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BACHELOR THESIS

THE ASSESMENT OF CBDC SENTIMENT

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Introduction

Relevance of the research topic: The idea of creation of central bank digital currency (CBDC) has emerged in the presence of evolving digital currency market. The discussions around the risk associated with cryptocurrencies has led to worries about money laundering, terrorist activities and speculation based on the fully-anonymous and no intrinsic value-having nature of the digital money. However, central banks have not posed it as a threat to a well-functioning financial system and law enforcement until the emergence of stablecoins, which are backed by sovereign currencies, and thus have intrinsic value and relatively stable prices. Eventually the creation of a private-issued Facebook's stablecoin Diem (former Libra) has encouraged raising questions about the further development of money at the level of state governing bodies. Central banks' approach to these two types of digital currencies was different: while Bitcoin was viewed as a study of new digital payment solutions, Libra became a possible threat to the global financial system and monetary sovereignty. The fear of the potential transmission of the Covid-19 virus through physical currency has additionally stimulated the impetus behind the CBDC project development (Auer, 2020; Chorzempa, 2021; Lee, 2021; Viñuela et al., 2020). Additionally, the CBDC issuance would serve as a preventive measure against the usage of cryptocurrencies that are tend to be volatile; other advantages include lower operating costs, better consumer protection, provided opportunity to access banking services for the unbanked and reduced costs associated with cross-border payments (Blakstad, 2018; Lee, 2021; Náñez et al, 2020). Recognising the mentioned opportunities, central banks responded and decided to actively involve in the projects of CBDC creation. In the research paper presented in 2021 by Bank of International Settlements (2021), 85% of world's central banks were included in the project of CBDC.

It is agreed that the success of the launched CBDC will mostly depend on the households' preference (Bindseil, 2019). However, there is a lack of studies that would help determining the sentiment for CBDC. This research aims to evaluate the sentiment surrounding CBDC as a crucial step towards understanding the acceptance, challenges, and opportunities associated with its adoption. By addressing the relevance and problem of this research topic, we will shed light on the sentiments of its possible users in Lithuania and CBDC's interconnectedness with cryptocurrency markets and provide insights that can guide institutions in their decision-making processes regarding CBDCs.

The problem of the topic. Insufficient knowledge about the sentiment towards CBDC and its issuance.

The object of the work. CBDC sentiment.

The aim of the research. To investigate the CBDC sentiment via conducting a survey and utilizing VAR model.

The objectives of the work:

1. To conduct a scientific literature analysis regarding the topic of CBDC.
2. To create methodology for VAR and survey
3. To conduct a combined approach of survey and VAR model methodologies to systematically analyze the sentiment surrounding CBDC.

Methods used: The methods used in the research include the analysis of existing literature and conducting a survey. The results are analysed empirically.

The structure of academic paper: The first section provides a literature analysis, which contains in-depth understanding of CBDC, is started with its definition, followed by an exploration of its progress and the potential avenues for implementation. The second subsection focuses on the relationship between cryptocurrency and CBDC, highlighting the contrasting features and functionalities of these digital currencies. Additionally, it investigates the evolving patterns of cash usage and its relevance to the development and adoption of CBDC. Moving forward, the thesis investigates the crucial aspects of CBDC adaptation and sentiment. It explores the variables that influence public sentiment towards CBDC, shedding light on the factors that shape individuals' attitudes and perceptions. The subsequent section presents the quantitative evaluation of CBDC sentiment, offering a systematic approach to measuring and analyzing public sentiment and CBDC's interconnection to cryptocurrency market by conducting a survey and utilizing VAR model. By encompassing these critical areas, this thesis contributes to a comprehensive understanding of CBDC, its potential implementation in Lithuania, and the sentiment's influence to cryptocurrencies.

1. CBDC literature review

1.1 CBDC definition, progress and implementation

CBDC is a concept that cannot be defined in only one way as there can be several interpretations of factors such as its design, implementations or implications to financial system. Finding a clear definition that would be applicable in all scenarios of a payment method that is still in a process of establishment can be troubling for researchers as well as institutions. However, the provided definitions help in the analysis of the progress of CBDC research and discussions regarding its features (1a Table and 1b Table).

Table 1a

Scholars define CBDC

	Category	Definition	Author
Scholars	Relationship with cash	A digital version and perfect substitute for notes and coins, with no additional features.	Chen & Siklos (2022)
		A legal tender convertible into cash and other private funds with stable value and is universally accepted, are ought to aid with computerized exchanges of money at minimal or no charge, ought to run on a safe, flexible, and adjustable payment infrastructure, whether existing or innovative, ultimately interoperable, fully available, and work based on standards and rules and comprise a competitive ecosystem that provides instant, safe, and cheap overlay services to end users.	Resendiz et al. (2022)
		An alternative to cash and demand deposits, serving as a store-of-value asset and a payment instrument.	Li (2022)
		A technologically advanced, digital form of central bank money, and here specifically a digital representation of cash in the form of a digital banknote, issued and governed by the monetary authority of a country or region.	Kuehnlenz et al. (2022)
		An electronic variant of cash issued by a central bank, which combines cryptography and digital ledger technology to offer this digital money.	Alonso et al. (2021)
	Central bank liability	A central bank liability offered in digital form to citizens and businesses for their retail payments, complementing the existence of cash and wholesale central bank deposits.	Tong and Jiayou (2021)
		An electronic obligation of a central bank, expressed in the national accounts unit and used as a medium of exchange and a mean of storing value.	Kochergin and Dostov (2020)
		A universally-accessible and interest-bearing central bank liability that competes with bank deposits as medium of exchange.	Barrdear & Kumhof (2021)
	Other definitions	The encrypted digit strings issued by central banks or monetary authorities, which represent specific amounts of real money and can be used for the consumption and trading of actual goods and services.	Liu and Hou (2020)

Compiled by the author based on the sources listed in the table

Table 1b

Financial governance institutions define CBDC

	Definition	Year	Institution
Insitutions	A digital liability of a central bank that is widely available to the general public.	2022	FED (2022)
	An electronic means of payment that anyone could use in the euro area. Secure and user-friendly, like cash is today. Different from “private money”, but you could also use a card or a phone app to pay with digital euro.	2022	ECB (2022)
	A digital banknote . It could be used by individuals to pay businesses, shops or each other (a "retail CBDC"), or between financial institutions to settle trades in financial markets (a "wholesale CBDC").	2021	BIS (2021)
	Central bank issued money that can be used for everyday payments, denominated in the national currency and exchangeable at par with commercial bank money.	2021	Risksbank (2021)
	A new form of money, issued digitally by the central bank and intended to serve as legal tender .	2018	IMF (2018)

Compiled by the author based on the sources listed in the table

The authors of scholarly articles often either associate CBDC with cash or acknowledge its status as a liability. The relationship between CBDC and banknotes encompasses several dimensions that are subject to each author's perspective. CBDC can be interpreted as a direct substitute for cash, an alternative to cash, or simply a distinct form of currency. Barrdear and Kumhof (2021) propose that CBDC competes with bank deposits as a medium of exchange, thereby revealing the potential for bank runs upon its issuance. While definitions may vary to some extent, there is a general consensus that CBDC would likely serve as a supplementary payment method. Additionally, CBDC is frequently emphasized as a digital asset. Liu and Hou (2020) specifically emphasize its digital nature, presenting CBDC as "encrypted digital strings."

While researchers often incorporate technological or design elements into their definitions, institutions primarily focus on providing concise and easily understandable statements about CBDC to the general public, that would be understandable regardless of their level of financial education. Apart from Risksbank, all institutions highlight the digital nature of CBDC, while the European Central Bank (ECB) specifically emphasizes its differentiation from privately issued currencies. The definition put forth by the Bank for International Settlements

(BIS) distinguishes between two types of CBDC, namely retail and wholesale. Retail CBDC is defined as a „digital equivalent of cash for use by end users (households and businesses)“, while the wholesale CBDC is „intended for the settlement of large interbank payments or to provide central bank money to settle transactions of digital tokenised financial assets in new infrastructures“.

However, the certain key characteristics consistently mentioned by both scientific researchers and institutions consistently emerge. Primarily, CBDC is acknowledged as a liability of a central bank, signifying its authoritative backing and guarantee. Furthermore, CBDC is commonly described as a payment instrument that shares similarities with physical cash, offering convenience and ease of use. Additionally, an essential attribute of CBDC is its digital nature, emphasizing its digital form and reliance on electronic systems for transactions. These aspects, derived from the collective input of experts and institutions, provide a foundation for understanding the core elements and conceptual framework of CBDC. Summarizing these points, CBDC is a liability of a central bank, a payment method that resembles cash and possesses a digital nature. The specific features emphasized in these definitions may vary. For example, Resendiz provides a comprehensive statement on the conception of CBDCs, encompassing aspects such as safety, reduced usage costs, and increased speed.

Irrespective of the various perspectives regarding the focal points of CBDC design, the concept of CBDC was accepted and has become a project which is actively pursued by the majority of central banks worldwide. The creation of the currency has especially gained momentum on a global scale in recent years. Boar and Wherli (2021) has conducted a survey of 63 central banks from developed as well as emerging economies regarding the CBDC progress thorough 2020 and have covered topics such as CBDC creation involvement, progress, motivations, authority to issue and digital currencies (Table 2). The survey results showed that the year 2020 was significant because of the first officially issued general purpose, or retail, CBDC. However, despite these advancements in this sphere, the widespread implementation of CBDC has appeared to remain distant in the foreseeable future. Summarising the opinion of the central banks, it is also quite apparent that cryptocurrencies were not seen as a possible widespread means of payment, with stablecoin developments being watched more closely. Kosse and Mattei (2022) have undertaken an empirical investigation on behalf of Bank for International Settlements (BIS) and concluded that in 2021, 85% of world's central banks have commenced exploring CBDC. 63 central banks participated in the survey. No central bank has exclusively focused their research on the wholesale version of CBDC. All central banks were focused either solely on retail CBDC or both. Additionally, the study reveals that more progress

has been made with retail CBDC, as one-fifth of central banks had entered the testing phase, which is twice the number compared to wholesale CBDC. Furthermore, up to 70% of central banks were contemplating the involvement of the private sector in the CBDC architecture. Compared to the survey of the previous year, a significant share of central banks in 2021 were uncertain about the potential of cryptocurrencies becoming a significant means of payment. Also, a substantial portion of central banks acknowledged the potential for stablecoins to emerge as a prevalent means of conducting payments in the future. That being said, digital currencies in the current years have become an important aspect to research and discuss amongst the central banks, as it closely relates to the possible determination factor of success for CBDC project developments.

Table 2

Surveys of central banks regarding CBDC

Theme	Authors	Sample size	Geographical coverage	Topics
CBDC progress	Boar & Wehrli (2021)	63	Emerging economies and advanced economies	Involvement in CBDC creation
				Types of CBDCs the central banks are researching; the stage of the project
				Motivations
				Authority to issue
				Private digital tokens
	Kosse & Mattei (2022)	81	Emerging economies and advanced economies	Involvement in CBDC creation
				Types of CBDCs the central banks are researching; the stage of the project
				Private sector in CBDC ecosystem
				Private digital tokens as means of payment

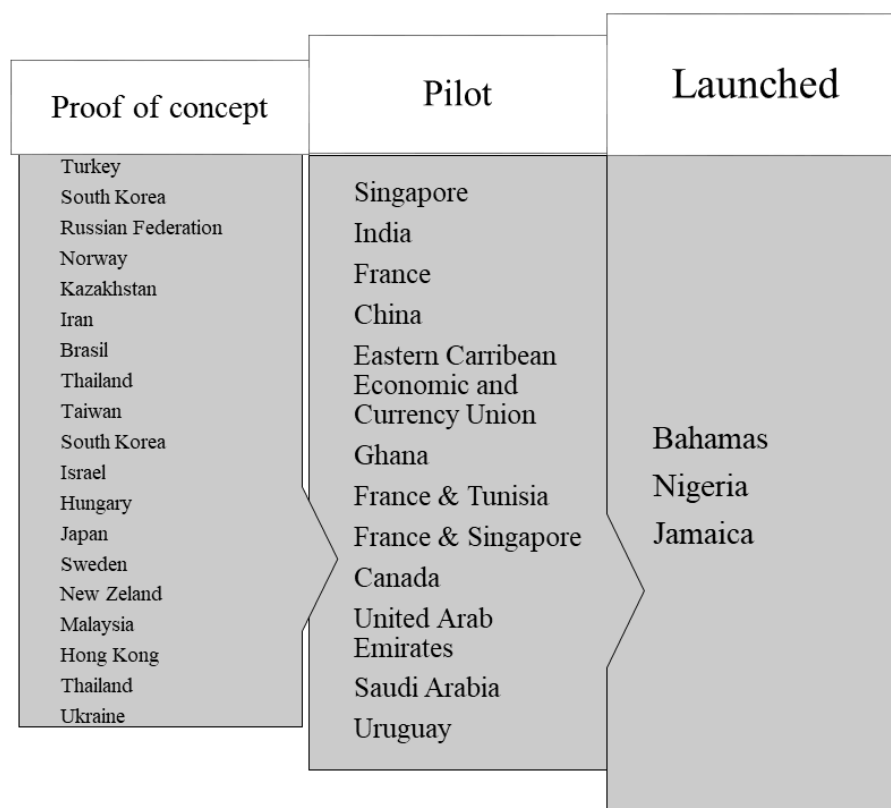
Compiled by the author based on the sources listed in the table

The involvement of the project development is encouraging as more financial organizations release CBDC reports, mostly reflecting on the design and implications to monetary policy or financial system. However, while most of central banks are in a research stage of the project, there are several countries that have presented the proof of concept or released the pilot version of their digital currencies. According to cbdctracker.org, at the moment

only three projects have reached the final stage of CBDC launch – the Sand Dollar of the Bahamas, e-Naira of Nigeria and Jam-Dex of Jamaica (Figure 1).

Figure 1

CBDC progress by country



Compiled using the information on the website cbdctracker.org (2023)

The success of adapting CBDC to economies to some extent will depend on the specific features of a country. Through the analysis of correlations between the countries that have either implemented or are in advanced stages of researching CBDC, Alonso et al. (2021) argues that low population density, fewer number of bank branches and rather high level of technology innovation are to potentially determine a successful introduction of retail CBDC. The countries that are optimal for its implementation are Lithuania, Estonia and Finland in Europe or Brazil, Uruguay, Malaysia and South Africa in other regions. To the extent, Lithuania's central bank has already tested the implementation of blockchain and digital currency. In 2020, a unique LBCOIN project was presented to the public. It is the world's first digital collector coin, which is dedicated to the 1918 Act of Independence of Lithuania and its signatories. The coin consists

of six digital tokens that can be exchanged for a silver collector coin. The project highlights the Lithuania's Central bank's positive outlook regarding the technological advancements and thus the bank applied it in a creative way (Bank of Lithuania, 2022).

After the analysis of various perspectives, it is evident that the definition of CBDC is subject to considerable debate. However, by synthesizing the viewpoints of institutions and researchers, a more comprehensive understanding of CBDC as a digital representation of central bank liabilities and a cash-like payment instrument with digital characteristics is established. In terms of the involvement in the development of CBDC project, the majority of the central banks are researching CBDC, with retail CBDC being the focus. In parallel, the evolution of digital currencies is closely tracked. With three official issuances of CBDC present, other countries, including Lithuania is thought to be a perfect environment for further CBDC implementation.

1.2 Incentives for CBDC creation

While it may appear that central banks are exploring the implementation of CBDC in order to keep pace with innovation, it is not the sole motivation. The changing needs of participants in the financial infrastructure are evolving alongside technological advancements. The present payment landscape gives rise to multiple concerns that should be considered (Figure 2). Firstly, the commercialization of data acquired through transactions for products and services is a prominent issue. Furthermore, the dominance of private currencies poses a risk as it has the potential to undermine the monetary policy authority of the state (Riksbank, 2021). Considering the novelty of digital currency and the ongoing need for improvements in the financial infrastructure supporting its functioning, the vulnerabilities of the technology are unavoidable, thus digital currency theft is not uncommon. The legislation system of cryptocurrencies is not yet clearly established, which creates uncertainty. As a result, cryptocurrencies and stablecoins are frequently employed for speculative endeavors rather than serving as a medium of exchange for goods and services. In addition, instances of financial misconduct, money laundering, and ransomware attacks associated with cryptocurrency usage have been observed. Equally important is the possibility of market manipulation as one of the base characters of cryptocurrency is anonymity and frequently large entities own a large share of the currencies. The anonymous nature of it additionally causes inability to protect the consumers and recover their losses or falsely made transactions. The price fluctuations are also concerning, taking into account that the currencies have no intrinsic value. Stablecoins, on the other hand, create an illusion of stability while lacking a sovereign foundation of intrinsic value. They can also potentially fragment liquidity and diminish the effectiveness of conventional monetary policies

(BIS, 2021). Considering these factors, CBDC can emerge as a safe alternative to private digital currencies. Not only it would be regulated and stable, the technical aspects are thoroughly considered. CBDC is intended to be a means of payment which could not be traded in the financial markets. This aspects creates stability and certainty for its potential users, adding the assured consumer protection.

Figure 2

Private digital currencies against CBDC

Digital currencies	Central bank digital currencies
• Drastic price fluctuations; • Lacking in regulation; • Technical inadequacy; • The possibility of market manipulation; • Inadequate consumer protection.	• Stable; • Regulated; • Technically adequate; • Not used for trading; • Consumer protection provided by state authorities.

Compiled by the author using the information by Liu & Hou (2020)

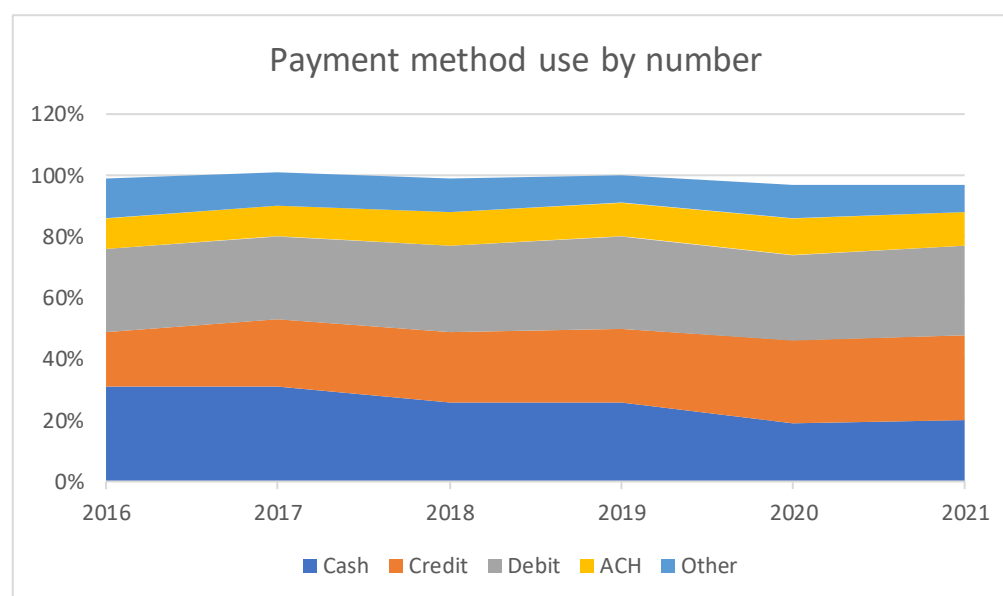
Furthermore, it is widely acknowledged that a more efficient and cost-effective value transfer system would benefit society, as individuals are accustomed to using technology in their daily lives and have a preference for electronic payments. CBDC has the potential to fulfill the needs of the general public, which may bear similarities to cryptocurrencies but offers a safer and regulated payment method. Additionally, it would introduce innovation to the existing payment landscape by removing limitations in terms of operating hours and reducing transaction complexity. Moreover, CBDC could enhance financial inclusion and contribute to a more environmentally friendly payment system (Alonso et al., 2020; Fegatelli, 2022). One of the indicators that illustrated the effectiveness of central bank-led accounts was their utilization in implementing fiscal relief programs during the COVID-19 pandemic. It was noted that distributing funds through central bank operations proved to be a more efficient and cost-effective approach compared to issuing government checks or processing tax returns (Mzoughi,

2022). In this context, CBDC holds the potential to serve as an efficient and secure means of distributing funds during times of crisis, thereby enhancing the implementation of financial assistance programs.

One of the more discussed arguments for the new digital form of central bank money is directed to declining use of cash and increasing favorability for financial digitalization (including electronic payments), with cryptocurrencies changing people's conception of money and payments. Regardless of the fact that cash has its own merits, one of the bigger incentives to create a CBDC is thought to be sparked by the decreased usage of cash. The pandemic contributed to adjusting consumer's payment preferences. 2020 and 2021 were the years when a significantly smaller share of the Eurozone's consumers made in-person cash payments, compared to 2019, while credit card payments increased across all income levels (Cubides & O'Brien, 2022) (Figure 3).

Figure 3

The decreasing cash usage compared with other payment methods 2016-2021



Compiled using the information provided by Cubides & O'Brien (2022)

It is also argued that countries should prepare their economies for the extinction of banknotes or at least the decreased usage of the means of payment in order to avoid the unexpected inconveniences. For instance, countries such as Sweden, New Zealand and the UK are moving toward the realization of cashless societies. Lesser usage of banknotes there seemingly lead to several downsides: in the mentioned countries it is harder to find access to

physical cash, also, the vulnerable groups are challenged in consumption and banking; moreover, the distribution systems of the public currency is also weakening. It is also known that the fallen demand for banknotes in case of the absence of its complementary payment method would imply that citizens would no longer have access to the central bank balance sheet. Societies are losing a critical public retail payment option, and retail consumers are losing important rights associated with using cash (Jung and Jeong; 2021; Goodell, 2021; Villaverde et al, 2020).

However, several scholars disregard the fact that all developed countries are in decline of the usage of cash. Apparently, in the times of negative interest rates, the citizens of the EU countries have repeatedly leaned toward the usage of cash (Zegarra and Willeson, 2020). On the other hand, as interest rates have been raised recently in the major world economies such as the USA and the Eurozone as a means for taming inflation, the above mentioned phenomenon could be reversed in the near future. Masciandro (2018) adds to the argument while exploring the demand for a CBDC through the lens of media of payments (MOPs) and their features. Apparently, the state-issued paper currencies are still widely used and are resilient in the most developed countries, even in the age of the popularity of electronic payments, supposedly because of the “well-performed” function of making the anonymity of payments accessible (illegal aims, such as tax evasion are not excluded). Firstly, it offers anonymity - private transactions guarantee that cash’s users won’t get “profiled, discriminated against or blocked” (Goodell, 2021). Moreover, there is no intermediary involved in the cash payments as the only owner of the money is a central bank. That means there is much less risk of its default and a very low chance that the central bank will abuse its position of a custodian. In contrast, bank deposits are intrinsically custodial and require their owners to trade the advantages of cash for a more limited set of rights. This leads us to conclude that there are reasons why cash payments are still being used in some advanced countries even in the face of technological era - there is a strong argument of anonymity in the equation, which at the moment is offered only by cash payments.

Falling demand for cash in some advanced economies cannot be elevated against the fact that banknotes are still being widely used in the rest of the strong economies and vice versa. However, in the first case, fears that the economies will lose access to the advantages of paper money and won’t have access to it in any form forces us to think the scenario through in advance, while keeping in mind the possibility of developing a CBDC as a form of hedging such a risk. In the second case scenario, as the technologies in the payment sphere are vastly improving, CBDC seem to be an inevitable step towards the renewal and synthesis of the central bank approach to innovations as well as people’s sentiment towards a new and more sustainable

future in payments. In addition, if we presume that a central bank digital currency will be designed to give people the desired features, it is also expected to succeed and bring people in the realm of the payment system's innovations. It is crucial to mention that a CBDC is not designed to replace cash, rather both of the forms - the digital and the physical one - would be created to complement each other.

1.3 CBDC adaptation and sentiment

Šiaudinis (2019) has highlighted that the cash substitute should “provide an integrative solution that simultaneously satisfies the public demand for safe and efficient payments, safeguards private innovations, and ensures financial stability”. While the two latter points are significant to consider in the process of creating CBDC, it is equally crucial to thoroughly examine the factor of public demand as there is a scarcity of empirical data on how the general public perceives and discusses CBDC (Ngo et al., 2023). While being aware of the CBDC sentiment, it is important to segregate specific groups of factors that may influence the acceptance of CBDC:

1. User-specific factors:
 - a) Respondents' knowledge of CBDC;
 - b) Technological literacy.
2. Institution-related factors:
 - a) Government performance;
 - b) Trust in banks and in the central bank;
 - c) Involved entities.
3. Economics-related factors:
 - a) Inflation rate;
 - b) Economic inequality.

According to the findings of a survey conducted by Bijlsma et al. (2021), a notable portion of respondents (53%) lacked prior awareness of CBDC, while the remaining 46% possessed prior knowledge of it. Among those familiar with CBDC, there was a higher propensity to utilize the CBDC more extensively compared to individuals who had not heard of CBDC. Notably, respondents who had heard of CBDC expressed a greater intention to utilize the CBDC account more intensively than those who had never been exposed to information about it. Technological innovation is also significant in the acceptance of CBDC. Due to the increased

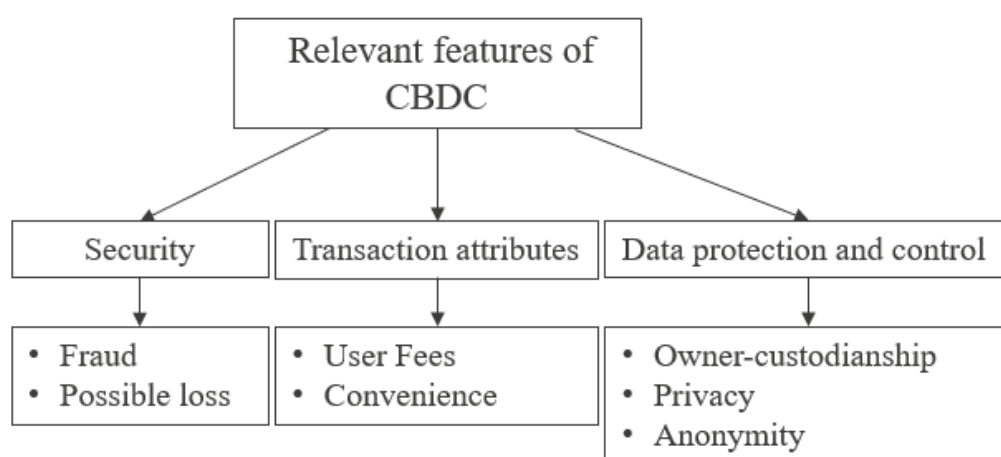
exposure to new technologies and innovations facilitated by internet usage, individuals with higher levels of technological and information literacy are more likely to readily understand and embrace CBDC as a technological innovation in payments sphere (Ngo, 2022). Institution related factors are also significant in CBDC acceptance. Auer et al. (2020) provide empirical evidence supporting the proposition that jurisdictions with higher levels of government effectiveness are more inclined to initiate CBDC projects. The support towards CBDC also stem from elevated levels of generalized trust, encompassing trust in fellow individuals, along with narrow-scope trust specifically directed towards the central bank, demonstrate a heightened likelihood of engaging in the opening of CBDC accounts. For institutions' efforts to propose a flexible and understandable currency to be successful in driving adoption, it is crucial for them to focus on building households' trust in the currency's system (Söilen & Benhayoun, 2021). After conducting expert and non-expert interviews Tronnier et al. (2023) found that the significance of institution involvement in the CBDC projects stems from privacy and security concerns, as survey respondents expressed a desire for sensitive transaction or product information to remain confidential from both family members and state agencies. In addition, income inequality which often stems from the lack of access to financial services is a big issue in emerging economies (Erlando et al., 2020). Consequently, governments in these countries are motivated to leverage innovative technologies like CBDC to enhance financial inclusion and narrow the income gap (Ngo et al., 2023).

In addition to external factors, several attributes of payment systems play a crucial role in the selection of a preferred payment method. (Figure 4). The security risks may concern people when choosing CBDC. According to Khiaonarong and Humphrey (2022), the possibility of fraud and losses of funds held in a form of CBDC could be prevented by „cash and tokenization, pin numbers, plus artificial intelligence for cards“. Moreover, while designing a new payment method, it is essential to take into account factors such as user fees and convenience. CBDC may have different fee solutions, including explicit user fees, free of charge CBDC usage, or even the possibility of interest payments. On the other hand, Khiaonarong and Humphrey state that the CBDC should not impose user fees, resembling the fee-free nature of cash, as it would encourage user incentives to rather opt for card-based payments. To add to the argument, Arifovic et al. (2017) have discovered that lower costs of a new payment method, or e-money which competes with cash and has lower costs than alternative payment methods attracts more users. It is also important to define the data protection and control surrounding the issuance of CBDC. If CBDC would be constructed to precisely resemble cash features, the aspect of privacy and anonymity should be taken into consideration. Certain CBDC transactions could be rendered

anonymous by implementing a restriction on the value of CBDC funds stored on a card or mobile phone for a specific subset of users. For ensuring privacy, Goodell et al (2021) offer to employ a „privacy-enhancing technology, such as blind signatures or zero-knowledge proofs“ while also implementing non-custodial wallets. Both of the design choices are one again backed by the cash resemblance factor: „Non-custodial wallets offer a way to preserve cash-like characteristics in digital transactions, and we have argued that the popularity of cryptocurrencies largely follows from the pursuit of privately held digital cash“.

Figure 4

Payment user incentive categories



Compiled using the information provided by Khiaonarong and Humphrey (2022); Goodell et al. (2021)

The mentioned factors, if taken into consideration while constructing the design, would lead to the alignment of preferences, positive sentiment of the payment method use and thus contribute to the success of the CBDC.

Sentiment can vary significantly among different age groups, income levels, educational backgrounds, and geographical regions. By not considering these diverse perspectives, there is a potential gap in understanding how CBDC sentiment varies across various segments of the population.

As cryptocurrency and CBDC are quite closely connected in terms of the innovations of the payment technology sphere, authors have previously analyzed the connections between the CBDC news and cryptocurrency market. Mzoughi et al. (2022) have implemented event study

methodology to investigate the Bitcoin price reaction to the news of launching Nigeria central bank digital currency (eNaira) and the Bahamas central bank digital currency (SANDdollar). The results showed that the intensity of reaction towards the issuance of the issuance of SANDdollar was stronger than to the eNaira. Also, through the analysis of cryptocurrency market reactions to central bank speeches Scharnowski (2022) have discovered that cryptocurrency prices exhibit a significant increase following speeches that convey a more positive stance towards CBDC. In addition, a general increase in volatility with a slight amplifying effect when CBDC sentiment is negative is noticed. These results suggest that CBDC is not perceived as a threat to cryptocurrency traders and a positive outlook on CBDCs is interpreted as a favorable signal for other forms of digital currencies.

To sum up, the sentiment towards a payment method might depend on user-specific, institution-related and economics-related factors. In case of CBDC, the most relevant features that include security, transaction attributes and data protection and control could significantly influence people's willingness to use CBDC as a payment method. In addition, several studies have found significant relations between CBDC and cryptocurrency market. That can indicate the interconnectedness of the two rather different digital currencies.

2. Methodology of the evaluation of CBDC sentiment

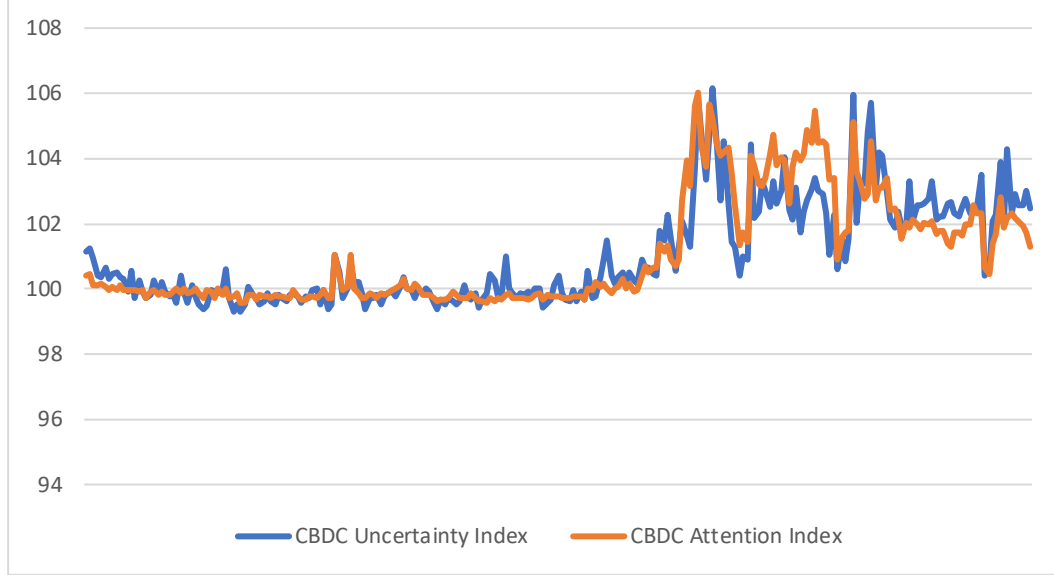
This study adopts an integrated research approach that combines survey analysis and vector autoregression (VAR) model to comprehensively examine the sentiment of CBDC. Given that CBDC initiatives are currently in the developmental stage across many countries, it becomes both challenging and essential to analyze the interconnections between CBDC sentiment and financial markets. In light of this, we employ CBDC sentiment indexes as a valuable tool to gain insights into the relationship between CBDC sentiment and the cryptocurrency market. By examining these interconnections, we aim to enhance our understanding of the potential impact of CBDC sentiment on the dynamics and behavior of the cryptocurrency market. However, understanding the diverse perspectives held by individuals regarding its implementation is equally crucial. By employing survey method, we aim to gather insights into the prevailing perceptions regarding the possible issuance of CBDC as well as determining factors that could improve current sentiment of public. Understanding the factors that influence individuals' willingness to use CBDCs can provide valuable insights for central banks and policymakers in designing effective CBDC frameworks. This integrated research method allows for a more holistic understanding of the current sentiment revolving around CBDC.

2.1 Methodology for VAR approach

One of the key challenges in studying CBDC sentiment is the limited availability of comprehensive CBDC-specific data. Since CBDC is a relatively new concept and is still being developed, there is not many sufficient empirical data to directly measure its sentiment. This limitation hampers traditional techniques that require specific CBDC-related variables. After recognizing this limitation, Wang et al. (2022) have created two indices that measure the uncertainty towards CBDC news (CBDCUI) as well as the attention index (CBDCAI). The indices are constructed by leveraging a comprehensive dataset of more than 660 million news articles obtained from the LexisNexis News & Business database and are considered as time series proxy for CBDC. These indices are directly linked to CBDC-related news and exhibit reactivity towards specific types of news, particularly those pertaining to uncertainty and garnering significant attention. The responsiveness of these indices can be observed through the volatilities (Figure 5), indicating their sensitivity to changes in the underlying news sentiment and market dynamics.

Figure 5

CBDCUI and CBDCAI



Compiled using the information provided by Wang et al. (2022)

In terms of data collection, the values of CBDC indices are accessed through the database of its creators which can be accessed through the corresponding research paper. The creators of the CBDC indices have compiled and organized the data within their database, making it available for further research purposes. Additionally, we obtain historical data for the CRIX, which represent the overall performance of cryptocurrencies. CRIX values are collected in the official page royalton-crix.com. The index was chosen following the suggestion for future research by Wang et al. (2022).

The data is analysed in two steps. Firstly, a correlation analysis is conducted to examine the relationship between the CBDC indices of uncertainty and attention and the CRIX indice. The correlation coefficients are calculated to measure the strength and direction of the relationships. This analysis will provide initial insights into the potential interconnections between CBDC sentiment and cryptocurrency market performance. Secondly, we employ time series analysis to explore the dynamic relationships between the CBDC indices and the CRIX. This involves vector autoregression (VAR) model. The model allows to assess the short-term and long-term relationships, identify lead-lag effects, and quantify the impact of CBDC sentiment on cryptocurrency market movements.

The VAR model can be defined by the formula $x_t = \mu + A_1x_{t-1} + \dots + A_px_{t-p} + w_t$, where x_t is a vector of endogenous variables at time t ; μ represents vector-valued series mean; A_1 and A_p are the coefficient matrices associated with the lagged values of the endogenous

variables, and w_t is a vector of error terms at time t . The VAR method implementation consists of the following steps:

1. Data preparation;
2. Stationarity test;
3. Lag adjustments. Variables in a time series often exhibit dependencies on their past values. By including lagged values of the variables in the model, we capture the temporal dynamics and allow for the analysis of how past values influence the current values. The choice of lag length in a VAR model is determined based on statistical criteria, such as information criteria like AIC (Akaike Information Criterion). Lag length selection aims to balance model complexity and goodness of fit, avoiding overfitting or underfitting the data;
4. Autocorrelation test;
5. Cointegration test.

The given steps will be implemented using a computer program RStudio.

2.2 Methodology for a survey approach

After recognizing a research gap due to the lack of information on the demand and general public sentiment for a central bank digital currency, which is currently mostly in a conceptual stage and is still yet to be implemented, we are conducting a survey targeted at Lithuanian people. The survey will be designed to capture the sentiment of consumers towards the usage of CBDC. It will include a series of questions related to their awareness, perception, and willingness to adopt CBDC (see Annex 1).

Purpose of the survey. The survey results will help to specify the current CBDC sentiment of Lithuanians and will be useful for providing offers regarding its attributes, the most effective sources of information that could help develop awareness around the topic as well as demographics of its potential users.

Sampling. The target demographic comprises adult consumers and internet users who are representative of the population. Sampling methods, such as random sampling or stratified sampling, will be considered to obtain a diverse and unbiased sample. The sample size will be determined based on statistical considerations to achieve an adequate level of confidence in the results.

Data collection. The survey responses are collected through various social media platforms such as LinkedIn and Facebook, as well as communication platforms including

Facebook Messenger, Telegram, and WhatsApp. To encourage a higher response rate, we offer a reward for participating in the survey. The survey is distributed during a 10 day period.

Presumptions. It is presumed that the majority of participants may have limited knowledge or understanding of CBDC, given its relatively new concept. Thus, the survey will include an informative section to provide basic explanations and definition of CBDC. Also, we presume that people's sentiment and perceptions regarding CBDC will depend on their gender, age and education.

Question groups. Based on the literature review, we have identified four groups of research questions that pertain to the sociodemographic characteristics of the respondents, awareness and willingness to use CBDC, the design of CBDC and its potential features that would be attractive for the people (Table 3). The respondent's sociodeographic data will be valuable in categorizing our participants into groups during the analysis stage. The second set of questions is designed to assess the pre-existing awareness of respondents regarding the concept of CBDC prior to their engagement with the questionnaire. However, irrespective of the present level of respondents' familiarity with CBDC, it remains crucial to examine their current inclination towards utilizing CBDC as a payment method, as it would suggest the sentiment revolving around it. I also inquire about the respondents' perceptions regarding the significance of CBDC's attributes such as remuneration and trust in depositing their funds into the CBDC.

Table 3

Research questions aimed to be answered by the survey data

	Question
1	What are the sociodemographics of the respondents?
2	What is the extent of awareness regarding the topic of CBDC?
3	What is the overall willingness to use CBDC as a payment method?
4	What CBDC features would be attractive to its potential users?

Compiled by the authors

Hypotheses:

- H2: The perceived benefits such as convenience, financial inclusion, and reduced transaction costs are important for people's sentiment towards CBDC.
- H3: Demographic factors, such as age, income level, and educational background, will have varying effects on consumers' sentiment towards CBDC.

Data analysis. Quantitative data collected from closed-ended questions will be analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations via statistical software SPSS Statistics. The findings will be presented using charts and tables to facilitate a comprehensive understanding of the survey results.

3. The results of CBDC sentiment research

3.1 Results of VAR analysis

Firstly, we ensure that the collected data is appropriately formatted for analysis. This involves performing data cleaning procedures, addressing missing values, and aligning the time periods across the CBDCUI, CBDCAI, and CRIX indices. The provided data for CBDCUI and CBDCAI indices is available at a frequency of every four days, whereas the CRIX index data is available on a daily basis, excluding weekends. To ensure consistency, we adjust the CRIX data to match the corresponding dates of the CBDC indices. Furthermore, it is important to note that the available data for the CRIX index spans from 2018 onwards, while the CBDCUI and CBDCAI values are provided until December 2022. Therefore, we align the data to the common time period from 2018 to December 2022 to ensure compatibility and facilitate accurate analysis.

Initially, we examine the correlation between the given variables (Table 4). The estimated sample correlation coefficient between CBDCUI and CRIX is 0.7558296, indicating a strong positive correlation. Similarly, the correlation coefficient between CBDCAI and CRIX is estimated to be 0.891658, further indicating a strong positive correlation. These positive coefficients imply that both CBDC indices are strongly positively correlated with the CRIX index, suggesting a significant association between the variables.

Table 4

Correlation analysis

	CBDCUI & CRIX	CBDCAI&CRIX
Pearson's product-moment correlation	0.7558296	0.891658
P-value	< 2.2e-16	< 2.2e-16

Compiled by the author

For iterpetation of p-value we formulate such hypothesis:

H0: The p-value is greater than or equal to the 95% significance level α .

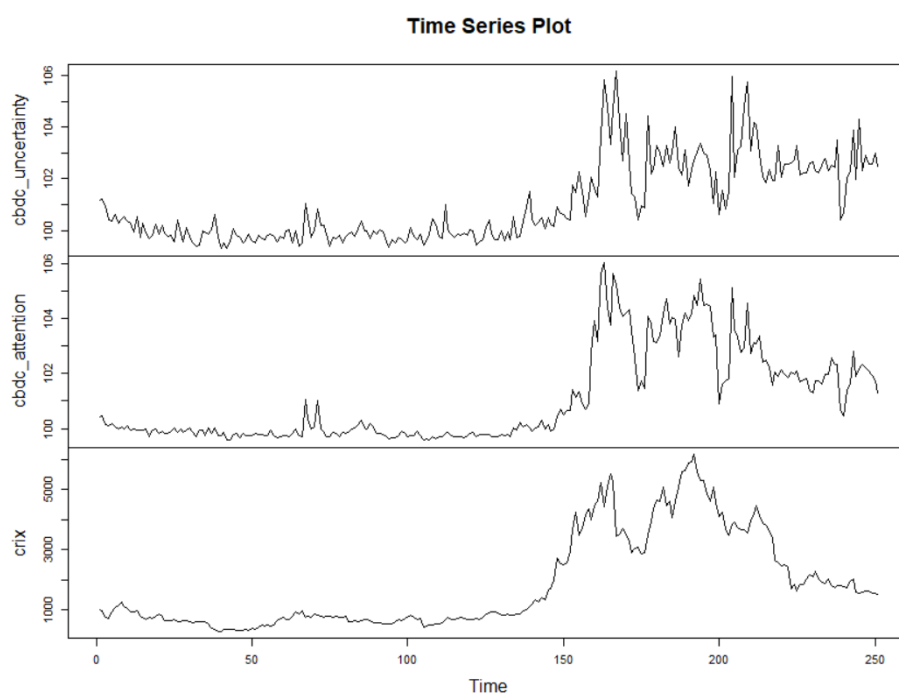
H1: The p-value is less than the 95% significance level α .

The p-value is less than $2.2e-16$, which is a smaller value than p-value of 0.05. This indicates strong evidence against the null hypothesis and suggests that the observed correlation is statistically significant.

Subsequently, we initiate the examination of data stationarity. Stationarity, in the context of time series analysis, refers to a property of data where statistical properties remain constant over time. More specifically, a time series is considered stationary when its mean, variance, and autocovariance structure do not exhibit significant changes or trends across different time periods. Upon initial observation, it appears that the time series variables exhibit non-stationarity (Figure 6).

Figure 6

Non-stationary variables



Compiled by the author

Nevertheless, we proceed to conduct the Augmented Dickey-Fuller (ADF) test to substantiate our findings quantitatively. Absolute values of t-statistic for all variables are smaller than the critical values, thus we cannot reject the null hypothesis of non-stationarity. Given the non-stationarity of the variables, we employ the process of differentiation.

Subsequently, lag selection is performed for the model using the Akaike Information Criterion (AIC). The lag with the lowest AIC score is considered an optional lag, which in this case was equal to 2.

Following the stationarity test and lag adjustments, we proceed to investigate autocorrelation through the implementation of the Portmanteau test. It is a statistical test used to assess the presence of autocorrelation in a time series model, such as a VAR (Vector Autoregression) model. In the given test result of p-value equal to 0.08777. The p-value is below a predetermined significance level (0.05). It suggests evidence to reject the null hypothesis in favor of the alternative hypothesis of the presence of autocorrelation. Hence, we apply autocorrelation-resistant standard errors, also known as heteroscedasticity and autocorrelation consistent (HAC) standard errors. It is a statistical technique used to estimate robust standard errors in the presence of autocorrelation and heteroscedasticity in the data. After applying the method, the repeatedly done Portmanteu test presented the the p-value of 0.147, which is is greater than the chosen significance level. Thus, there is not enough evidence to reject the null hypothesis of no autocorrelation in the residuals. This suggests that the model's residuals do not exhibit significant autocorrelation.

After that the Johansen test is employed as a statistical technique to examine the presence of cointegration among the variables in the analysis. Cointegration refers to a long-term relationship between non-stationary variables, implying that they move together in the long run, despite potentially exhibiting short-term deviations. The first hypothesis, denoted as $r=0$, examines the presence of cointegration (Table 5). It is evident that the test statistic, with a value of 208.28, significantly surpasses the critical value of 21.07 at the 5% level. This compelling evidence leads us to reject the null hypothesis, indicating the existence of cointegration among the variables. The second hypothesis tests for $r \leq 1$ against the alternative hypothesis of $r > 1$. Similar to the first test, the computed test statistic of 136.07 exceeds the critical value of 14.9 at the 5% level, providing strong evidence to reject the hypothesis of $r \leq 1$. This result further supports the presence of cointegration. Lastly, the final test examines the hypothesis of $r \leq 2$ against the alternative hypothesis of $r > 2$. Once again, the test statistic presents sufficient evidence to reject the null hypothesis, suggesting that $r \leq 2$ is not valid. In summary, all three tests yield robust evidence to reject their respective null hypotheses, confirming the presence of cointegration among the variables under investigation.

Table 5

Johansen test result

values of teststatistic and critical values of test:

	test	10pct	5pct	1pct
$r \leq 2$	87.69	6.50	8.18	11.65
$r \leq 1$	136.07	12.91	14.90	19.19
$r = 0$	208.28	18.90	21.07	25.75

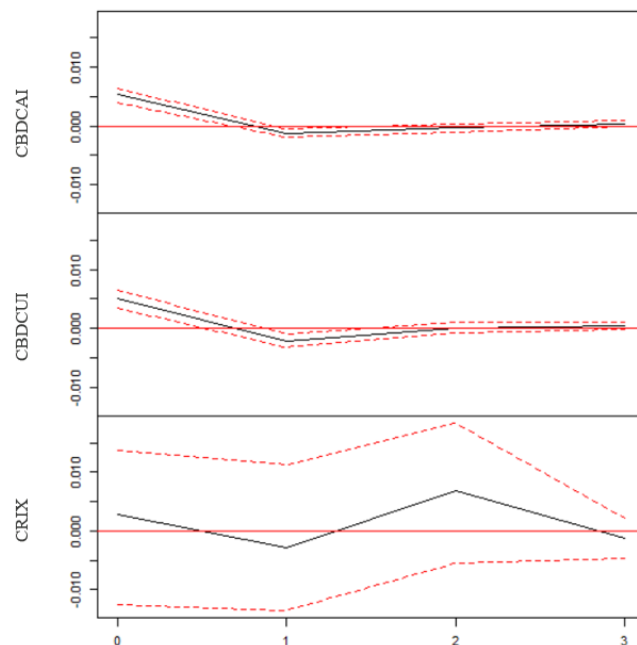
Compiled by the author

When the Johansen test indicates that CBDC Attention Index, CBDC Uncertainty Index, and CRIX Index are all cointegrated, it implies that there exists a long-term equilibrium relationship among these variables. Cointegration suggests that, although each variable may exhibit short-term fluctuations and deviations, they are bound together in the long run. In practical terms, this means that changes or shocks in one of these variables are expected to have a lasting impact on the other variables in the system. It indicates a sustained relationship and interdependencies among the CBDC Attention Index, CBDC Uncertainty Index, and CRIX Index, which are not adequately explained by short-term dynamics alone.

By recognizing the cointegration among these variables, it becomes possible to analyze and model their behavior in a longer term. Thus we model an Orthogonal Impulse Response for consecutive 3 years (Figure 7).

Figure 7

Orthogonal Impulse Response from CBDCAI



Compiled by the author

Based on the analysis, it is evident that the CBDC attention sentiment exerts a negative short-term impact on the CRIX index during the first year. However, as time progresses, this effect transitions to a positive impulse throughout the second and third years. Nevertheless, there is a possibility of a negative impulse emerging at the beginning of the fourth year. These findings suggest a dynamic relationship between CBDC attention sentiment and the CRIX index, where the nature and magnitude of the impact vary over time. The analysis does not emphasize the impulse of CBDC Attention Index (CBDCAI) on itself or its relationship with CBDC Uncertainty Index (CBDCUI) due to their close association.

3.2 Survey data results

According to countrysmeters.info, the population of Lithuania accounts to 2 801,000 people in Lithuania, of which 1 819,731 people are between 15 and 64 years old. The target population are people from 18 years old, however, we use the provided data for the lack of only-adult data in Lithuania. Given the confidence level of 95% and margin of error 5,72%, the estimated appropriate sample size is 293 people, which is the total number of respondents who participated in our survey. In order to assess the distribution of our population, we select a mean (μ) value of 0 and a standard deviation (σ) value of 1, resulting in a normal distribution. The groups were selected in a manner of randomness to ensure that none of the answers would be answered with bias. Since the questionnaire required respondents to answer all of the questions in order to complete it, there were no instances of unanswered questions. Therefore, no adjustments or modifications to the data were necessary in this sense.

Regarding the socio-demographic characteristics of the respondents (Table 6), the gender distribution indicates that 37.2% of the participants were males, while females accounted for the majority with 62.8%. In terms of age groups, the highest proportion of respondents, 77.5%, fell within the 18-29 age range, followed by 14.3% in the 30-39 age group. The remaining 8.2% of participants were in the 40-69 age range. It is noteworthy that no respondents were aged 60-69 or above 70, indicating an absence of participation from older age groups. In terms of educational attainment, a significant portion of the respondents, 70%, held university degrees. Approximately 22% had completed secondary education, while 7.9% possessed primary, technical, or senior secondary education.

Table 6.

Socio-demographic characteristics

Characteristics		Frequency	Percent
Gender	Male	109	37.2
	Female	184	62.8
Age	18 - 29 years	227	77.5
	30 - 39 years	42	14.3
	40 - 49 years	13	4.4
	50 - 59 years	11	3.8
	60 - 69 years	0	0.0
	≥ 70 years	0	0.0
Education	Primary	9	3.1
	Secondary	65	22.2
	Senior secondary	12	4.1
	Technical	2	0.7
	University degree	205	70

Compiled by the author

The participants rated the importance of various payment method features on a Likert scale (Table 7). An analysis of the data revealed significant gender differences in the perceived importance of certain features. Specifically, women rated anonymity and safety as significantly more important compared to men (p -value < 0.001 and 0.02 , respectively). Notably, anonymity had the largest standard deviation, indicating greater variability in responses for this feature with a value of 1.3 . On the other hand, features such as an attractive interface, user-friendly payment process, low tax rate for transactions, and payment transfer speed were deemed equally important by both genders. These features were rated with mean values ranging from 4.3 to 4.6 , indicating their overall significance in the participants' evaluations. Interestingly, it was found that females placed statistically greater importance on the absence of restrictions on money quantity. This finding suggests the financially responsible nature of women in valuing the freedom of unrestricted transactions. Overall, these results provide valuable insights into the differing preferences and priorities of men and women regarding payment method features, particularly highlighting the significance of anonymity and safety to women and the shared importance of user-friendly features among both genders.

Table 7

Evaluation of general preferences in terms of payment methods (M - mean and SD - Standard deviation) depending on the gender

Preferences in terms of payment methods	Gender	M	SN	Mean Ranks	p
Anonymity	Male	3.3	1.3	122.80	< 0.001
	Female			161.34	
Safety	Male	4.8	0.6	137.78	0.02
	Female			152.46	
Attractive app interface	Male	3.4	1.0	150.63	0.56
	Female			144.85	
User-friendly payment process	Male	4.6	0.7	138.38	0.11
	Female			152.11	
Low tax rate for transactions	Male	4.5	1.0	149.93	0.58
	Female			145.27	
Payment transfer speed	Male	4.3	0.9	150.89	0.50
	Female			144.69	
No restrictions on the money quantity	Male	3.7	1.1	130.97	0.01
	Female			156.50	

Compiled by the author

Moreover, additional insights regarding the importance of payment method features among different age groups were revealed (Table 8). Specifically, individuals aged 40-49 years old rated anonymity as significantly less important compared to other age groups (p-value = 0.01). Similarly, the same age group attached greater significance to the feature of low tax rates for transactions (p-value = 0.002). The heightened significance of low tax rates for transactions suggests that older individuals may be more conscientious about their financial responsibilities and consider tax implications in their payment method choices. In contrast, individuals in other age groups, particularly those of working age, may not perceive taxes as a significant factor when evaluating payment methods. This divergence in priorities between age groups underscores the influence of life stage and financial considerations on the perceived importance of payment method features.

Table 8

Evaluation of general preferences in terms of payment methods (M - mean and SD - Standard deviation) depending on the age

Preferences in terms of payment methods	Age	M	SN	Mean Ranks	p
Anonymity	18 - 29 years	3.3	1.3	148.94	0.01
	30 - 39 years			160.00	
	40 - 49 years			74.92	
	50 - 59 years			142.45	
Safety	18 - 29 years	4.8	0.6	145.37	0.19
	30 - 39 years			161.74	
	40 - 49 years			131.46	
	50 - 59 years			142.68	
Attractive app interface	18 - 29 years	3.4	1.0	152.47	0.07
	30 - 39 years			140.19	
	40 - 49 years			104.65	
	50 - 59 years			110.23	
User-friendly payment process	18 - 29 years	4.6	0.7	147.29	0.06
	30 - 39 years			163.98	
	40 - 49 years			113.88	
	50 - 59 years			115.27	
Low tax rate for transactions	18 - 29 years	4.5	1.0	153.46	0.002
	30 - 39 years			138.36	
	40 - 49 years			88.15	
	50 - 59 years			116.14	
Payment transfer speed	18 - 29 years	4.3	0.9	151.45	0.18
	30 - 39 years			140.12	
	40 - 49 years			120.04	
	50 - 59 years			113.36	
No restrictions on the money quantity	18 - 29 years	3.7	1.1	149.87	0.69
	30 - 39 years			138.29	
	40 - 49 years			141.88	
	50 - 59 years			127.14	

Compiled by the author

Additionally, participants who had obtained primary and senior secondary education considered anonymity as an important factor, with mean ranks of 170.22 and 170.17, respectively (Table 9). In contrast, those with secondary education attributed less importance to anonymity, as reflected by a lower mean rank of 105.98. Furthermore, safety emerged as the most important feature for individuals with technical education, while remaining significantly important for those with university degrees. Participants with technical education showed little concern for an attractive app interface, as indicated by their low mean rank of 7.5. In contrast, individuals in other educational groups placed greater importance on having an attractive interface, with mean ranks ranging from 122 and higher.

Table 9

Evaluation of general preferences in terms of payment methods (M - mean and SD - Standard deviation) depending on the education.

Preferences	Education	M	SN	Mean Ranks	p
Anonymity	Primary	3.3	1.3	170.22	< 0.001
	Secondary			105.98	
	Senior secondary			170.17	
	Technical			123.00	
	University degree			157.87	
Safety	Primary	4.8	0.6	121.17	0.02
	Secondary			136.50	
	Senior secondary			118.08	
	Technical			168.50	
	University degree			152.95	
Attractive app interface	Primary	3.4	1.0	136.44	0.004
	Secondary			122.39	
	Senior secondary			137.92	
	Technical			7.50	
	University degree			157.16	
User-friendly payment process	Primary	4.6	0.7	132.56	0.25
	Secondary			136.26	
	Senior secondary			122.25	
	Technical			199.00	
	University degree			151.98	
Low tax rate for transactions	Secondary	4.5	1.0	177.39	0.06
	Senior secondary			159.70	
	Technical			164.75	
	University degree			64.50	
Payment transfer speed	Secondary	4.3	0.9	141.40	0.08
	Senior secondary			118.56	
	Technical			168.51	
	University degree			142.58	
No restrictions on the money quantity	Secondary	3.7	1.1	91.00	0.49
	Senior secondary			142.23	
	Technical			143.39	
	University degree			142.79	

Compiled by the author

It is important to mention that prior to the survey, a significant portion of the respondents (51%), had not heard of CBDC. Furthermore, a higher percentage of males, specifically 70.6%, reported being aware of CBDC prior to the survey compared to women (Table 10). In terms of age groups, respondents in the 30-39 and 50-59 age ranges showed higher levels of awareness regarding CBDC, with approximately 70% and 72% respectively, compared to other age groups. Interestingly, there were no notable differences among the education groups in terms of awareness of CBDC.

Table 10

Hearing of CBDC prior to this survey depending on the gender, age and education.

Characteristics		Yes		No		p
		Frequency	Percent	Frequency	Percent	
Gender	Male	77	70.6	32	29.4	< 0.001
	Female	71	38.6	113	61.4	
Age	18 - 29 years	106	46.7	121	53.3	0.02
	30 - 39 years	29	69.0	13	31.0	
	40 - 49 years	5	38.5	8	61.5	
	50 - 59 years	8	72.7	3	27.3	
Education	Primary	5	55.6	4	44.4	0.19
	Secondary	28	43.1	37	56.9	
	Senior secondary	4	33.3	8	66.7	
	Technical	0	0.0	2	100.0	
	University degree	111	54.1	94	45.9	

Compiled by the author

The general understanding of CBDC is mostly rated on a level of understanding the basic concept, but most of the respondent's struggle to understand it. 50% of people say that they do not understand the concept of CBDC, 25% do, and the remaining 25% have no opinion. The result is not quite shocking taking into account that half of the people have not been aware of the existence of CBDC. Significantly more males understand the concept of CBDC than women (mean rank of 177.01 compared to 129.22) (Table 11). Also, people of ages 30-39 and 50-59 understand the concept better than the rest of the respondents. Surprisingly, people with primary education as well as university degrees understand the concept best. The overall score of understanding CBDC is equal to 2.5, which means that the concept of CBDC is not easy to comprehend. This is not surprising as a large count of countries are in the research stages of CBDC and thus do not educate people on the matter with much intensity.

Table 11

Evaluation of personal understanding of the CBDC concept (M - mean and SD - Standard deviation) depending on the gender, age and education

Characteristics	Education	M	SN	Mean Ranks	p
Gender	Male	2.5	1.2	177.01	< 0.001
	Female			129.22	
Age	18 - 29 years			139.2	0.01
	30 - 39 years			177.12	
	40 - 49 years			150.19	
	50 - 59 years			189.09	
Education	Primary			158.67	< 0.001
	Secondary			107.85	
	Senior secondary			123.17	
	Technical			41.00	
	University degree			161.33	

Compiled by the author

People overall are quite willing to use CBDC with the mean value being 3.1 from scale where 1 equals “I would never use it“ and 5 equals to “I would love to use it“ (Table 12) . However, there is a notable proportion of respondents who have not yet made a decision, as 48% remain undecided. On the other hand, 22% of respondents express a lack of interest in using CBDC for payments. When examining the age groups, individuals in the 30-39 year range demonstrate the highest level of interest in using CBDC as a means of payment. In contrast, respondents in the 40-49 age group appear to be less enthusiastic about CBDC adoption.

Table 12

Evaluation of personal willingness to use CBDC (M - mean and SD - Standard deviation) depending on the gender, age and education.

Characteristics	Education	M	SN	Mean Ranks	p
Gender	Male	3.1	1.0	150.47	0.56
	Female			144.95	
Age	18 - 29 years			142.51	0.04
	30 - 39 years			176.75	
	40 - 49 years			121.73	
	50 - 59 years			155.91	
Education	Primary			125.56	0.20
	Secondary			148.92	
	Senior secondary			119.75	
	Technical			41.00	
	University degree			149.96	

Compiled by the author

Talking about the reasons that would increase people's interest in CBDC, all of the features were listed at least as somewhat important (Table 13). However, there are some noteworthy gender differences in preference. Females tend to place a higher emphasis on the ability to use CBDC offline, with a higher mean rank compared to males. Additionally, the female group expresses a greater desire for the ability to use CBDC by card. Interestingly, while the factor of private sector involvement in CBDC creation is generally considered the least important among respondents, women value the idea of CBDC being created without the help of the private sector more than men do.

Table 13

Evaluation of the reasons which would increase interest to use CBDC (M - mean and SD - Standard deviation) depending on the gender.

Reasons	Gender	M	SN	Mean Ranks	p
Lower fees for money transfers	Male	4.1	1.0	157.57	0.08
	Female			140.74	
Faster payment transfers. especially abroad	Male	4.0	1.0	156.67	0.11
	Female			141.27	
Earning interest for holding CBDC	Male	4.1	1.0	147.82	0.89
	Female			146.52	
Ability to use CBDC offline	Male	3.9	1.1	130.51	0.007
	Female			156.77	
User-friendly interface	Male	4.1	1.0	141.93	0.40
	Female			150.00	
Ability to hold an unlimited amount of money in CBDC account	Male	3.8	1.1	136.52	0.09
	Female			153.21	
Ability to pay with card	Male	4.2	0.9	127.35	0.001
	Female			158.64	
Ability to pay with phone	Male	4.1	1.2	137.67	0.12
	Female			152.53	
Private sector's involvement in CBDC creation and implementation	Male	3.3	1.1	141.68	0.39
	Female			150.15	
Public sector's creation and implementation of CBDC without intermediaries	Male	3.0	1.1	129.83	0.005
	Female			157.17	

Compiled by the author

Apparently, among the older age groups, particularly those aged 40-49, the ability to use CBDC offline and make payments using a phone were considered the least important features (Table X). Similarly, the involvement of the private sector in the creation of CBDC was also

deemed less important for this age group. Additionally, respondents aged 50-59 expressed that the public sector's creation of CBDC without the involvement of the private sector was not significant.

Table 14

Evaluation of the reasons which would increase interest to use CBDC (M - mean and SD - Standard deviation) depending on the age.

Reasons	Gender	M	SN	Mean Ranks	p
Lower fees for money transfers	18 - 29 years	4.1	1.0	153.43	0.06
	30 - 39 years			127.85	
	40 - 49 years			110.54	
	50 - 59 years			130.50	
Faster payment transfers. especially abroad	18 - 29 years	4.0	1.0	150.58	0.50
	30 - 39 years			138.15	
	40 - 49 years			122.92	
	50 - 59 years			135.27	
Earning interest for holding CBDC	18 - 29 years	4.1	1.0	149.23	0.27
	30 - 39 years			152.43	
	40 - 49 years			116.62	
	50 - 59 years			116.18	
Ability to use CBDC offline	18 - 29 years	3.9	1.1	151.17	0.004
	30 - 39 years			154.44	
	40 - 49 years			72.85	
	50 - 59 years			120.27	
User-friendly interface	18 - 29 years	4.1	1.0	149.19	0.10
	30 - 39 years			156.79	
	40 - 49 years			109.77	
	50 - 59 years			108.55	
Ability to hold an unlimited amount of money in CBDC account	18 - 29 years	3.8	1.1	152.04	0.26
	30 - 39 years			131.11	
	40 - 49 years			121.38	
	50 - 59 years			133.95	
Ability to pay with card	18 - 29 years	4.2	0.9	150.83	0.23
	30 - 39 years			140.77	
	40 - 49 years			106.92	
	50 - 59 years			139.09	

Continuation of Table 14

Ability to pay with phone	18 - 29 years	4.1	1.2	149.84	0.004
	30 - 39 years			162.17	
	40 - 49 years			82.58	
	50 - 59 years			106.59	
Private sector's involvement in CBDC creation and implementation	18 - 29 years	3.3	1.1	155.34	0.005
	30 - 39 years			127.52	
	40 - 49 years			90.69	
	50 - 59 years			115.82	
Public sector's creation and implementation of CBDC without intermediaries	18 - 29 years	3.0	1.1	158.3	< 0.001
	30 - 39 years			110.98	
	40 - 49 years			126.88	
	50 - 59 years			75.05	

Compiled by the author

The survey results indicate that individuals with technical and primary education expressed the least enthusiasm regarding the ability to use CBDC offline (Table 15). Furthermore, respondents with senior secondary education displayed significantly less interest in using CBDC for payments with a card. Additionally, individuals with technical education did not consider the ability to pay with a phone as an important factor.

Table 15

Evaluation of the reasons which would increase interest to use CBDC (M - mean and SD - Standard deviation) depending on the education.

Reasons	Gender	M	SN	Mean Ranks	p
Lower fees for money transfers	Primary	4.1	1.0	144.72	0.51
	Secondary			153.46	
	Senior secondary			111.75	
	Technical			110.50	
	University degree			147.47	
Faster payment transfers. especially abroad	Primary	4.0	1.0	137.72	0.87
	Secondary			151.59	
	Senior secondary			126.25	
	Technical			130.00	
	University degree			147.33	

Continuation of Table 15

Earning interest for holding CBDC	Primary	4.1	1.0	128.44	0.76
	Secondary			147.75	
	Senior secondary			125.33	
	Technical			119.00	
	University degree			149.12	
Ability to use CBDC offline	Primary	3.9	1.1	85.83	0.01
	Secondary			161.83	
	Senior secondary			127.33	
	Technical			23.00	
	University degree			147.34	
User-friendly interface	Primary	4.1	1.0	176.83	0.68
	Secondary			153.24	
	Senior secondary			143.75	
	Technical			116.50	
	University degree			144.20	
Ability to hold an unlimited amount of money in CBDC account	Primary	3.8	1.1	112.44	0.39
	Secondary			147.41	
	Senior secondary			112.83	
	Technical			153.00	
	University degree			150.33	
Ability to pay with card	Primary	4.2	0.9	137.39	0.007
	Secondary			166.95	
	Senior secondary			79.33	
	Technical			107.00	
	University degree			145.45	
Ability to pay with phone	Primary	4.1	1.2	123.83	0.03
	Secondary			162.82	
	Senior secondary			109.17	
	Technical			24.50	
	University degree			146.41	
Private sector's involvement in CBDC creation and implementation	Primary	3.3	1.1	126.11	0.10
	Secondary			161.39	
	Senior secondary			114.50	
	Technical			42.00	
	University degree			146.28	
Public sector's creation and implementation of CBDC without intermediaries	Primary	3.0	1.1	117.17	0.18
	Secondary			162.18	

Continuation of Table 15

	Senior secondary			141.83	
	Technical			56.50	
	University degree			144.68	

Compiled by the author

To summarise, the provided findings from a survey explored preferences and attitudes towards payment methods and CBDC adoption across different age groups, education levels, and gender. The results indicate nuanced preferences among these demographic factors. Payment features such as anonymity, low tax rates, safety, and app interface attractiveness are differently perceived by several groups. Males in the 30-39 and 50-59 age groups display higher awareness of CBDC, while women and other age groups exhibit lower awareness. Enhanced education and awareness initiatives are recommended to improve public understanding of CBDC. Gender differences influence preferences regarding CBDC features, and older individuals may have less interest in offline usage and mobile transactions. Educational background also influences interest in CBDC usage, with varying perspectives across technical, primary, and senior secondary education levels. The survey suggests a moderate level of willingness to use CBDC among individuals in the 30-39 age group. However, overall, the sentiment of the respondents towards CBDC creation is rather positive.

Conclusions and recommendations

The definition of central bank digital currency (CBDC) is subject to debate, however, after synthesizing perspectives from institutions and researchers, it can be defined as a government-backed, cash-like currency of digital nature. Many central banks are researching CBDC, with a focus on retail CBDC. Some countries have already issued official CBDC, and Lithuania is seen as a favorable environment for further implementation. Moreover, the incentive of CBDC creation is related to the emergence of cryptocurrency and the fear of the potential that cashless societies will emerge. As cryptocurrencies have no intrinsic value, no consumer protection and are questioned for their lack of security, it becomes a more important problems that central banks are in consideration of. Interestingly, studies have found connections between CBDC and the cryptocurrency market, suggesting an interconnectedness between these different digital currencies. In addition, the demand for cash varies across economies, with some advanced economies seeing a decline while others continue to rely on banknotes. In either case, developing a CBDC can serve as a hedge against the risks associated with the potential loss of access to paper money or as a step towards embracing technological advancements in payments. The sentiment towards CBDC as a payment method is influenced by user-specific, institution-related, and economic factors. Security, transaction attributes, data protection, and control are important features that can influence people's willingness to use CBDC. Understanding CBDC involves clarifying its definition, monitoring central bank research and implementation efforts, considering the future of cash and cryptocurrency, embracing technological advancements, and recognizing the factors that influence people's perception and adoption of CBDC as a payment method.

For conducting a CBDC sentiment analysis, our objective is to examine the relationship between CBDC sentiment and the cryptocurrency market, as well as to elucidate the perception of Lithuanians towards CBDC. To achieve this, we employ an integrated research approach consisting of two components: firstly, calculating interconnections between CBDC sentiment-related indices using a VAR model, and secondly, conducting a survey and analyzing the data collected from individuals in Lithuania. The analysis is performed utilizing RStudio and SPSS softwares.

The results of the research has shown that there is evident interconnection between CBDC sentiment and cryptocurrency market. This observation yields valuable insights into the capacity of CBDC sentiment to impact cryptocurrency prices. The survey suggests a moderate level of willingness to use CBDC among individuals in the 30-39 age group. However, overall, the sentiment of the respondents towards CBDC creation is rather positive. Among the respondents, half reported having heard about this form of payment. Interestingly, an equal number of participants indicated a lack of comprehension regarding the concept of CBDC and remained undecided about their future usage of digital currencies issued by central banks as a means of payment. Males in the 30-39 and 50-59 age groups display higher awareness of CBDC, while women and other age groups exhibit lower awareness. Gender differences influence preferences regarding CBDC features, and older individuals may have less interest in offline usage and mobile transactions. Educational background also influences interest in CBDC usage, with varying perspectives across technical, primary, and senior secondary education levels. To attract users, the new digital currency should prioritize essential features such as security and the convenience of payment options through mobile devices or cards. Designing a CBDC that incorporates these desirable attributes could distinguish it from other payment methods. Considering that the success of CBDC upon its release hinges on the population's willingness to embrace it, it is crucial to prioritize public education on this subject. Such efforts will foster informed decision-making, prevent misconceptions, and promote a clearer understanding of the CBDC concept. These findings provide valuable insights for policymakers and developers to design CBDC systems that cater to the diverse needs and preferences of potential users.

In future studies, it would be beneficial to employ sampling quotas to ensure greater representativeness and enable a comprehensive analysis of the factors underlying individuals' reluctance to adopt CBDC. Additionally, as the survey of this research paper was aimed at Lithuanians, it also would be undoubtedly beneficial to understand the CBDC sentiment of citizens from other countries.

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Santrauka

CBDC SENTIMENTO VERTINIMAS

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Ekonomika

Vilniaus Universitetas, Ekonomikos ir Verslo Administravimo Fakultetas

Darbo vadovė – Alfreda Šapkauskienė

Vilnius, 2023

44 lapai, 7 paveikslai, 17 lentelių, 45 šaltiniai.

Pagrindinis šio akademinio darbo tikslas buvo, remiantis literatūros analize, taip pat taikant integruotą vektorinės autoregresijos (VAR) modelio tyrimo metodą ir apklausos duomenų analizę, įvertinti CBDC sentimentą. Darbą sudaro trys pagrindinės dalys: literatūros analizė, tyrimas ir jo rezultatai, išvados ir rekomendacijos.

Literatūros analizė atlikta siekiant apžvelgti pagrindines CBDC sąvokas, šios valiutos kūrimo eigą, privalumus ir pagrindines paskatas CBDC integruoti kaip naują mokėjimo būdą, taip pat nurodyti veiksniai, kurie turėtų įtakos CBDC sentimentui.

Atlikusi literatūros analizę, autorė išnagrinėjo CBDC sentimentą įtakos kriptovaliutų rinkai mastą ir dabartinį lietuvių požiūrį į CBDC. Pirmoje kiekybinės analizės dalyje CBDC sentimentą ir kriptovaliutų rinkos tarpusavio priklausomybę buvo įvertinta naudojant VAR modelį. Antroje dalyje buvo atlikta kiekybinė apklausa, kurioje Lietuvos piliečiai atsakė į klausimyną apie dabartinį jų suvokimą apie CBDC. Tyrimas atskleidė, kad CBDC sentimentas gali sukelti pokyčius kriptovaliutų rinkoje ir lietuviai domisi CBDC kaip potencialiu atsiskaitymo būdu.

Išvados ir rekomendacijose apibendrinamos pagrindinės literatūros analizės sąvokos bei atlikto tyrimo rezultatai. Autorė mano, kad tyrimo rezultatai yra naudingos gairės politikos formuotojams kuriant CBDC sistemas, kurios patenkintų potencialių vartotojų poreikius.

Summary

THE ASSESMENT OF CBDC SENTIMENT

IEVA TURSKYTĖ

Bachelor Thesis

Economics programme

Faculty of Economics and Business Administration of Vilnius University

Supervisor – assoc. prof. Alfreda Šapkauskienė

Vilnius, 2023

44 pages, 7 pictures, 15 tables, 45 references.

The main aim of this academic work was to evaluate a CBDC sentiment on the basis of the literature analysis as well as conducting an integrated research approach of Vector Autoregression (VAR) model and survey data analysis. The academic paper consists of three main parts: the analysis of literature, the research and its results, conclusions and recommendations.

The literature analysis was carried out to review the main concepts of CBDC, the progress of its creation, also the advantages and main incentives for integrating it as a new payment method, as well as to indicate the factors that would influence the sentiment towards it.

Having conducted the literature analysis, the author examined the extent of CBDC's sentiment influence to cryptocurrency market and the current sentiment of Lithuanians towards CBDC. In the first part of quantitative analysis, the interdependency between CBDC sentiment and the cryptocurrency market was estimated using a VAR model. In the second part a quantitative research survey was carried out where the citizens responded to the questionnaire regarding their current perception of CBDC. The research revealed that the CBDC sentiment can cause changes in the cryptocurrency market and Lithuanians are interested in using CBDC as a payment method.

The conclusions and recommendations summarize the main concepts of literature analysis as well as the results of the performed research. The author believes that the results of the study could serve as useful guidelines for policymakers to design CBDC systems that cater to the diverse needs and preferences of potential users.

Annexes

Annex 1 – survey questions

- 1) What are your general preferences in terms of payment methods? (1-least important; 5 - most important)
 1. Anonymity
 2. Safety
 3. Attractive app interface
 4. User-friendly payment process
 5. Low tax rate for transactions
 6. Payment transfer speed
 7. No restrictions on the money quantity

- 2) Have you heard of CBDC prior to this survey?
 1. Yes
 2. No

- 3) How would you evaluate your understanding of the CBDC concept?
 1. I don't understand it at all
 2. –
 3. –
 4. I understand it very well

und

- 4) How would you define your willingness to use CBDC?
 1. I would never use it
 2. –
 3. –
 4. –
 5. I would love to use it

wil

- 5) What would increase your interest to use CBDC?
 1. Lower fees for money transfers
 2. Faster payment transfers, especially abroad
 3. Earning interest for holding CBDC
 4. Ability to use CBDC offline
 5. User-friendly interface
 6. Ability to hold an unlimited amount of money in CBDC account
 7. Ability to pay with card
 8. Ability to pay with phone

9. Private sector's involvement in CBDC creation and implementation
10. Public sector's creation and implementation of CBDC without intermediaries

6) What is your gender?

1. Male
2. Female

7) What is your age?

1. 18-29
2. 30-39
3. 40-49
4. 50-59
5. 60-69
6. 70 and older

8) What is your education?

1. Primary
2. Secondary
3. Senior secondary
4. Technical
5. University degree