Statistical values indicate that these results are statistically significant. In conclusion, although several platforms have accused cryptocurrency markets of hosting illegal activities, such as terrorist activities, none of these forums have provided empirical evidence (Almaqableh, Reddy, et al. 2022).

Therefore, a detailed analysis of the links between terrorism, geopolitical risk, and Bitcoin prices provides an essential perspective on how geostrategic events can influence the dynamics of this emerging market. Investors and financial decision-makers should pay increased attention to these aspects to better understand Bitcoin's behavior in the context of geopolitical risks.

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[11] GPRA represents a variant of the global geopolitical risk index and covers all "acts" that constitute GPR. These acts can include events such as war, nuclear invasions, and terrorism.

[12] GPRT represents another variant of the global geopolitical risk index and focuses on the threats associated with the acts that make up GPR. It analyzes the threats associated with events such as wars, nuclear invasions, and terrorist acts.

[13] ARCH (Autoregressive Conditional Heteroskedasticity) models represent a class of economic models that address the conditional variability of a time series, i.e., conditional heteroskedasticity. This conditional variability means that the variance or volatility of the time series can vary based on the information available in the past.[14] The Capital Asset Pricing Model (CAPM) is a theoretical framework used in finance to assess the price of a financial asset and determine the expected return for such an asset. It was developed to provide a method for evaluating the expected return for an asset based on its risk and the overall market return.

[14] The Capital Asset Pricing Model (CAPM) is a theoretical framework used in finance to assess the price of a financial asset and determine the expected return for such an asset. It was developed to provide a method for evaluating the expected return for an asset based on its risk and the overall market return.

Much more detailed and informative, the study conducted by Yu Song, Bo Chen and Xin-Yi Wang (Song, Chen and Wang 2023) explores the interactions between terrorist incidents and Bitcoin prices, providing important information for risk analysis in this area. The results indicate that Bitcoin investors are more concerned about the number of deaths following terrorist attacks than their frequency. Furthermore, the impact of Bitcoin prices on terrorist attacks is considered negligible, suggesting that Bitcoin, while potentially a means of financing terrorism, currently does not play a significant role in this regard.

The study emphasizes that in a period of continuous development of cryptocurrencies, decision-makers in developed countries and developing economies should be aware of the risks of terrorism, which can significantly influence Bitcoin price volatility. In the context of these risks, interest in the connection between terrorists and the use of cryptocurrencies for funding terrorist activities has increased in recent years (Song, Chen and Wang 2023).

The study's methodology, based on the TVP-SV-VAR (Time-Varying Parameter Stochastic Volatility Vector Autoregressive) model[15], reveals the variability of attributes over time at different horizons and moments. Empirical results highlight that terrorist incidents and the level of brutality have a significant impact on Bitcoin prices, with positive correlations in certain periods and negative correlations in others. The study also addresses the effects of severe event shocks of political and economic uncertainty on the relationship between terrorist attacks and Bitcoin prices. The authors conclude that investors should consider not only the direct impact of terrorist attacks on Bitcoin prices but also the diverse interferences of economic or political uncertainties on financial markets (Song, Chen and Wang 2023). The emergence of cryptocurrencies is the result of technological progress that has led to the evolution of the financial market.

In this regard, it is essential for the government to improve regulatory mechanisms, simultaneously supporting the development of the virtual currency Bitcoin. Yu Song's study comes with a series of proposals for investors, economists, and politicians. Based on the aforementioned research, this analysis suggests some policy recommendations. Firstly, the impact of terrorist attacks on Bitcoin prices is variable over time and volatile, making Bitcoin an extremely speculative asset without clear risk protection properties. Therefore, investors should carefully manage their investments and avoid risks related to market fluctuations and possible Bitcoin market crashes by adopting portfolio diversification strategies. Secondly, the government and the industries involved should strengthen technological security and network protocols to ensure the orderly development of cryptocurrency markets. Regulatory authorities should maintain strict supervision over Bitcoin transactions, investigate fake news and malicious media speculation, and ensure the protection of investors' interests. Thirdly, there are misunderstandings internationally regarding Bitcoin regulation, favoring money laundering activities and speculation (Song, Chen and Wang 2023).

Although Bitcoin cannot be considered a suitable supporter of terrorist activities, careful monitoring of Bitcoin prices and ransomware attacks is imperative. The government should enforce laws and regulations regarding taxation, anti-money laundering, and other aspects. For example, anti-money laundering rules should prohibit anonymous transactions in cryptocurrencies. In conclusion, countries should actively cooperate, share information, and firmly regulate the global Bitcoin market to prevent illegal transactions and create a unified regulatory framework (Song, Chen and Wang 2023).

In the context of these conclusions, it is essential for investors to organize their investment strategies reasonably, avoiding financial market risks and possible declines in the

[15] The TVP-SV-VAR model is an advanced statistical method used in time series analysis, focusing on economic models with time-varying parameters and stochastic volatility.

Bitcoin market. The presented studies thus contribute to improving the theoretical system for combating terrorist financing and maintaining global peace and security, offering valuable perspectives for investment decisions and managing risks associated with cryptocurrencies.

4. The risk of money laundering through cryptocurrencies and terrorist financing in the specific context of Romania

In the recent activity reports of the National Office for Preventing and Combating Money Laundering for the period 2019-2022, sporadic mentions of cryptocurrencies are found, predominantly in a general criminal context, without specifically addressing cases related to virtual currencies (Context 2023).

The 2019 report includes two references to cryptocurrencies. The first indicates regular participation in self-training sessions on virtual currencies and associated service providers. The second mentions "speculation with virtual currencies" as part of the crimes for which Romania received information requests, providing a total of 295, without details regarding the distribution by types of offenses (Context 2023).

In the 2020 report, it is highlighted that out of the 242 information requests received, three were related to terrorism financing cases, while the other 239 were linked to suspicions of money laundering stemming from various crimes, including fraud related to exchange platforms or online trading and tax evasion (Context 2023).

The 2021 report emphasizes that high-value receipts of unverified origin from cryptocurrencies were a frequently encountered indicator in reports of suspicious transactions submitted by reporting entities (Context 2023).

In 2022, the establishment of a structure with exclusive responsibilities for overseeing service providers between fiat currencies and cryptocurrencies is mentioned, and reports of suspicious transactions highlight high-value receipts from cryptocurrencies as a suspicion indicator (Context 2023).

The Directorate for Investigating Organized Crime and Terrorism (DIICOT) deals with crimes involving cryptocurrencies, such as the creation of criminal groups, money laundering, and drug trafficking. Although prosecutors investigate cases involving cryptocurrency transactions, the institution does not have detailed statistics (Context 2023). Also, the National Agency for the Management of Seized Assets (ANABI) manages assets confiscated as a result of crimes, including virtual currencies. ANABI has organized public auctions for the realization of virtual currency and recorded a court decision to confiscate 0.00257563 Bitcoin in 2022 (Context 2023).

Cryptocurrencies are most often associated with crimes in cases related to drug consumption and trafficking, as well as in cases of fraud and the formation of organized criminal groups. Recently, a fraud case involving approximately $5 million and cryptocurrencies led to the arrest of three defendants and the placement of ten others under judicial control (Context 2023).

The Office responsible for combating money laundering in Romania faces the absence of specialized software for blockchain investigation, despite the registration of an increase in cryptocurrency-related crimes. The Moneyval report, elaborated by European experts, emphasizes that the implementation of this computer system should have been completed by the end of 2022 or the beginning of 2023 (Biro and Leonte 2023).

At the end of June 2023, Context.ro presented a report highlighting the lack of information regarding the volume of money laundered through cryptocurrencies in Romania. Despite the increasing phenomenon of virtual currency crimes, state institutions lack statistics on this new criminal trend (Biro and Leonte 2023).

The National Office for Preventing and Combating Money Laundering (ONPCSB), the central institution in the fight against money laundering, faces significant challenges, lacking access to dedicated blockchain analytical tools for monitoring and analyzing transactions with

virtual assets. The current situation shows that there are no visualization tools, and the analysis of account statements is done in Microsoft Excel. This aspect generates significant problems regarding the quality and promptness of analysis, contributing to the limited dissemination of information to prosecutors regarding individual transactions, excluding patterns and complex transaction schemes (Biro and Leonte 2023).

European experts in the Moneyval report emphasize that, despite the growth of cryptocurrency-related crime, Romanian authorities do not have statistics on this emerging criminal trend. Additionally, investigations into cybercrime, including those related to cryptocurrencies, are not a priority in Romania, and the lack of specialized software for blockchain investigation exacerbates this situation (Biro and Leonte 2023).

The report reveals that Romania faces an underground economy of approximately 30% of GDP, and the investigation and prosecution of money laundering are not prioritized, with a low number of investigations and convictions in this field. Even though organized crime groups of Romanian origin represent a major external threat for money laundering globally, the effectiveness of investigations in this regard is limited, and Romania lacks comprehensive statistics on investigations, prosecutions, and convictions in the field of money laundering (Biro and Leonte 2023).

Moneyval experts propose solutions that include increasing technological and human resources within ONPCSB, improving the capacity for financial investigations and asset tracking, developing practical guidelines for prosecutors, and enhancing existing controls to ensure the accuracy and updating of information about real beneficiaries (Biro and Leonte 2023).

Conclusions

During the period 2017-2022, Bitcoin and blockchain technology garnered global attention, becoming central subjects of research and discussions in the academic community and among investors. Research from various fields, such as computer science, engineering, telecommunications, and business, has highlighted the complexity and impact of this innovation on the global financial landscape.

The main research directions covered diverse aspects, including the impact of blockchain on corporate and market efficiency, security and privacy, digital currency management, cryptocurrency regulation, the integration of blockchain and FinTech, as well as cross-chain technology for efficient data exchange across different industries. The application of blockchain technology in companies has been recognized as having the potential to bring significant benefits, addressing regulatory requirements, providing financial solutions, facilitating data storage and sharing, as well as managing the supply chain and smart transactions.

In the context of volatile financial markets, Bitcoin has been studied as a possible refuge for investors during periods of global uncertainty. Studies show that Bitcoin can act as a hedge against geopolitical risks, although there are also critical voices emphasizing obstacles and challenges associated with this cryptocurrency, such as the lack of regulation and excessive speculation.

Regarding Romania, during the period 2019-2022, reports from the National Office for Preventing and Combating Money Laundering in Romania revealed sporadic concerns regarding cryptocurrencies. The lack of specialized software for blockchain investigation and limited information about money laundering through cryptocurrencies constitute major challenges. Proposals include increasing resources and improving investigative capacity, emphasizing the need for effective regulations in the complex context of cryptocurrencies.

In conclusion, Bitcoin is becoming increasingly attractive to investors as a significant option for portfolio diversification, and recent research supports this perspective. The attraction to Bitcoin is due to its consistently high average returns and low correlation with other financial assets.

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